Lohmeyer

Air Quality | Climate
Aerodynamics | Environmental Software

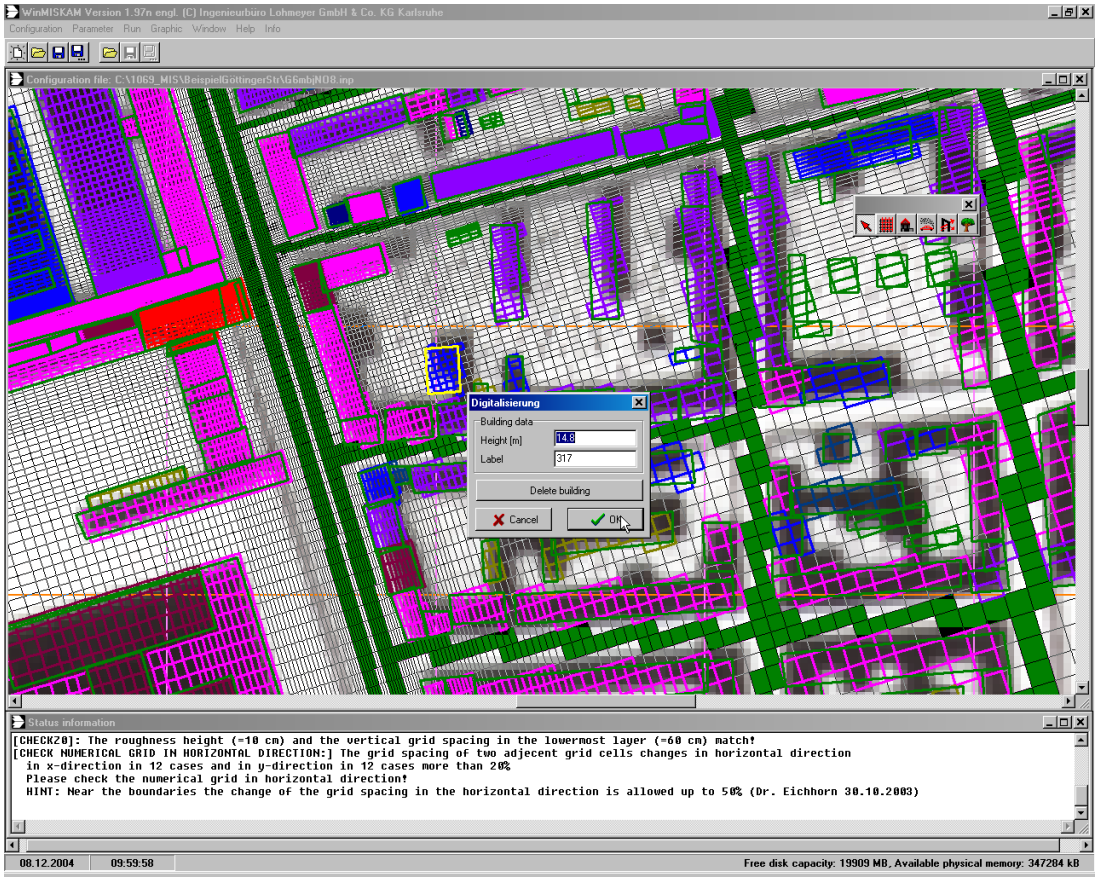
Version: 2021-11-16

WinMISKAM

... Miskam© for Windows

Manual

for version 2018.5.6 or later



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Johannes-Gutenberg- University, Mainz, Germany

Contents

Main Changes in the Program versions

Changes in WinMISKAM and MISKAM program versions.

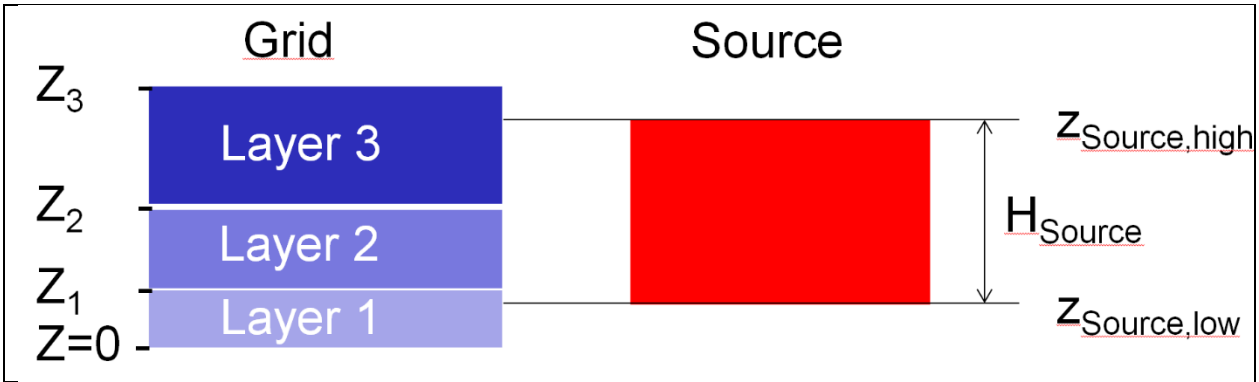
WinMISKAM

Changes in WinMISKAM program version 2019.6.1 compared to WinMISKAM program version 2018.5.6.

- MISKAM Version 6.42 (64bit, 10/22/2021) can be used.
- MISKAM Version 6.3 (July 29, 2014) can only be used as a 64-bit version.
- WinMISKAM add-on module interface MISKAM wind and turbulence fields for AUSTAL: Austal2000 replaced by AUSTAL 3
- Licensing possible with a new CodeMeter dongle
- Shape export function:
  - for PM10 and NOx additional column PM10_ExCnt or NO2_ExCnt (number of exceedances)
  - additional columns "u" and "v" for wind fields
- Calculation of statistical parameters: Additional option to save and load settings (* .skwcfg)
- When calculating single points, the point name is written to the SKW file
- Internal adjustments / corrections

Changes in WinMISKAM program version 2018.5.6 compared to WinMISKAM program version 2017.5.4.

- WinMISKAM extension module **"**Line sources"
  - Line sources are mapped on the MISKAM computational grid in flow through areas (e.g. tunnels) as well.
  - All vertical layers which are cutted by volume emissions are assigned by a weighted fraction of the emissions, cf. example in **Fig. 0.1**. **Important hint: If the lower and/or upper height of the emission source does not match the heights of the layers of the numerical grid of MISKAM, the current method gives another vertical source distribution and thus a different pollutant concentration distribution compared to the previous method. The total amount of pollutants emitted, however, is unaffected.**



Proportion of the emissions at cutted layers	
Method in WinMISKAM program version 2018.5.6	**Current method**
Layer 1: Proportion: z_1-$z_{Quelle,unten}$ / H_{Quelle}	*Layer 1: Proportion: 1 / 3*
Layer 2: Proportion: z_2-z_1 / H_{Quelle}	*Layer 2: Proportion: 1 / 3*
Layer 3: Proportion: $z_{Quelle,oben} - z_2$ / H_{Quelle}	*Layer 3: Proportion: 1 / 3*

Fig. 0.1: Example for the mapping of sources on the numerical grid of MISKAM in the actual version of WinMISKAM extension module "Line sources"

Changes in WinMISKAM program version 2017.5.4 compared to WinMISKAM program version 2016.5.3

- Shape export: new option "Screen area", new option "no rotation", settings "Load" and "Save" (indexes)
- Maximum number of cpu cores to be used is increased to 36
- Complete integration of RosePlot (representing, editing and importing meteorological time series)
- Import of meteorological time series in uSonic3 format (dat)
- Internal changes / corrections

Changes in WinMISKAM program version 2016.5.3 compared to WinMISKAM program version 2014.5.

- Calculate statistical values: Extrapolation of measured wind velocity to reference height = 100 m) using **logarithmic wind profile**. Previous method (= power law) can be used futhermore.
- The anemometer position may be **in the computational domain of MISKAM**.
- In addition to Gauss Krueger reference coordinates **UTM reference coordinates** may be used.
- **Calculation of the mean speed** in horizontal sections in the MISKAM computational domain.

Changes in WinMISKAM program version **2014.5** compared to WinMISKAM program version 2012.

- **MISKAM version 6.3** (08.11.2013) is usable.
- **MISKAM version 6.3 64bit** (08.11.2013) is usable.
- 3D visualization of building structures in horizontal sections.

Changes in WinMISKAM program version **2012.4** compared to WinMISKAM program version 2011.

- Implementation of NO_X-NO_2 CONVERSION according to Duering et al. (2011).

- Generalization of **Grid generation in vertical direction.** According to the grid generation procedure in horizontal direction, the vertical grid can be generated containing equidistant and non-equidistant sub-zones.

Changes in WinMISKAM program version **2011.4** compared to WinMISKAM program version 2010.

- **MISKAM version 6.1** (12.11.2011) is usable.[1]
- **Grid generation in horizontal direction** has been generalized: A grid can be generated which consists of several equidistant and non-equidistant zones.
- Source location and source strength (if not time dependent) can be **imported** from a AUSTAL2000.txt file.

Changes in WinMISKAM program version **2010.2.9** compared to program version 2008.2.3:

- **MISKAM version 6.00** (15.02.2010) is usable.
- **Multicore capabilities** for MISKAM calculations when usig the menue items "Run | MISKAM runs for several wind directions ..." and “Run | Batch mode ...“ in conjunction with selection of "MISKAM runs for several wind directions". The number of PC kernels can be selected according to the available hardware. The maximum number of PC kernels is limited by 16.
- Check of road nets for double road segments and road segments shorter than 1 cm.
- Content of “Status information” dialog is stored in the program subdirectory LOG. The actual date and time is added to the log file name.

MISKAM

Changes in MISKAM 6.42 (16.11.2021) compared to MISKAM 6.3 (26.11.2020):

- For the side inflow profile, a roughness length can be selected that is no longer limited by the selected vertical calculation grid, but results from the respective specific requirements, e.g. 2 m for a consistently urban character.
- The turbulent Schmidt number has been adjusted. This results in very small differences in the concentrations compared to MISKAM 6.3. This adjustment does not affect the current. This means that the validation protocol for MISKAM 6.4 continues to apply.

Changes from MISKAM 6.4 (26.01.2020) compared to MISKAM 6.3 (08.11.2013):

- Setting of the turbulence closure changed, the default is Kato Launder closure. Kato-Launder-Lopez (standard setting in MISKAM 6.3) can still be selected with the parameter value 'el'.
- Creation of the validation protocol in accordance with guideline VDI 3783 Part 9 (2017).

Changes in MISKAM 6.3 (08.11.2013) compared to MISKAM 6.1 (27.02.2011):

- time-step for turbulence model may even be sub-divided into four steps
- instabilities which rarely occurred connected to very high grid resolutions eliminated
- Improved advection calculation by optional use of McCormack scheme for velocity components and MPDATA algorithm for all scalar quantities

Changes in MISKAM 6.1 (12.11.2011) compared to MISKAM 6.1 (27.02.2011):

- Removal of bugs in the vegetation model
- Removal of bugs when reading „old“ INP files which contains only ground level and wall roughness length (and no roof roughness length).

[1] **Important hint**: ZWU, ZWK-files of MISKAM version 6.1 can **not** be read by WinMISKAM 2010 and older WinMISKAM versions.

Changes in MISKAM 6.1 (27.02.2011) compared to MISKAM 6.0 (15.02.2010):

- Different values for roof and wall roughness length can be set.

Changes in MISKAM 6.0 (15.02.2010) compared to MISKAM 5.02 (7.03.2007):

- Momentum advection is optionally tread with the MacCormack scheme, advection of turbulence with the MPDATA scheme.
- Removal of bugs in the turbulence model
- Removal of bugs in the lateral boundary condition formulation of the dispersion model.
- Revisions in order to reduce computing time.

Introduction

The program WinMISKAM is a combination of a user-friendly interface (Ingenieurbüro Lohmeyer GmbH & Co. KG) and the computational program MISKAM (Dr. Eichhorn, University of Mainz). MISKAM (Microscale climatic and dispersion model) is a three-dimensional non-hydrostatic flow and dispersion model for microscale prediction of wind distributions and concentrations in urban areas. The simulation of building influence and other barriers on the flow properties is made possible by rectangular block structures.

The user-friendly interface of WinMISKAM generates the necessary files for the calculations and provides the visual implementation of buildings and sources as well as the definition of the computational grid on screen. The digitized data is transferred by WinMISKAM into the computational grid. WinMISKAM allows the computation of single cases as well as the automated batch processing of multiple cases. A computation of statistical values on the basis of given wind statistics result in the calculated concentration fields. A homogeneous background concentration or the background concentration caused by road networks calculated with the program PROKAS can be taken into consideration.

The functions of the program WinMISKAM are described in this manual. Please use the hotline (+49) 721 62510 0 for further questions concerning WinMISKAM. The newest manual is published on the internet under http://www.lohmeyer.de/software. Dr. Eichhorn can be addressed for questions concerning the model MISKAM.

Installation

The program WinMISKAM is developed for the operating systems Windows XP or 7, 8 and 10.

Please insert the WINMISKAM CD into the drive and run the installer "setup.exe". Follow the instructions on the screen. We recommend to maintain the proposed installation directory "C:\LOHMEYER\WINMISKAM". To start WinMISKAM, double click the appropriate icon.

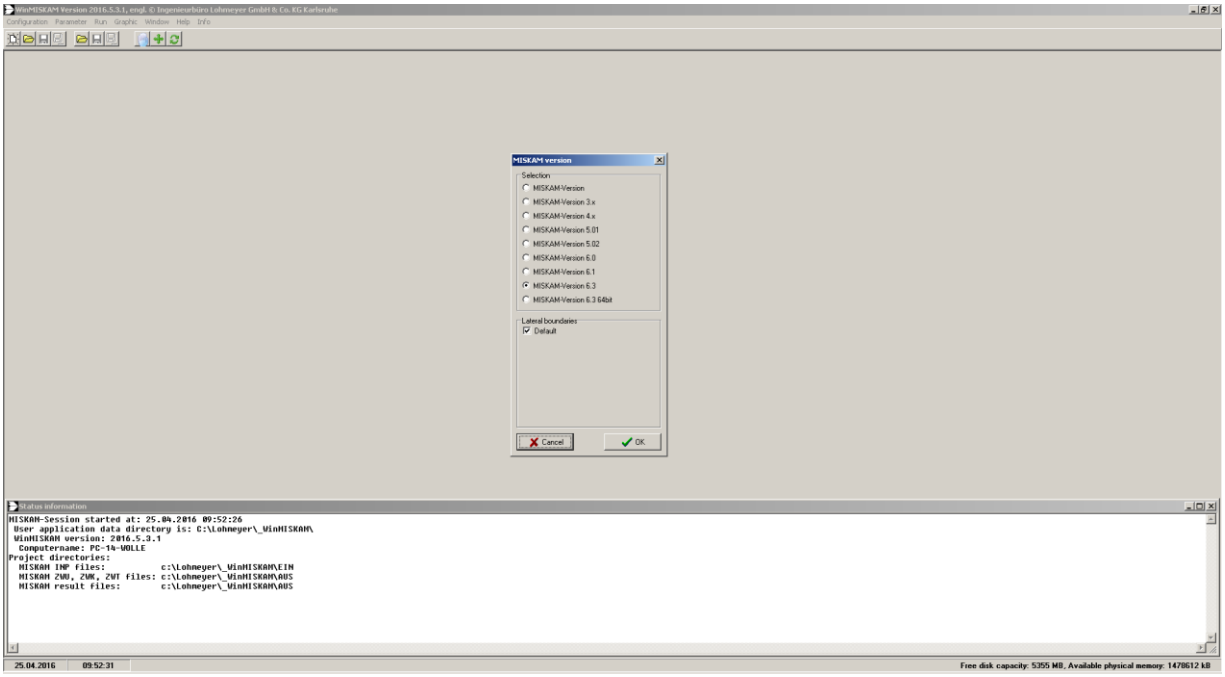


Fig. 0.1: Starting window of WinMISKAM

The program WinMISKAM is available as a single license and is provided with a key, a so-called "hard key" or "dongle". This device must be plugged into a USB-port. Please execute the program “Sentinel Protection Installer 7.6.3.exe” or a later version on the WinMISKAM CD in the folder *Dongle device driver* to install the Dongle driver. You need administrator access in order to successfully install the Dongle driver on your computer.
The device has to be plugged in while working on a project.

Prefaces

The description of the program WinMISKAM is built up according to the menu options and the workflow of a new project. The contents and formats of the needed starting files are described by sample data. Sample files are created in the subdirectory “[CommonApplicationDataDir[2]]\\Lohmeyer\WinMISKAM\EIN” and/or “[CommonApplicationDataDir]\Lohmeyer\WinMISKAM\AUS” on the hard disk by the installation program.
Contrary to old WinMISKAM versions, computations can also be made in other directories. More details are given in chapter **0**. However, the subdirectories EIN and AUS are still mandatory, since intermediate results are stored there.
The following files with the corresponding file extensions are needed or created by MISKAM:

Files with the extension	Input/Output	Content
*.inp	Input	Grid definition, configuration of buildings, definition of sources. **Central input file**
*.ini	Input	Control parameter of a MISKAM run
*.zwu	Output	Wind field (binary)
*.zwt	Output	Turbulence field (binary)
*.zwk	Output	Concentration field (binary)
*.uvw	Output	Wind field (Ascii)
*.tur	Output	Turbulence field (Ascii)

[2] [CommonApplicationDataDir] is computer and operation system dependent. In general on WINDOWS XP the directory [CommonApplicationDataDir] is „C:\Documents and Settings\All Users\Application data“.

*.kon	Output	Concentration field (Ascii)
*.prs	Output	Protocol file for MISKAM flow computation
*.pra	Output	Protocol file for MISKAM dispersion computation

Table 0.1: Input and output files of MISKAM

Files with the following extensions will be additionally needed or created by WinMISKAM:

Files with the extension	Input/Output	Content
*.wnd	Input	Wind statistics (only for the computation of statistical values)
*.par	Input	Parameter file for the computation of statistical values concerning turbulences produced by traffic.
*.egx	Input	Variation over time of emission files for the computation of statistic values concerning traffic.
*.bln	Input/Output	Building mapping file, which can be either produced by WinMISKAM or provided to WinMISKAM
***.STR, *.DTV, *.SD3**	Input/Output	Traffic or emission files for roads, which can be either produced by WinMISKAM or provided to WinMISKAM. Usable with line source module
*.skw	Output	Statistical value (annual average and percentile value) file
*.pkt	Output	Is generated while computing the statistical values and contains the centers of all lower boxes
*.ezw	Output	single value file, which can optionally be activated for the computation of statistical values and is the interface for PROKAS
*.psg	Output	Mapping file
*.ref	Output	Internal file
*.log	Output	Allocation file between file name and wind direction (used for the computation of statistical values)
*.lut	Input/Output	Scaling values and colors of the legend needed for the graphics
*.bxr	Input/Output	Grid definition and digitized buildings
*.lst	Input	List of ini-files which are computed sequentially

Table 0.2: Input and output files of WinMISKAM

Configuration

In order to work on a project in WinMISKAM, a configuration file has to be newly created or an existing one has to be loaded. Most of the menu options are not available without a configuration file. A configuration file is created or changed in the menu option *Configuration*. The submenus associated to the menu option *Configuration* are explained in the following section.

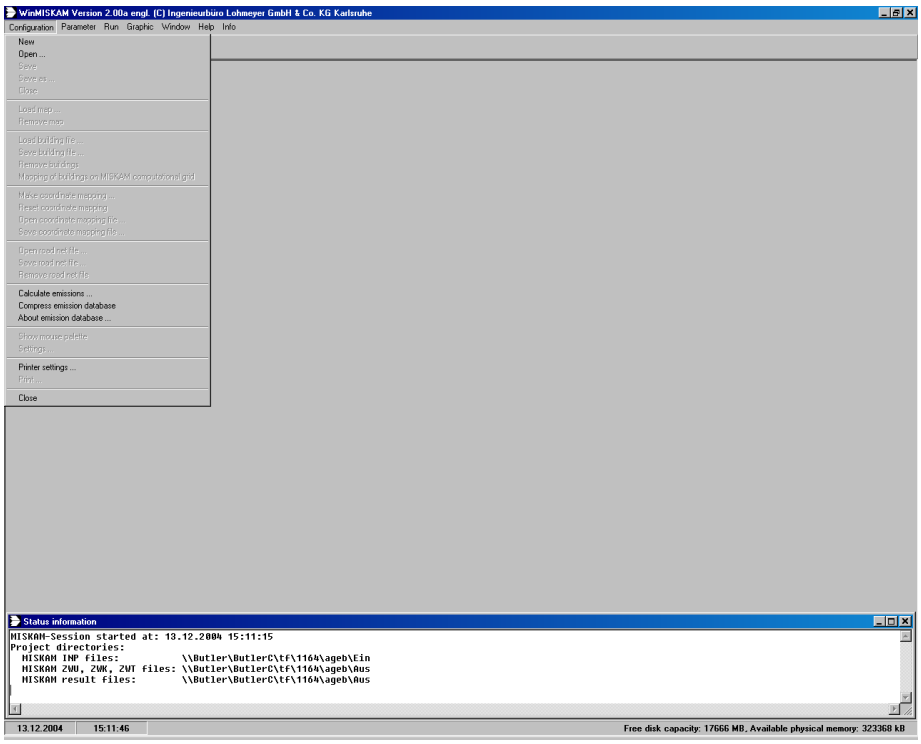


Fig. 0.1: Starting window of WinMISKAM with the menu option Configuration

Menu option New, Creating a configuration file

A new computational grid is created with the menu option *New*. It is important for the domain definition that the number of grid cells in the x-, y- and z- direction is not set arbitrarily high, in order to avoid exceeding the available RAM of the computer during the use of a MISKAM-version with dynamic memory allocation (from version MISKAM-4x) is running. The consequence would be a drastic increase of calculation times.

It should be noted that at the moment only 32 bit versions of MISKAM are available. Therefore MISKAM can only handle cases where the memory requirement is less than 2 GBytes[3].

[3] Even if your PC has more RAM

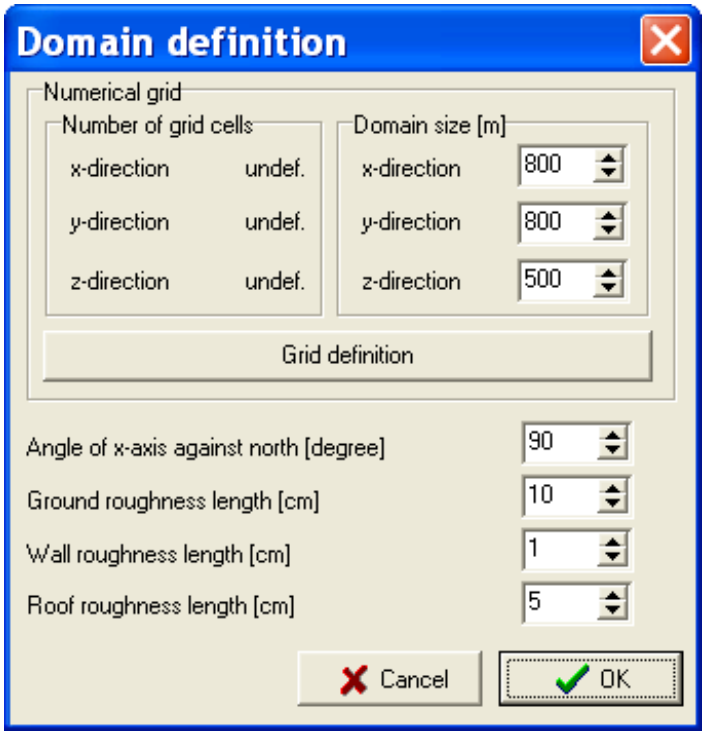
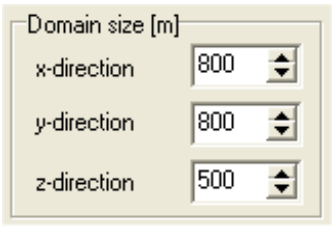


Fig. 0.2: Definition of the Computational grid

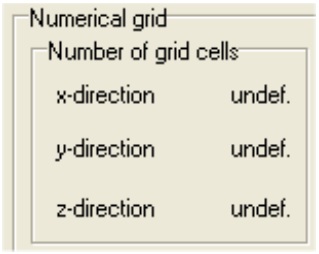
Horizontal grid



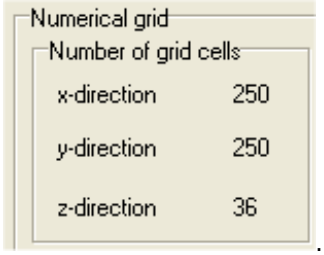
The entries for *Domain size* give the maximum extent in meters in each direction for the initial grid.

After pressing the button

the dialog *Grid definition in horizontal direction* (cf. Cap. 0) is shown. With this dialog the grid in the horizontal and vertical direction (grid size, number of grid points) is defined. After editing this dialog instead of

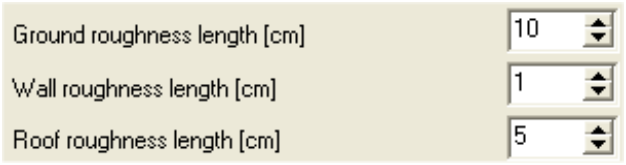


the number of grid points is shown[4].



[4] This is just an example.

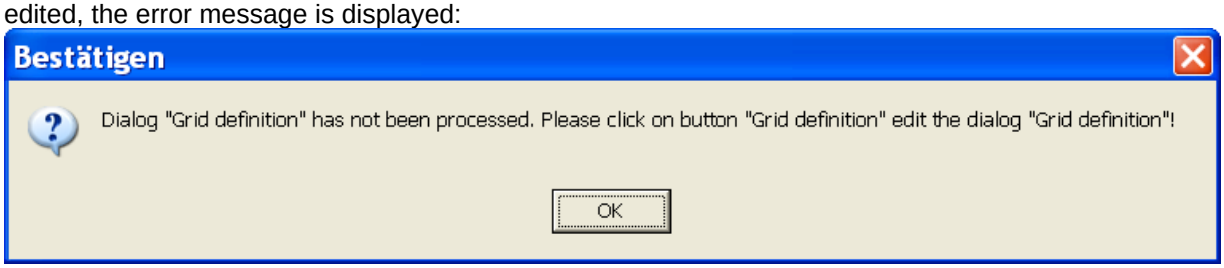
The orientation of the computational grid is variable. It can be changed by turning *the angle of x-axis against north* in steps of one degree.



The values for ground, wall and roof roughness length have to be set from a technical point of view. References are given in the MISKAM manual. The values for roughness in this window will imply the application of a unique roughness for all ground boxes and boxes with buildings.

The value for the ground roughness length is usually **not** the value found in the literature for build up areas. In this context a value for the ground roughness length should be chosen that describes the ground roughness within the modeling domain **without the buildings explicitly modeled with MISKAM**[5].

After entering the desired values the dialog is closed by clicking on the OK button. If the button *Grid definition* has not been clicked and therefore dialog *Grid definition in horizontal direction* has not been edited, the error message is displayed:



The Dialog Grid definition

The dialog *Grid definition* (initially) looks like:

[5] See guideline VDI 3783/13 (VDI (2010), end of chapter 4.9.2, page 28: „Buildings that are explicitly considered in the dispersion calculation […] shall not be included in the determination of the mean roughness length...)

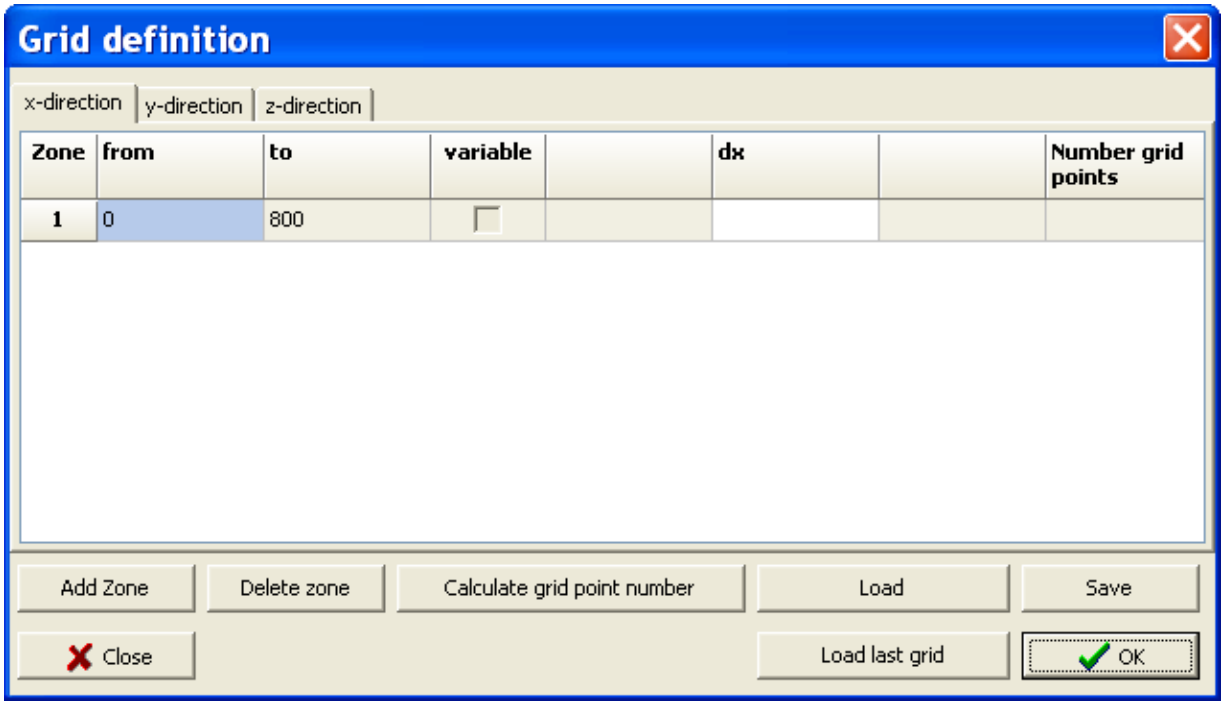
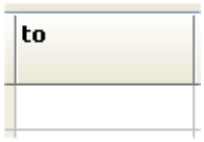


Fig. 0.3: Dialog Grid definition[6]

With the help of this dialog *Grid definition*, a grid can be generated that consists of several equidistant and non-equidistant sub-zones. For non-equidistant sub-zones of the maximum spreading factor of 1.2 is maintained. A maximum grid size can be specified to limit the grid size of the computational grid.

Meaning of the elements of the dialog *Grid definition*

The meaning of dialog elements is described below only for the x-direction. The same applies to the y- and z-direction.

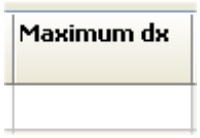


End of each subzone in meters (relative coordinates, i.e. the start of zone 1 is always 0 m and all information relates thereto). Enter only possible if two or more subzones will be defined.

Checked: Appropriate subzone has non-equidistant grid.

Not checked: corresponding subzone has equidistant grid.

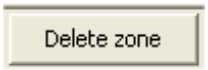
Grid size in meters (if grid should be defined only from one subzone) and minimum grid size in meters at the end of the zone (if grid should be defined from two or more subzones).



Maximum allowable grid size in meters. Input only possible if two or more subzones and "variable" is checked.

[6] The value “800” in Fig. 0.3 in column “to” and row “Zone 1” is an example. It is copied from the dialog Domain definition, panel “Domain size” and input field “x-direction”.

Pressing this button will add a further subzone.



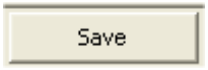
Pressing this button will delete the last subzone.

Pressing this button displays the total number of grid points, for example:

Number of grid points in x- and y-direction: Nx = 58, Ny = 58

and for each subzone and direction in space, for example:

Number grid points
9
40
9



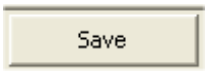
Grid definition can be saved under a freely selectable file name.

Saved grid definition is loaded.

Dialog is closed. Adjustments or changes are not accepted.

Settings or changes are checked for consistency. If no errors are found, the settings are accepted and the dialog is closed.

<u>Caution</u>: The settings the dialog grid definition in horizontal direction will be lost after closing WinMISKAM. Should the settings will become available again later, the settings must be saved, see button

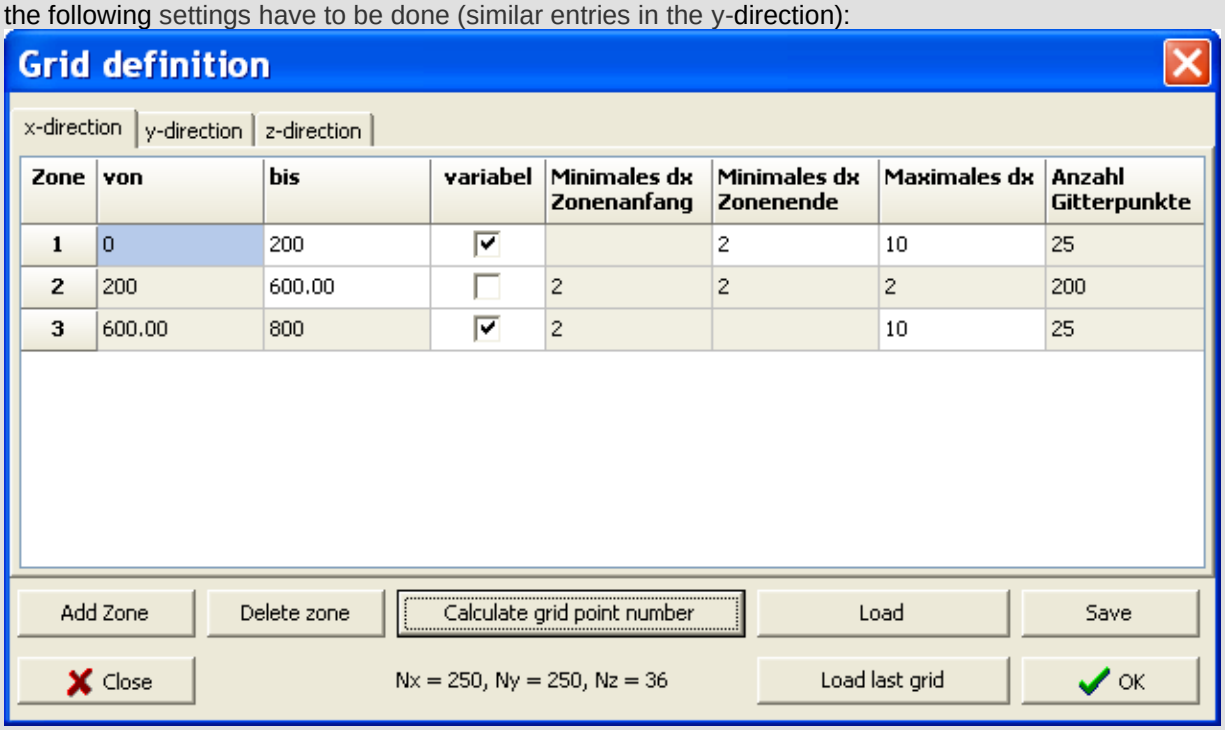


For reasons of continuity for 2 or more sub-zones yields:

- The value of "to" is equal to the value "from" of the following zone.
- The value of "Minimum dx end" is equal to the value "Minimum dx start" of the following zone.

For more than two subzones, not the first or last subzone and a subzone with constant grid size (i.e. "variable" not checked) all input fields related to the grid size specification are disabled. In this case, all three grid size specifications are the same, i.e. "Minimum dx start" = "Minimum dx end" = "Maximum dx". The value of "Minimum dx start" is derived from "Minimum dx end" of the zone above.

Example: Generating a grid with 3 zones with constant mesh size of 2 m in x-and y-direction in a 400 m wide inner zone. Outside of that inner zone the grid size should increase by a factor of 1.2 without a maximum limit. Domain size is 800 m.
To generate this grid in the dialog *Domain definition,* in the input fields *Domain size, x-and y-direction*, the value 400 meters has to be entered. In addition in the dialog *Grid definition in horizontal direction*, the following settings have to be done (similar entries in the y-direction):



If parameters have been chosen as shown above a grid with 250 cells in x- and y-direction will be generated. The automatically generated grid looks like this:

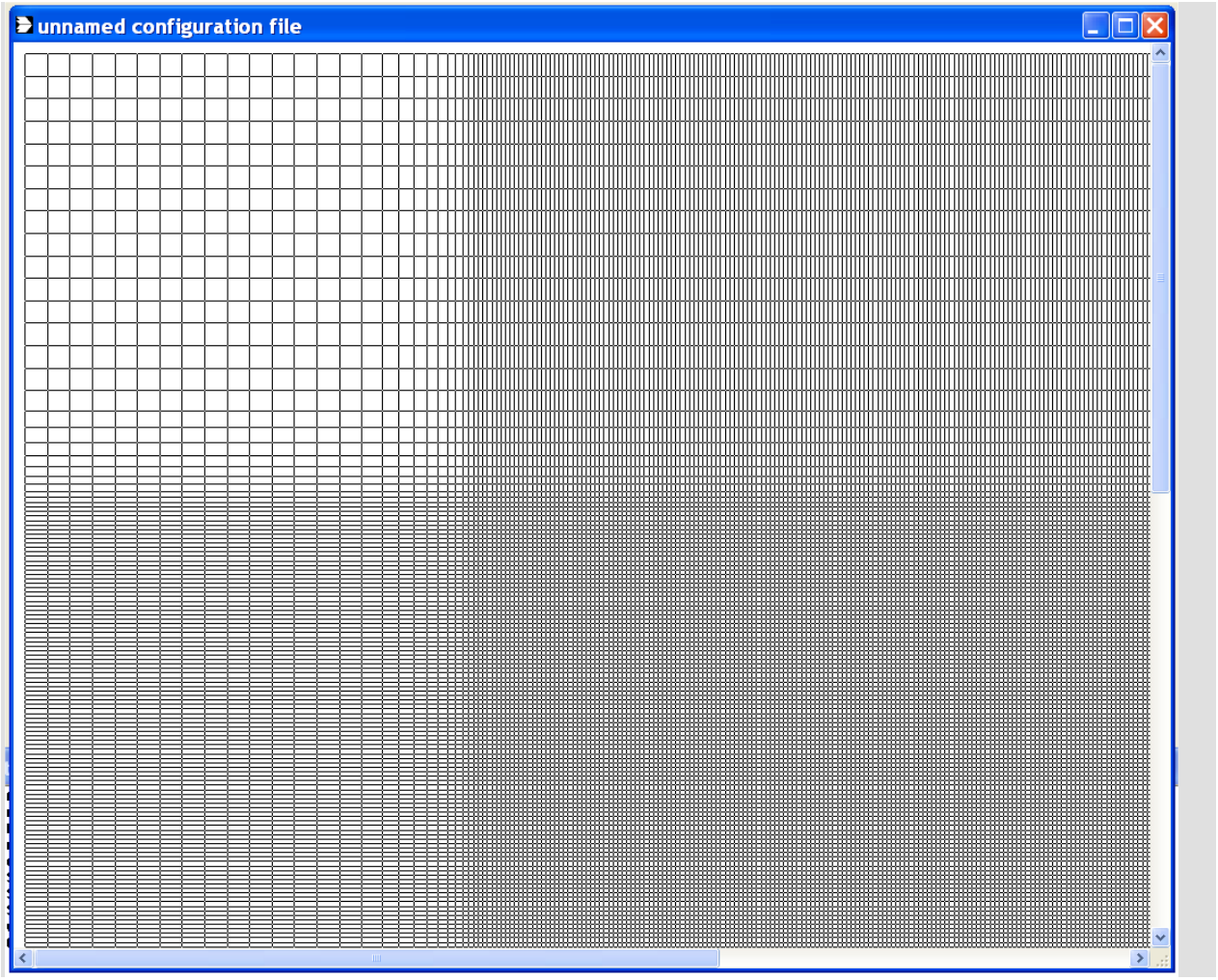


Fig. 0.4: Example for the automatically generated grid with the help of the dialog Grid definition (only a quarter of the computational domain is shown)

A window with a toolbox[7] will pop up simultaneously. This can be helpful amongst others for moving and adjusting the grid to the specifications of the project. The functions of the toolbox are described in chapter 0.

Fig. 0.5: Toolbox for changes in the computational grid

Switching between graphical and numerical mode

The file “[Name].INP” is the central input file of MISKAM. The numerical contents of this ASCII file may be viewed by double clicking on the computational grid with the left mouse button. The content of this file can only be viewed. No changes to entries can be done in this mode. If necessary, the file “[Name].INP” has to be opened in an editor for this purpose.

Enlarging or zooming in the graphical mode

A variable zoom function within the grid is activated by keeping the left mouse button pressed while drawing the zoom box on the grid. Zooming can be done multiple times until the limits of the zoom are

[7] When a tool is activated the mouse pointer is associated with a specific function.

reached. The zoom can be reset only to the total view; partial zooming out is not possible. See chapter 0 for resetting the zoom.

Popup menu

The following popup menu appears when pushing the *right mouse button*.

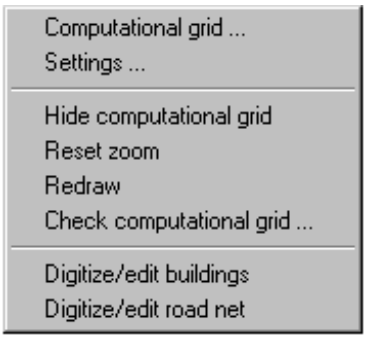


Fig. 0.6: Content of the Popup menu

Function Computational grid

The function *Computational grid* in the popup menu will open a window for changes in the settings of the initial computational grid.

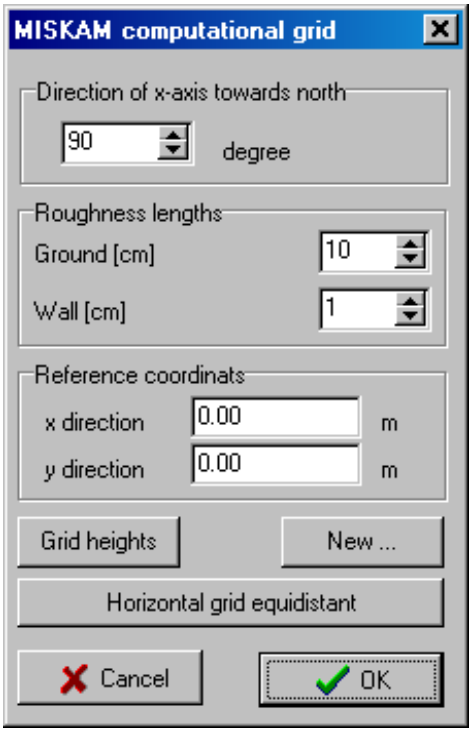


Fig. 0.7: Dialog MISKAM computational grid

The field *Direction of the x-axis towards north* will adjust the computational grid in order to fit an existing map or plan. The average ground and wall roughness of the domain can also be set. Reference coordinates can be set for the lower left corner of the computational grid in order to adjust the grid to the map. The origin of the computational grid is moved via these values.

Button Grid height

The height or z-value of a grid cell is changed through the button *Grid height*. The following window will show up after pressing the *Grid heights* button.

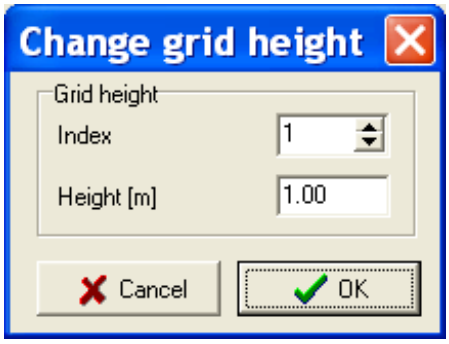


Fig. 0.8: Dialog Change grid height

Index refers to the desired vertical layer above the model's lower edge. Height refers to the height in meters above ground or above the model's lower edge of the corresponding upper edge of the vertical layer. If the values for the height are out of range, an error message will appear on screen. All the changes are accepted with OK. The next vertical layer can be treated accordingly by opening the window once more.

Button New

The initial values can be corrected with the button *New* in the window *MISKAM computational grid*. This will always generate an equidistant grid. User-defined values for horizontal and vertical mesh widths will be undone.

Button horizontal grid equidistant

Clicking on the button *Horizontal grid equidistant* will produce a grid with a uniform mesh in the horizontal direction.

Function Settings

The function *Settings* in the popup menu determines the screen presentation. These are general settings such as font, emission color, line width of emissions or the font size for polygon names of buildings and roads. This function is described in detail in chapter **0**

Function Hide computational grid/ Show computational grid

The grid lines on screen will disappear through the function *Hide computational grid.* Then, only orientation lines will show up in a distance of 100 m in the x- and y-direction. Activating the popup menu once more allows to reset the grid lines to visible using the function *Show computational grid*.

Function Hide reference grid/ Show reference grid

The reference lines on screen will disappear through the function *Hide reference grid.* Activating the popup menu once more allows to reset the reference lines to visible using the function *Show reference grid*. This will show up lines in the distance of 100 m in the x- and y-direction.

Function Reset zoom

The function *Reset zoom* in the popup menu causes an adjustment of the total computational grid to the window size of the *Configuration file*.

Function Redraw

If the graphics on screen do not look any longer as expected after several manipulations, the function *Redraw* in the popup menu can help. For instance, if the zoom mode is changed, the old display may remain. The function *Redraw* eliminates all polygon trails on screen.

Function Check computational grid

The function *Check computational grid* in the popup menu will check the grid spacing in horizontal direction of the opened *Configuration file* “[Name].inp”. If this function is called a message text is written in the status window.

Function Digitize/ edit buildings

The function *Digitize / edit buildings* in the popup window activates the digitization mode for buildings. Buildings can be digitized as polygons in this mode by clicking on the corners of the building with the *left mouse button* while keeping the *CTRL key* pressed. The polygon must have at least three corners and is closed automatically by releasing the CTRL key. A window will pop up with a suggested name for the building and the height of its upper edge. They can be corrected according to the project. Then, a new building can be worked on. The digitization mode for buildings is finished by a repeated activation of the popup menu and selecting the appropriate function. These described functions are particularly important for the digitization of mapped buildings. Buildings captured in this way are transferred into the computational grid with the menu option *Configuration* | *Mapping of buildings on MISKAM computational grid.*

Digitize/ edit road net

The function *Digitize* | *edit road net* in the popup menu activates the digitization mode for line sources. Roads and line sources can be digitized as polygons in this mode. These functions are described in detail in chapter **0**.

The tool box for creating an configuration file

Together with the window containing an configuration file a tool box window[8] is shown (see **Fig. 0.9**)

Fig. 0.9: Toolbox with the buttons "basic functions, zoom", "computational grid", "building", "source", "flow through[9]" and "vegetation[10]"

The tool box contains six button. One of them is always active. The active button has a light-colored background. Moving the mouse over the buttons a hint about its function is given. In the following the meaning of the buttons is explained.

Basis functions, Zoom

With an activated arrow button (cf. **Fig. 0.10**) the basis functions and zoom is activated. By double clicking on the computational grid with the left mouse button, the numerical contents of this ASCII file may be viewed (cf. chapter **0**)

Fig. 0.10: Toolbox with activated basic functions and zoom

A variable zoom function is activated by keeping the left mouse button pressed while drawing the zoom box on the grid (cf. chapter **0**).

Change horizontal numerical grid

The program MISKAM also allows non-equidistant grids. In WinMISKAM, changes in the numerical grid can be done on screen. If the second button on the tool box (grid symbol) is activated nine additional functions (cf. Fig. 0.11) are available which can be activated by left clicking.

In the following the nine additional functions are explained from left to right.

Fig. 0.11: Toolbox with activated button computational grid and nine additional functions

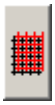
[8] When a tool is activated the mouse pointer is associated with a specific function.
[9] Only available if the extension module "flow through" is licensed. Is not part of the WinMISKAM basic version.
[10] Only available if the extension module "Vegetation" is licensed. Is not part of the WinMISKAM basic version.

Toolbox buttons Arrow right/ Arrow up 

A line of the computational grid can be grabbed and moved with the *left mouse button*. This causes a change in the mesh width of all grid boxes corresponding to the moving direction. One line can be fixed by double-click in order that the movement occurs relatively to this fixed line. The coordinates (x, y in meters), the box number (i, j in numbers) and the mesh width (dx, dy in meters) of each selected grid box are displayed on screen in the same line as the speed buttons. The change, while moving the grid lines, can thus be monitored.

The Arrow up in the toolbox permits a move in y-direction. If the toolbox function Arrow right is activated (x direction), the grid lines in the x-direction can be moved.

The moving of lines is only possible when neither the function *Digitize* | *edit buildings* nor the the function *Digitize* | *edit road net* is activated.
Pressing the Button U undoes the last grid change.

Toolbox button Move whole grid translational 

The whole computational grid can be grabbed and moved with the left mouse button. The mesh widths of all grid boxes remain the same. This function is useful in the context of the mapping of buildings and sources, so the grid can be moved to areas of interest.

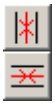
Pressing the Button U undoes the last grid movement.

Toolbox button Equidistant line vertical / Equidistant line horizontal 

An equidistant grid between two fixed lines or over the whole computational grid is created by clicking on the button with several lines.

If the grid lines of a selected area should only be moved , these grid lines can be fixed by double clicking the line with the left mouse button. This line's color changes to red on screen. The fixed line is freed again by double clicking with the left mouse button.

Pressing the Button U undoes the last change of the grid.

Toolbox button Delete line x=const / Delete line y=const 

Single grid lines with x=const. or y=const. can be deleted by clicking on the button *Delete line.* The action has to be confirmed in a popup window.

For this action the undo function is not available.

Toolbox button Add line x=const / Add line y=const 

Single grid lines with x=const or y=const. can be added by clicking on the button *Add line*. The action has to be confirmed in a popup window.

After the organization of the grid is done, it is recommended to activate basis function of the toolbox (cf. **0**) so that no unintentional moving can occur. Changes in the grid can still be performed after closing the toolbox without deactivating the functions.

For this action the undo function is not available.

Tool Undo 

The button U on the right side is only available when changes of the grid like arrow right/arrow up, move whole grid translational or equidistant line vertical/equidistant line horizontal were done. In this case the button U is black, while the button U is grey when it is not possible to be used. Clicking on the button U reverses the last change of the grid.

Marking boxes of the computational grid as buildings

A relatively simple constellation of buildings can be done directly in the computational grid without mapping the buildings (chapter 0) and without using the menu option *Digitize building* in the popup menu.

To transfer buildings directly into the computational grid, one or several grid boxes have to be marked with the left mouse button while the toolbox button building  is pressed. Upon releasing the left mouse button, the window **Select building height** (**Fig. 0.12**) will pop up. The number of boxes in the vertical direction, which have to be regarded as buildings in the configuration file, is specified by the field *Index*. The height of the upper edge of the box above ground is shown below the variable.

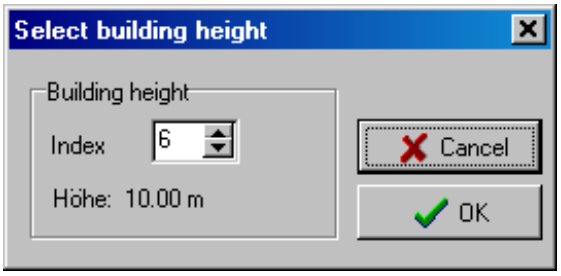


Fig. 0.12: Function Select building height for registering the buildings in the computational grid

This function is also used to change the building height later on in an existing configuration file. The height of existing buildings is indicated next to the speed buttons while rolling over a grid box. Selecting a box containing a building can thus easily be achieved with this control. Through setting the index to 0, the building is deleted from the configuration file.

Register or edit sources

Sources can be entered either directly into the computational grid or through the function Digitize road network for line sources (chapter **0**).

To enter sources directly in the computational grid, single or several grid boxes have to be marked by the left mouse button while the toolbox button source  is pressed. Upon releasing the left mouse button, the window **Sources** will pop up in which the values for the specific conditions can be set.

The name of the emitted material, which is not allowed to be called ENDE, should be indicated for information purposes. It should be noted that with the setting of NO_x material the NO_2 concentration is considered in addition for the calculation of the statistical values.

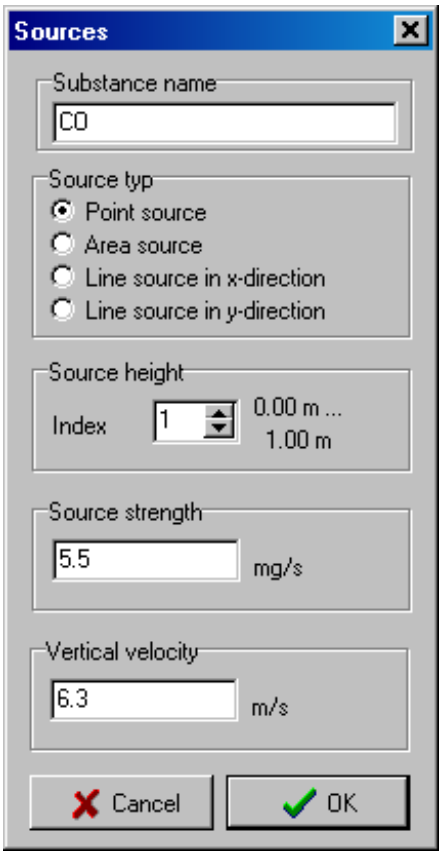


Fig. 0.13: Window Sources for setting the sources in the computational grid.

The source type has to be selected by clicking on the appropriate field. The source strength has to be set. Its unit will change according to the source type. The source strength will be adjusted internally by the volume of the grid box. The units of the various types of sources are listed in **Table 3.1**.

Source type	Unit of source strength
point source	mg/s
area source	mg/(m^2 s)
line source	mg/(m s)

Table 0.1: Source types an units of source strength

Line sources are differentiated by direction. Because grid boxes of sources do not have to be rectangular, differences in length in the x and y directions have to be considered.
The source height indicates in which grid box above ground the source is located. Therefore source configurations close to the ground as well as higher ones are possible. The source strength has to be set according to the specific material and source type.

In the input field *Vertical velocity*[11] the vertical velocity is given which is prescribed at the selected source boxes. This input is relevant if the emissions are released from a stack and the outlet velocity is not negligible.

Note: If a vertical velocity is prescribed at a source box, it is not possible to calculate statistical values (cf. chapter **0**) This is due to the fact that the velocity field is not scalable.

Source information in the information panel of WinMISKAM

Source information in the computational grid of the INPUT file “[Name].INP” appear in the information panel of WinMISKAM (cf. **Fig. 0.14**).

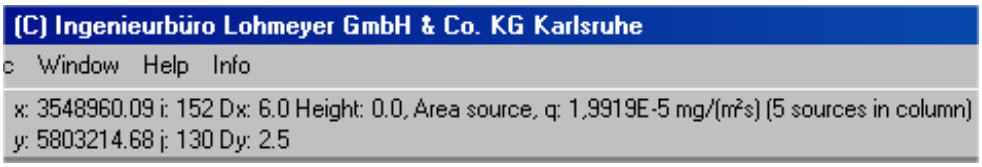


Fig. 0.14: Information panel of WinMISKAM with source information

When moving the mouse cursor over a box with emissions in the computational grid, source type and source strength is shown. If more than one source box are on top of each other, the message "n sources in column" will pop up. The source strength of the various boxes are shown in a popup window which appears after clicking with the right mouse button on the source box.

Note: MISKAM dispersion calculations can consider sedimentation and deposition; these inputs are not yet supported by WinMISKAM. Please check the MISKAM manual for explanations and instructions.

Register or edit flow through[12] *areas*

MISKAM offers the possibility to consider the flow through buildings like bridges, arcades, etc. For this an additional input file is needed with the same name as the configuration file name “[name].inp” but with the extension “.001”**.** This file is stored in the same subdirectory as the configuration file “[name].inp”.

In order to register flow through areas, in the tool box the *flow through* button  has to be activated. If the *flow through* button is activated the desired flow through boxes are selected by keeping the left mouse button pressed while drawing the rectangle on the grid (cf. **Fig. 0.15**). At least one box has to be selected.

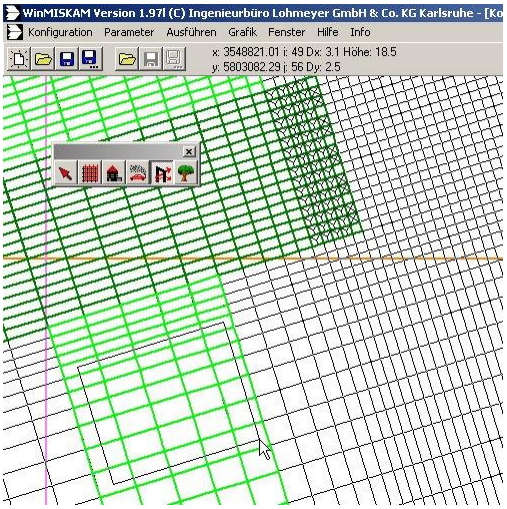


Fig. 0.15: Selection of an flow through area by keeping the left mouse button pressed while drawing the rectangle on the grid

[11] Only available if the extension module “Vertical Jet” is licensed. Is not part of the WinMISKAM basic version.
[12] Only available if the extension module “Flow through” is licensed. Is not part of the WinMISKAM basic version.

Upon releasing the left mouse button the defined area appears in blue color and the window **Flow through** (cf. Fig. 0.16) will pop up in which the box indices I (x-direction) and J (y-direction) are set. The k-index must be set manually. The k-index is the vertical extension of the flow through area. In addition, it must be set whether the remove direction of the selected flow through area is in x- or y-direction.

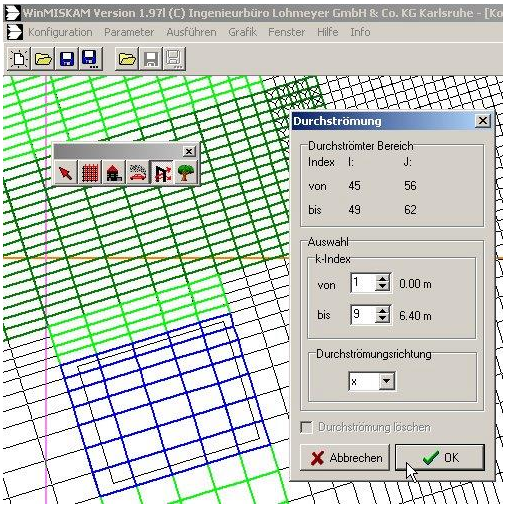


Fig. 0.16: Window Flow through. The vertical extension of the flow through area and the remove direction of the selected flow through area has to be set.

After clicking the OK-button the flow through area is marked by X and/or Y. X or Y indicate the selected remove direction of the selected flow through area (cf. Fig. 0.17).

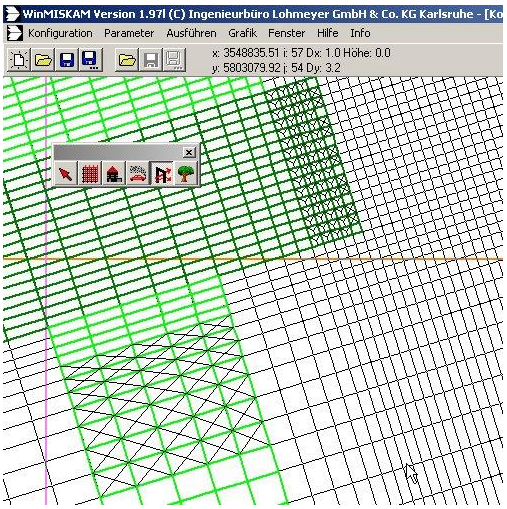


Fig. 0.17: Flow through areas are marked by X and/or Y. X or Y indicate the selected remove direction of the selected flow through area.

Note: If a flow through area is defined, the blocking effect of buildings is removed in the flow through area, i.e. the flow is allowed to flow in that regions.
The selected remove direction x or y influences directly the boxes where the blocking effect is removed or which walls remain.

In order to understand the meaning of the two different remove directions it's helpful to have the imagination as if a bulldozer with an relevant width and height (as defined above with the flow through area) is moving in x- or y-direction and removes all walls including the first and the last wall in x- or y-direction. On the left and right side and above of the bulldozer the lateral walls and the ceiling remain. Further explanation are given in the MISKAM manual.

Register or edit vegetation[13]

MISKAM offers the possibility to consider the effect of vegetation. To store the area of vegetation an additional input file is needed with the same name as the configuration file name “[name].inp” but with the extension “.003” **.** This file is stored in the same subdirectory as the configuration file “[name].inp”.

In order to register an area with vegetation, in the tool box the *vegetation* button  has to be activated. If the vegetation button is activated the desired vegetation boxes are selected by keeping the left mouse button pressed while drawing the rectangle on the grid (cf. Fig. 0.18). At least one box has to be selected.

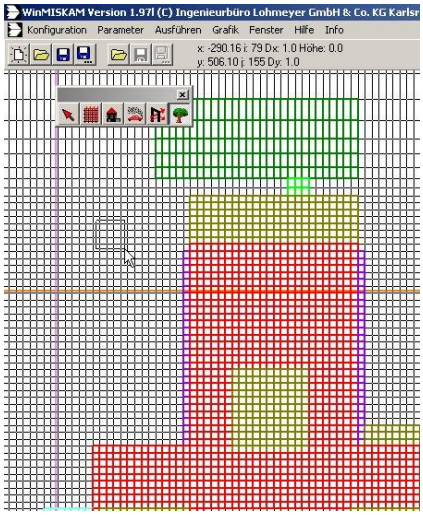


Fig. 0.18: Selection of an area with vegetation by keeping the left mouse button pressed while drawing the rectangle on the grid

Upon releasing the left mouse button the defined area appears in green color and the window **Vegetation** (cf. Fig. 0.19) will pop up in which the box indices i (x-direction) and j (y-direction) are set. The k-index must be set manually. The k-index is the vertical extension of the area of vegetation. In addition the leaf area index and the vegetation cover rate has to be specified.
The leaf area index is the surface of all leafs which are in 1 m³. (unit: m²/m³). The vegetation cover rate is the ration of the volume of the tree within a grid box and the volume of the grid box itself.

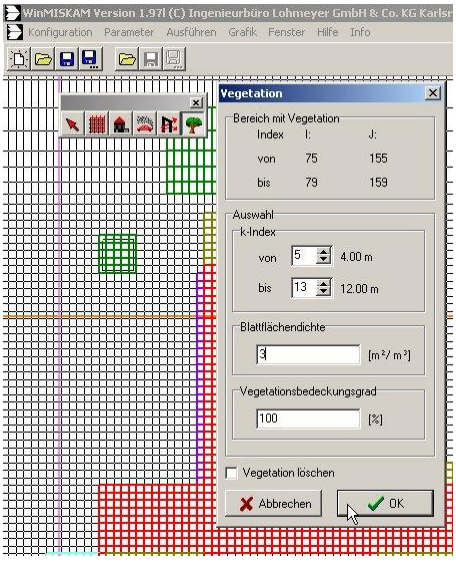


Fig. 0.19: Window Vegetation. The vertical extension of the area of vegetation, the leaf cover index and the vegetation cover rate of the selected area of vegetation has to be set.

[13] Only available if the extension module “Vegetation” is licensed. Is not part of the WinMISKAM basic version.

After clicking the OK-button the vegetation area is marked by a color (cf. Fig. 0.20) which can be set by the user in the settings window (cf. chapter 0).

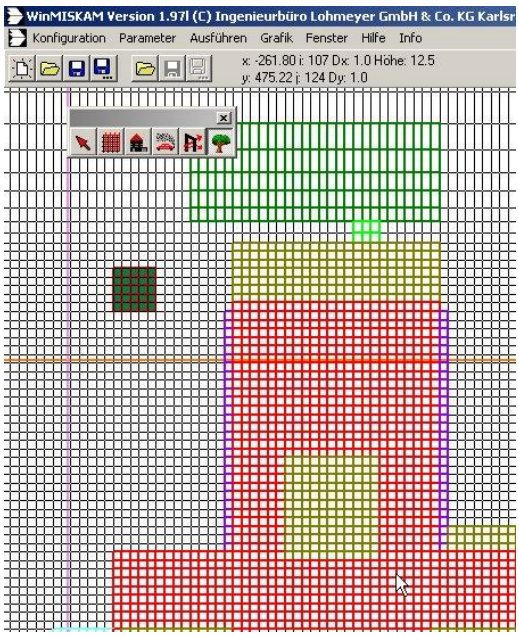


Fig. 0.20: The area of vegetation is marked by a color.

Import map - generate configuration file with a map

WinMISKAM offers the possibility to import buildings with the help of a scanned map or plan. The digitized buildings are then transferred automatically into the computational grid. With the help of this function the computational grid can be easily fixed on screen.

To import a map or plan, either a new configuration file has to be generated or an existing one has to be opened as described in chapter 0. To start a new project the computational grid has to be initialized.

Loading a background map

WinMISKAM can use maps and plans in various formats:

- Windows-Bitmap-Format “[Name].BMP”
- JPEG-Fig. file “[Name].JPG” or “[Name].JPEG”
- Extended meta file “[Name].EMF”
- Meta files “[Name].WMF”

The map is imported into WinMISKAM through the menu option *Configuration* | *Import background map.* This is possible for black and white bitmaps as well as for colored maps.

After importing the map, it is displayed as a background map below the computational grid.

In order for the overlay of the bitmap and the computational grid to be correct, a coordinate mapping has to be performed.

Note: If an empty window appears on screen after the map is loaded or an error message is displayed, the reference coordinates of the computational grid have to be adjusted. The coordinates of the computational grid do not fit those of the bitmap, which means that the coordinates are too far apart.

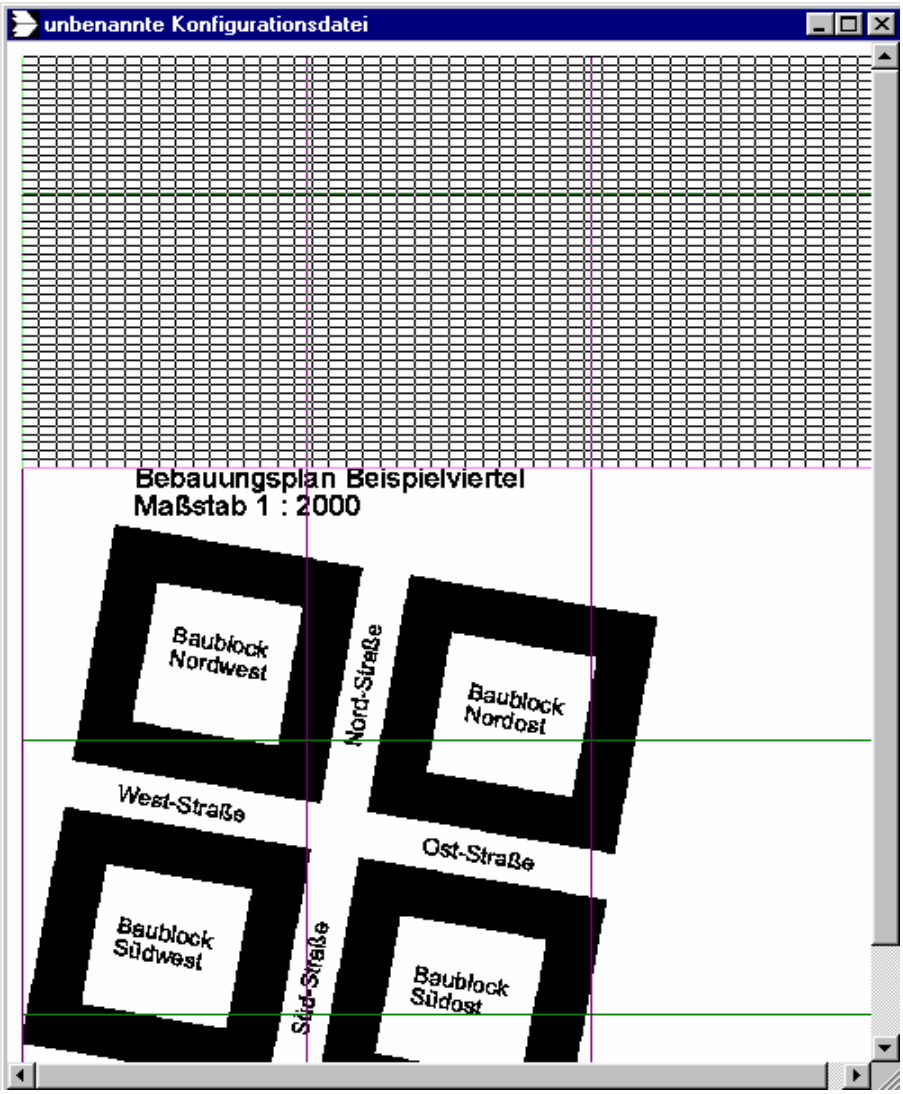


Fig. 0.21: Screen view with loaded bitmap

Coordinate mapping

The menu option *Configuration* | *Coordinate mapping* will open the window **Coordinate mapping**. WinMISKAM uses a so-called two-point-fitting, which means that two different points on the map translate the local coordinates into pixel coordinates.

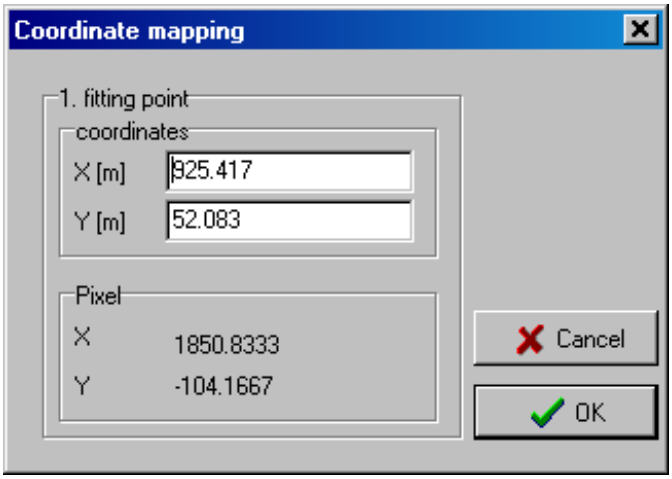


Fig. 0.22: Window Coordinate mapping

Moving the mouse on screen changes the setting of the coordinates and the pixels. At first, a fitting point with known coordinates has to be selected. If static parameters have to be calculated on the basis of wind statistics with WinMISKAM, it is advisable to select the coordinates in the west-east and north-south directions. This is given for instance with the Gauss-Krüger-coordinates of topographic maps.

The selection of the fitting point on the map is made easier by zooming in. Zooming in on a map as well as zooming out also works while the window **Coordinate mapping** is open. If the window **Coordinate mapping** is hindering the display, it can be simply dragged away with the mouse. If a suitable point is found on the map, it can be fixed by a double click with the left mouse button. Then, the field x coordinate should be activated by a mouse click and the value has to be set. The same has to be done for the y coordinate. It is important that the mouse does not exit the window **Coordinate mapping** while setting these values. By clicking on the OK button, the selection for the second fitting point will appear. This has to be fixed as described above. After the fitting is done, the whole window will be shown.

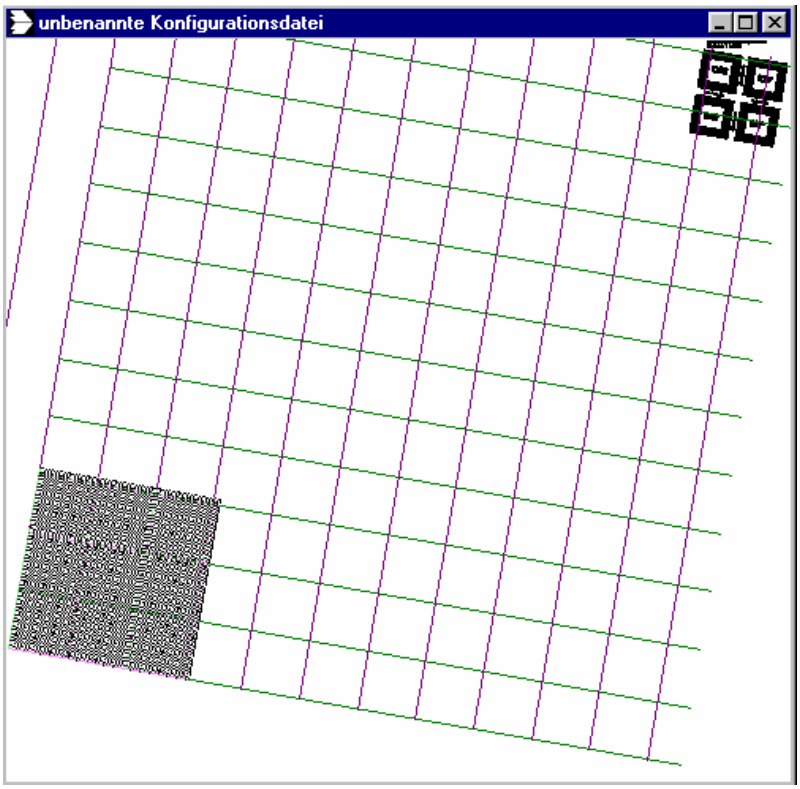


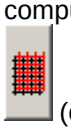
Fig. 0.23: On screen output after mapping

If the mapping is not correct, it can be reset directly with the menu option *Configuration* | *Mapping*.

Save mapping

After fitting the map, it should be saved right away through the menu option *Configuration* | *Save mapping* which generates the file “[Name].PSG”. If this bitmap and a computational grid are loaded a second time, they can be fitted through activating the menu option *Configuration* | *Load mapping* and selecting the file “[Name].PSG”.

Fitting the computational grid to the background map

By following the proposed steps, the computational grid and the map are not on top of each other. This can be fixed by activating the popup menu with the right mouse button and then selecting the function *Computational grid*. The reference coordinates of the lower left corner of the computational grid can be approximately fitted to the map. Now the computational grid and the map are on top of each other. This step can be repeated to obtain the required position of the computational grid. Alternatively, the computational grid can also be arranged via the toolbox and the activated button *translational grid move*  (cf. **0**) . The size and angle of the computational grid is changed with the button New.

Generating buildings on the background map

Buildings are digitized through the function *Digitize* | *edit buildings* in the popup menu. The shape and height of the buildings are traced by pressing the CTRL key and clicking on the corners of the building with the left mouse button. The polygon must consist of at least three corners and is closed automatically by releasing the CTRL key. A window will pop up with a suggested name for the building and the height of its upper border, which can be changed accordingly.

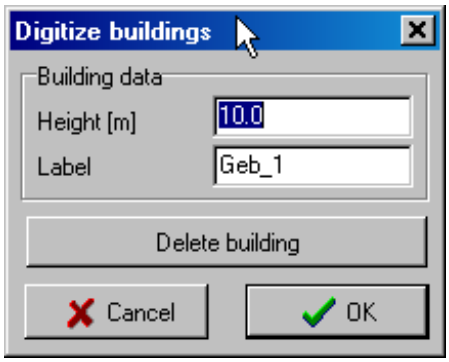


Fig. 0.24: Popup window for name and height of the building

After this, a new building can be digitized. A building with varying heights must be divided into several polygons for digitizing. If a building has an inside yard, it makes sense to divide it into several buildings in order to adjust the height of the yard properly.
Only the height and the name of the digitized buildings can be adjusted. To change its shape, it has to be digitized once again. Polygons and buildings that are no longer needed can be deleted with the button *Delete building*.
In order to save the mapped buildings, the digitizing mode has to be with the function *Configuration* | *Grid buildings* in the configuration file “[Name].INP”. A DOS-box will open for calculations. Once the calculations are finished, the buildings are integrated into the configuration file and appear in the computational grid as colored boxes. If they do not show up strong enough, the line width should be increased through the menu option *Configuration* | *Options*. Following these steps, the computational grid and the building grid will appear on screen as desired. The building grid should be saved (*Configuration* | *Save building grid*) and removed from the picture (*Configuration* | *Remove building grid*) to simplify the Fig.. The height of a building is displayed besides the speed buttons as soon as the mouse cursor is moved over it.

The grid of a building can be corrected with *Digitize building* in the *popup menu* and the function *Grid building*. The buildings also can be changed in the grid by activating one or several grid boxes with the left mouse button while pressing the CTRL key.

Implementing sources in the background map

After the buildings are saved in the configuration file “[Name].INP”, the sources have to be implemented as described in **0** and **0**. The source boxes can be marked with the left mouse button while pressing the ALT key. After releasing the ALT key, the fields in the window *Sources* have to be filled out.
Line source emissions can be implemented in the computational grid with the extension module "Line sources" of WinMISKAM.
The completed configuration file is saved. So the conditions to run the flow and after this the dispersion calculation are made.

Digitizing line sources with the extension module "Line sources"[14]

The extension module **“**Line sources” simplifies the digitalization of line sources and road nets in particular. It is advisable to digitize line sources only with the help of this module.

The function *Digitize/edit road net* in the popup menu activates the digitization mode for line sources. Roads and line sources are digitized as polygons either in a bitmap or directly on the computational grid. Once this function is initialized, a second speed button list will show up.

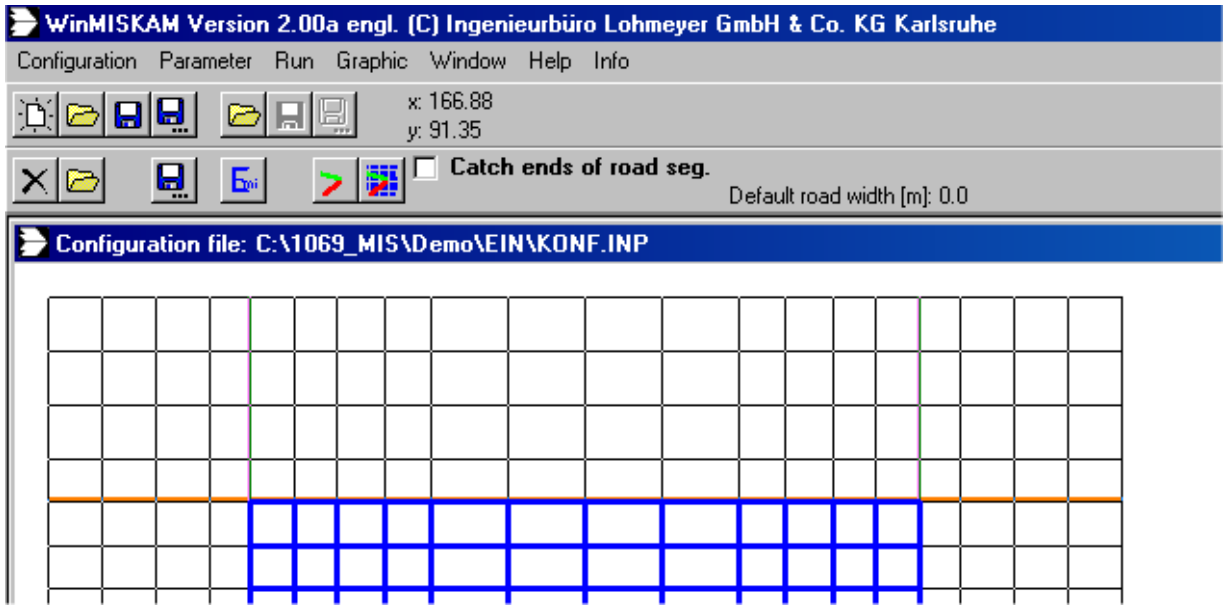


Fig. 0.25: Additional tool bar for the module Digitize / edit road net.

To start digitizing, press the button with the red and green line icon  .
Start at the beginning of a road by clicking with the left mouse button. Then, it has to be clicked on the end of the first straight part. This will open the window **Road parameters** with its register options Geometry, Concentration, DTV and Mobilev. The values in the register options Geometry and Concentration must be set for calculations with WinMISKAM. The option DTV can be used for information purposes and may become useful for further programs as PROKAS or MOBILEV for concentration calculations of traffic data.

[14] Only available, if the extension module "Line source" is licensed. It is not part of the basic version of WinMISKAM

The values of the register option MobileV have to be set if WinMISKAM's extension module for computation of traffic-dependent emissions on the basis of Mobilev Version 1.0 GL is installed. With this module, concentrations based on traffic data and on results from the extension module MobileV can be calculated and mapped into the computational grid.

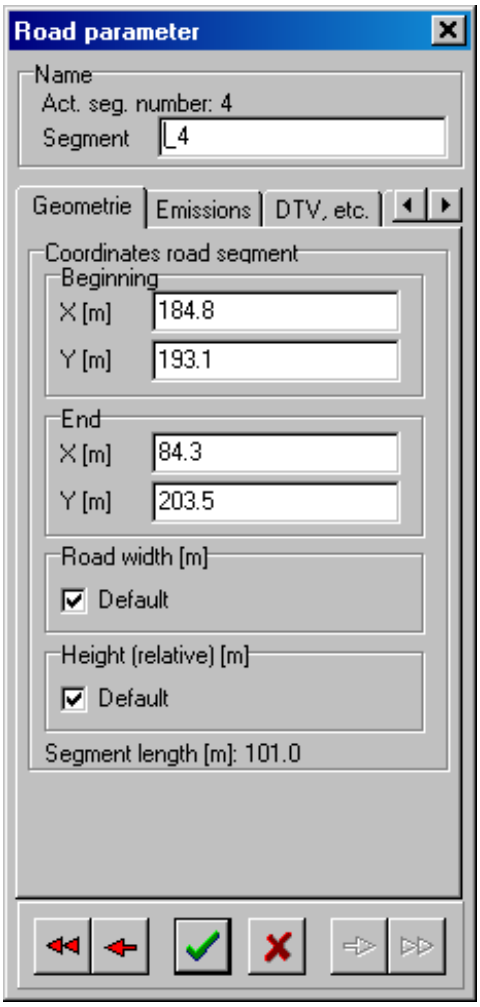


Fig. 0.26: Window road parameters

The name of the road can be set in the first field. If more than one attached road section is implemented sequentially, an increasing numbering is automatically appended to the road name. The coordinates are already given by the digitization, but they may still be changed. The road width and its height in the computational grid can be varied for each road segment, if the check in front of *Default* is unplugged The default values (default is zero) are used if there are made no changes. All changes have to be confirmed by clicking the button with the green check at the bottom of the window  . It is possible to jump from one road segment to the next by using the arrow buttons in this tool bar, if more than one section is implemented. Pressing the button with the cross  will delete the current segment. A general change of the default value of the road width is possible by double clicking the words *Default road width* (see Fig. 0.27) in the second speedbutton list. Then the default value for road width can be entered in the window **Road net**.

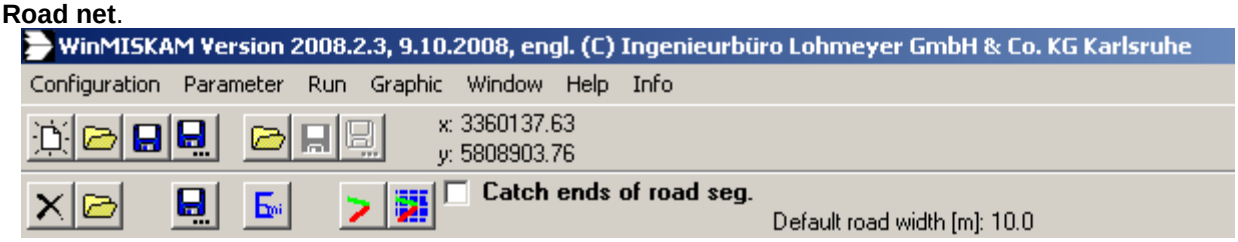


Fig. 0.27: Supplementary second speedbuttom list while Digitize/edit road net is activated

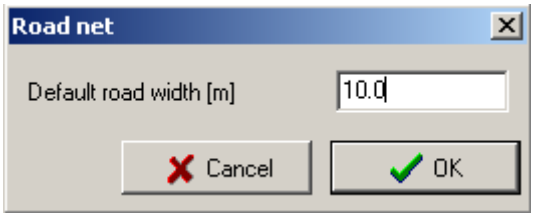


Fig. 0.28: Window Road net

The emission density of the materials NO_x, benzene, PM 10 and soot in milligrams per meter and second should be entered in the register *Emissions*. This can be done separately for each segment. Furthermore, there is the possibility to define six more emissions. By default they are named Stoff 5, Stoff 6, and so forth. Another name can be entered clicking on the field. The emissions density is expressed in milligram per meter and second.

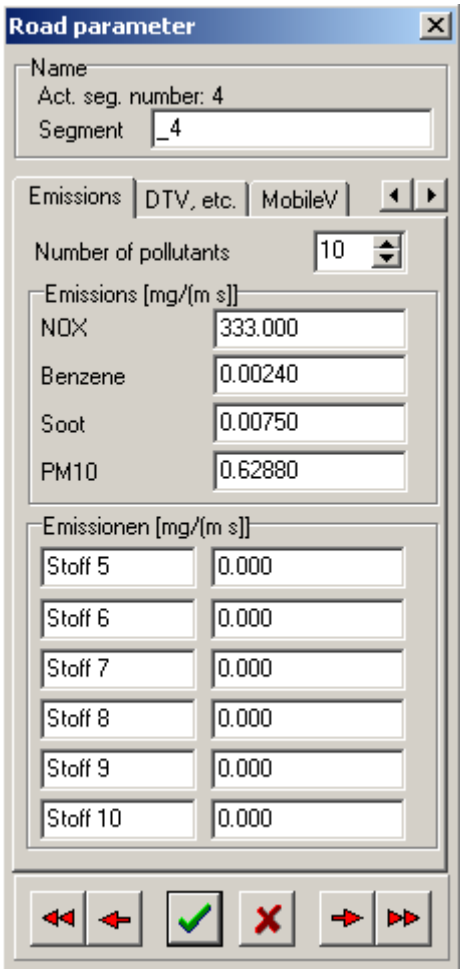


Fig. 0.29: Register Emissions of the window Road parameter

The register *DTV* does not necessarily have to be filled out for WinMISKAM purposes. (DTV stands for average daily traffic density (durchschnittliche tägliche Verkehrsstärke) in cars per day, truck share= percentage of heavy duty vehicles is the daily number of trucks divided by DTV, driving pattern is the traffic situation according to the manual of emission factors by the national environmental office (Umweltbundesamt). For PROKAS purposes, the source heights equal the heights above surface and the type of gulches equal the types of constructions at the borders - these parameters are not important for WinMISKAM). The register *MobileV* is not required for WinMISKAM purposes; it has to be filled out if WinMISKAM's extension module for computation of traffic-dependent emissions on the basis of Mobilev Version 2.0 GL should be used. (DTV stands for average daily traffic density (durchschnittliche tägliche

Verkehrsstärke) in cars per day, truck share is the daily number of trucks divided by DTV, lNfz share is the daily number of light commercial vehicles divided by DTV, Lbus share is the daily number of buses divided by DTV, road category is the description of the traffic situation according to MobileV and domain stands for the area according to MobileV). Detailed descriptions are provided in the documentation of the extension module.
If all the menu options are filled out for the first segment, they will also be taken over for the following segments. A road block is finished with a double click or by pressing the button  . In this way, more than one block can be registered at once. To avoid gaps at crossings, the function *Catch ends of road seg*. should be used in order to make the end of the particular segment connect to the nearest road segment. This function has to be activated before clicking on a road segment.
Digitized road sections can be moved with the left mouse button while the CTRL key is pressed. Here the function *Catch ends of road seg*. is also useful if crossings should be integrated.

The digitized road network can be saved by clicking on the button  in the second speedbutton list or through the menu option *Configuration* | *Save road net file.* "[Name].STR", "[Name].SDV" or "[Name].SD3" should be used as file extensions. The extension "[Name].DTV" is reserved for traffic data and not important for WinMISKAM calculations. The extension "[Name].SD3" is most important and contains all entered data, i.e. emission and traffic data. An externally saved road file can be loaded and processed by WinMISKAM.
Another road network can be opened in the *Digitize* | *edit road net* mode in the popup menu via button  in the second speedbutton list.

The active road network can be removed by clicking on the button  in the second speedbutton list. If this particular mode is not active, the road network can be either opened or removed through the menu option *Configuration* | *Open Road net file* or *Configuration* | *Remove road net*.
If an empty window appears after loading the file or an error message, the reference coordinates of the computational grid have to be adjusted. The reason is, that the coordinates of the computational grid do not match those of the road net file, i.e. the coordinates are too far apart. The reference coordinates have to be adjusted in the popup menu (right mouse button) in the option *Computational grid*. Changing the road file is also possible but very complex.

The button  in the second tool bar will transfuse the digitized road net into the computational grid. This will open a window for selecting the emitted materials. Please note that the amount of material depends on the kind of road file.

- "[Name].STR" files contain the materials NO_x, benzene, and soot;
- "[Name].SDV" files contain the materials NO_x, benzene, soot , and PM 10;
- and "[Name].SD3" files contain NO_x, benzene, soot, PM 10 as well as six further materials.

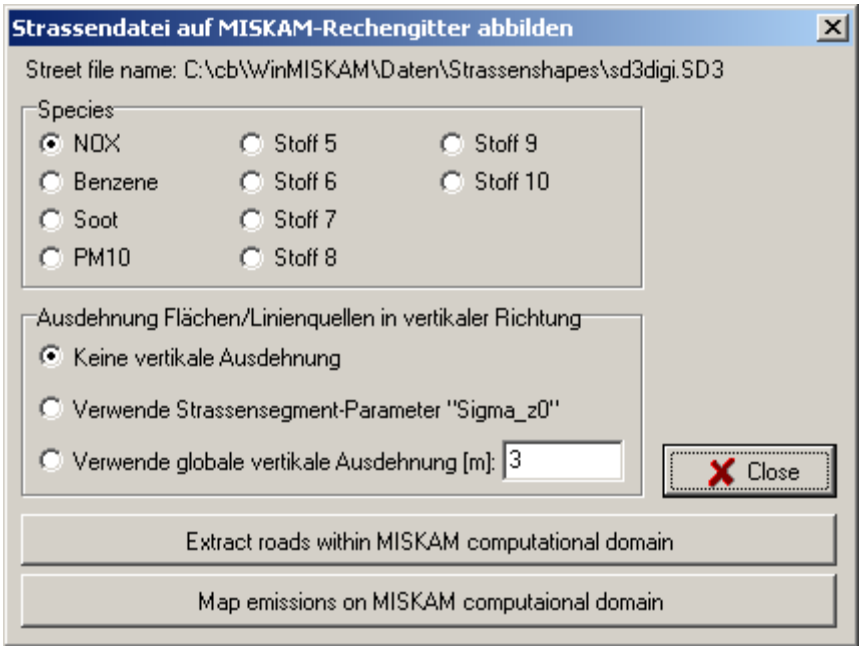


Fig. 0.30: Implementation of line sources into the computational grid

For the extension of the emissions in vertical direction it is possible to choose one of three options. The first one implements no vertical extension of the emissions. The second one effect that the value defined in the SD3-file in column 23 as “sigma_z0” (meaning extension of the source in vertical direction) is used. The last option allows to determine a general value. Choosing no vertical extension or global vertical extension causes that the definition of vertical extension in the SD3-file is ignored.
The pollutant has to be selected here. For WinMISKAM purposes the button *Map emissions on MISKAM computational domain* should be used to depict pollution sources on the grid. This will append the emissions to the input file. The input file should be saved under an appropriate name. The same procedure can be performed once more for another pollutant. While the road file is being gridded, the concentrations are distributed to all those boxes of the computational grid which are crossed by the road. If the road width is bigger than zero, the concentrations are distributed over the computed area. The emissions are distributed in such a way that the entire emissions of the road segments are equal to those of the computational grid and that the distribution in the computational grid is approximately homogeneous. This method assures that no emissions are placed within the buildings.
Additional note: If calculations should be performed for buildings with flows through the buildings (e.g. underpasses), the appropriate parts of the building have to be removed in an auxiliary file before generating the road file. Then, the emissions will be correctly arranged in the computational grid. These emissions have to be transferred to the correct input file for the distribution calculations with underflow.

The function *Extract roads within MISKAM computational domain* has to be used if a big road network file exists (e.g. from PROKAS operations). One file is generated for the inside of the computed area and one for the outside.

After finalizing the road file, this step should be terminated through the popup menu (right mouse button, Stop Digitize /edit road net.

The function *Configuration* | *Remove road net file* will remove the lines from the computational grid. This function should be used in particular after transferring the line sources into the grid structure (*Mapping of buildings on MISKAM computational grid*).

Menu option Open

Activating the menu option *Configuration* | *Open* or the corresponding speed button  will initiate the search for a configuration file “[Name].INP” in the current directory. The directory can be changed. After

selecting the file and pressing OK, the computational grid of the configuration file will show up. Through double clicking on the computational grid, the numerical content of the file is shown.

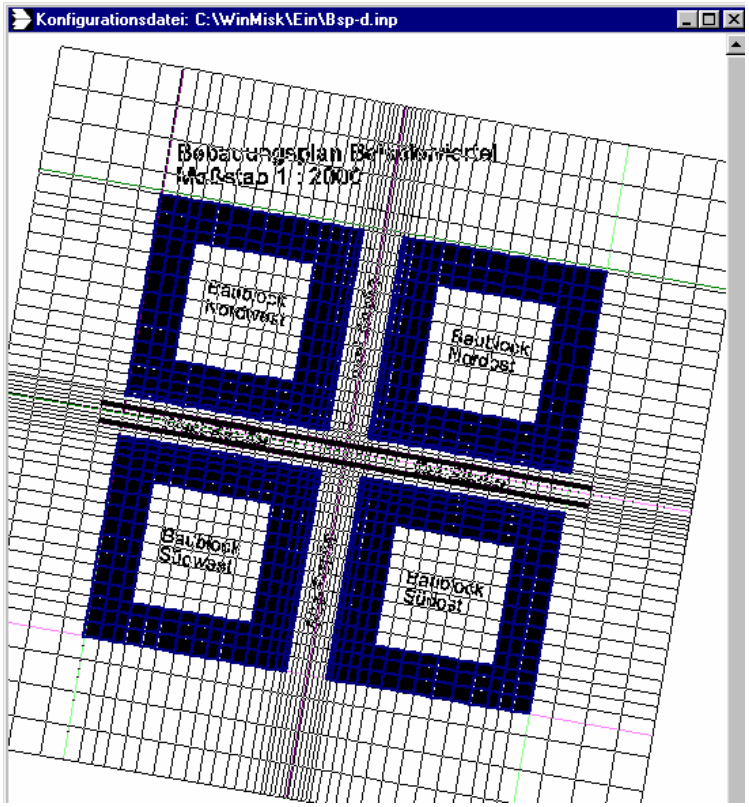


Fig. 0.31: Bitmap, adjusted computational grid, buildings, and line sources on screen

Menu option Save

An existing configuration file is saved via the submenu option C*onfiguration* | *Save* or the corresponding speed button  . This will overwrite the existing version. If a newly created configuration file is saved with the submenu option S*ave*, a name must be given for the file. This corresponds to the submenu option S*ave as.*

Menu option Save as

An existing configuration file is saved under a new name via the submenu option C*onfiguration* | *Save as* or the corresponding speed button  .

Menu option Close

The submenu option C*onfiguration* | *Close* will close the current configuration file without saving it. If the configuration file is freshly created or has been changed, the question appears whether the configuration file should be saved or updated.

Menu option Load background map

Via the menu option C*onfiguration* | *Load background map,* a map or plan can be loaded into WinMISKAM. It can be in black and white or in color of any common graphic format (see chapter 0). This menu option is available only after a configuration file has been generated or loaded.

After the map has been loaded, the bitmap will be layered below the computational grid. The bitmap must be mapped and the reference coordinates of the computational grid must be adjusted.

If an empty window appears after loading the file or an error message, the reference coordinates of the computational grid must be adjusted. The reason is, that the coordinates of the computational grid do not match those of the road net file, i.e. the coordinates are too far apart. A mapping of the coordinates is necessary in this case.

Menu option Remove background map

A background map may be removed by selecting the submenu option C*onfiguration* | *Remove background map*, after which only the computational grid is visible.

Menu option Load buildings

A building file “[Name].BLN” is layered over the initialized or loaded computational grid through the submenu option C*onfiguration* | *Load buildings.*

If an empty window appears after loading the building file or an error message is shown, the reference coordinates of the computational grid have to be adjusted. The reason is, that the coordinates of the computational grid do not match those of the road net file, i.e. the coordinates are too far apart. The reference coordinates must be adjusted to the computational grid in the popup menu (right mouse button). Changing the building mapping is equally possible, but is very complex.

The building file contains polygons with names and building heights. While loading the data into WinMISKAM, the polygons will appear on screen. If this does not happen, the reference coordinates of the computational grid have to be adjusted to the coordinates of the buildings.

In **Table 0.2** the ASCII-file of a building is commented.

4 1 15	building_1	(= number of corners, value 1, height, name)
1000		1000 (=x,y)
1100		1000
1100		1200
1050		1200
1000		1000

Table 0.2: Format of the building file “[Name].BLN”

Menu option Save buildings

The digitized buildings can be saved through the submenu option *Configuration* | *Save building* as a “[Name].BLN” file.

Menu option Hide buildings

The function C*onfiguration* | *Hide buildings* will hide the polygons of the buildings in the computational grid. It may be used in particular after the implementation of the buildings into the grid structure (*Mapping of buildings on MISKAM computational grid*).

Menu option Mapping of buildings on MISKAM computational grid

The generated and loaded buildings are implemented into the computational grid and hence also into the configuration file with the function *Configuration* | *Mapping of buildings on MISKAM computational grid*.

In the following window one option out off three can be chosen.

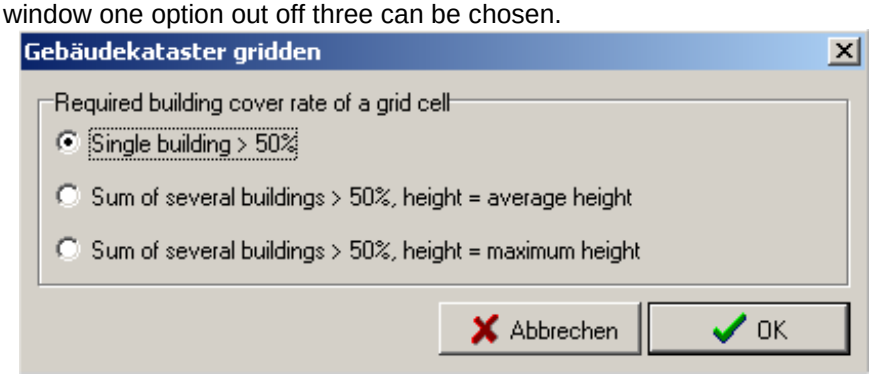


Fig. 0.32: Dialog Gebäudekataster gridden

Meaning:

- *Single building > 50%:* computational grid cells are assigned as building, if the building covers more than 50 % of the cell.
- *Sum of several buildings> 50%, height = average height*: computational grid cells are assigned as building, if all buildings which are located in this cell cover summary over 50 % of the cell. As height a average building height is calculated.
- *Sum of several buildings > 50%, height = maximum height*: like *Sum of several buildings > 50% height = average height*, but as height is utilized the maximum building height of the buildings which are located in this computational cell.

After pressing the button *OK* a DOS-box opens and executes the conversation. After completing the conversation and closing the DOS-box, the buildings are integrated into the configuration file and will show up as colored boxes in the computational grid.
One have to pay attention, that as general rule the building height saved in the mapped building is not exactly expressed in MISKAM computational grid. The reason therefore is that the “real” building height is mapped to the discrete height of the MISKAM computational grid in z-direction. If necessary the number of grid cells in z-direction have to be increased and/or the grid height in z-direction have to be adapted.

Menu option Make coordinate mapping

The coordinates have to be mapped after a map has been loaded, so that the map and the computational grid match. The menu option *Configuration* | *Make coordinate mapping* will open the window for coordinate mapping. WinMISKAM uses a so-called two-point-fitting which means that the local coordinates are assigned to pixel coordinates on screen at two different points on the map. How to use the coordinate mapping is described in chapter **0**.

Menu option Reset coordinate mapping

If the fitting was not successful, the coordinate mapping can always be reset to the original situation by the submenu option *Configuration / Reset coordinate mapping.*

Menu option Open coordinate mapping file

A locally saved fitting file “[Name].PSG” can be loaded through the submenu option *Configuration* | *Open coordinate mapping* file and a fresh coordinate mapping is started. This is important when, for example, the bitmap has been removed in WinMISKAM and should be loaded again after opening the configuration file.

Menu option Save coordinate mapping file

The mapped coordinates should to be saved instantly after the fitting is completed via the menu option *Configuration* | *Save coordinate mapping*. A file “[Name].PSG” will be generated.

Menu option Open road net file

A road file “[Name].STR”, “[Name].SDV”, “[Name].SD3”, or “[Name].DTV” can be layered over the initialized or opened computational grid through the submenu option *Configuration* | *Open road net file*.

If an empty window appears after loading the road net file or an error message, the reference coordinates of the computational grid have to be adjusted. The reason is, that the coordinates of the computational grid do not match those of the road net file, i.e. the coordinates are too far apart. The reference coordinates can be adjusted in the popup menu (right mouse button) through the option *Computational grid*. The road file also can be changed directly, but this is very complex.

The road file contains lines with information concerning geometry, name and contents like emissions or traffic data. The lines will show up on screen while the data is imported into WinMISKAM. If this does not occur, the reference coordinates of the computational grid have to be adjusted to the coordinates of the road file. The contents of each line are: index number, coordinates of the beginning and the end of the segment, concentrations of NO_x, benzene, soot, road width, gulch types, dummy, and segment name.

Clicking on the computational grid will open the window for road parameters after the road files have been loaded and the function *Digitize* | *Edit road net* in the *popup menu* has been initialized by a click of the right mouse button. In this way, the content of the file can be checked for each segment.

Menu option Save road net file

The digitized road network can be saved via the menu option *Configuration* | *Save road net file* or via the disk icon in the second tool bar. The files have to be saved as “[Name].STR”, “[Name].SDV” or “[Name].SD3” for further use with WinMISKAM. The file extension “[Name].DTV” is reserved for traffic data. The file extension “[Name].SD3” is the most extensive one and contains all information in the input fields such as emissions and traffic data. A saved road file can be loaded in WinMISKAM and used for further purposes.

Menu option Remove road net file

The menu option *Configuration* | *Remove road net file* will remove the road net layer. This should be used in particular after transferring the line sources into the grid structure.

Menu option Calculate emissions…

With this menu item is the additional module "Emissions - PROKAS_E" started.
For more information on the program part "Emissions - PROKAS_E" see PROKAS_E Help.

Menu option Show mouse palette

The functions of the toolbox are helpful for fitting the computational grid. If the toolbox window is closed, it can be reopened with the help of this function *Configuration* | *Show mouse palette*.

The functions and possible uses of the toolbox are described in chapter **0**

It has to be pointed out that the functions of the toolbox are also available, even if the window toolbox is not open. This might happen in particular when the toolbox was closed or removed from the screen without deactivating its individual functions.

Menu option Settings…

The window Settings which defines the illustrations on screen can be accessed through the submenu option *Configuration* | *Settings.* On screen output like font, color of emissions, border line width for buildings and sources, polygon line width for buildings as well as the road file are set through this function.

The indication of names for building polygons can be done under the register *Digitized buildings* by checking the according field. In the same way, the lines in the street file can be activated under the register *Road net*. Also, the line width of the roads and their color can be chosen there.

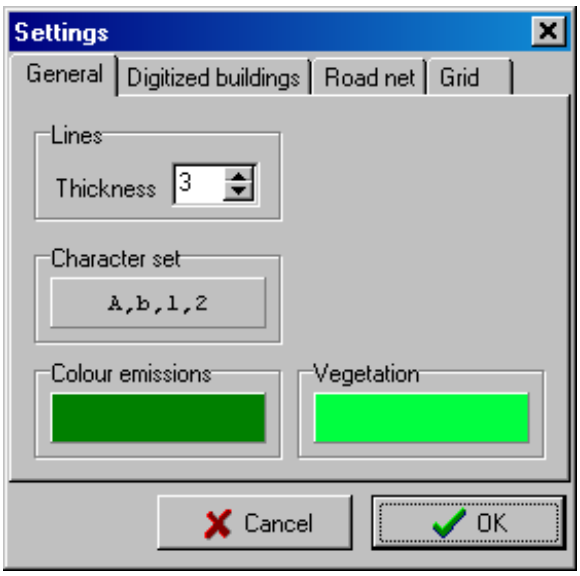


Fig. 0.33: Window settings with open register general

In addition, the minimal horizontal and vertical mesh width in meters can be specified by choosing the input register *Grid.* Those values avoids a horizontal and a vertical mesh lower that specified minimum values. *Grid spacing of the reference grid* specifies the distance of the colored lines of the reference grid. The optional grid widths are shown in Fig. 0.34.

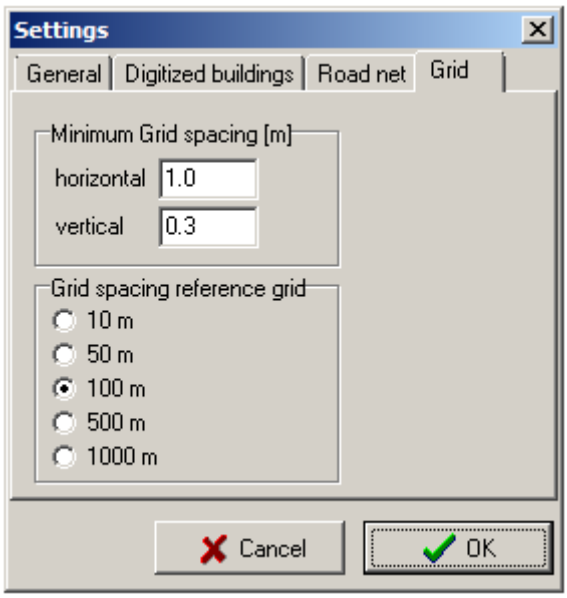


Fig. 0.34: Window settings with open register grid

Menu option Printer settings

The window Printer settings is activated through the menu option *Configuration* | *Printer settings*, with which the printer can be selected and adjusted.

Menu option Print

The screen content can be printed with this menu option. The configuration file with computational grid, buildings, sources and bitmap will be sent to the printer as a screenshot.

The configuration file “[Name].INP” with computational grid, buildings and sources can also be loaded through the menu option *Graphic* | *Horizontal planes…* and passed on to the printer with the menu option *Graphic* | *Print.*

Menu option Close

This function allows to close the current WinMISKAM session. If an existing configuration file “[Name].INP” has been changed without saving or a new configuration file has been generated, WinMISKAM will ask whether to save the files before closing.

Parameters

After having generated the configuration file “[Name].INP”, the calculations of MISKAM have to be prepared. The computations consist of flow calculations and dispersion calculations which base on their results. The initialization files “[Name].INI” may be opened, edited and saved via the menu option *Parameters*. If WinMISKAM is freshly started, the parameters are set to default values. It is necessary to adjust the parameters to the current situation before running simulation calculations.

5.1 Menu option Edit

The window *INI-file* may be opened through the submenu option *Parameters* | *Edit* (**Fig. 4.1**). The option *Turbulence closing* cannot be selected in the current MISKAM version. MISKAM **always** uses the E-eps-Model for calculations (contrary to older versions of MISKAM, the option *Turbulence closing* is not listed in the window *INI-file*). When loading the INI-file for the first time, it does not yet have a name. After the initial saving of the file, the name and the path of the “[Name].INI” file will be displayed as the headline of this window.

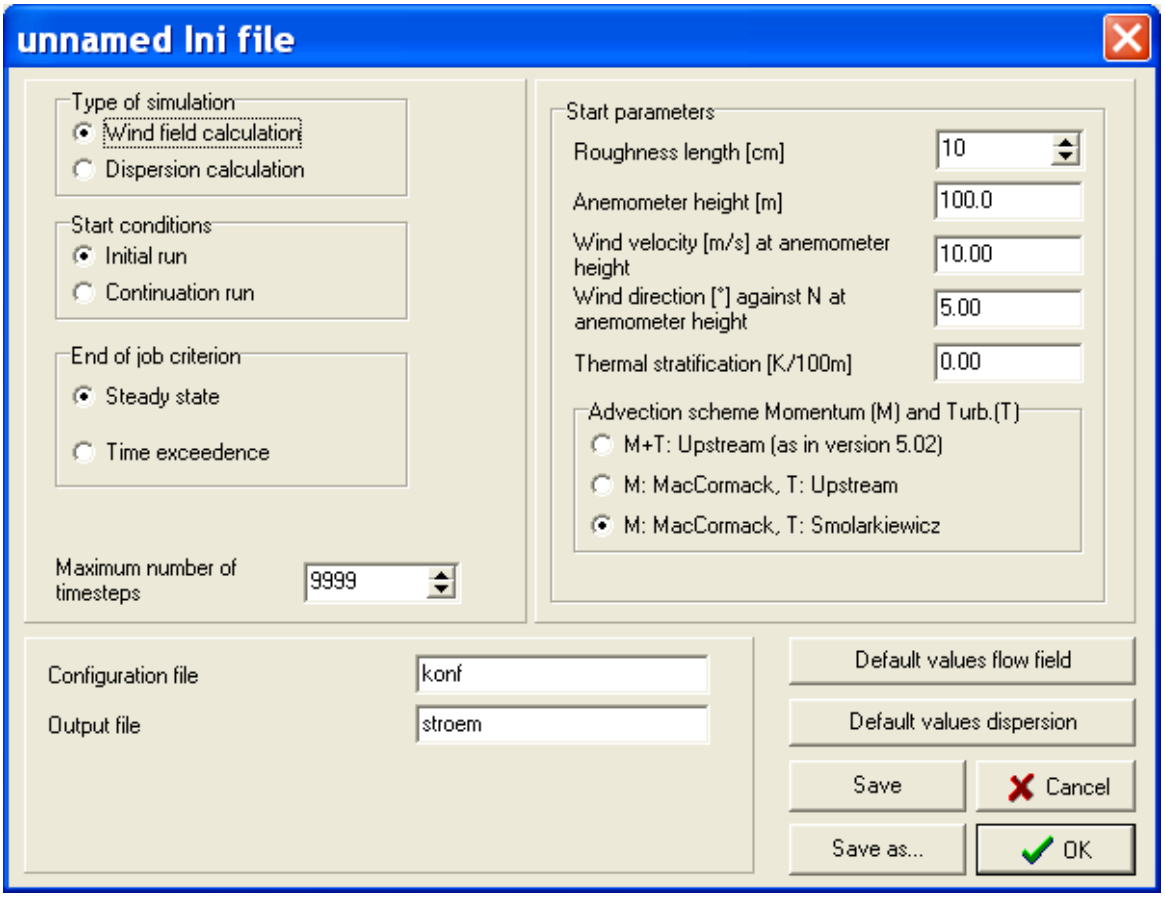
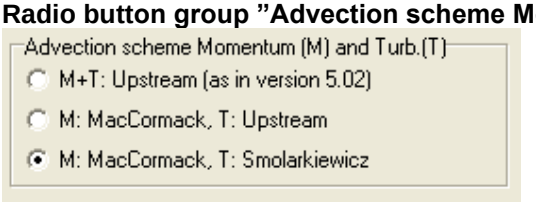


Fig. 0.1: Window INI-File in the menu option Parameters

In order to calculate concentrations with MISKAM a flow simulation must be performed first, followed by a dispersion calculation. The calculation method may be selected by marking the appropriate field with a click of the left mouse button. The window appearance will change according to the method chosen.
Note: Emissions and source distributions do not have to be set for flow calculations. But if emissions are later added to the computational grid, they cannot change the box width, the box number or the building boxes.
Start conditions determines if the simulation is an initial run or if it is a rerun. If it is a rerun of flow simulation, the upper right area of the INI-file window which deals with the starting parameters of flow initialization is not displayed. The name of the existing wind field file has to be given in the lower area of the window.
The abort criteria have to be selected from a technical point of view. More details are presented in the MISKAM manual. For time exceedance the maximum can be set to 99999 s and the maximum number of time steps to 9999.
The most secure way to load the configuration file is by double clicking on the input field with the left mouse button. The window *Open* will pop up, where the configuration file can be searched for. The name for the wind field file must also be specified. Its name should not exceed five characters, because upon repeated flow calculations from different directions the flow angle will be appended to this name.
The starting parameters for the flow simulation should be determined from a technical point of view as described in the MISKAM manual. If it is intended to calculate more than one flow direction, there is no need to input the wind direction. This angle is required for single calculations and must be entered in degrees to the north direction.
Radio button group ”Advection scheme Momentum (M) and Turbulence (T)”:



From MISKAM version 6 the numerical scheme for advection of momentum and/or turbulence can be selected by the user. If an older version of MISKAM is used the selection in the radio button group ”Advection scheme Momentum (M) and Turbulence (T)” has no influence.
If ”M+T Upstream“ is selected an upstream advection scheme (1st order scheme) like in MISKAM version 5.02 and earlier is applied. This scheme is numerically robust but contains an increased amount of “numerical” diffusion.
If ”M: MacCormack, T: Upstream“ or ”M: MacCormack, T: Smolarkiewicz“ is selected, for the advection of momentum or for the advection of momentum and turbulence a second order scheme is applied with is numerically more accurate than the first order upwind scheme.
The setting “M: MacCormack, T: Smolarkiewicz“ is the default setting.
If a MISKAM run with the setting “M: MacCormack, T: Smolarkiewicz“ does not converge try again at first with the setting „M: MacCormack, T: Upstream“ or if you still have convergence problems with the setting “M+T Upstream“.
Clicking on the field *Default values flow field* will set back all fields to the default values. The values will be registered and the INI-window closed by pressing the OK button.
At this moment, the calculation of the flows can be started.
The input of the wind field file is needed to generate an INI-file for a dispersion simulation. To determine the location of the wind field file the input field has to be double clicked with the left mouse button. If it is a rerun, the name of the existing concentration file must still be determined. The name of the generated concentration file does not have to be the same as the one of the wind field, but it should contain no more than five characters.
Three abort criteria are given for dispersion calculations: stationarity (S1) for road networks and line sources, which leads relatively quickly to stationary calculations, i.e. the calculation time is short. Stationarity (S2) for point sources requires more calculation time. Alternatively, time exceedence can be determined freely. The abort criteria should be selected from a technical point of view. More details are given in the MISKAM manual. MISKAM allows a maximum time exceedence of 99999 s and a maximum number of timesteps of 9999.
The advection scheme in the upper right window should be selected according to technical aspects for the dispersion calculations with the help of the MISKAM manual.
Ab der MISKAM-Version 6 kann für Impuls- und/oder Turbulenzadvektion das numerische Verfahren ausgewählt werden. Bei Verwendung von MISKAM 5.02 oder älter ist das Auswahlfeld ohne Bedeutung.

Bei Auswahl von „I+T Upstream“ wird ein Upstream-Advektionsverfahren (Verfahren erster Ordnung) wie in MISKAM-Version 5.02 und früher verwendet. Dieses Verfahren ist numerisch sehr robust, enthält jedoch ein erhöhtes Maß an „numerischer Diffusion“.
Bei Auswahl von „I: MacCormack, T: Upstream“ bzw. „I: MacCormack, T: Smolarkiewicz“ wird für Impulsadvektion bzw. für die Impuls- und Turbulenzadvektion ein numerisch genaueres Verfahren zweiter Ordnung verwendet.
Die Einstellung „I: MacCormack, T: Smolarkiewicz“ ist die Defaulteinstellung. Falls eine MISKAM-Fall mit dieser Einstellung nicht konvergieren sollte, so ist zunächst die Einstellung „I: MacCormack, T: Upstream“ oder bei weiterhin auftretenden Konvergenzproblemen die Einstellung „I+T Upstream“ zu verwenden.
Clicking on the field *Default value dispersion* will reset to default values. The values will be registered and the INI-window closed by pressing the OK button.
After the flow simulation is finished, the dispersion calculation can be started with respect to the generated wind fields.

Menu option Open

Selecting the menu option *Parameters* | *Open* will start a search for a parameter file “[Name].INI” in the current directory. The directory may be changed, but should be the same directory in which the ”[Name].INP” file is located. More details concerning the directory structure are given in chapter **0**. After the selection, the INI-window will open.

Menu option Save

An existing parameter file is saved via the option *Parameters* | *Save*. This will update the current situation. If a freshly generated parameter file is saved with the option *Save*, it first has to be given a name. This corresponds to the menu option *Parameters* | *Save as*.

Menu option Save as

An existing file is saved with a new name through the option *Parameters* | *Save as.*

Run

MISKAM can be started on the WinMISKAM interface through the menu option *Run*. A window will open as shown in **Fig. 0.1**. The project directory has to be determined before starting a calculation. This step will be described in chapter **0**. Several options are possible for the calculation: a single case calculation, a calculation with multiple flow angles, a batch for several prepared calculation runs, or a calculation of statistical values. If the "Interface wind and turbulence fields for AUSTAL2000" is installed, it can be activated in this menu option, too. In addition, the MISKAM version can be set by selecting between versions 3.x and the current version 6.x (the current version is set by default). Every time before starting a calculation, MISKAM will ask which version should be used. There is also the possibility to stop a calculation at any time with the menu option *Execute.*

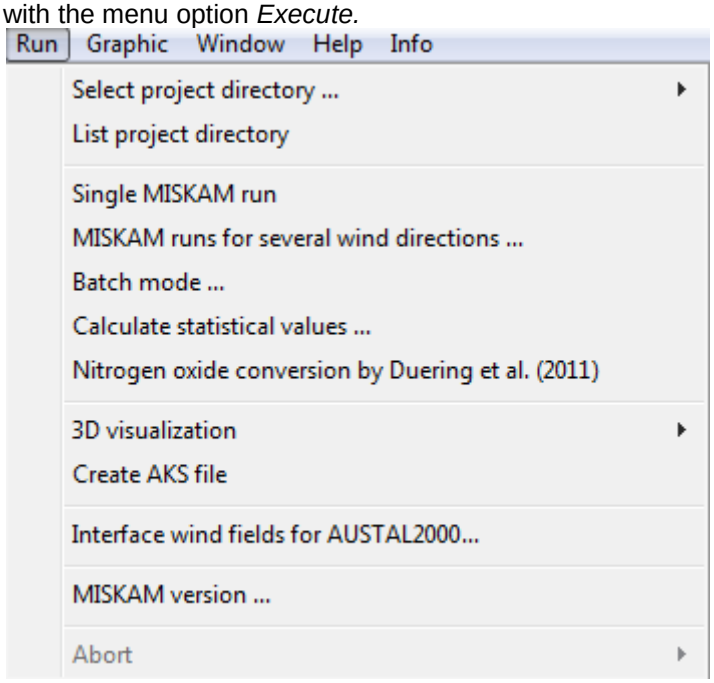


Fig. 0.1: Content of the menu Run

Menu option Select project directory

With the current version of WinMISKAM, as opposed to previous versions, it is not necessary to perform the calculations only in the directories “[*directory*]\EIN” or “[*directory*]\AUS”. The selection of the directory can be handled individually with the current version. However, this requires that the project directory with all its three subdirectories is defined by the menu option *Select project directory* before the project is started.

Selecting the menu option *Select project directory* will open three submenus: *Input INP* (configuration), *Input ZWU*, *ZWK* or *ZWT* as well as *Output*. All three functions have to be started and set.

After clicking on the submenu *Input INP (Configuration),* the window Search directory with the subtitle Project directory for MISKAM INP files will be opened. The directory in which to find the appropriate input file has to be selected. Subdirectories can be opened and closed by double clicking on a directory (folder icon). The icon "+" in front of the folder icon indicates whether subdirectories exist. The icon “-“ appears

when the subdirectories are opened. Directories trees can also be expanded or collapsed by clicking on these symbols. The selection of the directory has to be checked by clicking on the OK button.
The directory for ZWU, ZWK or ZWT input has to be selected. After selecting the submenu *Input ZWU, ZWK or ZWT,* the window *Search directory* with the subtitle *Project directory for MISKAM ZWU, ZWK, ZWT files* will open, where directory which already contains results should be indicated. Upon the first calculation of the current situation, the directory in which the results will be stored has to be determined. If a dispersion calculation is running, the flow fields for example are read out of the indicated directory. This also holds for reruns of existing calculations.
The third step is to determine the location of the result files. Selecting the submenu *Output* will open the window *Search directory* with the subtitle *Project directory for MISKAM result files*, in which the directory for saving results will have to be indicated.
Clicking on one of the menu options *Run* | *Single MISKAM run*, *Run* | *MISKAM runs for several wind directions* and *Run* | *Batch mode* will open the window *Bestätigung (*Confirmation), which displays the project directories currently set. These settings have to be checked by clicking on the OK button, which will also close the window. However, any correction of the input can be made at this point if required.

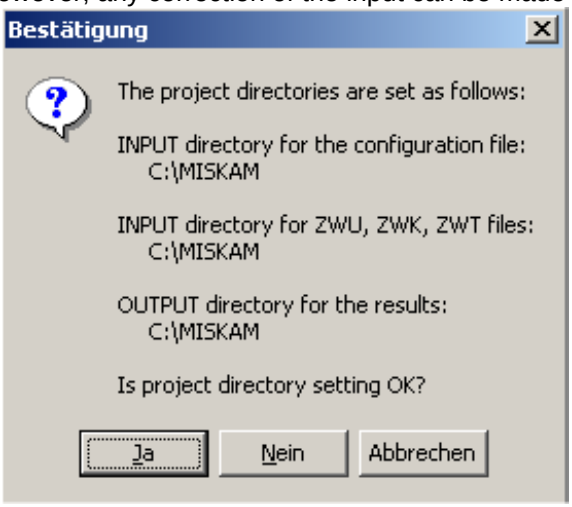


Fig. 0.2: Bestätigung (Confirmation) with the selected directories

Menu option Single MISKAM run

Selecting the submenu option *Run* | *Single MISKAM run* will start the calculation of the “[Name].INI” file for the situation defined through the menu option *Parameters* | *Edit*. This includes the values of the configuration file, the calculation method, and the initial parameters. The window *Verify*, which lists the project directories, will open, which is to be followed by a click on the *Yes* button. Then, the window *MISKAM version* will open in order to select the MISKAM version. Following this the calculation can start. The calculation status can be viewed in the window *Status information.* In addition, a DOS-window of MISKAM output will open for the single case calculation, which can be moved on top of other windows by a double click on the icon in the task bar or by pressing the ALT and the TAB keys simultaneously. The first step of the calculations may take very long, during which no continuing updates can be seen in the MISKAM window. After this initial calculation step, it is possible to follow the status of the calculations in the MISKAM window.
If the configuration file does not exist, an error message will be displayed. If the single case already exists, an appropriate message will appear in the MISKAM window.
The following files will be generated in the determined folder for results for flow calculations: “[Name].ZWU”, “[Name].ZWT”, “[Name].UVW”, “[Name].TUR”, “[Name].PRS”. The existence of the file “[Name].ZWU” is important for the recognition of whether the result of a flow calculation already exists. The file “[Name].PRS” describes the progress of the calculation.
The following files will be generated in the determined folder for results for dispersion calculations: “[Name].ZWK”, “[Name].KON”, “[Name].PRA”. The existence of the files “[Name].ZWK” is important for the recognition of whether the result of a dispersion calculation already exists. The file “[Name].PRA” is a log of the calculation progress.

Menu option MISKAM runs for several wind directions

The window *MISKAM runs for several wind directions* will open when selecting the submenu option *Run* | *MISKAM runs for several wind directions.*

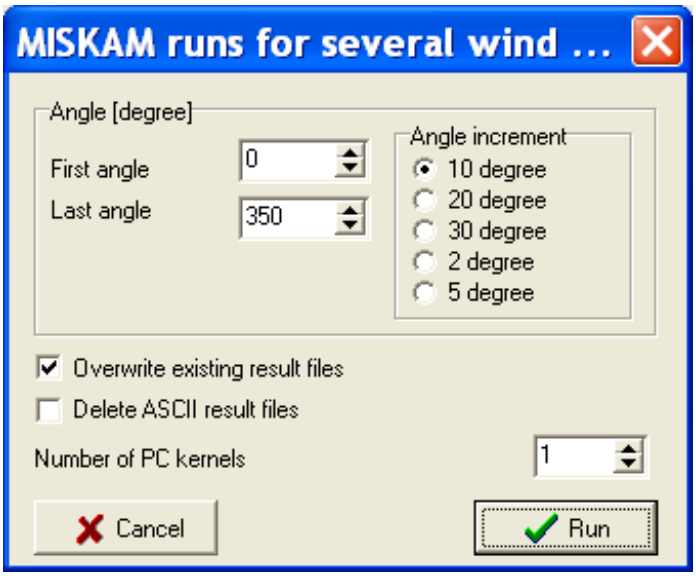


Fig. 0.3: Window MISKAM runs for several wind directions in the menu option Run

The definition of the situation or of the cases calculated in the file "[Name].INI" in the menu option *Parameters* | *Edit* is required for starting the batch mode. The calculation of the wind fields in steps of 10, 20, 30, 2, or 5 degrees can be initialized by selecting a value in the input area *Angle increment*. These angle increments have to be selected from a technical point of view. The dispersion calculations require the existence of appropriate wind fields. The name of the result file will be extended by the flow angle (e.g. *****210.ZWU, *****_10.ZWU etc.).
Checking the field *Overwrite existing result files* will start a recalculation of all selected flow directions. If this check is not set, all existing cases will be omitted from the calculations. Existing cases are recognized by the complete name of the result file.
Clicking the *Run* button will open the *MISKAM version* window for setting the preferred MISKAM version. The calculation can then be started. Binary files ("[Name].ZWU", "[Name].ZWT", "[Name].ZWK") will be generated during the calculations, which are needed for further purposes in WinMISKAM. Files in the ASCII-format will be generated in addition ("[Name].UVW", "[Name].TUR", "[Name].KON"), not being needed for any purposes by WinMISKAM. Their creation can be avoided by activating the option *Delete ASCII result files*, as these files need a lot of disk space.

Multicore capabilites of MISKAM calculations

If your PC, on which MISKAM calculations are performed has more than one PC kernel, the number of PC kernels can be selected, which are used for the MISKAM calculations.

The total computing time for all MISKAM calculations which are performed when pressing the Run button is reduced nearly linear according to the available and used number of PC kernels (if enough RAM is available).

It is not checked whether the selected number of PC kernels is larger than the available number of PC kernels. Is that the case the total computing time for all MISKAM calculations is not reduced according to the selected number of PC kernels. The maximum number of selectable PC kernels is limited by 16.

After pressing the Run button a number of MISKAM calculations are started and performed simultaneously according to the selected number of PC kernels.

The simultaneously running MISKAM processes can be seen on the task bar (following example is for „Number of PC kernels: 4")

The following files will be generated in the determined folder for results following flow calculations: “[Name].LOG”, “[Name].ZWU”, “[Name].ZWT”, “[Name].UVW”, “[Name].TUR”, “[Name].PRS” (suppressing the creation of ASCII-files would omit the files “[Name].UVW”, “[Name].TUR”).

The existence of the following files in the determined folder (set by the menu option *Run* | *Select project directory* | *Input ZWU, ZWK or ZWT)* is required for dispersion calculation: “[Name].LOG”, “[Name].ZWU”, “[Name].ZWT”. The following files will be generated in the folder for results following dispersion calculations: “[Name].ZWK”, “[Name].KON”, “[Name].PRA” (suppressing the creation of ASCII-files would omit the file “[Name].KON”). The file “[Name].LOG” in the folder for results will be extended, if the names of the wind field files and the concentration files are the same. If the concentration file has another name than the flow files (see menu option *Parameters* | *Edit)*, a new file “[Name].LOG” will be generated in the folder for results.

It is possible to work on several flow angles in batch mode under the menu option *Run / Batch mode*.

Menu option Batch mode

The window *Batch mode* will open after selecting the submenu option *Run* | *Batch mode* and approving **Bestätigung** (Confirmation). Several prepared calculations can be run simultaneously in WinMISKAM. This holds for single case situations as well as for runs of multiple flow directions.

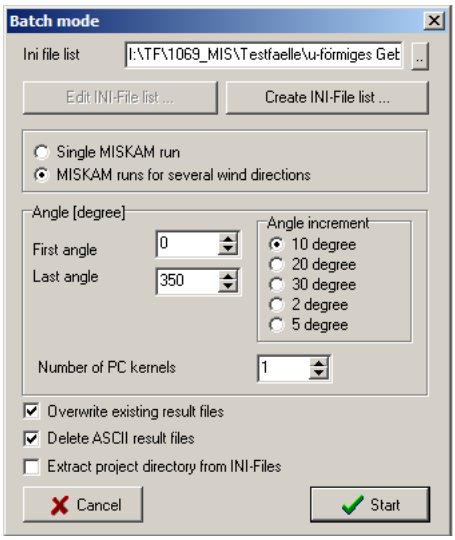


Fig. 0.4: Window Batch mode

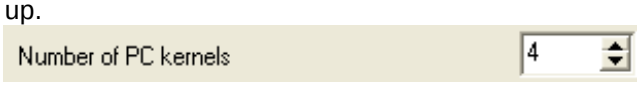
To start the batch mode, several “[Name].INI” files have to exist in the determined folder, set through the menu option *Run* | *Select project directory* | *Input INP (configuration)*. A list of the INI files corresponding to the calculations to be processed have to be entered with a editor into an ASCII file. The name of the batch mode control file can be selected freely. To save this file as “[Name].LST” is obligatory. We have named the file in this example “JOB.LST” and its content is the following :

bsp-s.ini
bsp-a.ini

Table 0.1: Content of the control file for the batch mode

If the INI-file to be selected does not exist at the determined location, the complete path of this INI-file has to be entered in the control file (“JOB.LST”). To run the batch mode for flow and dispersion calculations, parameter files “[Name].INI” have to be generated and saved under different names.
In the window *Batch mode*, there is the possibility to select the calculation of either a single case situation or several runs with several wind directions by marking the corresponding box. For single case situations,

it has to be selected, whether existing result files should be overwritten. In addition, the creation of the result files in ASCII-format can be omitted by marking the option *Delete ASCII-result files*.
If flow calculations for multiple flow directions, followed by dispersion calculations with the corresponding wind fields for multiple pollutants should be run, the second box (*MISKAM runs for several wind directions*) has to be selected. In this case, the input possibilities concerning flow directions described above will show up.

The meaning of 

is explained in chapter 0.

The window *MISKAM version* will open when clicking on the *Start* button and batch mode calculations will begin.

Menu option Calculate statistical values

The submenu option *Run* | *Calculate statistical values* can be used as soon as the concentration fields for all wind directions to be included in the statistics have been calculated. Selecting this submenu option will open the window *Statistical values*, which contains seven input registers: *Files / Background concentration, Meteorology, Percentile / Threshold value, NO-NO2-conversion, PM10 short term threshold value, Computational domain* and *Traffic induced turbulence*.

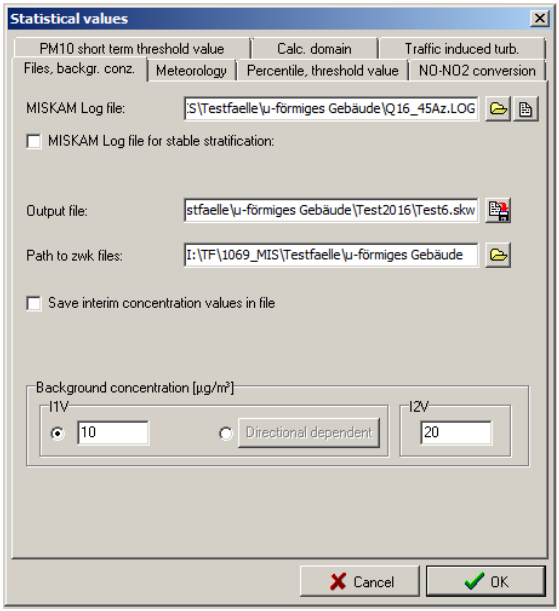
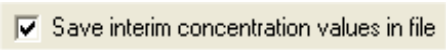
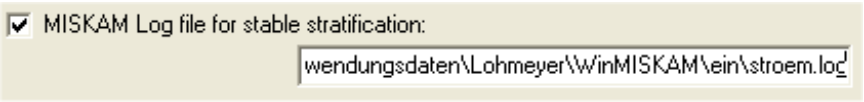


Fig. 0.5: Window Statistical values with the input register Files / Background concentration

The input and output files which are needed for calculating statistical values have to be specified in the input register *Files / Background concentration*. For this purpose, the input fields *MISKAM Log file, Wind statistic file* and *Path to zwk files* have to be filled out. The “[Name].LOG” file was generated by the batch mode calculations of concentration fields in the selected output directory (menu option *Run* | *Select project directory* | *Output*). If the name of the flow file corresponds with the name of the concentration file, only one “[Name].LOG” file will exist. If different names have been chosen, the “[Name].LOG” file of the concentration calculations has to be used for the calculations of the statistical values in the input field *MISKAM Log file*.



If the field *Save interim concentration value in file* is checked, a file “[Name].EZW” will be generated in the selected output directory. This will turn off the function *background concentration*, i.e. the set values of the background concentration will be ignored. This single value file can also be used in the program PROKAS (Ingenieurbüro Lohmeyer GmbH & Co. KG) and is further described there. This makes possible a linking of the results of the road network calculations (PROKAS) and these of the micro scale calculations of WinMISKAM.



The option *"MISKAM Log file for stable stratification"* should be marked, if concentration fields for a stable atmospheric stratification are available and should be integrated into the calculation of statistical values.

When doing dispersion calculations in WINMISKAM the concentration distribution due to the considered sources inside of the computational domain is calculated. Background concentration levels can be entered in the input fields for *background concentration*. Those values will be superimposed to the concentration distribution calculated by WinMISKAM.

If dispersion calculations are done for NO_x, the values of the background concentration have to be entered as NO_2 values and not as NO_x values. Internally the NO_2 background concentrations are converted to NO_x background concentration values.

The input field *I1V* inside of *background concentration [µg/m³]* [15] defines the annual average of background concentration of the treated pollutant. The 98-percentile of the background concentration of the treated pollutant has to be set into the input field *I2V*.

Important hint: For NO_X, NO_2 has to be entered as input values in both I1V and I2V input fields.

There is the possibility to choose between a constant and a wind direction dependent mean annual value for *I1V.* Pushing on *I1V direction dependent* the window **Background concentration** (Fig. 0.6) opens. It is possible to enter the value of mean annual background concentration for each wind direction manually.

[15] If statistical values are calculated for NOx and as NO-NO2 conversion method "Duering et al. (2011)" has been selected, the input fields for the background concentration I1V and I2V are deactivated. Those values are entered later at menu option "Run | NO-NO2 conversion according to Duering et al. (2012)".

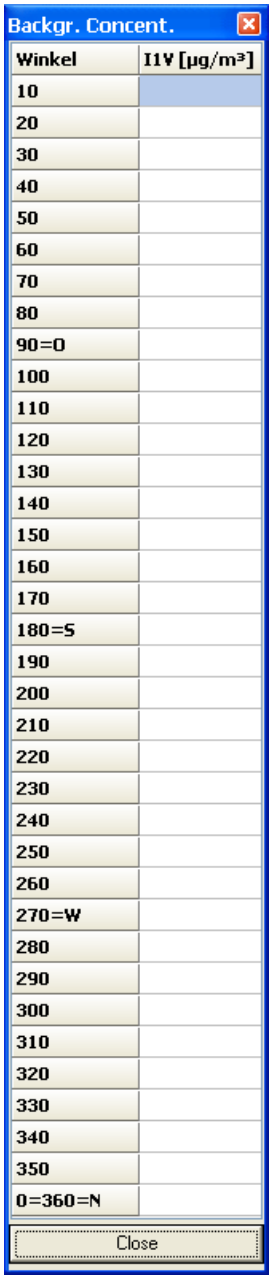


Fig. 0.6: Window for the input of background concentrations

Important hint: For NO_X , NO_2 has to be entered as input values in the I1V input fields.

All values can be saved using *"Save as"* in the popup menu (Fig. 0.7), which appears after pressing the right mouse button. Applying *"Load …"*, a once saved wind direction dependent background concentration can be reloaded. Furthermore, the background concentrations of the last run can be used choosing "*Load last values"*. The function *"Filling up missing values"* in the popup menu distributes values to all the missing wind directions, if there is at least one known value. Missing values between two known background concentrations are filled up applying linear interpolation. Choosing the function *"Empty column"* all values are erased.

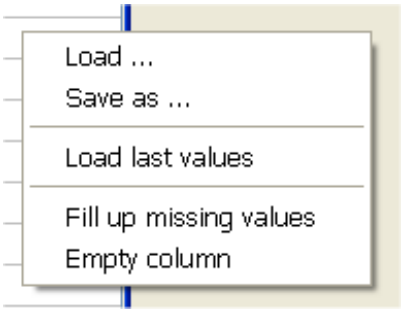


Fig. 0.7: Popup menu of the window background concentration

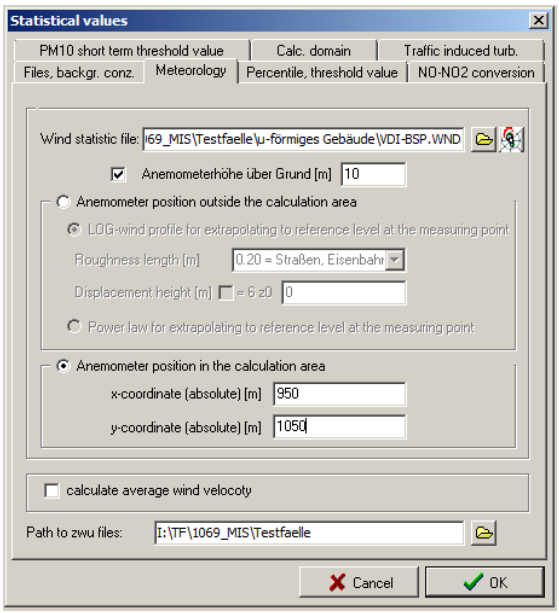
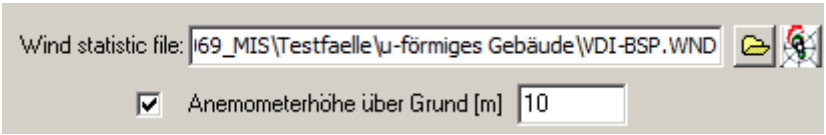


Fig. 0.8: Window Statistical values with the input register Meteorology

In the input register Meteorology (Fig. 0.8) the wind statistics needed for the calculation of statistical parameters are determined. In addition, the anemometer height and the horizontal anemometer position (in or outside the computational domain) can be specified. If the anemometer position is outside of the computational domain, the wind velocity is extrapolated from measuring height to the reference height of 100 m either with the logarithmic wind profile, using the roughness length and displacement height or with the power law.



In the input field *Wind statistic file* the wind statistics (see Chap. 0 in WND- or AKS format) or the meteorological time series (in the AKT format) has to be entered. When checking a*nemometer above ground [m]* the anemometer height is explicitly set. If not checked and the wind statistics is in the WND format the anemometer height is extracted from the first line of the wind statistics file otherwise an anemometer height of 10 m is assumed.

After pressing the button  , a window appears in which the wind distribution is displayed. For further information see RosePlot Help.

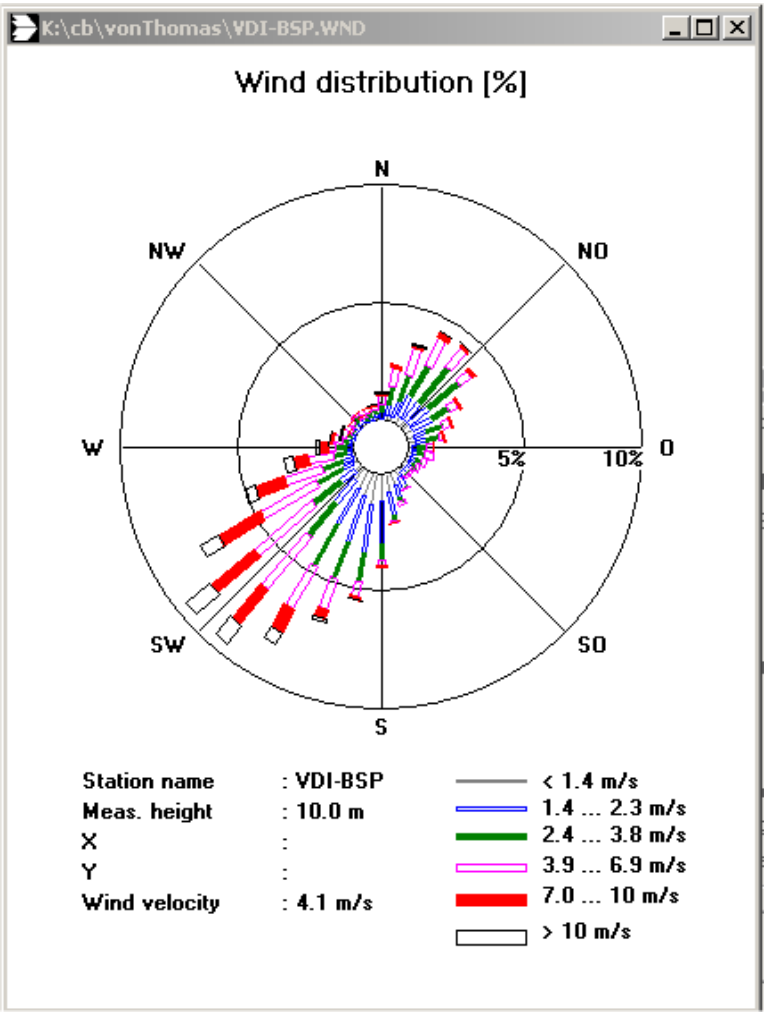


Fig. 0.9: Visualisation of the wind distribution

In the input field *Percentile* in the register *Percentile | Threshold value* the desired percentile value has to entered. This describes a concentration value, which will not be exceeded in the given percentage of time. In addition a five step *percentile time function* has to be given, representing the diurnal cycle of the emissions in the concentration calculation.

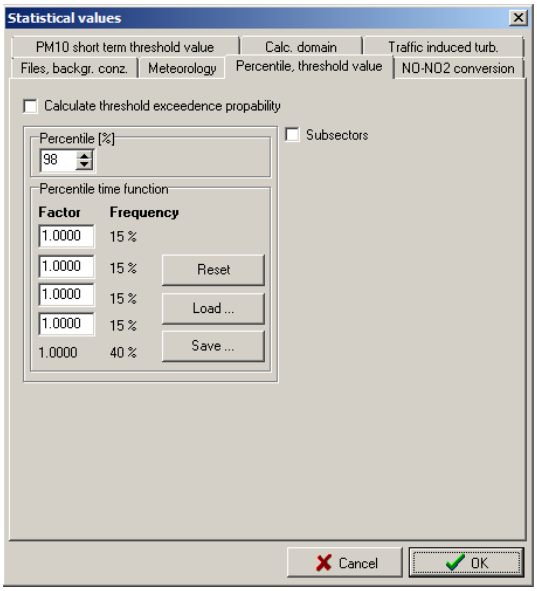


Fig. 0.10: Window Statistical values with the input register Percentile | Threshold value

The time function allows to consider diurnal variation of the source strengths. Setting the value 1 in all four input fields assumes an equal distribution over the day. The settings saved or reloaded by pressing the corresponding buttons. The button *Reset* will reset the variables to an equal distributed source strength over the day.

The button *Calculate threshold exceedance probability* is only available if the extension module "Threshold exceedance probability" is licensed.

Checking the option *Subsectors* will offer the possibility to refine the calculation of statistical values by using concentration fields which have been generated with wind fields having a 5 or 2 degree wind direction increment instead of the 10 degree increment, which is default.

The register *NO-NO_2-Conversion* (cf. Fig. 0.11) offers 4 different parametrizations for the calculation of the NO-NO_2-conversion:

1. Romberg et al. (1996)
2. Romberg et al. (1996) modified at high NO_x values
3. Romberg et al. (1996) with own parameters
4. Duering et al. (2012)

"Romberg et al. (1996) modified at high NO_x values" offers the possibility to leave the Romberg formula at a specified concentration (see input field "Connection to Romberg") and to continue for higher values with a linear function between NO_x- and NO_2-concentration values. The linear function fits to a NO_x-NO_2-value pair which must be entered in the input field "2nd value pair".

The user is responsible for the selection of appropriate value for the input field "Connection to Romberg" and "2nd value pair". Default values are not given here.

"Romberg et al. (1996) with own parameters" offers the possibility to change the Romberg default parameters. Appropriate parameters can be obtained by a statistical analysis of NO_x/NO_2 measurement.

The user is responsible for the selection of appropriate value for those parameters.

Pressing the "Default"-Button resets the values to the default values according to Romberg et al. (1996). Selecting (1.) Romberg et al. (1996) und (3.) Romberg et al. (1996) with own parameters and pressing the "Default"-Button gives the same results.

For "Duering et al. (2012) " see chapter 0.

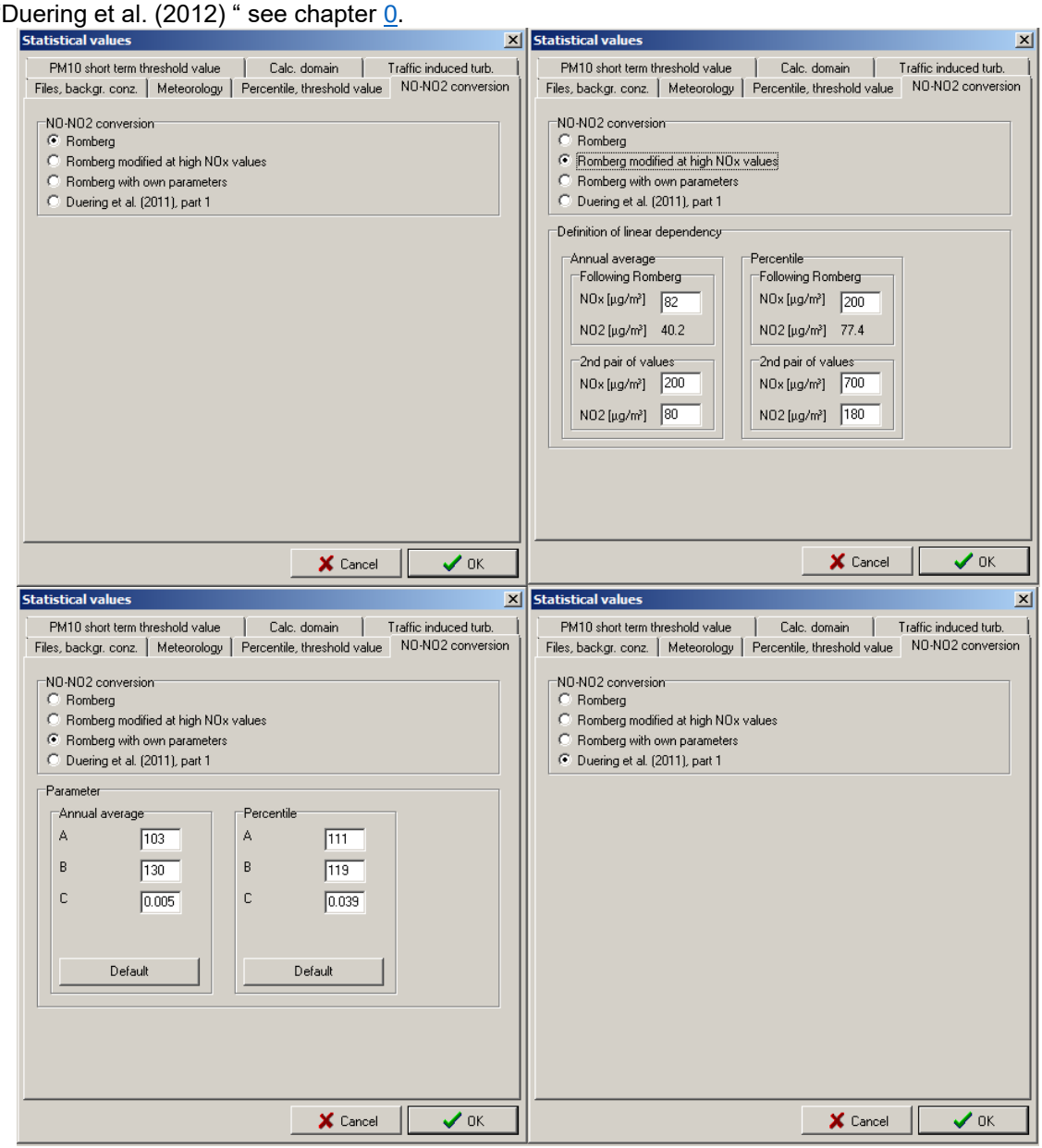


Fig. 0.11: Window Statistical values with the input register NO-NO2 conversion

The register *PM10 short term threshold value* offers four different ways to calculate the short term threshold values for PM10. The result of the calculation is the number of days having a daily average value above 50 µm/m³. The theoretical background for the different calculation methods is explained in the annex.

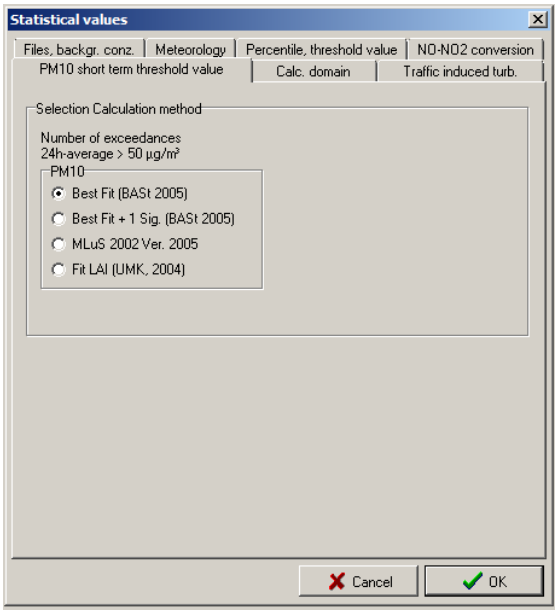


Fig. 0.12: Window Statistical values with the input register PM10 short term threshold value

The input register *Computational domain* allows to determine whether the calculation of the statistical values should be done for the whole computational grid or only for an sub-region. If *all indices* is checked, the whole computational grid will be calculated. After unchecking the checkbox *all indices* in the field *x-direction* and *y-direction* respectively gives the possibility to limit the calculation by entering the smallest and the biggest index of the computational grid which should be included in the calculations. Alternatively, a file can be specified, which contains the i and j indices of the computational grid boxes to be included in the statistical calculations (each point one row, i and j separated by a space). An input window will open when clicking on the field *Read i, j index from file*, in which the path and the name of the file has to be entered.

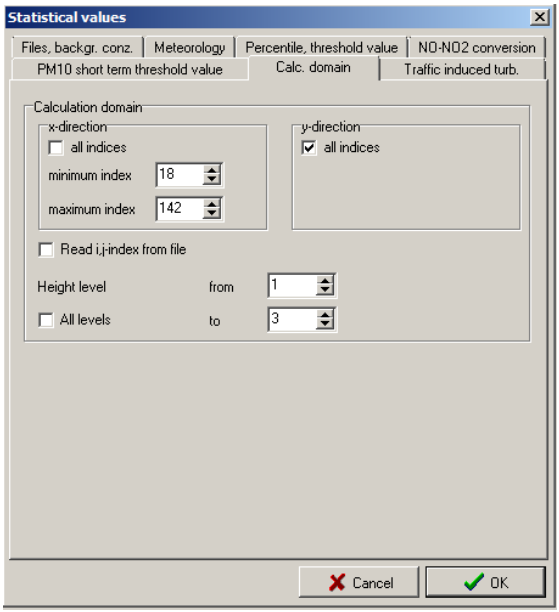


Fig. 0.13: Window Statistical values with the input register Computational domain

The height level determines, in which box above ground the statistical values of the emissions will be calculated. Therefore *all levels* can be checked to calculate statistical values vertically over the whole computational domain. If the calculation should be done for a limited vertical level, the upper and the lower limit can be entered into the fields *from* an *to*.
The input register *Traffic induced turbulence* contains a box for activating this function. If this box is not checked, the concentration will be scaled in inverse ratio to the wind velocity (for further explanations see chapter 0). Checking the field *consider traffic induced turbulence* opens the window Fig. 0.14.
These inputs can be changed for dispersion calculations from a technical point of view, if it is required. The default values which are predetermines represent the current knowledge (see chapter 0). The user can vary these values. The field *default values* reset all changes of parameters.

The calculation of the statistical values may be started by accepting the input in the window *Statistical values*. Following this, the concentration fields are loaded before all the grid boxes are calculated. The loading and the calculation of these various steps can be followed in the footer of WinMISKAM.

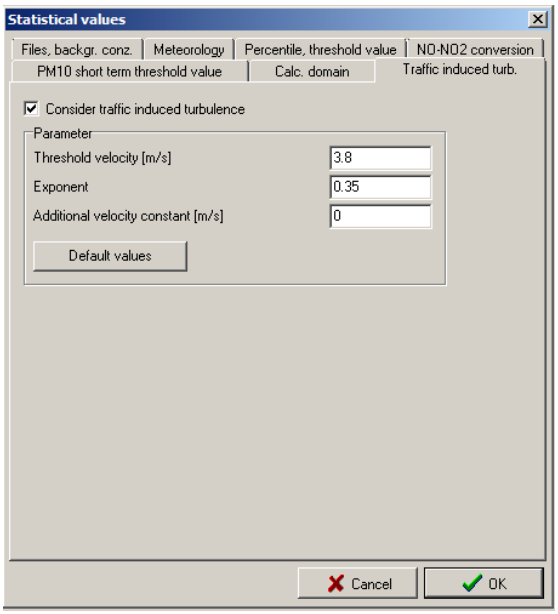


Fig. 0.14: Window Statistical values with the input register Traffic induced turbulence

Wind statistic files

WND-format

Wind conditions are considered in form of a dispersion class statistic in the TA-air format. The file contains information about the frequency of wind directions, wind velocities and dispersion classes in 1/100 per mille. For all wind directions in steps of 10 or 30 degrees, the frequency of wind velocity must be provided in 9 classes and the dispersion classes in six groups. The format of the file is listed for the first dispersion class in **Table 5.2**.
The 9 wind velocities at the measuring height are 1, 1.5, 2, 3, 4.5, 6, 7.5, 9 and 12 m/s.

Anemometer height	10										Station example FREILAND						
107	101	89	78	75	75	75	540	370	240	180	140	120	100	100	140	240	.
96	89	80	71	69	66	66	180	120	80	60	50	40	30	30	50	80	.
107	105	101	94	91	89	89	150	90	60	40	30	20	20	20	30	60	.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 0.2: Extract of a wind file "[Name].WND"

The measured height or the anemometer height (in meters) has to be entered as the second character string in the first line. This string has to be separated by at least one empty space in both directions. This number will be defined by WinMISKAM as measured height of the wind statistics zw. The following characters will further be scanned for the presence of the string "FREILAND" (see chapters 0 and 0). The presence of the word "FREILAND" indicates that the wind statistic was measured in a not aerodynamically rough area. Otherwise, it is considered a rough area (city).
The case frequencies are listed starting from the second line. WinMISKAM accepts and recognizes statistics with 10, 20 and 30 degree partitions. The example (Table 0.2) demonstrates a 20 degree partition.
Table 0.3 indicates the number of columns of the "WND-file" beginning at the second row. Additionally the wind direction of the first and last column is shown.

degree partition of dispersion class statistic	**Number of columns**	**First column according to wind direction**	**Last column according to wind direction**
10-Grad	36	10 Grad	360 Grad
20-Grad	18	20 Grad	360 Grad
30-Grad	12	0 Grad	330 Grad

Table 0.3: Number of columns and the wind direction of the first and last column of a WND-file

The rows are generally ordered in blocks by 9 rows. There are 6 blocks. I.e. altogether 6 blocks with 9 rows per block = 54 rows. The 9 rows of each block stand for the nine wind velocity classes 1; 1.5; 2; 3; 4.5; 6; 7.5; 9; 12 m/s. And the 6 blocks stand for six dispersion classes I, II, III/1, III/2, IV, V.

AKS-format

WinMISKAM is able to read dispersion class statistics (= AKS) in the AUSTAL2000 format. Normally, they consist of fife headers. As they do not include the anemometer height, this has to be defined in the register *meteorology* in the window **statistical values**. The meaning of the lines following the header is identical to those of "wnd-files".

```
ANONYM
01.10.1995 - 31.12.1999
KLUG/MANIER (TA-LUFT)
JAHR
ALLE FAELLE
  107  101   89   78   75   75   75
   96   89   80   71   69   66   66
  107  105  101   94   91   89   89
    0    0    0    0    0    0    0
    0    0    0    0    0    0    0
```

Fig. 0.15: Extraction of an AKS-file

Meteorological time series in AKT-format

WinMISKAM is able to read meteorological time series (=AKT) in the AUSTAL2000 format. The meteorological time series are converted internally into a dispersion class statistic. The AKTerm is text files, which contains one line with meteorological parameters for every hour of the year. Two formats are supported:

1. format[16]: Every line contains 24 signs with the following meaning:

parameter	**position**
Station number	1 to 5
Date (JJJJMMTTSS)	6 to15
Interpolation identifier	16
Wind direction (Dekagrad)	17 to 18
Wind velocity (Knot)	19 to 20
Klug/Manier class (1..6)	21
Turner class	22
ww-cod number	23 to 24

Table 0.4: Description of AKTerm, correlation between parameters and position

The station number has to consist of 5 numbers. For missing data station number and date is mandatory, but the following values as wind velocity are substituted by blanks. The value 0 for the Klug/Manier class is assessed as invalid or missing in AUSTAL2000.

Example:

```
10999199801010001973460
10999199801010102073463
10999199801010201963460
10999199801010301963421
10999199801010402063400
10999199801010502263400
10999199801010602163413
10999199801010702153400
10999199801010802052400
10999199801010902152400
10999199801011002153400
10999199801011102364400
```

Fig. 0.16: Extraction of an AKTerm

2. format[17]: The file consists of a header and a data set. The header contains up to five comment lines beginning with a star (*) as first sign. The header is followed by a line containing the anemometer heights for different roughness lengths. This line is initialized with

   + Anemometerhoehen (0,1m)

[16] This format is used by the DWD since 1998-04-01.
[17] This format is used by the DWD since 2004-04-01

followed by 9 integral numbers for anemometer heights in the units of 0,1 m (each with four numbers without leading ceros, separated by blanks) for the roughness lengths 0,01 m to 2 m described in annex 3 of TA air[18].

The data set contains lines with 16 entries, which are separated by exactly one blank. The meanings of the entries are:

entry	meaning	position	range
KENN	Identifier for the data collective	1 to 2	AK
STA	Station number	4 to 8	00001-99999
JAHR	year	10 to 13	1800-2...
MON	month	15 to 16	1-12
TAG	day	18 to 19	1-31
STUN	hour	21 to 22	0-23
NULL	Numerical empty space	24 to 25	0
QDD	Quality byte (wind direction)	27	0,1,2,9
QFF	Quality byte (Wind velocity)	29	0,1,2,3,9
DD	Wind direction	31 to 33	0-360,999
FF	Wind velocity	35 to 37	0-999
QB	Quality byte (value-status)	39	0-5,9
KM	Dispersion class after Klug/Manier	41	1-7,9
QB	Quality byte (value-status)	43	0,1,9
HM	Mixing layer height (m)	45 to 48	0-9999
QB	Quality byte (value-status)	50	0-5,9

Table 0.5: Description of the AKTerm used since 2002, correlation between meaning and position

Example:

```
* Az.: KU11A7/08/A865
* AK Zeitreihe, Deutscher Wetterdienst, Offenbach (KU11A)
* Station Muenchen-Erdinger Moos Flughafen
* Zeitraum 01.01.2002-31.12.2002
+ Anemometerhoehen (0.1 m):   71   85  107  129  157  208  262  304  340
AK 10870 2002 01 01 00 00 1 1 260  46 1 3 1 -999 9
AK 10870 2002 01 01 01 00 1 1 240  29 1 2 1 -999 9
AK 10870 2002 01 01 02 00 1 1 250  26 1 2 1 -999 9
AK 10870 2002 01 01 03 00 1 1 260  23 1 1 1 -999 9
AK 10870 2002 01 01 04 00 1 1 220  30 1 2 1 -999 9
AK 10870 2002 01 01 05 00 1 1 240  40 1 3 1 -999 9
AK 10870 2002 01 01 06 00 1 1 240  49 1 3 1 -999 9
```

Fig. 0.17: The first lines of an AKTerm (new format)

The quality byte for wind direction can have the following values:

QDD	Meaning
0	Wind direction in deka degree
1	Wind direction in degree, original in deka degree
2	Wind direction in degree, original in degree
9	Wind direction missing

Table 0.6: Meaning of possible values of quality bytes for wind direction

[18] Information for the derivation of these anemometer heights are found in the internet under www.austal2000.de on the page Fragen und Antworten (questions and answers)

The quality byte for wind velocity can have the following values:

QFF	meaning
0	Wind velocity in knots
1	Wind velocity in 0,1m/s, original in 0,1m/s
2	Wind velocity in 0,1m/s, original in knots (0,514m/s)
3	Wind velocity in 0,1m/s, original in m/s
9	Wind velocity missing

Table 0.7: Meaning of possible values of quality bytes for wind velocity

If the dispersion class is not detectable, KM has the value 7 and the value 9 as missing identifier.

EGX file

The temporal variation of emission files describes the dispersion of emissions of a material (e.g. NO_x, benzene, PM 10 or soot), the dispersion being aggregated in five classes. These files are needed for the calculation of the percentile value, but not for the calculation of the yearly average. The “[Name].EGX” files contain the five values for the relative strength of emission P_l and the relative frequency of the class b_l. EGX represents EGR, EGB and EGN extensions. The extensions EGR, EGB, EGP and EGN stand for the files for the materials soot, benzene, PM 10 and NO_x respectively.

The five values for the relative strength of emission P_l are generally derived from the temporal variation of traffic density for a selected road segment. The relative strengths of emission refer to the average emission densities.

The “[Name].EGX” files are constructed as follows. The first line consists of comments. Lines 2 to 6 list the relative strength of emission (the first number of a line) and the frequency of 5 emission classes (the second number). The relative strength of emission are multiples of the average emission density, each of the first 4 classes has a frequency of 14.881 % , the last class is 40.476 %.

In the given sample file for NO_x, the emission of 1.9782-times the weekly average value is realized 14.881 % of the time, an emission of 1.7622-times 14.881 % of the time, etc. This classification has withstood sensitivity tests. However, it is possible to work with other classifications, providing that the sum of the frequencies is one. The seventh line of the “[Name].EGX” file is for comments. 168 lines follow, each representing one hour of a week along with the hourly emissions. These lines are sorted by emission size.

[Name].EGN		[Name].EGB		[Name].EGR	
NO_xEmgFile from:		BenzeneEmgFile from:		SootEmgFile from:	
1.9782	0.14881	1.9947	0.14881	2.0812	0.14881
1.7622	0.14881	1.5684	0.14881	1.9401	0.14881
1.3307	0.14881	1.3663	0.14881	1.2038	0.14881
0.7389	0.14881	0.9089	0.14881	0.6554	0.14881
0.3345	0.40476	0.3242	0.40476	0.3086	0.40476
Emission frequency distribution		Emission frequency distribution		Emission frequency distribution	
1	1.5029	1	0.0179	1	0.0224
2	1.5029	2	0.0179	2	0.0224
3	1.5029	3	0.0179	3	0.0224
4	1.5029	4	0.0179	4	0.0224
5	1.5029	5	0.0179	5	0.0224
6	1.4406	6	0.0175	6	0.0214
7	1.4406	7	0.0175	7	0.0214
8	1.4406	8	0.0175	8	0.0214
9	1.4406	9	0.0175	9	0.0214
10	1.4406	10	0.0175	10	0.0214
.	.	.	.	.	.
168	0.0423	168	0.0007	168	0.0004

Table 0.8: Extracts from the files "[Name].EGN", "[Name].EGB" and "[Name].EGR"

The data starting from line 7 are for information purposes and are not needed by WinMISKAM.

Parameter file VDI_FREI.PAR

Only the last line of the file VDI_FREI.PAR is used by WinMISKAM. It contains information about the default scaling of concentrations with regards to the wind velocities for situations with traffic turbulence implementation (see chapter **0**). The default values are:

- threshold wind velocity u_S = 3.8 m/s and
- Exponent n = 0.35,
- Additional velocity constant Δu = 0.0 m/s,

These default values can be changed by checking the button *Consider traffic induced turbulence* in the window *Run* | *Calculate statistical values* | *Traffic induced turbulence*, if it is required from a technical point of view. If the button is not checked, the scaling of the concentration is done in inverse ratio to the wind velocity (i.e. exponent n = 1).

TA air:	class	Nr	G	g	F	f	m
I	F	1	0.241	0.662	1.294	0.718	0.37
II	E	2	0.264	0.774	0.801	0.754	0.32
III/1	D	3	0.215	0.885	0.640	0.784	0.26
III/2	C	4	0.165	0.996	0.659	0.807	0.18
IV	B	5	0.127	1.108	0.876	0.823	0.14
V	A	6	0.151	1.219	1.503	0.833	0.12
traffic_turbulence parameter			exponent	delta_u	threshold velocity.		constant
			0.35	0	3.8		1

Table 0.9: The file "VDI_FREI.PAR" with default content

For areas where traffic induced turbulence should be considered, above a threshold value of 3.8 m/s in 100m height the scaling of concentrations is done in inverse ratio to the wind velocity, and proportional to the wind velocity $u^{-0.35}$ below this threshold value. This takes into consideration the influence of the traffic induced turbulence within street canyons (Schädler et al., 1996). The concentrations calculated with the scaling of $u^{-0.35}$ in MISKAM only hold for the immediate surroundings of a source, for the distant surroundings the scaling has to be done in inverse ratio to the wind velocity. The influence of the traffic induced turbulence and its consideration in the flow models is currently scope of the research. It is currently not known in which distance of the road the transition of the scaling with u to $u^{-0.35}$ should take place.

Calculation of statistical values

Anemometer position is outside the computational domain

Yearly average concentration

The yearly average concentration of a passive pollutant[19] is calculated for the point of interest with the help of a three-dimensional dispersion class statistic Φ.
The yearly average is calculated as follows:

$$\bar{c} = \sum_{k=1}^{K}\sum_{j=1}^{J}\sum_{i=1}^{I} \Phi\left(v_i, \varphi_j, d_k\right) \cdot c\left(\varphi_j, d_k\right) \cdot u_{100} \cdot \min\left(\frac{1}{u_i\left(d_k\right)}, \frac{1}{u_s}\left(\frac{u_s}{u_i\left(d_k\right)}\right)^n\right) + \bar{c}_V \qquad (1)$$

with

- Φ: frequency of the three-dimensional dispersion class statistic
- K: number of stability classes (normally K=6),
- J: number of wind direction sectors (normally J=36)
- I: number of wind velocity steps (normally I=9)
- u_{100} wind velocity in 100 m above ground used by MISKAM [m/s]

[19] For nitric oxides, Eq. (1) is used to calculate the yearly average concentration of NO_x

u_s threshold velocity [m/s]

n exponent [-] (e.g. 0.35)

u_i: i-th wind velocity extrapolated to 100 m height above ground [m/s]

φj: j-th wind direction sector

dk: k-th stability class

c_V : background concentration [µg/m³]

$c(\varphi_j, d_k)$: concentration calculated by MISKAM for the flow direction φj and the k-th stability class d_k for a wind velocity in 100 m above ground u_{100} [µg/m³]

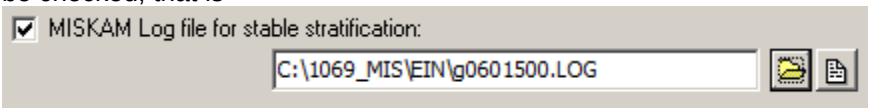
If WINMISKAM is applied for a situation with **predominantly urban street canyon characteristic**, it can be assumed that due to the building induced turbulence in the MISKAM computational domain a neutral stratification occurs. Thus, it is sufficient to calculate with MISKAM exclusively concentrations for a neutral stratification. In Eq. (1) it is thus sufficient to describe the three-dimensional field concentration instead of $c(\varphi_j, d_k)$ only in dependence of the flow direction, i.e. $c(\varphi_j)$.

In the case of that **only a few buildings** exist within the MISKAM calculation domain, the building induced turbulence is not dominant. Therefore non-neutral stratifications may occur. With MISKAM it is possible to calculate the concentration distribution not only for neutral but also for stable stratification. Have MISKAM calculations been performed for neutral and stable stratification and the calculated three-dimensional concentration fields are referred to $c_{neutral}(\varphi_j)$ and $c_{stabil}(\varphi_j)$, the following assignment of $c_{neutral}(\varphi_j)$ and $c_{stabil}(\varphi_j)$ to $c(\varphi_j, d_k)$is implemented in WINMISKAM:

Stability class dk	$c(\varphi_j, d_k)$
I	$c_{stabil}(\varphi_j)$
II	$c_{stabil}(\varphi_j)$
III/1	$c_{neutral}(\varphi_j)$
III/2	$c_{neutral}(\varphi_j)$
IV	$c_{neutral}(\varphi_j)$
V	$c_{neutral}(\varphi_j)$

Table 0.10: Assignment of the three-dimensional concentration fields $c_{neutral}(\varphi_j)$ and $c_{stabil}(\varphi_j)$ to $c(\varphi_j, d_k)$ in dependence of the stability class dk

To enable this stability-dependent concentration mapping, "MISKAM Log file for stable stratification" must be checked, that is



The i-th wind velocity extrapolated to 100 m height above ground is calculated either with the power law or with the logarithmic wind profile.

a. Power law wind profile

$$u_i(d_k) = v_i\left(\frac{100m}{h_a}\right)^{m(d_k)} \qquad (2)$$

The wind velocities v_i (i=1 to 9) at the measuring height h_a are 1, 1.5, 2, 3, 4.5, 6, 7.5, 9 and 12 m/s. If the wind statistic is measured in an area with a **low aerodynamic roughness length**, the following values are used for the stability dependent exponent $m(d_k)$:

Stability class d_k	Exponent $m(d_k)$
I	0.37
II	0.32
III/1	0.26
III/2	0.18
IV	0.14
V	0.12

Table 0.11: Stability classes and corresponding exponents

If the wind statistic is measured in an area with a **high aerodynamic roughness length** (e.g. urban areas), for all stability classes for the exponent a value of 0.31 is applied (c.f. VDI 3782 Part 1, exponent for rough terrain and stability class III/1).

b. The logarithmic wind profile

Following the methodology of determining the anemometer height in AUSTAL2000, the extrapolation from measuring height to the reference height of 100 m can be made using the logarithmic wind profile:

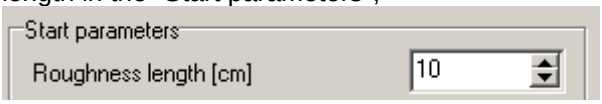
$$u_i = v_i \frac{\ln\left(\frac{100m - d_{0,s}}{z_{0,s}}\right)}{\ln\left(\frac{h_a - d_{0,s}}{z_{0,s}}\right)} \qquad (3)$$

Here is

$d_{0,s}$: Displacement height at measuring site

$z_{0,s}$: Roughness length at measuring site

In this approach, the extrapolation to the reference height of 100 m is not depending on the atmospheric stability.
In WINMISKAM both methods are implemented. Using the logarithmic wind profile with the roughness length and displacement height as input parameters is preferable to the power law. This will be explained in following.
The power law wind profile originates from inflow profile measurements in the wind tunnel. The logarithmic wind profile results, however, from the exact solution based on the momentum conservation equations near the ground, assuming the horizontal homogeneity and certain assumptions for the turbulent fluxes. Since MISKAM applies the same assumptions, the MISKAM inflow profile is logarithmic. If therefore for the displacement height at measuring site the value $d_{0,s} = 0\,m$ and for the roughness length at measuring site the same value is used as entered in the dialog "Parameter" (cf. Chap. 4) for roughness length in the "Start parameters",



would be equivalent to the assumption that the measuring site is located directly at the lateral boundary of the MISKAM computational domain. It should be noted that, depending on the flow direction, this location is located at different sides of the lateral boundaries of the MISKAM calculation domain.

Percentile

The determination of the percentile value is more complex in comparison to the yearly average, because the daily cycle of the emissions has to be considered.

If the daily and weekly cycle of traffic density is known, the emission density and hence also the immission concentration could be calculated for all 168 hours. However, this procedure would require strong computer capacities. The computing time can be reduced by aggregating the 168 hours into 5 classes. The following procedure is to be used for aggregation. First, the 168 hourly averages of the emission density must be sorted by size and then clustered into classes. It has been shown, that the distribution of the 168 hourly values into "clusters" with the width of 25, 25, 25, 25 and 68 hours is suitable. The generated distribution function PI for the emissions has further to be normalized, so that the sum of the products of the relative strength of emission PI and class width bI is one, i.e.:

$$\sum_{l=1}^{L} P_l \cdot b_l = 1 \tag{4}$$

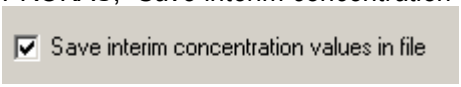
with

L: number of classes of the relative emission strength (here: L = 5)
PI: Relative emission density in the class l
bI: Relative frequency of the class l

With the help of the relative emission strength PI, concentration values $c_{i,j,k,l}$ and probabilities $w_{i,j,k,l}$ for the range i=1,...,I, j=1,...,J, k=1,...,K and l=1,...,L can be determined for the point of interest:

$$c_{i,j,k,l} = P_l \cdot c(\varphi_j) \cdot u_{100} \cdot \min\left(\frac{1}{u_i(d_k)}, \frac{1}{u_s}\left(\frac{u_s}{u_i(d_k)}\right)^n\right), \quad w_{i,j,k,l} = b_l \cdot \Phi(u_i, \varphi_j, d_k) \tag{5}$$

The percentile value is determined as follows. If the concentration values $c_{i,j,k,l}$ are sorted by size, then the percentile value is the concentration value, for which the sum of all probabilities (the sum starting at the smallest concentration) exceeds the desired percentile value (e.g. 98 %) for the first time.
The background concentration and the additional concentration calculated by MISKAM have to be superimposed in an appropriate way for the calculation of the percentile value of the total concentration. In WinMISKAM, the percentile value of the background concentration and the percentile value of the additional concentration are superimposed by the TA air method.
An alternative method is more detailed and is implemented in PROKAS. An appropriate[20] value for the background concentration is calculated for each concentration value calculated by MISKAM. These concentration values of the background and the additional concentration are then directly summed up, i.e. $c_{i,j,k,l} = c_{V,i,j,k,l} + c_{Z,i,j,k,l}$.
The export of MISKAM concentration values for an import in PROKAS may be done via a file containing interim concentration values. If this file is to be generated for the calculation of the statistical values in PROKAS, "*Save interim concentration values in file"* in the window **Statistical values** must be checked.



Anemometer position is inside the computational domain

If it is stated that the anemometer position is inside the MISKAM computational domain, the yearly average concentration is calculated as follows:

$$\bar{c} = \sum_{k=1}^{K}\sum_{j=1}^{J}\sum_{i=1}^{I} \Phi(v_i, \varphi_j, d_k) \cdot c(\varphi_j, d_k) \cdot u_A(\varphi_j) \cdot \min\left(\frac{1}{v_i}, \frac{1}{u_s}\left(\frac{u_s}{v_i}\right)^n\right) + \bar{c}_V \tag{6}$$

with:

Φ: frequency of the three-dimensional dispersion class statistic
K: number of stability classes (normally K=6),
J: number of wind direction sectors (normally J=36)
I: number of wind velocity steps (normally I=9)

[20] for the appropriate wind direction, wind velocity and stability.

$u_A(\varphi_j)$ Interpolated wind velocity at the measuring site from the MISKAM wind fields for the j-th wind direction sector φ_j [m/s].

u_s threshold velocity [m/s]

n exponent [-] (e.g. 0.35)

v_i: i-th wind velocitiy [m/s]

φj: j-th wind direction sector at the measuring site

d_k: k-th stability class

c_V : background concentration [µg/m³]

$c(\varphi_j, d_k)$: concentration calculated by MISKAM for the flow direction φj at the measuring site and the k-th stability class d_k [µg/m³]

For the calculation of the percentile instead of equation (5) in Chap. 0 the following equation is used. The meaning of the variables is identical to the meaning specified in chapter 0.

$$c_{i,j,k,l} = P_l \cdot c(\varphi_j, d_k) \cdot u_A(\varphi_j) \cdot \min\left(\frac{1}{v_i}, \frac{1}{u_s}\left(\frac{u_s}{v_i}\right)^n\right), \quad w_{i,j,k,l} = b_l \cdot \Phi(v_i, \varphi_j, d_k) \qquad (7)$$

Menu option NO-NO$_2$ conversion according to Duering et al. (2011)

Applying the NO-NO$_2$ conversion method according to Duering et al. (2011) two skw-files are required:

1. NO$_x$ annual concentration of the addition load (without the NO$_x$ background concentration).
2. Annual average of the NO$_2$ addition load caused by directly emitted NO$_2$ from traffic vehicles.

For the latter skw-file, in general 36 separate concentration calculations with MISKAM have to be performed. As emission for that calculations the directly emitted NO$_2$ from traffic vehicles has to be used. Selecting menu option “NO-NO$_2$ conversion according to Duering et al. (2011)“ the following dialog appears:

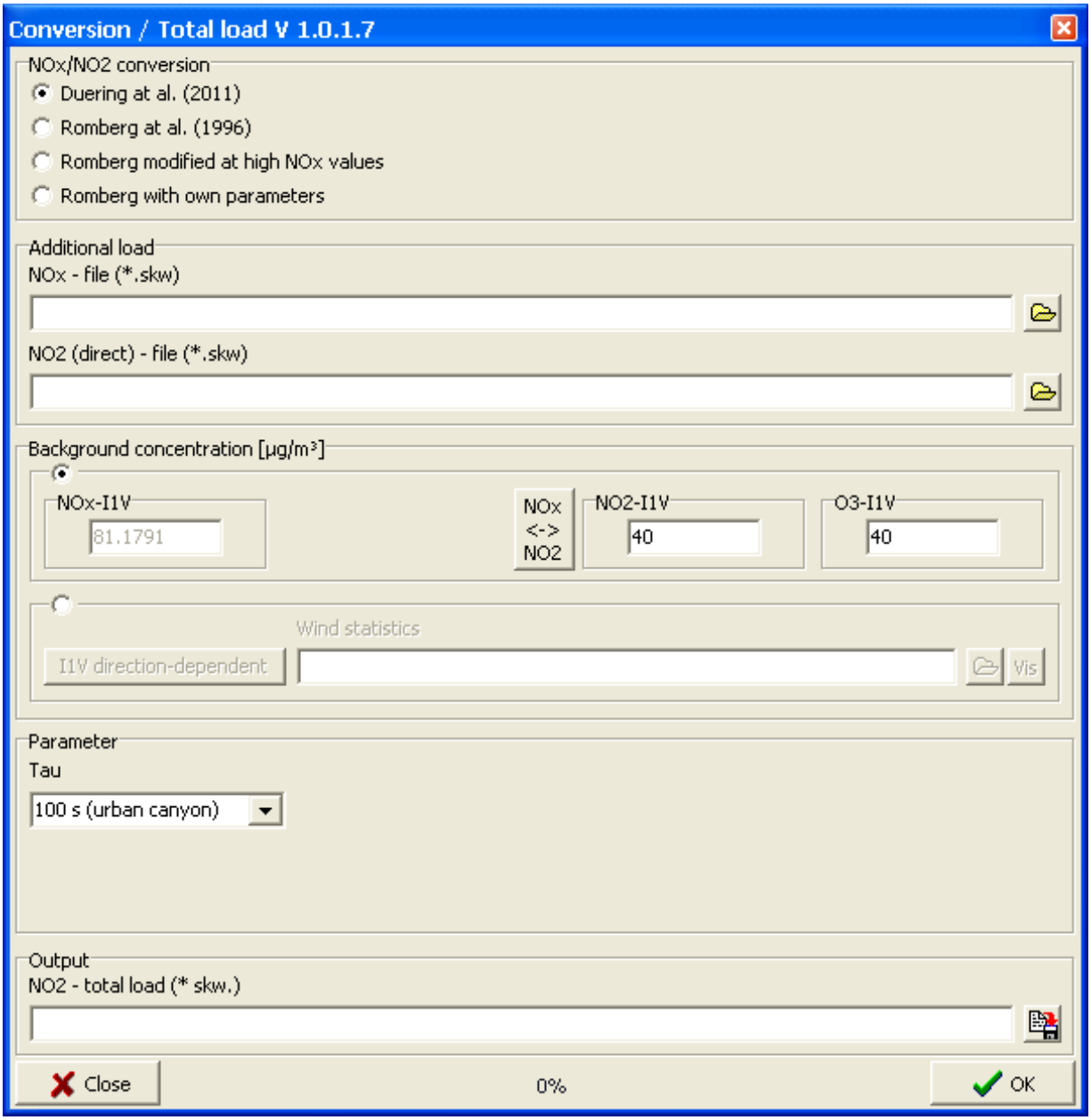
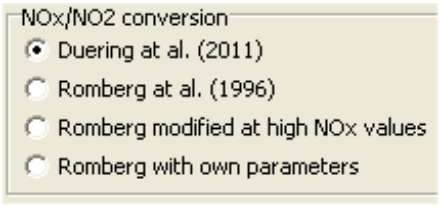


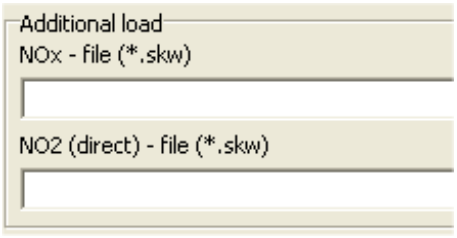
Fig. 0.18: Dialog Conversion / total load

Meaning of the elements of the dialog C*onversion / Total load*



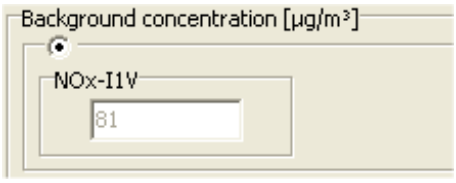
Selection of the NO-NO_2 conversion method.

For completeness sake, the methods "Romberg et al. (1996)", "Romberg modified at high NOx values" and "Romberg with own parameters" are repeated, cf. also chapter 0, menu option „Run | Calculation of statistical values ..."

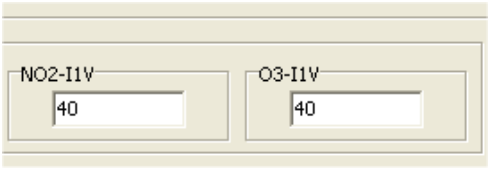


Name of the skw-file[21] for the

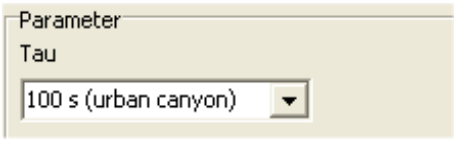
- **NO_x-additional load and**
- **NO_2-additional load caused by directly emitted NO_2 from traffic vehicles**



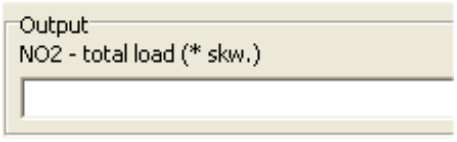
Annual average of the NO_x background concentration



Annual average of the NO_2 und O_3 background concentration [22]

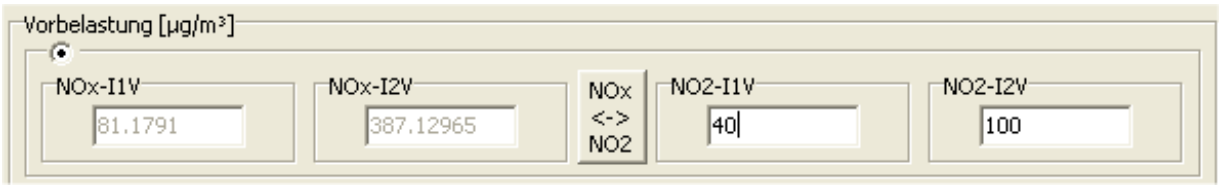


Parameter for the chemistry model according to Duering et al. (2011). Two parameter values are offered, one for applications in street canyons and one for an application in the open country.

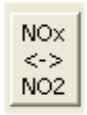


Name of the skw-result file containing the NO_2 total load.

When selecting a NO-NO_2 conversion method based on „Romberg“, the background concentration can be entered either as NO_x or as NO_2.

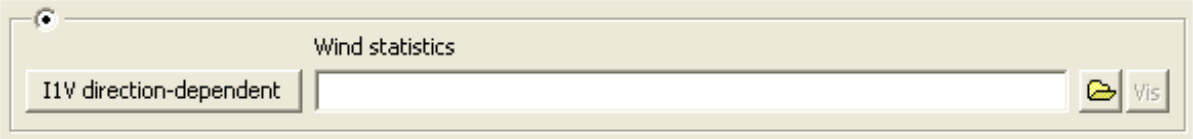


When pressing the button



it is switched between the two possibilities.
Analogous to the possibilities in the dialog „Statistical values“, cf. chapter 0, menu option „Run | Calculation of statistical values ...“, a wind direction dependent annual average of the background concentration can be specified.

[21] When selecting a NO-NO_2 conversion method based on „Romberg“, the input field „NO2 (direct) – file (*.skw)“ is set invisible.
[22] When selecting a NO-NO_2 conversion method based on „Romberg“, the input field „ O3-I1V “ is set invisible.



Further details to the input possibilities of wind direction dependent annual averages of the background concentration are given in chapter 0.
When selecting “Duering et al. (2011)“ as NO-NO_2 conversion method, in addition to NO_x the wind direction dependent annual averages of the background concentration of NO_2 und O_3 has to be entered into the dialog.

Menu option Interface wind and turbulence fields for AUSTAL2000

For the WinMISKAM extention modul „Interface wind and turbulence fields for AUSTAL2000” a separate manual is available.

Menu option 3D visualization

With this menu item is the additional module started "3D visualization".
For more information on the program part "3D visualization" see 3DViewer Help.

Menu option Create AKS file

With this menu item is the additional module started "RosePlot".
For more information on the program part " RosePlot " see RosePlot Help.

Menu option MISKAM version

The MISKAM version needed for the calculations can be set through the submenu option *Execute* | *MISKAM version*: From MISKAM 3.x up to the current version MISKAM 6.x can be selected with the latter as default setting. The version MISKAM 3.x is no longer supported, and should only be used for recalculating old values.
From version 4.x there is the possibility to select the number of grid cells at the border with three different methods:
1. Using the default settings
By checking *Default*, one obtain:

- 5 additional border cells
- Mesh spreading: The factor for mesh spreading is determined by the quotient of the mesh widths of the last two grid cells, however the maximum value being set to 2. Hence, the mesh width of the border cells is calculated as follows:
    1. border cell: mesh width = factor * mesh width of last border cell
    2. border cell: mesh width = factor * mesh width of first border cell
    3. to 5. border cell: mesh width = factor * mesh width of second border cell

With a spreading factor of 2 for example, the first border cell has twice the mesh width of the last border cell, the second border cell has four times its mesh width and border cells 3 to 5 have eight times its mesh width.

- No obstacles at the border

2. user defined addition of a border cell at the corner cells (analog to MISKAM 3.6)
By unmarking *Default* the option *1 add. border cell (analog to MISKAM 3.6)* in the field *Number of border cells* can be chosen. A grid cell with the same mesh width as the mesh width of the last grid cell of the domain is added with this method. The option *no obstacles at the borders* implies, that the additional border cells are without any obstacle, even if the outer grid cells of the model domain do present themselves as one.
3. user defined addition of 5 border cell at the corner cells
Using MISKAM version 4.x or later, it is recommended to chose *5 add. border cells* after unmarking *Default.* Here, on the one hand there is the possibility to select the mesh width of the border cells

equidistantly by checking the appropriate box. On the other hand, the mesh width of the additional border cells can be chosen as variabe by setting the proportional grid distances of two neighboring grid cells into the field *Ratio.* For instance, the ratio of 1.2 and a mesh width of 5 m leads to the neighboring cell having a mesh width of 6 m. The ratios have to be set from a technical point of view. The option *no obstacle at the borders* implies, that the additional border cells are without any obstacles, even if the outer grid cells of the model domain do present themselves as such.

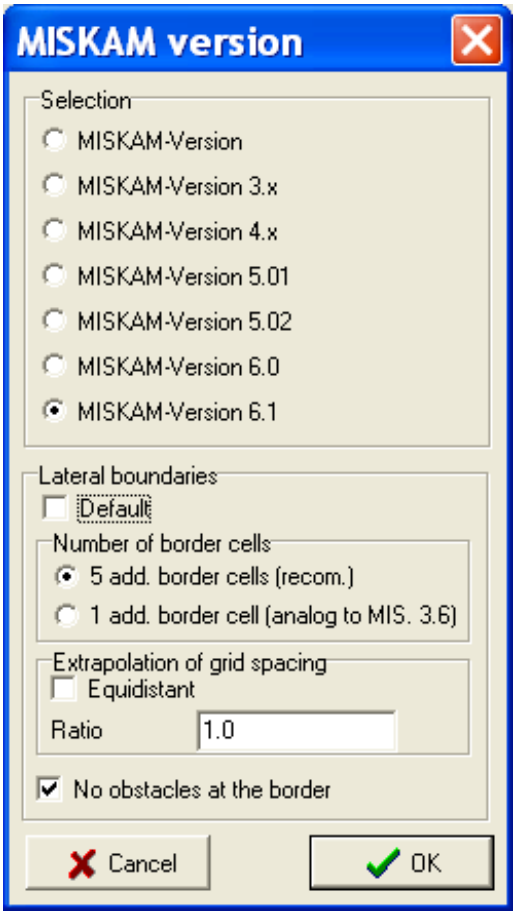


Fig. 0.19: Input window MISKAM version

Menu option Abort

The current MISKAM run is aborted without saving via the option *Run* | *Abort*. No result will be delivered for a single case calculation. For the calculation of multiple flow angles, only the last case having been calculated will not be saved. The result files of all previous calculations are saved.

Graphic

The graphical layout refers to the display of input files and result files. Therefore, one of the following files is necessary: “[Name].INP”, “[Name].ZWU”, “[Name].ZWK”, “[Name].SKW”. Loading a configuration file is not needed for displaying the results
The submenu options *Horizontal planes, X Y planes*[23]*, Y Z planes, perspective view of configuration, Print, Export* and *Shape-Export*[24] are available in the menu option *Graphic.* The submenu option *Graphics* | *Print a*nd *Graphics* | *Export* can only be selected if a result file is open.

Menu option horizontal cuts

Horizontal cuts (X Y cuts) of result files and of the input file “[Name].INP” can be displayed with the submenu option *Graphics* | *Horizontal planes*. After selecting the option, the dialog *Open* will open. There is a list of available result files “[Name].ZWU”, “[Name].ZWK”, “[Name].SKW” in the determined directory for results, which may be selected via the menu option *Run* | *Select project directory* | *Output*, or through the input files “[Name].INP” in the input directory, being set by the menu option *Run* | *Select project directory* | *Input INP*. WinMISKAM will display the directory that was last worked in by default in the window *Open*.

Wind field files (“[Name].ZWU”, “[Name].ZWT”) must at first be generated with MISKAM, before flow calculations can be performed (file “[Name].ZWK”). If concentration fields exist for all wind directions, WinMISKAM may calculate statistical values (file “[Name].SKW”). The description of the functionalities will follow this order.

The buildings and sources will show up on screen once the input file “[Name].INP” is loaded. The functionalities of the popup menu are displayed by clicking with the right mouse button. They will be described later.
After loading a wind field file, wind arrows will be displayed on screen. This may take some time due to the numerous arrows to be displayed. The zooming functions are also available for result displays by marking the area which should be zoomed with the left mouse button.

[23] Only available, if the additional module –“ Extended graphics" is licensed. It does not belong to the basic WinMISKAM versions.
[24] Only available, if the additional module –“ Shape export" is licensed. It does not belong to the basic WinMISKAM versions.

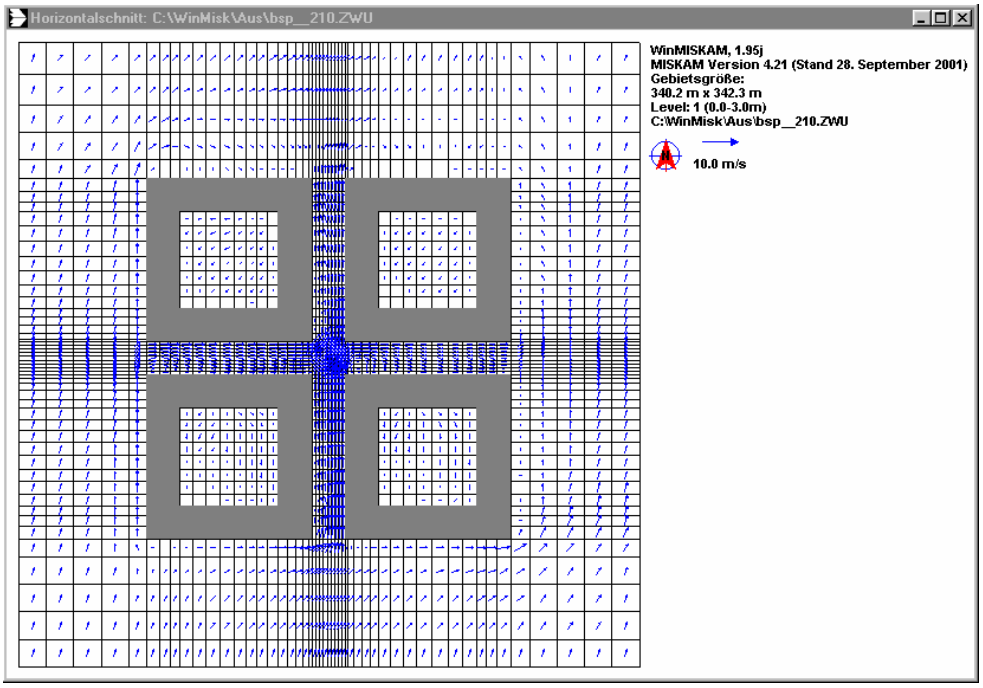


Fig. 0.1: Graphical display of the flow file in the horizontal cut

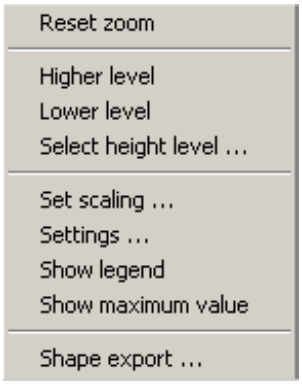


Fig. 0.2: Popup menu

Functions of the popup menu in a graphic execution

The functions of the popup menu will be described following the example of the result file of a flow calculation “[Name].ZWU”. Additional display options for the results of concentration files “[Name].ZWK” and statistical values “[Name].SKW” as well as input files ”[Name].INP” will be explained later.

Execution of “[Name].ZWU”

Changes in the execution can be done via the popup menu which is activated by clicking with the right mouse button. Several functions are available.

The first function in the popup menu will reset the zoom.

The function *Higher level* will change the graphical display by showing the contents of the next highest grid box level. This will show, for example for a “[Name].ZWU” file, the wind arrows in the next highest grid

box level above ground. This function can be selected as long as the upper level of the computational grid is not reached. Next to the graphical display of the figure, there is information about the current display, the field *Level* shows the layer number and the height above ground in brackets.

The levels of the graphical display are moved towards ground level by the function *Lower level*. This function is only active if the current level is not the lowest level.

A certain height level (number of the level as index number) can be directly selected by the function *Select height level*. The lower and upper borders of a level are indicated below the input field *Index*.

The scaling of the colors can be changed by the function Set *Scaling* in the popup menu. Changes are possible for both numbers and colors. The new color scheme can be saved and reloaded at later times.

The window *Setting* can be opened by selecting the field *Settings..* in the popup menu. This window contains the registers *General*, *Velocity, Vegetation* and *Caption*.

The building settings are defined on the register *General*. The color for the building can be changed by clicking on the colored area. Checking the box *Show computational grid* will activate the display of the borders of the box. At the bottom of the window, the box *Show w- component* can be found. Activating it will display a color legend, which accompanies a colored display of the vertical velocities of all boxes. The scaling of the vertical velocities is done automatically with the help of the corresponding extreme in the current situation. A legend with the appropriate colors for the flow velocities in [m/s] is shown in the displayed figure. How to change the color scaling will be described later with the function *Scaling* of the popup menu. Only if Show w-component is activated, the field Set scaling in the popup menu can be selected. Thus an extra window appears with the legend. This is useful when the zoom causes the disappearance of the legend of result representation.

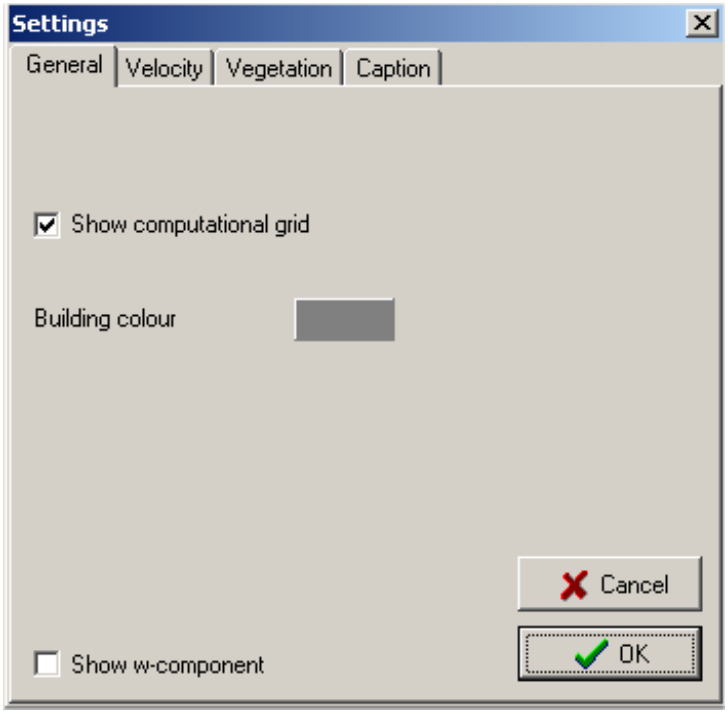


Fig. 0.3: Window Settings / General

The parameters for the arrows displaying the velocity vectors are changed in the register *Velocity*. The arrows can be adjusted in color (blue is default), relative length, line width and tip. Changes in the opening angle between 1 degree and 90 degrees will result in more narrow or wider arrow tips. However, an arrow tip with an opening angle of 1 degree can hardly be recognized. The color can be changed by clicking on

the colored area. The line width can be varied between 1 and 5. The *scaling value* influences the absolute length of the arrows. The flow velocity of the arrow which is displayed in the legend is determined by the input of the *scaling value*. The length of the arrows, relative to the calculated flow velocities within the mesh, depends on this scaling factor. If the arrows have to be short, the scaling factor should be increased. Thus, the arrows might fit in a grid with small meshes. The illustration of all arrows may lead to a confusing display. This can be changed in the *Arrow density* window by setting that only every second or fifth arrow be displayed.

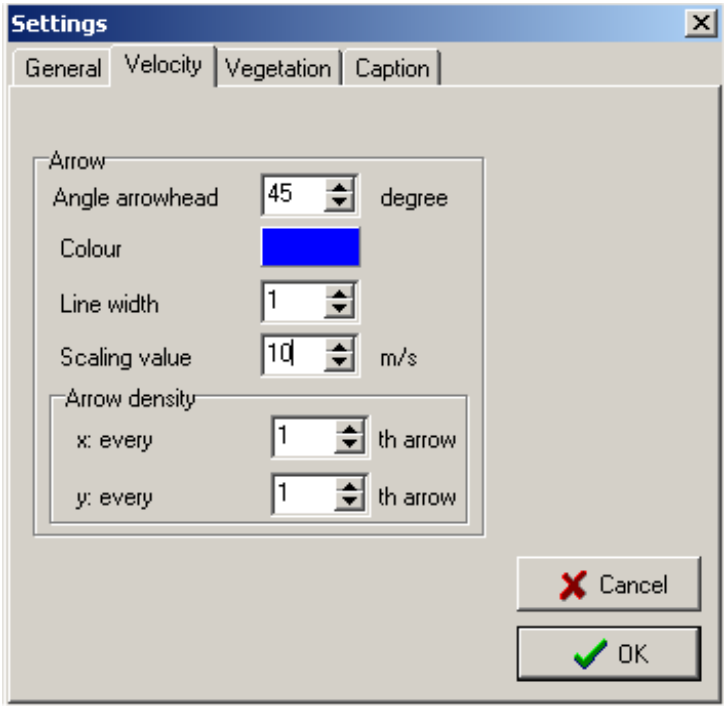


Fig. 0.4: Window Settings / Velocity

The parameters for the display of vegetation are changed in the register *Vegetation.* The boxes which are defined as vegetation are assigned by color when *show vegetation* is activated. The color for the vegetation can be changed by clicking on the colored area. Checking the box *fill area*

will fill the vegetation boxes. Is this box not activated, the boxes with vegetation are colored bordered.

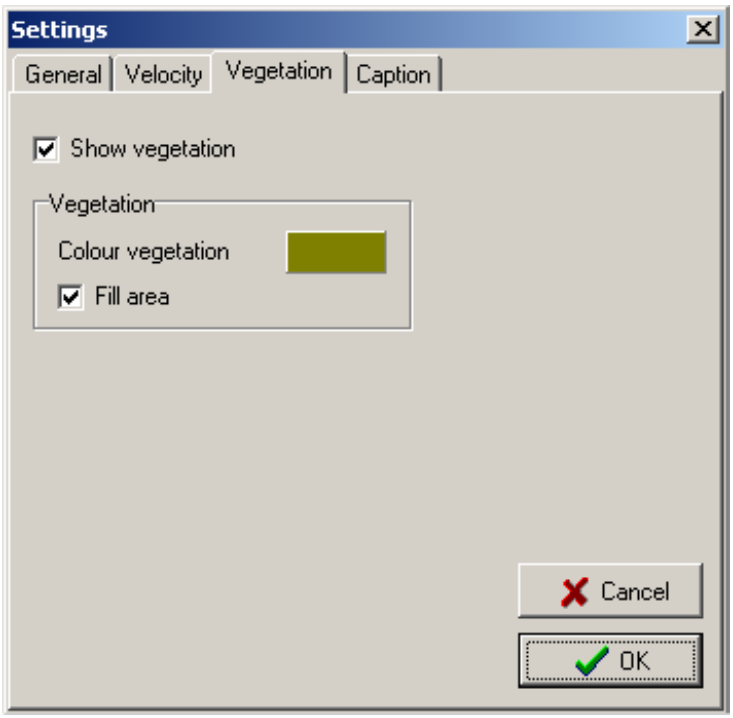


Fig. 0.5: Window Settings / Vegetation

The first four rows of the legend are defined in the register *Caption.*

If a flow-through, a vertical jet or a vegetation file with the name of the configuration file as prefix ("[ConfName].001", "[ConfName].002" or "[ConfName].003") exists in the result directory when a flow calculation "[Name].ZWU" is opened, this/ these will be read. In this case the boxes with flow-through are shown as free area (without building), vegetation as colored area and source boxes with vertical jet as point.

The last function *Shape export…*[25] of the popup menu converts the active result file into a shape file for GIS.

[25] Only available, if the additional module –" Shape export" is licensed. It does not belong to the basic WinMISKAM versions.

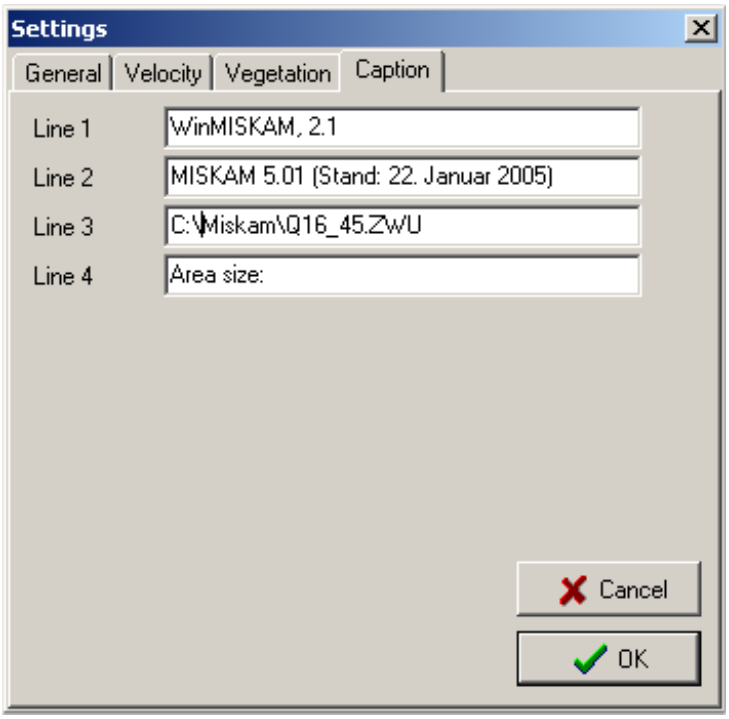


Fig. 0.6: Window Setting / Caption

Execution of "[Name].ZWK"

An figure with a colored computational grid is displayed when the concentration file "[Name].ZWK" is loaded.

Clicking the right mouse bottom the following popup menu appears (Fig. 0.7).

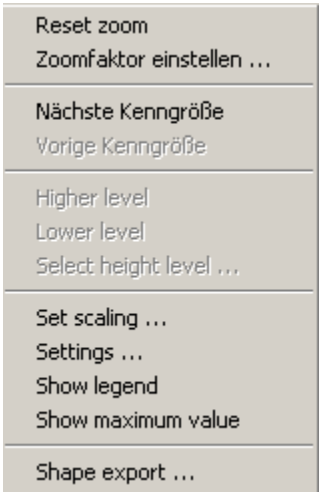


Fig. 0.7: Content of the popup menu

Regulate zoom factor… makes it possible to change the zoom factor manually.

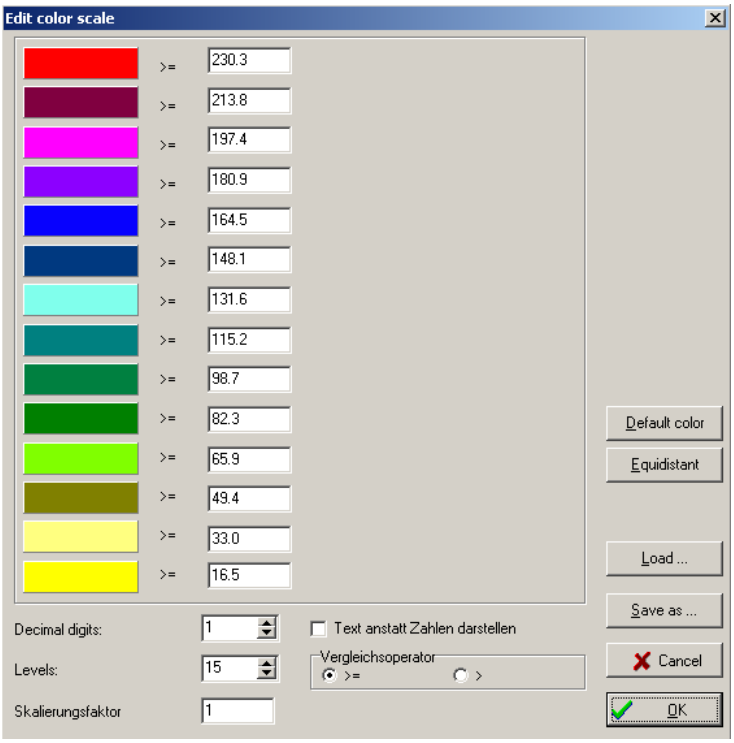


Fig. 0.8: Edit color scale including the classification of colors to the values

The colors correspond to the concentration values in the legend. The scaling of the colors can be changed by the function *Set Scaling* in the popup menu.

As relational operator, greater/equal >= and greater > can be chosen. Checking the field *Text instead of numbers*, behind each color a field appears to enter an arbitrary name. This name is shown in the legend instead of numbers. Manually a scaling factor can be applied to the output file “[Name].ZWK”. For the demonstration of the concentration field all concentrations are multiplied with this factor. This function facilitates the demonstration of concentrations in different units. All the properties of scaling are saved using *Save as…* Is the scaling once saved, it can be reloaded by *Load…*

After loading the concentration file ”[Name].ZWK”, the building colors can be changed in the window *Settings,* which can be opened with *Settings…* in the popup menu. The color of the buildings and the shape of the sources can be varied after clicking on the corresponding colored area. Checking the box *Autoscale* the color scale of the legend is adapted to the maximum value for every layer. By not marking this box the color scale is retained. There is also the option for displaying the source boxes in the lower part of the window. If the box *Fill area* is checked, the source boxes will be displayed in the selected color. If the box is not checked, only the borders of the source boxes are displayed in the selected color. The display of the box borders can be activated by marking the box *Show computational grid*. If a concentration file is opened from the result directory having the same name as the corresponding flow file “[Name].ZWU”, then this flow file will also be loaded and the flow arrows will be displayed. The display of the arrows can be deactivated by unchecking the box *Display wind arrows*. The possibilities for displaying arrows have been described earlier (0).

The function *Show legend* causes the appearance of an extra window with the legend. This can be useful for zooming, when the legend of the result display is no longer on screen because of enlargement. A title for the legend, taken from “[Name].ZWK” file, is proposed in the input field *Legend* in the window *Settings* opened with the popup menu, where it also can be changed.

With the function *Show maximum value* a little flag appears in the display of the concentration file “[Name].ZWK”. The flag points on the box with the highest concentration in the displayed level.

If a flow-through, a vertical jet or a vegetation file with the name of the configuration file as prefix ("[ConfName].001", "[ConfName].002" or "[ConfName].003") exists in the result directory when a concentration file "[Name].ZWK" is opened, this/ these will be read. In this case the boxes with flow-through are shown as free area (without building), vegetation as colored area and source boxes with vertical jet as point.

Execution of "[Name].SKW"

After loading a file with statistical values "[Name].SKW", an figure with a colored mesh of the computational grid will be shown.

In the legend, the colors are allocated to concentrations. The scaling of the colors can be changed by the function *Set Scaling* in the popup menu the same way as described in 0.

If the statistical values were calculated for a given height[26], the functions for changing the height levels in the popup menu are deactivated. Instead, it is possible to select *Next value* as well as *Previous value*. The first value is the yearly average and the next value is the calculated percentile value. If a dispersion calculation for the source group NO_x was performed, the results are saved in the "[Name].SKW" file in the following order: yearly average for NO_x, percentile value for NO_x, yearly average for NO_2, percentile value for NO_2.

If the result files of statistical values "[Name].SKW" are loaded, the building color, the headline of the legend, the vegetation color and the box display of the sources can be changed in the window *Settings.* In addition, the display of the computational grid can be turned off. The color scale for concentrations is changed via the function *Scaling* in the popup menu.

If a flow-through, a vertical jet or a vegetation file with the name of the configuration file as prefix ("[ConfName].001", "[ConfName].002" or "[ConfName].003") exists in the result directory when a statistical value file "[Name].SWK" is opened, this/ these will be read. In this case the boxes with flow-through are shown as free area (without building), vegetation as colored area and source boxes with vertical jet as point.

The color legend will be displayed in a separate window after activating the field *Show legend*. This can be useful for zooming, when the legend of the result display is no longer on screen.

Execution of "[Name].inp"

After loading a file with the initial input "[Name].inp", an figure with the building and the source will be shown.
The color for the source can be changed by clicking on the colored area in the register *General* of the window *Settings*. Checking the box *Color proportional to emission* will activate a color scale for the source. The color scale can be varied after choosing the function *Set scaling* in the *popup menu.* If the box *Color proportional to emissions* is deactivated, the color can be changed by clicking on the colored area. If the box *Fill area* is checked, the source boxes will be displayed in the selected color. If the box is not checked, only the borders of the source boxes are displayed in the selected color. This applies to *Color proportional to emissions* as well as to the color selected with the colored area.

[26] Choice of height level see **Fig. 0.13**

Menu option X Z cuts[27]

Vertical cuts in the X Z direction of the result files and the input file “[Name].inp” can be displayed via the submenu option *Graphics* | *X Z planes*. The boxes in x-direction are displayed on the horizontal axis and the boxes in z-direction on the vertical axis. Zooming is also possible with this submenu option. The functions *Reset zoom*, *Set scaling*, and *Show legend* are available in the popup menu as described in chapter **0** for the files “[Name].INP”, “[Name].ZWU” and “[Name].ZWK”. The vertical axis can be elevated against the horizontal axis with the help of the function *Settings*. In addition the value for wind velocity (display of the v- component) for a “[Name].ZWU” can be displayed vertically to the display level through colored zones. The function *Next xz level* is also available, with which the display is moved one level lower in the y-direction of the computational grid. The function *Previous xz level* will select a level in the direction of smaller y-values. The function *Select xz level* allows to directly enter a level index for the y-level through which the cut should be made. The corresponding y-level in meters will be shown below the input field.

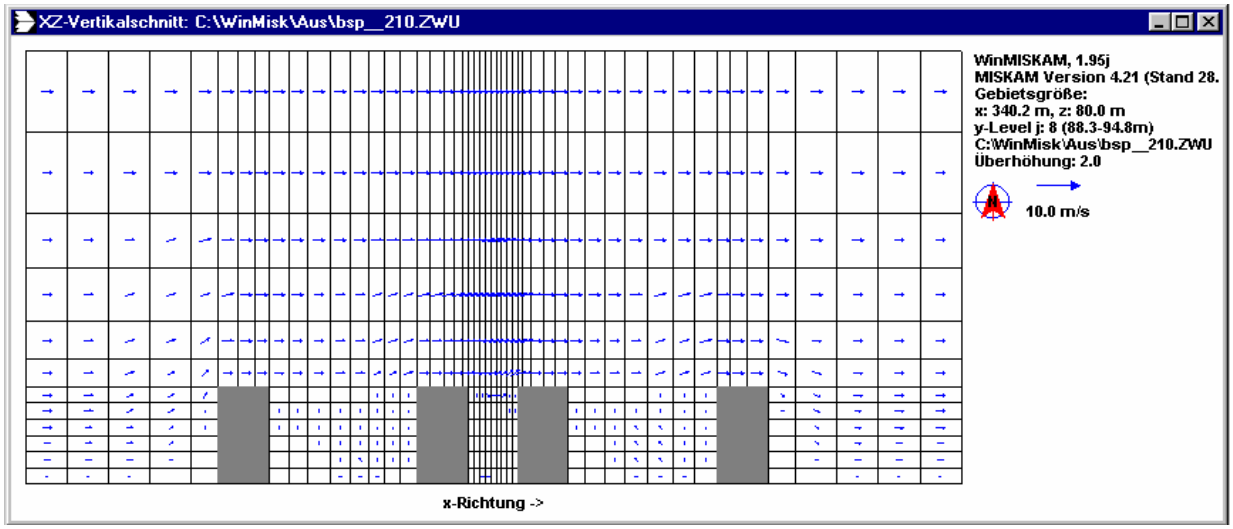


Fig. 0.9: Graphical display of the flow file in the X Z cut

Menu option Y Z cut[28]

Vertical cuts in the y-z-direction of the result files and the input file “[Name].inp” can be displayed via the submenu option *Graphics* | *Y Z planes.* This is a profile where the boxes in the y-direction are displayed on the horizontal axis and the boxes in the z-direction on the vertical axis. Zooming is possible with this submenu option. The functions *Reset zoom*, *Set Scaling*, and *Show legend* are available in the popup menu as described in chapter **0** for the files “[Name].INP”, “[Name].ZWU” and “[Name].ZWK”. The vertical axis can be elevated against the horizontal axis with the help of the function *Settings.* In addition the value for wind velocity (display of the u-component) can be displayed vertically to the display level through colored zones. The function *Next yz level* is also available, with which the display is moved one level lower in the x-direction of the computational grid. The function *Previous yz level* will select a level in the direction of smaller X values. The function *Select yz level* allows to directly enter a level index for the x-level through which the cut should be made. The corresponding x-level in meters will be shown below the input field.

[27] Only available, if the additional module – “Extended graphics" is licensed. It does not belong to the basic WinMISKAM version.
[28] Only available, if the additional module – “Extended graphics" is licensed. It does not belong to the basic WinMISKAM version.

Menu option Perspective view of configuration[29]

The configuration files “[Name].INP” can be displayed three-dimensionally via the submenu option *Graphics* | *Perspective view of configuration* (result files as “[Name].ZWU” and “[Name].ZWK” can also be loaded, but without a graphical display of the flow or immission). Loading the configuration file corresponds to the description for horizontal planes given in chapter **0**. Zooming is possible in this display. The settings menu is adjusted to the three-dimensional display. Thus, it can be determined whether a computational grid, buildings, or the outer border of the computational grid should be displayed or not by checking the appropriate box in the popup window (under *settings*). The display can be changed in the field *Perspective view* by altering the *largest layer index* (indices in the vertical direction), the *angle* versus the horizon, the *vertical stretching factor* versus the x-direction and *the shortening of y-axis* versus thex-direction. Flow-through, vegetation and sources with vertical jet are not considered in the perspective view.

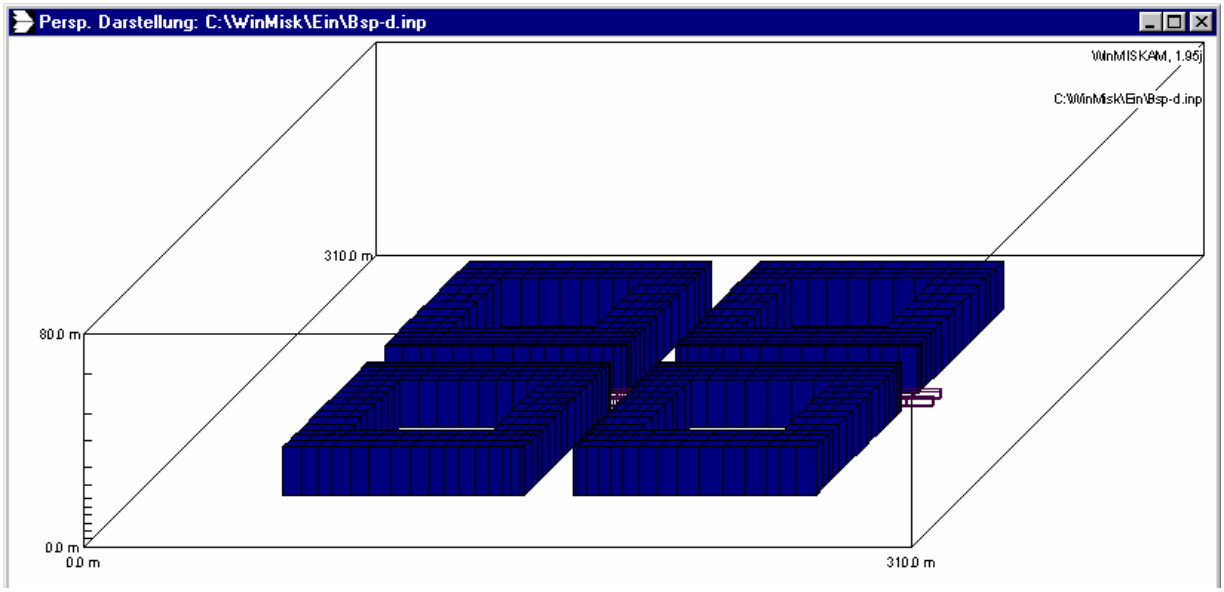


Fig. 0.10: Perspective graphical display of the configuration file

[29] Only available, if the additional module – “Extended graphics" is licensed. It does not belong to the basic WinMISKAM version.

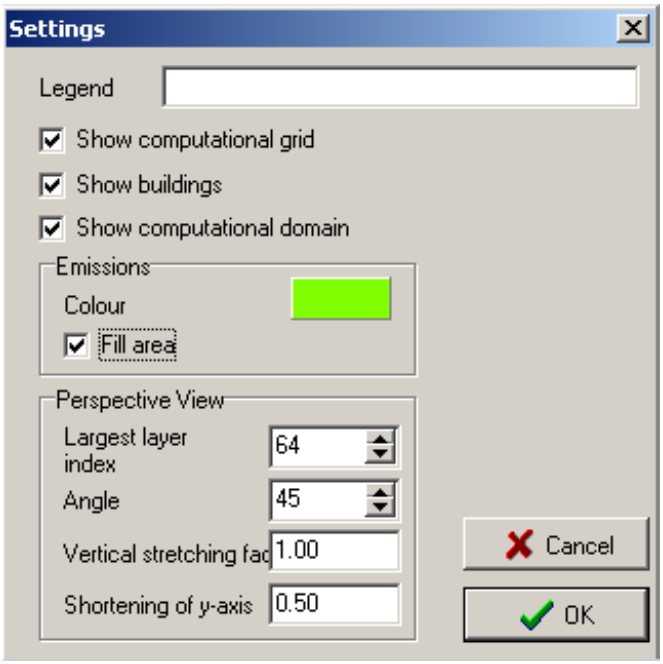


Fig. 0.11: Window Settings for the perspective graphical display

Menu option Print

The figure of the result is passed to the printer by selecting the submenu option *Graphics* | *Print*. The printer settings can be changed in the appearing window. If the settings are not changed, the default settings, as determined in *Configuration* | *Printer settings*, will be used. The entire figure of the result will be printed every time. If horizontal cuts should be printed, the printed area can be changed from *All* to *Markierung* (marked area). If *Markierung* is activated and the printing is initiated by the OK button, a window *Print area boundaries* will open, where the area can be determined to be printed by setting the indices in the x- and y-directions.

Menu option Export

The generated graphical display can be exported via the submenu option *Graphics* | *Export* as a Windows Meta file “[Name].WMF” or in the picture formats “[Name].BMP” or “[Name].JPG”. For horizontal cuts, after confirming the export, the selected areas in the x- and y-directions have to be determined in the window *Print area boundaries*, where the area to be printed can be determined by setting the indices in the x- and y-directions. The generated files can be imported into common Windows programs (e.g. Word for Windows) and edited there.

Menu option Shape Export

Exporting a *.shp file under the menu item Graphics | Shape-export can be executed only if the WinMISKAM graphics window with the horizontal sections (see Section 7.1.) is open.
If there are no reference coordinates in the horizontal section specified, the window with the question if the reference coordinates should be entered, can be confirmed. In the window "reference coordinate" the extension of the coordinates in the x- and y-direction, in each case in m, will be entered. There is in addition the possibility of importing existing reference coordinates from a INP- or SKW file. With the OK button the registered or charged coordinates can be confirmed.
A new window "Save As" will open in which the path and name of the file to be exported can be entered.

Menu option Shape Export

Exporting a *.vtk file under the menu item Graphics | Paraview export can also be leads, if no WinMISKAM graphics window with the horizontal sections is still open.

In the window "Para ViewExport" that opens, a MISKAM wind field file (*.zwu) or a file with MISKAM concentration values (* .zwk) can be specified as an input file. The location where ParaView file (*.vtk) will be saved have to be entered in the "Output" field.

Window

The menu option *Window* allows the common display of multiple windows on screen.

Info

The menu option *Info* provides information about the current version of WinMISKAM as well as copyrights.

Import of Shape Files

WinMISKAM offers the possibility to import building information (= building contour and height) of a shape file[30].

Building-Shapes

The following window is shown if a file with the extension ".shp" is selected in the window **Gebäudekataster laden** after choosing *Configuration* | *Load building file.*

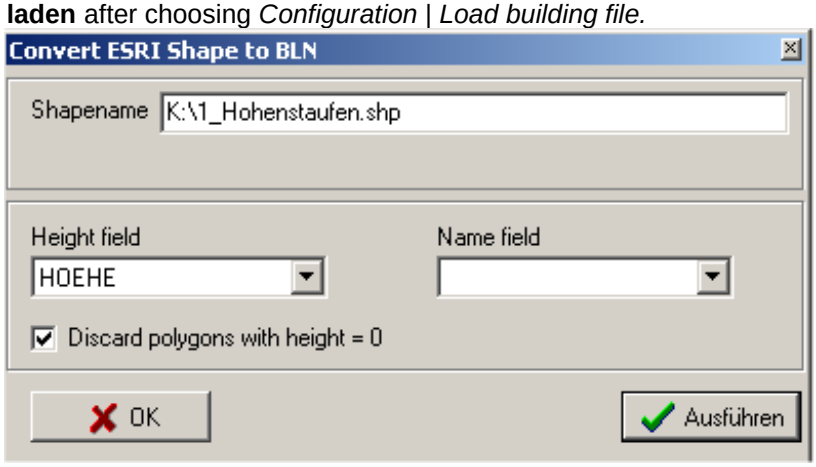


Fig. 0.1: Window Convert ESRI Shape to BLN for the import of shape files which includes building information

The following table explains the meaning of the content of the window.

Window detail	**Meaning**
Input file *Shapename*	**Name of the shape file which includes building information. Additionally to the file with the extension ".shp" one file with the same prefix and the extension ".shx" and another file with the extension ".dbf" have to exist.**
Scroll down list *Height field*	**Name of the field which includes the building height. "HOEHE" is the default. If this name does not exist in the shape file this field remains empty. The user can also select another field name from the list, which contains the building height.**
Scroll down list *Name field*	**Name of a field for the building denomination. There is no default for the field name. Hence this field is empty at the beginning.**
Controllfield *Discard polygons with height = 0.*	☑ **all buildings with height=0 are not transferred**

[30] Format from the company ESRI for geodata . Simultaneous to the shp-file for saving the geometry data, a shx-file for saving the index information for geometry and a dbf-file for saving object data is used.

	☐ **Also buildings with height=0 are transferred (To illustrate these polygons as well, this setting can be helpful. However buildings with height=0 have no influence for MISKAM calculation.)**

Building shapes with negative building height are generally discarded
The following error information will appear after clicking the button *Ausführen* if at least one of the scroll down fields stays empty.

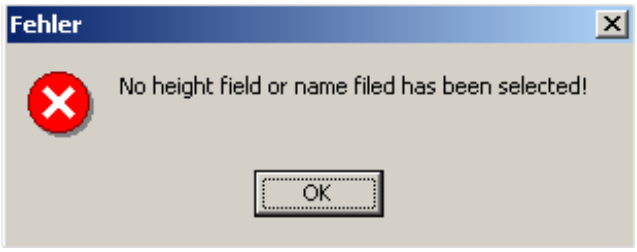


Fig. 0.2: Window Fehler, if no height field or name field was chosen

The following error information will appear if in the scroll down list *Hight field* a field name has been selected which does not contain numbers.

Fig. 0.3: Window Fehler, if the content of height field does not contain numbers

Both error information are closed by clicking on the bottom *OK*. Thus the window **Convert ESRI Shape to BLN** comes to the fore and appropriate changes can be done.
The building shapes can contain several parts of polygons (e.g. island polygons).

Street shapes

Similar to the buildings WinMISKAM offers the possibility to import street information (=location of the streets, as well as DTV= daily average number of vehicles, LKW-Anteil= percentage of heavy duty vehicles, etc.) out of a shape files. The following window is shown if a file with the extension “shp“ is selected in the window **Open road net file** after choosing *Configuration* | *Open road net file.*

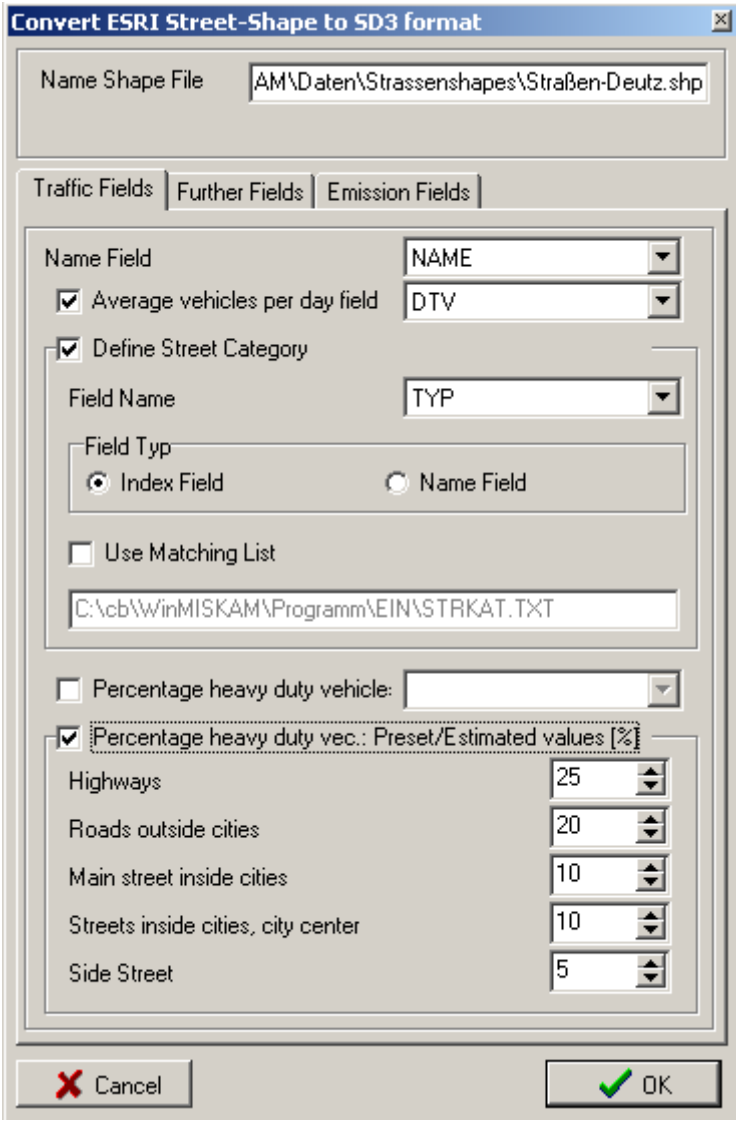
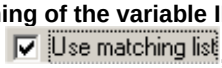
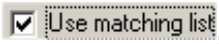
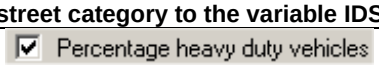
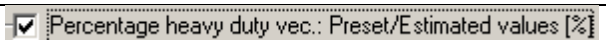


Fig. 0.4: Window Convert ESRI Street-Shape to SD3 format with the selected register Traffic Fields for the import of shape files which includes street information

The following table explains the meaning of the content of the window.

Window detail	**Meaning**
Input field *Name Name Shape file*	**Name of the shape file which includes street information. Additionally to the file with the extension ".shp" one file with the same prefix and the extension ".shx" and another file with the extension ".dbf" have to exist.**
Scroll down list *Name field*	Name of a field for the street segment denomination. "NAME" is the default field name. If this name does not exist as field name in the shape file this field remains empty.
Scroll down list *Average vehicles per day field*	**Name of the field which includes the DTV (average vehicles per day) value.**  **activates the scroll down list. "DTV" or "IDTV" is the default field name. If this name does not exist as field name in the shape file this field remains empty.**
Scrolldown list *Street category| Field name*	**Name of the field which includes the street category. "TYP" is the default field name. If this name does not exist as field name in the shape file this field remains empty.**

Option *Street category| Field typ*	 **The entry in the shape file for the field Street category are integers. If no matching list is used (i.e. setting**  **), this field has the meaning of the variable IDSKM (see Table 0.4) If an matching list is used, i.e.**  **, the values, read in the shape file, are transformed according to the matching list into the analogous value of IDSKM. The configuration of the matching list is described in chapter 0**  **The entry in the shape file for the field street category are strings. If no matching list is used (i.e. setting**  **), only these strings are allowed which are given in Table 0.4. If a matching list is used, i.e.**  **, only these strings are allowed which are given in the second column of the matching list. The strings which are read out of the shape files are transformed analogous to the matching list into the appropriate values of IDSKM.**
Input field File name for matching list	**Input only necessary/possible using a matching list. The matching list (chapter 0) faciliates the matching of entries in the shape file for the field street category to the variable IDSKM (see Table 0.4)**
Scrolldown list *Percentage heavy duty vehicles*	 (check placed in front of Percentage heavy duty vehicles): Name of the field for percentage of heavy duty vehicles. “LKW” is the default. If this name does not exist as field name in the shape file this field remains empty. Value range: 0 ... 1, i.e. for a percentage of heavy duty vehicles of 10% the value of 0.1 have to be indicated
Input field Percentage heavy duty vec.: Preset/ Estimated values [%]	 (check placed in front of Percentage heavy duty vec.: Preset/ Estimated values [%]). If there is no field for heavy vehicles percentage, alternatively it can be attached depending on street categories[31].

[31] It has to be attended, that this kind of classification of the truck share (percentage of heavy duty vehicles) is quiet an approximate simplification. Therefore immissions predictions as result of such classification of the percentage of heavy duty vehicles have at least screening quality.

On the register *Further fields* field names for number of lanes, width of lane and classes of longitudinal gradient can be given. The window **Convert ESRI Street-Shape to SD3 format** with the register *Further fields* is shown in **Fig. 0.5**.

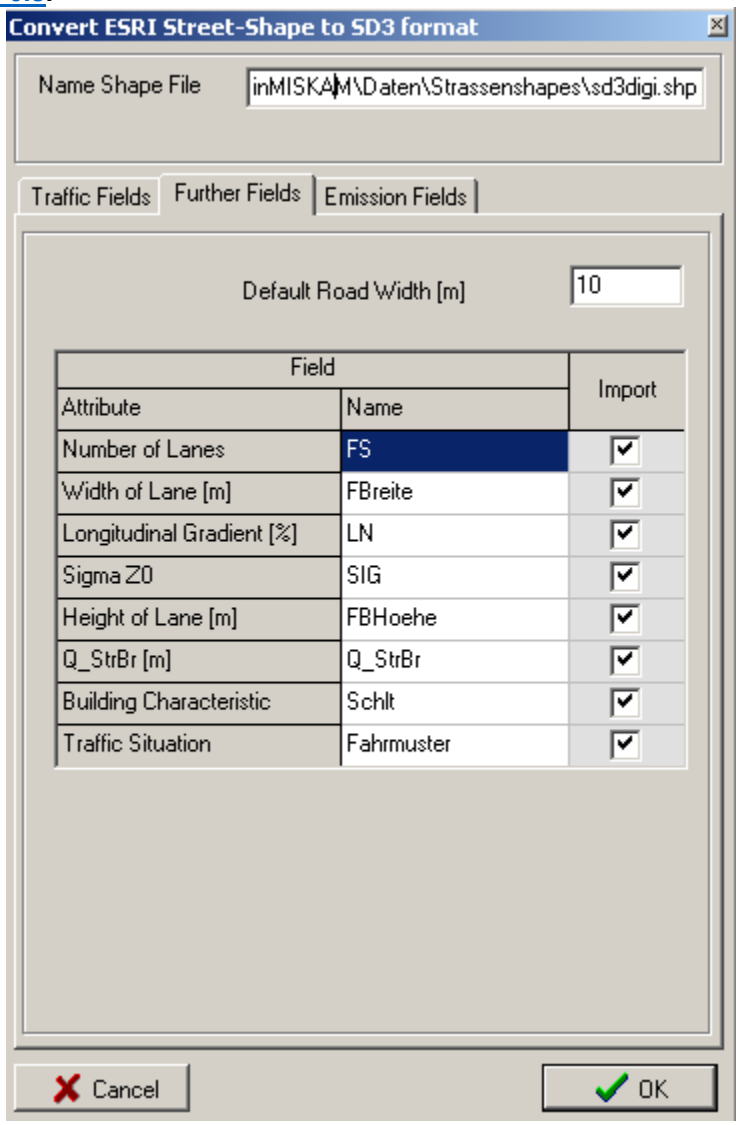


Fig. 0.5: Window Convert ESRI Street-Shape to SD3 format with the register Further fields for the import of shape files which contains street information

The *default road width* can be entered manually. It is used in case no attribute *Width of lane* was chosen. The table below illustrates all attributes to characterize the lane. If they are found in the shape-file, the name allocated in Table 0.1 is automatically listed in the column *Name*. The field in the column *Name* remains empty in case the attribute is not found in the shape-file. Nevertheless an adequate name can be entered clicking twice on the field to access a scroll down list.
Most of the attributes are self-explanatory. Sigma Z0 means the extension of the source in vertical direction. The attributes Q_StrBr, Building Characteristic and Traffic Situation are not used in WinMISKAM. In case the attributes are not defined in the shape-file, the default values described in Table 0.1 are valid.
Only the values of attributes checked in the column *Import* are imported from the shape-file. All not marked attributes are dealt as undefined, meaning the default values (Table 0.1)are applied. The field in the *Import* column can be checked and unchecked by double clicking. In case the field in the column *Name* is empty, the attribute is treated as if the column *Import* is unckecked.

Attribute	**Name**	**default value in MISKAM**
Number of lanes	„Spuren“, „FS“	2

Width of lane	**„Breite“, „Fbreite“**	Default width of lane is used
Longitudinal gradient	„Steigung“, „LN“	No longitudinal gradient = 7 (
Sigma Z0	„SIG“	1,5
Height of lane	„FBHoehe“	
Q_StrBr	„Q_StrBr“, „Quellhoehe“	Not used in MISKAM
Building characteristics	„Schlt“, „Bebtyp“	Not used in MISKAM
Traffic situation	„Fahrmuster“, „Modus“	Not used in MISKAM

Table 0.1: Attribute of the register further fields and the corresponding name and default value in MISKAM

LNKLASSE	**Longitudinal gradient**
1	-6%
3	-4%
5	-2%
7	0%
9	+2%
11	+4%
13	+6%
16	+/-2%
18	+/-4%
20	+/-6%

Table 0.2: Allowed values of the field LNKLASSE and corresponding longitudinal gradient

The register *Emission Fields* includes the definition of emissions, which ought to be imported from the shape-file. If the emissions are found in the shape-file, the name allocated in Table 0.3 is automatically listed in the column *Name*.

Emission	**Name**
NOX	„eNOX“, „NOX“
Benzol	„eBzl“, „ebenzol“
Ruß	„eRuss“, „Russ“
PM10	„ePM10“, „ePM10“
Stoff x	„eStoffx“, „Stoffx“

Table 0.3: Emissions and the corresponding name of the register Emission Fields

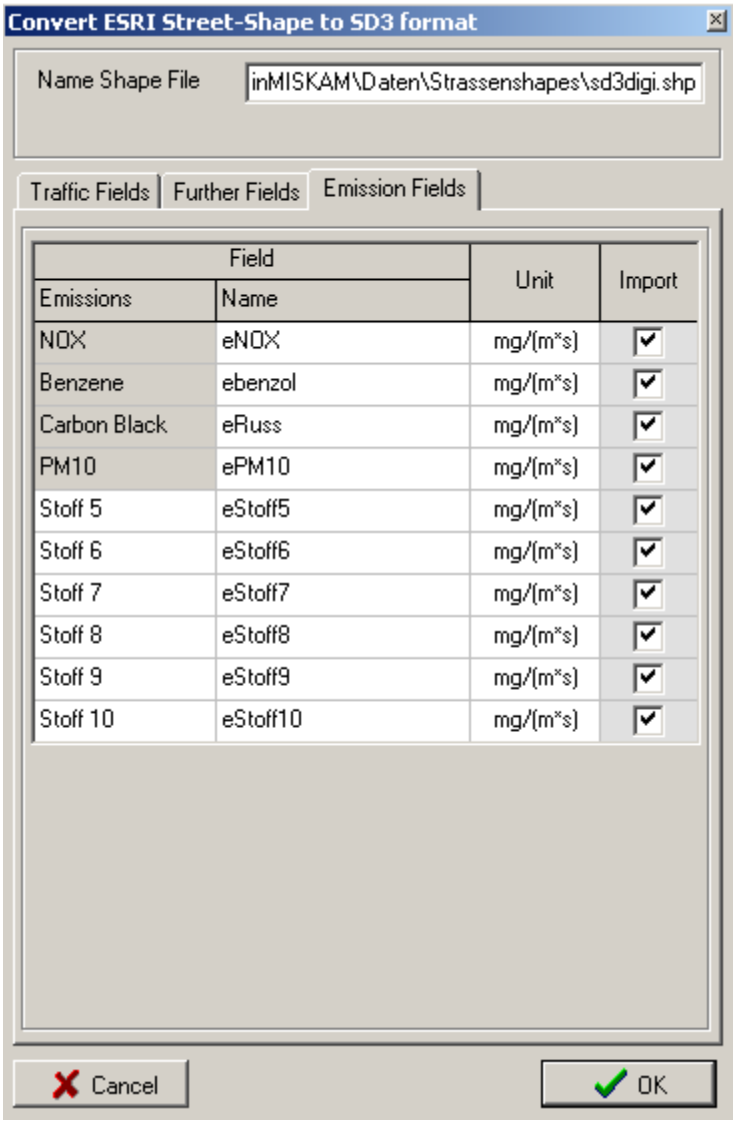


Fig. 0.6: Window Convert ESRI Street-Shape to SD3 format with the register Emission fields

There is the possibility to determine the column *Unit* and the column *Import* universally by clicking with the right mouse button on the headline. The following units can be chosen: mg/(m*s), t/a, mg/s und g/(km*h). For *Import* the options *Import all* or *Import None* are offered. Clicking twice on the corresponding field, the unit can be determined individually in the scrolldown list. Likewise the emissions can be checked or unchecked individually in the column *Import* by double clicking.
The column *Emissions* offers the possibility to define further emissions additionally to the four default emissions NOX, Benzene, Carbon Black and PM10. If the emissions are found in the shape-file, the name allocated in Table 0.3 is automatically listed in the column *Name*. The field in the column *Name* remains empty in case the attribute is not found in the shape-file. Nevertheless an adequate name can be entered clicking twice on the field to access a scroll down list.

The allocation list for street category

The matching list affords the matching of entries in the shape file for the field street category to the variable IDSKM (see **Table 0.4**). The matching list is an ASCII file and contains tree columns. A semicolon is used as column divider. The content of the first row only serves for explanation. From the second row every row has tree entries (divided with semicolon):

1. Type number, as used in the street shape file,
2. Denomination for this type of street as allocation and
3. attributed IDSKM number.

The following five rows are an example.
Type; denomination ; IDSKM

```
10;motorway                          ; 10
20;main street                       ; 6
30;main street and bypass            ; 6
70;outside city, highway       ; 3
```

IDSKM	Street category
2	Outside city, good developed street, streight
3	Outside city, good developed street, regular winding
4	Outside city, irregular winding
5	Inside city, main street, Speed limit>50 km/h
6	Inside city, main street, having right of way
7	Inside city, main street, with light-signal system
8	Inside city, city centre
9	Side road
10	motorway, without speed limit
11	motorway, speed limit 120
12	motorway, speed limit 100
13	motorway, speed limit 80
14	motorway, speed limit 60

Table 0.4: Allowed values of the field IDSKM and corresponding street category
Note: The second column of the allocation list has no meaning, if the field type for the input field street category is an index field.

Literature

BASt (2005) (DUERING, I.,BÖSINGER, R., LOHMEYER, A.): PM_{10}-Emissionen an Außerortsstraßen mit Zusatzuntersuchung zum Vergleich der PM_{10}-Konzentrationen aus Messungen an der A1 Hamburg und Ausbreitungsberechnungen. Verkerhstechnik Heft V 125.

Duering, I., Bächlin, W., Ketzel, M., Baum, A., Friedrich, U., Wurzler, S. (2011): A new simplified NO/NO_2 conversion model under consideration of direct NO_2-emissions. Meteorologische Zeitschrift, Vol. 20 067-073 (February 2011).

UMK (2004): Partikelemissionen des Straßenverkehrs. Endbericht der UMK AG „Umwelt und Verkehr“.

ROMBERG, E., BÖSINGER, R., LOHMEYER, A., RUHNKE, R., RÖTH, E. (1996): NO-NO2-Umwandlungsmodell für die Anwendung bei Immissionsprognosen für Kfz-Abgase. Hrsg.: Gefahrstoffe-Reinhaltung der Luft, Band 56, Heft 6, 215-218.

Annex

Additional information about NO-NO2 conversion and PM-10 short term threshold values.

A NO-NO_2 CONVERSION according to Romberg et al. (1996)

The NO-NO2 conversion in MISKAM is based on the Romberg formula (Romberg et al., 1996).

$$NO2 = f(NOx) * NOx \quad (8)$$

$$f(NOx) = A/(B + NOx) + C \quad (9)$$

With this formula the NO2 concentration, which drives from NOx conversion, can be calculated using known annual average background concentration (I1V) or 98-percentile (I2V) respectively. The constants A, B and C are applied as illustrated in Table I depending on which background concentration the calculation is based on.

		A	B	C
I2-value	98-Perzentil	111	119	0,039
I1-value	Annual average	103	130	0,005

Table I: Values for the constants A, B and C to calculate the NO2 concentration

The conversion rate is determined by the NO2/NOx-proprotion, which depends on the NOx immissions (Figure I).

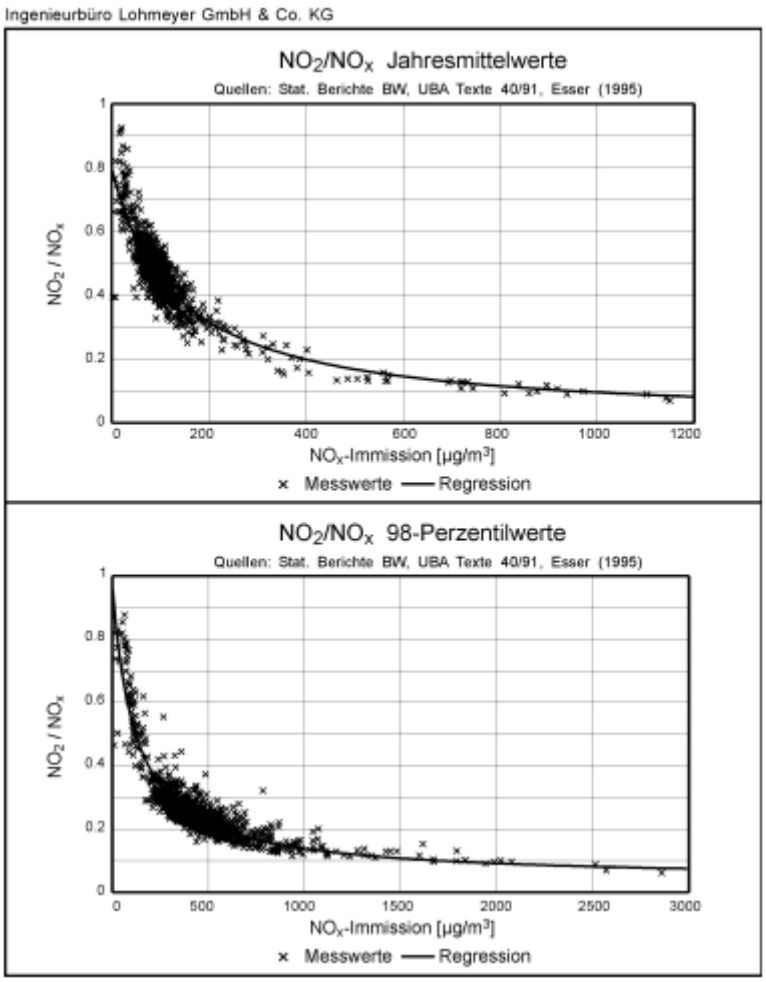


Figure I : NO2/NOx-proportion (conversion rate) depending on the NOx annual average (top) and 98-percentile (down) concentration.

B NO-NO_2 CONVERSION according to Duering et al. (2011)

The chemical conversion of NO to NO_2 is often parameterized in dispersion calculations of exhaust emissions. A widely applied conversion model is the so-called Romberg approach from 1996. However, the Romberg approach has to be re-evaluated to accommodate the above-mentioned conditions. Duering et al. (2011) presents an adjustment to the Romberg approach in accordance with the measured data from 2000 to 2006, taking into consideration substantially higher NO_2/NO_x-ratios especially for higher NO_x-concentrations.

A simplified chemistry model based on annual mean NO_x- and NO_2-concentrations, and background ozone concentrations, as well as primary NO_2-emissions is applied as a better method than the updated Romberg approach. This model simulates the annual mean NO_2-concentrations much more accurately than the conventional and the updated Romberg approaches.

The full article of Duering et al (2011) can be accessed from our homepage www.lohmeyer.de following the menue item Downloads|Publications.

C PM-10 SHORT TERM THRESHOLD VALUES

MISKAM offers four calculation methods to detect the number of exceedances of 50 µg/m³ for daily average PM10 values according to 22. BImSchV.

Within the framework of a research project for the Federal Highway Research Institute a good correlation is found between number of days with PM10 daily average values higher than 50 µg/m³ and PM10 annual average values using 914 measured data from 1999 to 2003 (Figure ii). Hence, a functional dependence

between frequency of exceedances and PM10 annual average values was derived [BASt, 2005]. Furthermore illustrated are the regression curve using the method of the smallest square (“best fit”), the same regression curve including an additional safety margin of standard deviation (“best fit+1 sigma”), the regression curve including an additional safety margin of twice the standard deviation (MLuS, changed version 05) and the regression curve following the UMK report 2004 (“fit LAI”) (figure ii).
The regression curve “best fit“ was developed based on the available dates. The function “best fit” for the number of days of exceedance is:

$$ÜB=-0{,}000065*(JM)4 +0{,}00694*(JM)^3-0{,}15*(JM)^2 +1{,}1064*(JM) \quad (10)$$

The “best fit” regression curve including an additional safety margin of standard deviation yields in the “best fit+1 sigma” function:

$$ÜB=-0{,}000065*(JM)4 +0{,}00694*(JM)^3-0{,}15*(JM)^2 +1{,}1064*(JM)+0{,}23*JM \quad (11)$$

The report „PM10-Emissionen an Außerortsstraßen“ of the Federal Highway Research Institute (BASt) (2005) suggests to apply an safety margin of two sigma (annual average value dependent) to calculate the frequency of exceedance from PM10 annual average values (MluS, changed version 05). The function for the number of days of exceedance is:

$$ÜB=-0{,}000065*(JM)4 +0{,}00694*(JM)^3-0{,}15*(JM)^2 +1{,}1064*(JM)+2*(0{,}23*JM) \quad (12)$$

In October 2004, the working group ”Umwelt und Verkehr” of the Environment Ministers´ Conference (UMK) presented a corresponding function to “best fit” based on available measured values of 2001 to 2003 [UMK, 2004]. The resulting regression curve for the number of days of exceedance is:

$$ÜB= 0{,}0003*JM3{,}392 \quad (13)$$

Up to an annual average value of around 40 µg/m³, this function reveals an almost identical trend to the “best fit” according to BASt (2005). In the statistical average an exceedance of the PM10 short term threshold value is expected at an annual average PM10 value of 31 µg/m³.

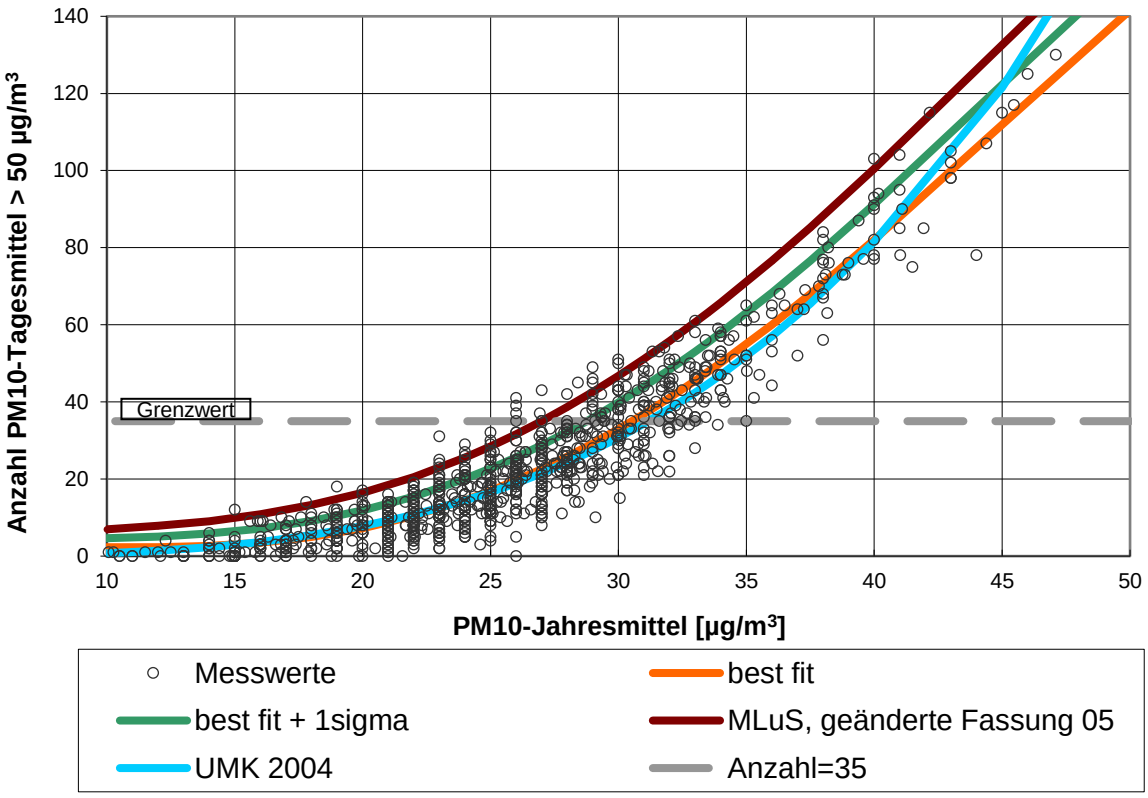


Figure ii: Number of days with more than 50 µg PM10/m³ in daily average depending on PM10 annual average of gauging stations of the Federal States and the Federal Environmental Agency (1999-2003); also included are the functions „best fit“, „best fit+ 1sigma“, MLus (changed version 05) and UMK 2004

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PROKAS_E

PROKAS_E is a graphical user interface for the calculation of VEH emissions at road sections.

Note before starting

Minimum requirements for the calculation are a sd-Shape-File or sd3-ASCII-File and an eft-File. (see File formats)

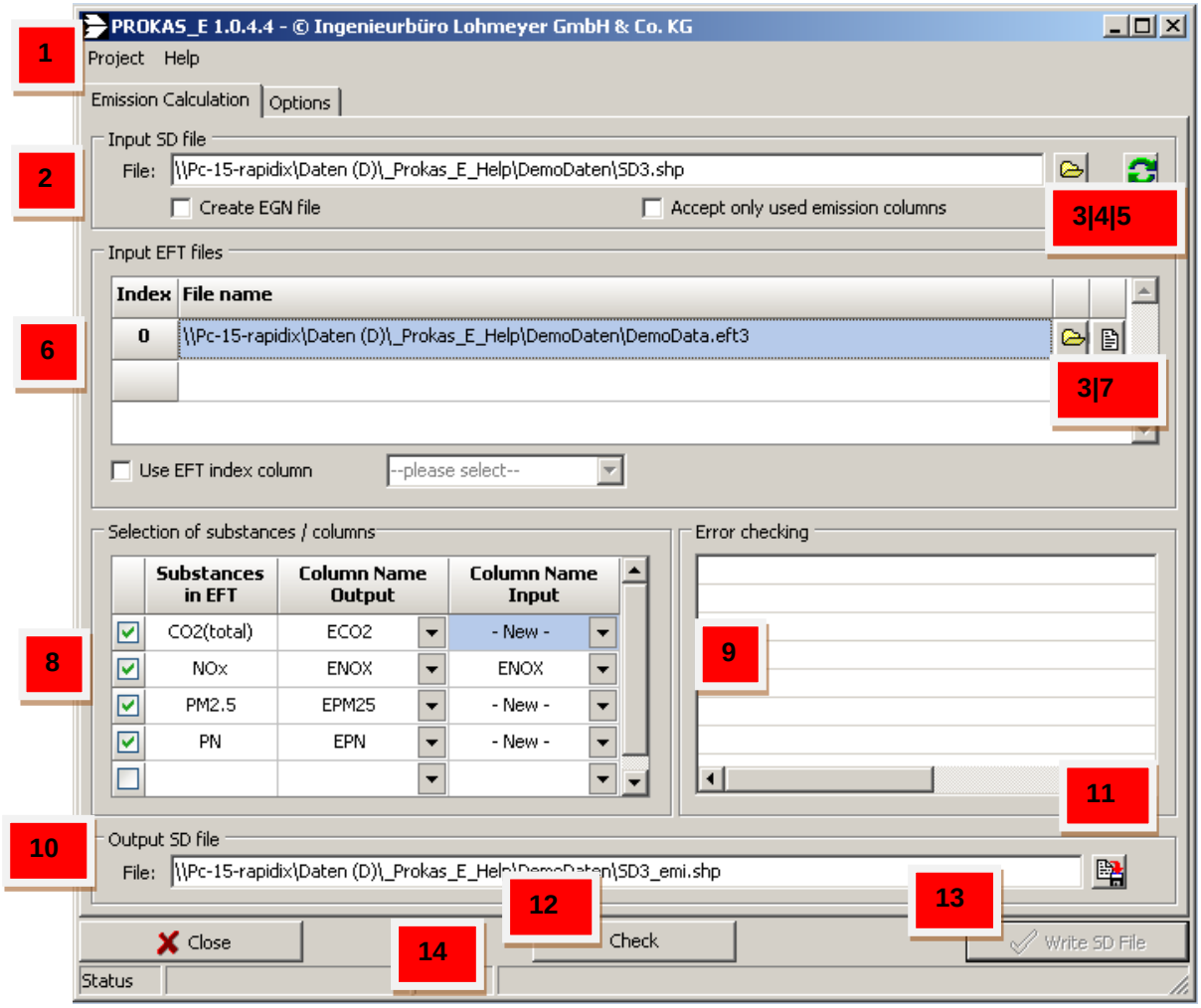
By pressing the key **F1** you can call **Help** functions.

IMPORTANT NOTE: For all decimal numbers, which will be entered into the edit fields of PROKAS_E, the **decimal separator** has to be a point. It is helpful to set 'point' for decimal separator and 'comma' for digit groups in 'Regional Options' of the Windows system controls in the record card 'Numbers'.

Basic informations about the functions of PROKAS_E are mentioned in the help text of the topic Program Control.

PROKAS_E Program Control

Program Control takes place entirely with the user interface.



For more information, press the **F1** (**Help Key**) in the input fields.

A SD-File, i.e. a file with line geometry and according attributes of road parameters (number of street segment, DTV for VEC and HDV, traffic situation, if applicable stop&go shares, tunnel information and road condition) for every street segment is required. For base year dependent emission factors and vehicle fleet compositions an EFT-file is needed. If applicable a VTG-File with user defined details for diurnal and weekly variations can be used.

Menu Bar - Project [1]

Open Project:

The function „**Open Project“** in the menu „**Project**“ [1] | allows to open an existing project. Thereby the relevant folder can be selected and the project (*.emp) can be opened. In the window error checking a hint appears in case the project was loaded successfully. The status bar shows the path of the current loaded project.

Save Project:

The function „**Save Project“** in the menu „**Project**“ saves the current settings of the project. If the project is saved first time, storage location and file name (*.emp) has to be entered first.

Save As Project:

The function „**Save As Project“** in the menu „**Project**“ opens a window to define the storage location for the project. After the selection of a folder a project-file (*.emp) will be generated. In case an equal named project already exists, an enquiry appears to decide whether the existing project will be overwritten or not.

Close Project:

The program can be closed clicking the button Close at the left lower corner or the black cross on the right upper corner.

Emission Calculation

Input SD-File [2]

A SD-File, i.e. a file with line geometry and according attributes of road parameters (number of street segment, DTV for VEC and HDV, traffic situation, if applicable stop&go shares, tunnel information and road condition) for every street segment has to be entered.

Possible input options:

- Click on the button „**Open**“ (record card symbol) [3]
- Drag&drop or entry of path- and file name

Formats:

- SHP (ESRI-Shape file)
- SD3 (ASCII-file)

In case there is a connection between ArcGIS and Prokas_E, it's possible to display the SD-file in ArcGIS by clicking the button „**ArcGIS**“ [4]| in PROKAS_E

I you push the button “**Update**“ [5] the specified SD-file will be load afresh.

The following options can be selected loading a SD-file:

Create EGN - file:

Creation of an emission time series using a user-defined a diurnal cycle/week cycle of the traffic.

This field is only active when the VTG-file is loaded. For the calculation of emissions with working day traffic values, a diurnal cycle/week cycle of the traffic and the selection of a significant street segment are required.

Use stop&go shares:

Import stop&go shares

Accept only used emission columns:

In the Output-Shape-file only used emission columns are written. The allocation of columns has to be specified in **Selection substances/columns** [8].

Input EFT-File [6]

Input of the EFT-file with base year dependent emission factors and vehicle fleet composition.

Input possibilities:

- double click or button „Open“ for dialog box [3]
- input of path- and file name

File formats:

- EFT3 (ASCII-File) Emission factors according to vehicle type categories in conjunction with Euro-Norm and type of drive and traffic composition of the vehicle type categories PKW, LNF and so on.
- EFTk (ASCII-File) Emission factors according to vehicle type group (vehicles (VEH) and heavy duty vehicles (HDV))

The button „Show“ allows to display the file in a standard editor.

Use EFT index-column:

The EFT-Index column allows to use more than one EFT-file e.g. for environmental zones. An index is attributed to every EFT-file in a list. For each street segment the attribute environmental zone index (default column name iUZ) has to be included as an Integer column according to the index in the EFT-file list of the SD-file.

The respective emission factor set, which is extracted from the EFT-file, will be assigned to the street segment according to the index.

Selection of substances/columns [8]

Substances in EFT

All substances, which are found in the **EFT - file**, are displayed in the column substances in eft. The checkbox specifies, whether emissions will be calculated for a certain substance or not.

Column Name Output:

In „**column name output**“ predefined names for the selected substances can be specified in a list for the output-shape-file (SD-File).

The specification of „**column name output**“ causes a renaming of the column name in output-shape-file (only for input-SD-file in shape-format)

Column Name Input:

In „**column name input**“ a column has to be chosen, which will be transferred to the output-shape-file (SD-File) for the calculation of emissions.

Error checking [9]

Program information is displayed as following symbols:

✓ = No Error

= Process started / finished

= Caution!

= Error

Output SD-File [10]

Storage directory and name for the output emission file has to be entered. As default the storage location and name of the Input file with the extension „_emi“ are suggested.

Input possibilities:

- double click or button „Save“ for input dialog
- drag&drop or manual input of path- and file name

In case PROKAS_E was opened in **ArcGIS** it’s possible to open and display the output file in ArcGIS.

Check [12]

The function „**Check**“ has to be executed **before writing SD File**.

The input data will be checked for errors. In the view box the result will be displayed.

Possible errors are:

column "IDTV" not found in SD-File

column "PLV" not found in SD-File

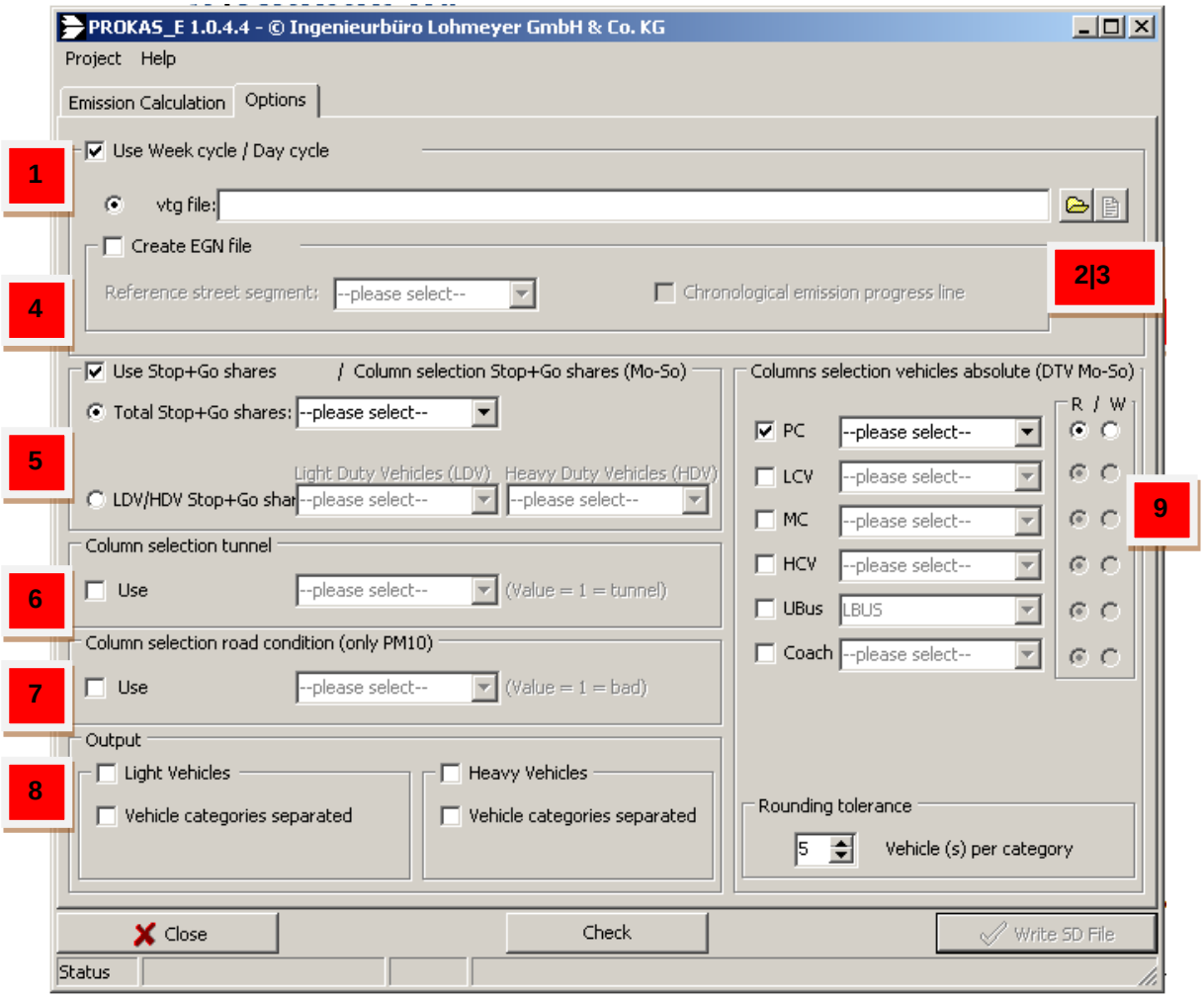
column "traffic situation" not found in SD-File

traffic situation AB100 not found in eft-file Nr.: 0

Write SD-File [13]

By using the button „**Write SD File**“ [13] emissions for every street segment will be calculated and written to the Output SD-File

Options


PROKAS_E 1.0.4.4 - © Ingenieurbüro Lohmeyer GmbH & Co. KG
Project
Help
Emission Calculation
Options
1
Use Week cycle / Day cycle
vtg file:
Create EGN file
2|3
4
Reference street segment:
--please select--
Chronological emission progress line
Use Stop+Go shares
/ Column selection Stop+Go shares (Mo-So)
Total Stop+Go shares:
--please select--
5
LDV/HDV Stop+Go shar
Light Duty Vehicles (LDV)
Heavy Duty Vehicles (HDV)
--please select--
--please select--
Column selection tunnel
6
Use
--please select--
(Value = 1 = tunnel)
Column selection road condition (only PM10)
7
Use
--please select--
(Value = 1 = bad)
Output
8
Light Vehicles
Vehicle categories separated
Heavy Vehicles
Vehicle categories separated
Columns selection vehicles absolute (DTV Mo-So)
R / W
9
PC
--please select--
LCV
--please select--
MC
--please select--
HCV
--please select--
UBus
LBUS
Coach
--please select--
Rounding tolerance
5
Vehicle (s) per category
Close
Check
Write SD File
Status

Use Week cycle/Day cycle [1]

It's required to use a week cycle/day cycle, if DTV values are working day traffic statistic.

VTG-File:

A VTG-File can be imported by using the button „Open" [2]The VTG-File can be displayed in a standard editor with the button „**Text**" [3]

By executing a dispersion calculation with the programs PROKAS, PROKAS_B or SELMA-PROKAS it's required to specify an emission density (EGN-file). The usage of a VTG-file including day and week cycles is necessary.

Create EGN-File:

Activating the check box „create EGN-file" [4] leads to a summarized, sorted emission curve for a street segment, which will be created in addition to a Output-Shape-File. This EGN-file is just needed for the programs PROKAS, PROKAS_B or SELMA_PROKAS.

Reference street segment:

A representative segment of the Input SD-file needs to be selected for the investigation area. The street segments in the SD-file can be identified by the attribute „**STR_NAME**".

Chronological emission progress line:

By activating the checkbox **chronological emission progress line** [4]a CGN-file (ASCII-file) will be created in addition to the output-shape-file and EGN-file. Therein a chronological emission progress line for working days (Mo-Fr), Saturday (Sa) and Sunday (So) will be saved.

Column selection Stop+Go shares [5]

To activate this section the checkbox „use Stop+Go shares" in the tab „Emission calculation" needs to be hooked.

Stop+Go shares are specified as share and factors respectively (not in percentage). The emissions of a street segment in the relevant traffic situation are composed of an

according emission factor multiplied by (1 - Stop+Go share) plus Stop+Go share multiplied by emission factor of the same traffic situation.

Total Stop+Go shares:

Specifies the column name (Default = STANT) of the Input-SD-file, which contains the total stop+go shares for each street segment. In case the column has the name „STANT“, it will be preselected automatically.

LV- / HV-Stop+Go shares:

Activating the checkbox **LV- / HV-Stop+Go shares** enables the option to specify stop+go shares for light and heavy vehicles separately. The boxes **light vehicles** (Default = LV_STANT) and **heavy vehicles** (Default = SV_STANT) define the according column name of the Input-SD-file for the emission calculation of each street segment.

Column selection tunnel [6]

use tunnel:

The particulate matter emission factors for abrasion and resuspension in street tunnels distinguish from open roadways. Therefor the emission calculation for PM10 and PM2.5 in tunnel segments uses modified E-factors (exhaust emission remain uneffected). Tunnel segments in a Input-SD-file can be identified with the option **use tunnel**.

The column with information of the tunnel (Default = TUNNEL**)** must contain Integer values. The value=1 indicates a tunnel segment. All other values indicate no tunnel.

Column selection road condition (only PM10) [7]

use road condition:

For street segments in bad condition PM10 abrasion and resuspension factors can be doubled (exhaust emission remain uneffected). These street segments are specified in the Input-SD-file in the column selection (Default = ZUSTAND). The value=1 indicates bad road conditions. All other values indicate normal conditions.

Output [8]

Light vehicles and / or Heavy vehicles:

Usually emissions are calculated as a density for all vehicle type categories for each street segment. The option **Light vehicles and / or Heavy vehicles** can be used to calculate emissions for vehicle type categories separately (e.g. EPM10_LV, EPM10_HV).

If the checkbox „**vehicle categories separated**“ is hooked, emissions are calculated even more detailed among vehicle categories for each pollutant (e.g. EPM10_PKW, EPM10_LNF). Considered light vehicle categories (LV) are PKW, LNF and KR. Considered heavy vehicle categories (HV) are SNF, LBUS and RBUS.

Column selection vehicles absolute [9]

Generally information about the traffic composition is obtained by an EFT3-file. However it’s possible to define DTV values separately for each street segment and vehicle type category with „**column selection vehicles absolute**“. Thereby average traffic counts for one or more vehicle type categories can be predefined in the Input-SD-file. Furthermore Option „**R**“ for read must be activated.

The columns traffic counts and heavy vehicles share are still required, in case one vehicle type category is not defined separately. The traffic data of the according vehicle type category are calculated from differences.

For example:

Specifications:

- $DTV_{Mo\text{-}So}$ (IDTV) = 10 000,
- HDV-share (PLV) = 10 %
- PC = 8 500 vehicles

Calculation:

- LV (9 000 vehicles) from DTV and HV
- LV – PC = LCV und MC (500 vehicles)
- 500 vehicles are allocated proportionately to LCV and MC depending on traffic composition

Furthermore to check it’s possible to write the absolute number of individual vehicle types in the Output-Shape-file by activating the checkbox „**W**“ (Write). Thereby a column must exist in the Input-SD-file to write the traffic counts of the vehicle type.

Rounding tolerance:

Using absolute vehicle counts and / or VTG-Files can lead to deviation due to rounding. The sum of vehicles of all vehicle categories can differ from the DTV-value (column IDTV). The option **Rounding tolerance** enables the possibility to specify a tolerance value per category. Between 0 and 10 vehicles can be chosen. In case this condition is not fullfilled, a warning message occurs in the .

File formats

Detailed description of file formats used by PROKAS_E.

Input-SD-File

The Input-SD-File can be either a *.shp-file, a *.sd3-file or a *.dtv-file.

These files contain in each case the definition of street segments with street width, traffic intensity, HDV share, traffic situation, source height of emissions of street segments.

For each street segment a row has to be created.

An Input-SD-file has to hold the following structure.

Variable(s)	Type	meaning	required	
			Shape	ASCII (column)
KENNNR	Integer	Identification number	optional	mandatory (1)
X1	Float	Start coordinate of the straight street segment [m]	optional	mandatory (2)
Y1	Float	Start coordinate of the straight street segment [m]	optional	mandatory (3)
X2	Float	End coordinate of the straight street segment [m]	optional	mandatory (4)
Y2	Float	End coordinate of the straight street segment [m]	optional	mandatory (5)
FBREITE	Float	Lane width [m]	optional	mandatory (6)
FBHOEHE	Float	Lane height [m]	optional	mandatory (7)
ENOX	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	mandatory (8)
ENOX_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENOX_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENOX_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENOX_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENOX_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENOX_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENOX_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENOX_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	mandatory (9)
EBZL_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBZL_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	mandatory (10)
ERUSS_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ERUSS_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM10	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	mandatory (11)
EPM10_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM10_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional

EPM10_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM10_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM10_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM10_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM10_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM10_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPM25_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENO2_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EBaP_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ENH3_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO2_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ECO_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN_LV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional

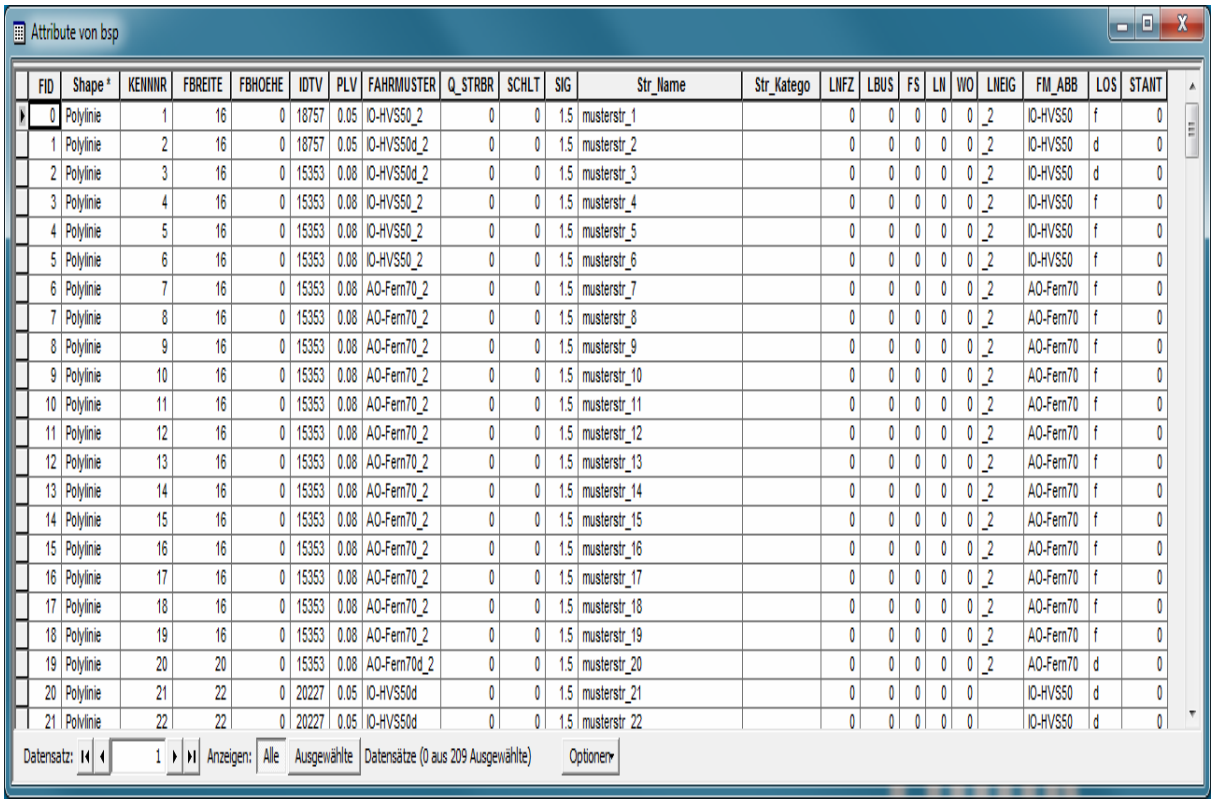
EPN_SV	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN_PKW	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN_LNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN_KR	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN_SNF	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN_LBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
EPN_RBUS	Float	mean emission density [mg/(m*s)] accordant to variable id	optional	optional
ESTOFF5	Float	mean emission density for further pollutants [mg/(m*s)]	optional	mandatory (12)
ESTOFF6	Float	mean emission density for further pollutants [mg/(m*s)]	optional	mandatory (13)
ESTOFF7	Float	mean emission density for further pollutants [mg/(m*s)]	optional	mandatory (14)
ESTOFF8	Float	mean emission density for further pollutants [mg/(m*s)]	optional	mandatory (15)
ESTOFF9	Float	mean emission density for further pollutants [mg/(m*s)]	optional	mandatory (16)
ESTOFF10	Float	mean emission density for further pollutants [mg/(m*s)]	optional	mandatory (17)
IDTV	Integer	mean daily traffic volume	mandatory	mandatory (18)
PLV	Float	HDV-share of the vehicle fleet	mandatory	mandatory (19)
FAHRMUSTER	String	Traffic situation	mandatory	mandatory (20)
Q_STRBR	Float	• roads without ribbon development: source height [m] • roads with both-sided ribbon development: distance between opposing buildings [m] • roads with one-sided ribbon development : doubled distance from the middle of the street to the ribbon development [m]	optional	mandatory (21)
SCHLT	Integer	Schluchttyp	optional	mandatory (22)
SIG	Float	Rate of the initial dilution pollutant concentration, default: 1.5 m	optional	mandatory (23)
Str_Name	String	distinct street name	optional	mandatory (24)
Str_Katego	String	informationen of the street category	optional	mandatory (25)
PKW	Integer	absolute number of passenger cars	optional	optional
LNF	Integer	absolute number of light commercial vehicles	optional	mandatory (26)
KR	Integer	absolute number of motorcycles	optional	optional
SNF	Integer	absolute number of HGV (mix: trucks, trailers, ..)	optional	optional
LBUS	Integer	absolute number of urban buses	optional	optional
RBUS	Integer	absolute number of tour coaches	optional	optional
STANT	Float	Stop&Go share	optional	optional
LV_STANT	Float	Stop&Go share LDV	optional	optional
SV_STANT	Float	Stop&Go share HDV	optional	optional
FS	Integer	lane number	optional	optional
IUZ	Integer	environmental zone index (Auswahl EFT3-Datei)	optional	optional
TUNNEL	Integer	tunnel index (1=Tunnel)	optional	optional
ZUSTAND	Integer	road condition index (1=schlecht)	optional	optional

Input-SHP-file

Actually a SHP-file consists of a file compound of *.shp, *.shx, *.dbf and others. Each of these files contains different information of the shape-file, e.g. geometry, attributes. The following description targets on the file compound.

In the SHP-file an object-ID is specified automatically by ArcGIS in the column „FID“. The geometry of street segments is saved in the column „shape“. Apart from that the columns has to be created analogue to the table in 1.4.. Input-shp-files shall be used for dispersion calculation with PROKAS, PROKAS_B and SELMA-PROKAS.

In the following an example Input-SD-file is shown:



FID	Shape *	KENNNR	FBREITE	FBHOEHE	IDTV	PLV	FAHRMUSTER	Q_STRBR	SCHLT	SIG	Str_Name	Str_Katego	LNFZ	LBUS	FS	LN	WO	LNEIG	FM_ABB	LOS	STANT
0	Polylinie	1	16	0	18757	0.05	IO-HVS50_2	0	0	1.5	musterstr_1		0	0	0	0	0	_2	IO-HVS50	f	0
1	Polylinie	2	16	0	18757	0.05	IO-HVS50d_2	0	0	1.5	musterstr_2		0	0	0	0	0	_2	IO-HVS50	d	0
2	Polylinie	3	16	0	15353	0.08	IO-HVS50d_2	0	0	1.5	musterstr_3		0	0	0	0	0	_2	IO-HVS50	d	0
3	Polylinie	4	16	0	15353	0.08	IO-HVS50_2	0	0	1.5	musterstr_4		0	0	0	0	0	_2	IO-HVS50	f	0
4	Polylinie	5	16	0	15353	0.08	IO-HVS50_2	0	0	1.5	musterstr_5		0	0	0	0	0	_2	IO-HVS50	f	0
5	Polylinie	6	16	0	15353	0.08	IO-HVS50_2	0	0	1.5	musterstr_6		0	0	0	0	0	_2	IO-HVS50	f	0
6	Polylinie	7	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_7		0	0	0	0	0	_2	AO-Fern70	f	0
7	Polylinie	8	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_8		0	0	0	0	0	_2	AO-Fern70	f	0
8	Polylinie	9	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_9		0	0	0	0	0	_2	AO-Fern70	f	0
9	Polylinie	10	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_10		0	0	0	0	0	_2	AO-Fern70	f	0
10	Polylinie	11	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_11		0	0	0	0	0	_2	AO-Fern70	f	0
11	Polylinie	12	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_12		0	0	0	0	0	_2	AO-Fern70	f	0
12	Polylinie	13	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_13		0	0	0	0	0	_2	AO-Fern70	f	0
13	Polylinie	14	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_14		0	0	0	0	0	_2	AO-Fern70	f	0
14	Polylinie	15	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_15		0	0	0	0	0	_2	AO-Fern70	f	0
15	Polylinie	16	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_16		0	0	0	0	0	_2	AO-Fern70	f	0
16	Polylinie	17	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_17		0	0	0	0	0	_2	AO-Fern70	f	0
17	Polylinie	18	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_18		0	0	0	0	0	_2	AO-Fern70	f	0
18	Polylinie	19	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_19		0	0	0	0	0	_2	AO-Fern70	f	0
19	Polylinie	20	20	0	15353	0.08	AO-Fern70d_2	0	0	1.5	musterstr_20		0	0	0	0	0	_2	AO-Fern70	d	0
20	Polylinie	21	22	0	20227	0.05	IO-HVS50d	0	0	1.5	musterstr_21		0	0	0	0	0		IO-HVS50	d	0
21	Polylinie	22	22	0	20227	0.05	IO-HVS50d	0	0	1.5	musterstr_22		0	0	0	0	0		IO-HVS50	d	0

Various options of PROKAS_E can be used by adding further columns. Correspondent properties for each column gathered from table with the information about the structure of an SD-file.

For example it‘s necessary to add 2 columns, if stop&go share for LV and HV shall be specified separately.

Input-SD3-File

All informations for considered street segments are saved in an Input-SD-file. For SD-files in the ASCII-format there are restrictions on the functionality of PROKAS_E.

Notice for the ASCII-format: In case a row starts with a non-Integer value, the row is treated as a comment.

Straßenfile : C:\Lohmeyer\Beispiel\bsp_sd3.SD3 DefaultStrassenbreite : 0.00
Erzeugt am: 09.12.2011 12:59:45

lfd. Nr.	x1 [m]	y1 [m]	x2 [m]	y2 [m]	Straßensegment Breite[m]	Höhe[m]	mittl. Emiss. [mg/(m*s)] NO2	NOx	PM25	PM10	Stoff5	Stoff6	Stoff7	Stoff8	Stoff9	Stoff10	DTV [Kfz/d]	Lkw-Anteil [-]	Fahrmuster	Qh/SBr[m]	Typ [-]	S_z0 [m]	Str-name
1	3561509.15	5926836.03	3561445.63	5926932.19	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	48300	0.168	AB130	0.000	0	2.0	1
2	3561375.17	5927038.86	3561257.65	5927190.43	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	44100	0.176	AB130	0.000	0	2.0	2
3	3561149.35	5927342.13	3561077.28	5927448.28	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	54100	0.165	AB130	0.000	0	1.5	3
4	3561070.07	5927461.07	3561018.78	5927552.11	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	54100	0.165	AB130	0.000	0	1.5	4
5	3560947.13	5927685.62	3560901.72	5927783.07	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	54100	0.165	AB130	0.000	0	2.0	5
6	3560889.15	5927811.61	3560837.77	5927946.76	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	54100	0.165	AB130	0.000	0	2.0	6
7	3560837.77	5927946.76	3560783.88	5928124.90	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	54100	0.165	AB130	0.000	0	2.0	7
8	3560783.88	5928124.90	3560733.73	5928318.75	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	54100	0.165	AB130	0.000	0	2.0	8
9	3560730.37	5928340.58	3560697.80	5928552.27	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	49400	0.168	AO-Fern70	0.000	0	2.0	9
10	3560697.80	5928552.27	3560688.27	5928629.40	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	49400	0.168	AO-Fern70	0.000	0	2.0	10
11	3560667.12	5928806.01	3560653.64	5929046.27	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	0.000	0	2.0	11
12	3560653.64	5929046.27	3560646.49	5929241.35	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	0.000	0	2.0	12
13	3560646.49	5929241.35	3560643.11	5929539.87	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	0.000	0	2.0	13
14	3560640.99	5929690.15	3560638.41	5929847.48	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	0.000	0	2.0	14
15	3560637.18	5929942.19	3560623.96	5930142.60	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	0.000	0	2.0	15
16	3560602.29	5930427.78	3560590.29	5930544.08	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	0.000	0	2.0	16
17	3560588.53	5930561.18	3560554.85	5930826.88	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	5.000	0	1.5	17
18	3560554.85	5930826.88	3560529.40	5931002.78	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	57900	0.163	AO-Fern70	7.000	0	1.5	18
19	3560577.00	5930833.61	3560551.55	5931009.50	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	7.000	0	1.5	19
20	3560755.89	5928325.48	3560719.96	5928559.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	49800	0.166	AO-Fern70	0.000	0	2.0	20
21	3561044.67	5927552.21	3560986.42	5927655.60	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	52400	0.172	AO-Fern70	0.000	0	2.0	21
22	3560610.68	5930567.90	3560577.00	5930833.61	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	5.000	0	1.5	22
23	3560804.81	5928128.03	3560755.89	5928325.48	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	52400	0.172	AO-Fern70	0.000	0	2.0	23
24	3560668.88	5929278.59	3560665.41	5929539.74	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	0.000	0	2.0	24
25	3561165.73	5927356.30	3561099.43	5927455.01	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	52400	0.172	AO-Fern70	11.000	0	1.5	25
26	3560675.62	5929053.00	3560669.62	5929241.11	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	0.000	0	2.0	26
27	3560624.70	5930432.10	3560612.94	5930546.04	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	0.000	0	2.0	27
28	3560859.92	5927953.49	3560804.81	5928128.03	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	52400	0.172	AO-Fern70	0.000	0	2.0	28
29	3561397.33	5927045.59	3561272.75	5927205.29	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	43600	0.188	AO-Fern70	0.000	0	2.0	29
30	3560659.60	5929902.59	3560650.47	5930071.10	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	0.000	0	2.0	30
31	3560689.27	5928812.74	3560675.80	5929053.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	0.000	0	2.0	31
32	3560904.34	5927835.50	3560859.92	5927953.49	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	52400	0.172	AO-Fern70	0.000	0	2.0	32
33	3561531.30	5926842.75	3561465.45	5926942.45	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	43600	0.188	AO-Fern70	0.000	0	2.0	33
34	3560707.90	5928658.51	3560689.27	5928812.74	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	0.000	0	2.0	34
35	3560664.13	5929628.74	3560663.05	5929699.90	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	56700	0.165	AO-Fern70	0.000	0	2.0	35
36	3560967.42	5927696.36	3560912.68	5927815.50	0.00	0.00	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	52400	0.172	AO-Fern70	0.000	0	2.0	36

Input-EFT-File

In the head of the Input EFT3-file the following is specified::

- the version of the handbook HBEFA
- date of creation of the EFT-file
- version of HbefaToEft
- title of the file
- Year of the emission factors
- cold start Yes/No
- petrol/diesel separated? No

Therefor the creation of E-factors is reproducible.

The cold start addition is only applied for traffic situations in town, which are characterized with „IO“ or „IOS“. Furthermore the driving performance rate for standard light vehicles and standard heavy vehicles are displayed separately in percentage [%].

In the EFT-file for all traffic situations for the following pollutants NOx

- NO2
- PM10
- PM2.5
- BaP
- NH3

- CO2(total)
- CO
- Benzol
- PN(particle number)

emission factors in [g/km*vehicles for the vehicle categories:

- PKW (PC)
- LNF (LCV)
- KR (MC)
- SNF (HGV)
- LBus (urban bus)
- RBus (tour coach)

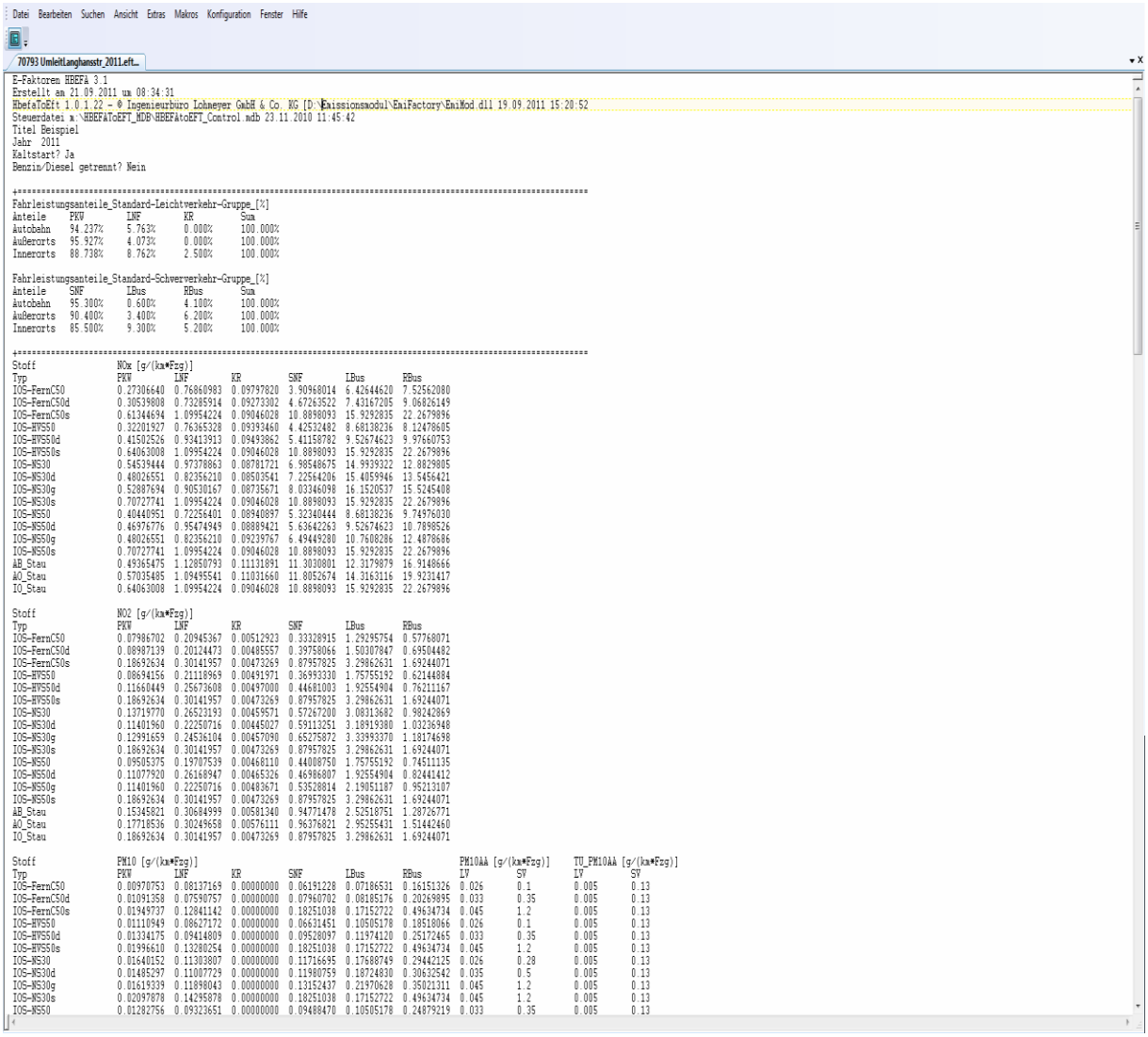
are specified.

Furthermore longitudinal slope and level of service (LOS) is specified for every traffic situation. For the level of service 4 different groups are differentiated:

- freeflow
- heavy
- saturated
- stop + go

Longitudinal slope is differentiated in groups of 0%, 2%, 4% and 6%. Whereas there is a difference between „+“, „-„ and „+/-„ (specified as „_“). An exact description of traffic situations is attached hereto.

For the emission factors for PM10 and PM2.5 the emissions for abrasion and resuspension as well as abrasion and resuspension emissions for tunnels are specified separately.



Datei Bearbeiten Suchen Ansicht Extras Makros Konfiguration Fenster Hilfe

70793 UmleitLanghansstr_2011.eft...

E-Faktoren HBEFA 3.1
Erstellt am 21.09.2011 um 08:34:31
HbefaToEft 1.0.1.22 - © Ingenieurbüro Lohmeyer GmbH & Co. KG [D:\Emissionsmodul\EmiFactory\EmiMod.dll 19.09.2011 15:20:52
Steuerdatei x:\HBEFAToEFT_MDB\HBEFAtoEFT_Control.mdb 23.11.2010 11:45:42
Titel Beispiel
Jahr 2011
Kaltstart? Ja
Benzin/Diesel getrennt? Nein

+----------

Fahrleistungsanteile_Standard-Leichtverkehr-Gruppe_[%]

Anteile	PKW	LNF	KR	Sum
Autobahn	94.237%	5.763%	0.000%	100.000%
Außerorts	95.927%	4.073%	0.000%	100.000%
Innerorts	88.738%	8.762%	2.500%	100.000%

Fahrleistungsanteile_Standard-Schwerverkehr-Gruppe_[%]

Anteile	SNF	LBus	RBus	Sum
Autobahn	95.300%	0.600%	4.100%	100.000%
Außerorts	90.400%	3.400%	6.200%	100.000%
Innerorts	85.500%	9.300%	5.200%	100.000%

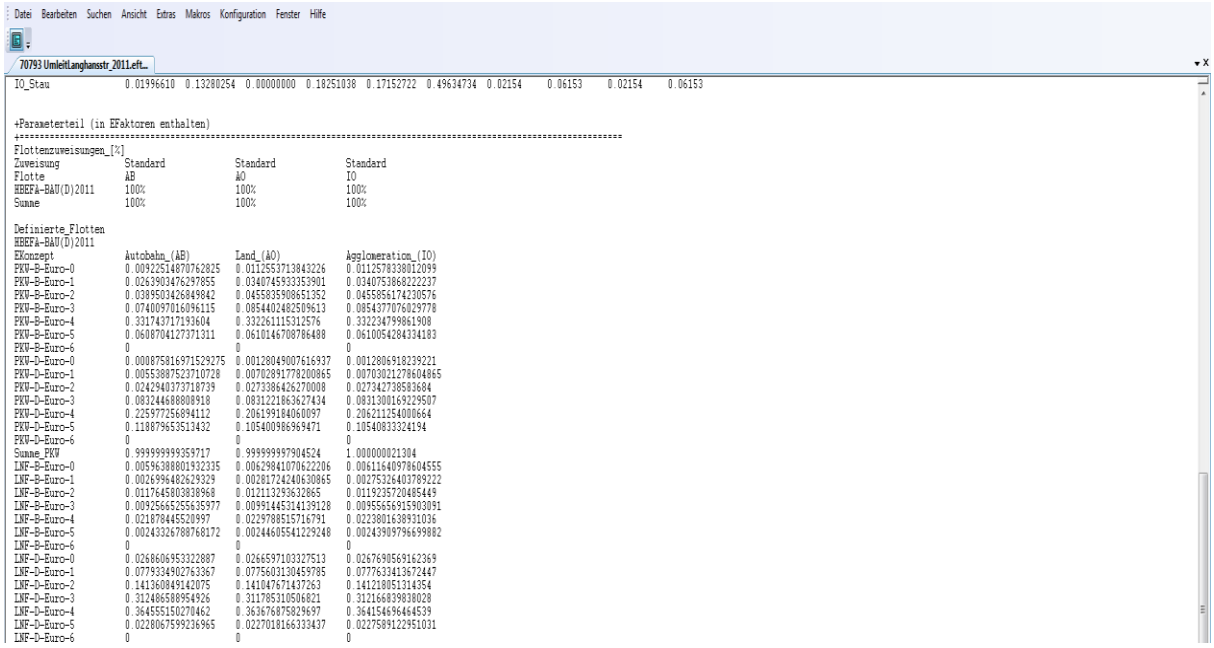
+----------

Stoff	NOx [g/(km*Fzg)]					
Typ	PKW	LNF	KR	SNF	LBus	RBus
IOS-FernC50	0.27306640	0.76860983	0.09797820	3.90968014	6.42644620	7.52562080
IOS-FernC50d	0.20539808	0.73285914	0.09273302	4.67263522	7.43167205	9.06826149
IOS-FernC50s	0.61344694	1.09954224	0.09046028	10.8898093	15.9292835	22.2679896
IOS-HVS50	0.32201927	0.76365328	0.09393460	4.42532482	8.68138236	8.12478605
IOS-HVS50d	0.41502526	0.93413913	0.09493862	5.41158782	9.52674623	9.97660753
IOS-HVS50s	0.64063008	1.09954224	0.09046028	10.8898093	15.9292835	22.2679896
IOS-WS30	0.54539444	0.97378863	0.08781721	6.98548675	14.9939322	12.8829805
IOS-WS30d	0.48026551	0.82356210	0.08503541	7.22564206	15.4059946	13.5456421
IOS-WS30g	0.52887694	0.90530167	0.08735671	8.03346098	16.1520537	15.5245408
IOS-WS30s	0.70727741	1.09954224	0.09046028	10.8898093	15.9292835	22.2679896
IOS-WS50	0.40440951	0.72256401	0.08940897	5.32340444	8.68138236	9.74976030
IOS-WS50d	0.46976776	0.95474949	0.08889421	5.63642263	9.52674623	10.7898526
IOS-WS50g	0.48026551	0.82356210	0.09239767	6.49449280	10.7608286	12.4878686
IOS-WS50s	0.70727741	1.09954224	0.09046028	10.8898093	15.9292835	22.2679896
AB_Stau	0.49365475	1.12850793	0.11131891	11.3030801	12.3179879	16.9148666
AO_Stau	0.57035485	1.09495541	0.11031660	11.8052674	14.3163116	19.9231417
IO_Stau	0.64063008	1.09954224	0.09046028	10.8898093	15.9292835	22.2679896

Stoff	NO2 [g/(km*Fzg)]					
Typ	PKW	LNF	KR	SNF	LBus	RBus
IOS-FernC50	0.07986702	0.20945367	0.00512923	0.33328915	1.29295754	0.57768071
IOS-FernC50d	0.08987139	0.20124473	0.00485557	0.39758066	1.50307847	0.69504482
IOS-FernC50s	0.18692634	0.30141957	0.00473269	0.87957825	3.29862631	1.69244071
IOS-HVS50	0.08694156	0.21118969	0.00491971	0.36993330	1.75755192	0.62144884
IOS-HVS50d	0.11660449	0.25673608	0.00497000	0.44681003	1.92554904	0.76211167
IOS-HVS50s	0.18692634	0.30141957	0.00473269	0.87957825	3.29862631	1.69244071
IOS-WS30	0.13719770	0.26523193	0.00459571	0.57267200	3.08313682	0.98242869
IOS-WS30d	0.11401960	0.22250716	0.00445027	0.59113251	3.18919380	1.03236948
IOS-WS30g	0.12991659	0.24536104	0.00457090	0.65275872	3.33993370	1.18174698
IOS-WS30s	0.18692634	0.30141957	0.00473269	0.87957825	3.29862631	1.69244071
IOS-WS50	0.09505375	0.19707539	0.00468110	0.44008750	1.75755192	0.74511135
IOS-WS50d	0.11077920	0.26168947	0.00465326	0.46986807	1.92554904	0.82441412
IOS-WS50g	0.11401960	0.22250716	0.00483671	0.53528814	2.19051187	0.95213107
IOS-WS50s	0.18692634	0.30141957	0.00473269	0.87957825	3.29862631	1.69244071
AB_Stau	0.15345821	0.30684999	0.00581340	0.94771478	2.52518751	1.28726771
AO_Stau	0.17718536	0.30249658	0.00576111	0.96376821	2.95255431	1.51442460
IO_Stau	0.18692634	0.30141957	0.00473269	0.87957825	3.29862631	1.69244071

Stoff	PM10 [g/(km*Fzg)]						PM10AA [g/(km*Fzg)]		TU_PM10AA [g/(km*Fzg)]	
Typ	PKW	LNF	KR	SNF	LBus	RBus	LV	SV	LV	SV
IOS-FernC50	0.00970753	0.08137169	0.00000000	0.06191228	0.07186531	0.16151326	0.026	0.1	0.005	0.13
IOS-FernC50d	0.01091358	0.07590757	0.00000000	0.07960702	0.08185176	0.20269895	0.033	0.35	0.005	0.13
IOS-FernC50s	0.01949737	0.12841142	0.00000000	0.18251038	0.17152722	0.49634734	0.045	1.2	0.005	0.13
IOS-HVS50	0.01110949	0.08627172	0.00000000	0.06631451	0.10505178	0.18518066	0.026	0.1	0.005	0.13
IOS-HVS50d	0.01334175	0.09414809	0.00000000	0.09528097	0.11974120	0.25172465	0.033	0.35	0.005	0.13
IOS-HVS50s	0.01996610	0.13280254	0.00000000	0.18251038	0.17152722	0.49634734	0.045	1.2	0.005	0.13
IOS-WS30	0.01640152	0.11303807	0.00000000	0.11716695	0.17688749	0.29442125	0.026	0.28	0.005	0.13
IOS-WS30d	0.01485297	0.11007729	0.00000000	0.11980759	0.18724830	0.30632542	0.035	0.5	0.005	0.13
IOS-WS30g	0.01619339	0.11898043	0.00000000	0.13152437	0.21970628	0.35021311	0.045	1.2	0.005	0.13
IOS-WS30s	0.02097878	0.14295878	0.00000000	0.18251038	0.17152722	0.49634734	0.045	1.2	0.005	0.13
IOS-WS50	0.01282756	0.09323651	0.00000000	0.09488470	0.10505178	0.24879219	0.033	0.35	0.005	0.13

The division of the vehicle fleet composition for traffic on highways, out of town and in town for different Euro fleeds are included in the EFT-file-.



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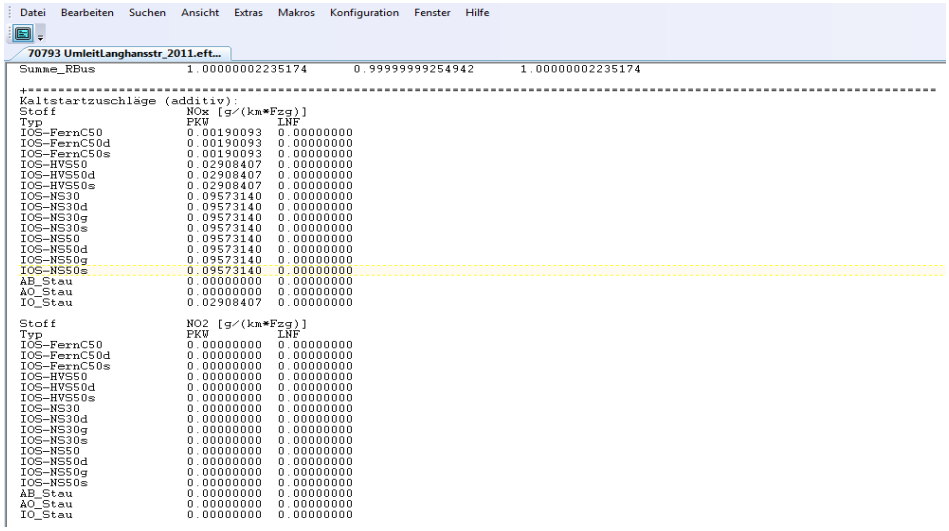
Datei  Bearbeiten  Suchen  Ansicht  Extras  Makros  Konfiguration  Fenster  Hilfe
70793 UmleitLanghansstr_2011.eft...
IO_Stau          0.01996610  0.13280254  0.00000000  0.18251038  0.17152722  0.49634734  0.02154     0.06153     0.02154     0.06153


+Parameterteil (in EFaktoren enthalten)
+=============================================================================================================
Flottenzuweisungen_[%]
Zuweisung        Standard            Standard            Standard
Flotte           AB                  AO                  IO
HBEFA-BAU(D)2011 100%                100%                100%
Summe            100%                100%                100%

Definierte_Flotten
HBEFA-BAU(D)2011
EKonzept         Autobahn_(AB)       Land_(AO)           Agglomeration_(IO)
PKW-B-Euro-0     0.0092251480762825  0.0112553713843226  0.0112578338012099
PKW-B-Euro-1     0.0263903476297855  0.0340745933353901  0.0340753868222237
PKW-B-Euro-2     0.0389503426849842  0.0455835908651352  0.0455856174230576
PKW-B-Euro-3     0.0740097016096115  0.0854402482509613  0.0854377076029778
PKW-B-Euro-4     0.331743717193604   0.332261115312576   0.332234799861908
PKW-B-Euro-5     0.0608704127371311  0.0610146708786488  0.0610054284334183
PKW-B-Euro-6     0                   0                   0
PKW-D-Euro-0     0.000875816971529275 0.00128049007616937 0.00128069182392221
PKW-D-Euro-1     0.00553887523710728 0.00702891778200865 0.00703021278604865
PKW-D-Euro-2     0.0242940373718739  0.0273386426270008  0.027342738583684
PKW-D-Euro-3     0.083244688808918   0.0831221863627434  0.0831300169229507
PKW-D-Euro-4     0.225977256894112   0.206199184060097   0.206211254000664
PKW-D-Euro-5     0.118879653513432   0.105400986969471   0.10540833324194
PKW-D-Euro-6     0                   0                   0
Summe_PKW        0.999999999359717   0.999999997904524   1.00000002l304
LNF-B-Euro-0     0.00596388801932335 0.00629841070622206 0.00611640978604555
LNF-B-Euro-1     0.00269964826299229 0.00281724240630865 0.00275326403789222
LNF-B-Euro-2     0.0117645803838968  0.0121132936328665  0.0119235720485449
LNF-B-Euro-3     0.00925665255635977 0.00991445314139128 0.00955656915903091
LNF-B-Euro-4     0.021870445520997   0.0229788515716791  0.0223801638931036
LNF-B-Euro-5     0.00243326788768172 0.00244605541229248 0.00243909796699882
LNF-B-Euro-6     0                   0                   0
LNF-D-Euro-0     0.0268606953322887  0.0266597103327513  0.0267690569162369
LNF-D-Euro-1     0.0779334902763367  0.0775603130459785  0.0777633413672447
LNF-D-Euro-2     0.141360849142075   0.141047671437263   0.141218051314354
LNF-D-Euro-3     0.312486588954926   0.311785310506821   0.312166839838028
LNF-D-Euro-4     0.364555515027046   0.363676875829697   0.364154696464539
LNF-D-Euro-5     0.0228067599236965  0.0227018166333437  0.0227589122951031
LNF-D-Euro-6     0                   0                   0
```

Furthermore the cold start addition for different traffic situations for the in town traffic are specified. For NO_x the cold start addition is only applied for PKW.



```
Datei  Bearbeiten  Suchen  Ansicht  Extras  Makros  Konfiguration  Fenster  Hilfe
70793 UmleitLanghansstr_2011.eft...
Summe_RBus           1.00000002235174      0.99999999254942      1.00000002235174

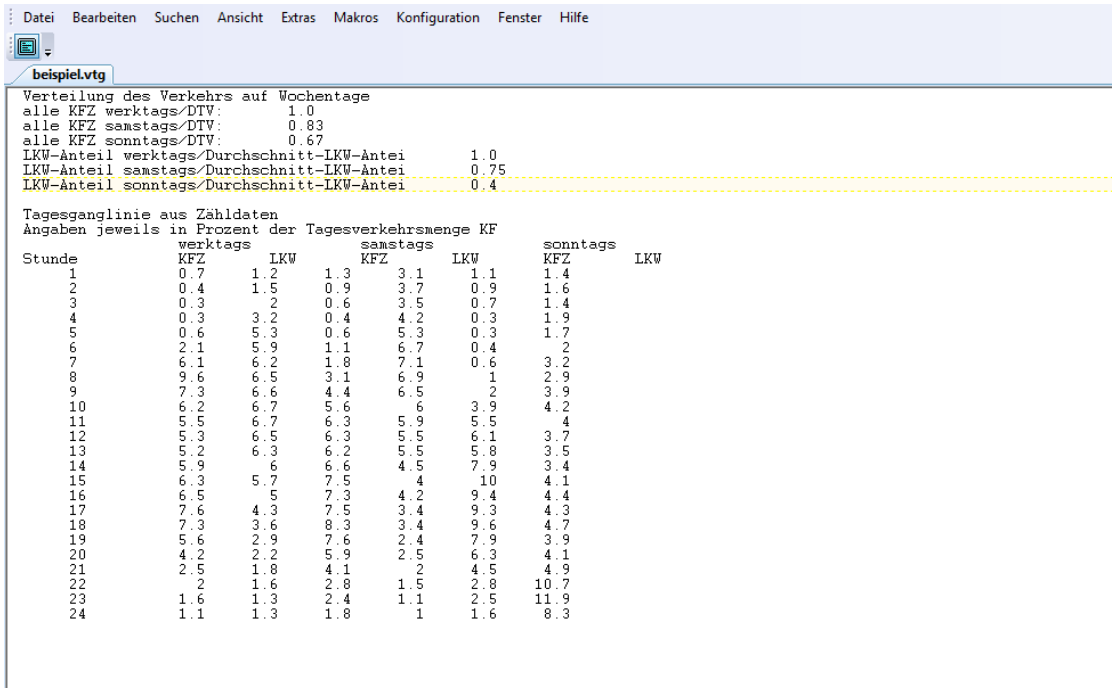
+=============================================================================================================
Kaltstartzuschläge (additiv):
Stoff                NOx [g/(km*Fzg)]
Typ                  PKW                LNF
IOS-FernC50          0.00190093  0.00000000
IOS-FernC50d         0.00190093  0.00000000
IOS-FernC50s         0.00190093  0.00000000
IOS-HVS50            0.02908407  0.00000000
IOS-HVS50d           0.02908407  0.00000000
IOS-HVS50s           0.02908407  0.00000000
IOS-NS30             0.09573140  0.00000000
IOS-NS30d            0.09573140  0.00000000
IOS-NS30g            0.09573140  0.00000000
IOS-NS30s            0.09573140  0.00000000
IOS-NS50             0.09573140  0.00000000
IOS-NS50d            0.09573140  0.00000000
IOS-NS50g            0.09573140  0.00000000
IOS-NS50s            0.09573140  0.00000000
AB_Stau              0.00000000  0.00000000
AO_Stau              0.00000000  0.00000000
IO_Stau              0.02908407  0.00000000

Stoff                NO2 [g/(km*Fzg)]
Typ                  PKW                LNF
IOS-FernC50          0.00000000  0.00000000
IOS-FernC50d         0.00000000  0.00000000
IOS-FernC50s         0.00000000  0.00000000
IOS-HVS50            0.00000000  0.00000000
IOS-HVS50d           0.00000000  0.00000000
IOS-HVS50s           0.00000000  0.00000000
IOS-NS30             0.00000000  0.00000000
IOS-NS30d            0.00000000  0.00000000
IOS-NS30g            0.00000000  0.00000000
IOS-NS30s            0.00000000  0.00000000
IOS-NS50             0.00000000  0.00000000
IOS-NS50d            0.00000000  0.00000000
IOS-NS50g            0.00000000  0.00000000
IOS-NS50s            0.00000000  0.00000000
AB_Stau              0.00000000  0.00000000
AO_Stau              0.00000000  0.00000000
IO_Stau              0.00000000  0.00000000
```

VTG-File

The VTG-file can be opened in the tab option, when using week cycle/ day cycle is hooked.

This file is only needed, if traffic data is available for single working days or if the dispersion calculation will be executed with PROKAS, PROKAS_B or SELMA-PROKAS. These programs require a x.EGN-File.



Datei Bearbeiten Suchen Ansicht Extras Makros Konfiguration Fenster Hilfe

beispiel.vtg

```
Verteilung des Verkehrs auf Wochentage
alle KFZ werktags/DTV:        1.0
alle KFZ samstags/DTV:        0.83
alle KFZ sonntags/DTV:        0.67
LKW-Anteil werktags/Durchschnitt-LKW-Antei       1.0
LKW-Anteil samstags/Durchschnitt-LKW-Antei       0.75
LKW-Anteil sonntags/Durchschnitt-LKW-Antei       0.4

Tagesganglinie aus Zählдaten
Angaben jeweils in Prozent der Tagesverkehrsmenge KF
                werktags            samstags            sonntags
Stunde          KFZ       LKW       KFZ       LKW       KFZ       LKW
     1          0.7      1.2      1.3      3.1      1.1      1.4
     2          0.4      1.5      0.9      3.7      0.9      1.6
     3          0.3         2     0.6      3.5      0.7      1.4
     4          0.3      3.2      0.4      4.2      0.3      1.9
     5          0.6      5.3      0.6      5.3      0.3      1.7
     6          2.1      5.9      1.1      6.7      0.4        2
     7          6.1      6.2      1.8      7.1      0.6      3.2
     8          9.6      6.5      3.1      6.9        1      2.9
     9          7.3      6.6      4.4      6.5        2      3.9
    10          6.2      6.7      5.6        6      3.9      4.2
    11          5.5      6.7      6.3      5.9      5.5        4
    12          5.3      6.5      6.3      5.5      6.1      3.7
    13          5.2      6.3      6.2      5.5      5.8      3.5
    14          5.9        6      6.6      4.5      7.9      3.4
    15          6.3      5.7      7.5        4       10      4.1
    16          6.5        5      7.3      4.2      9.4      4.4
    17          7.6      4.3      7.5      3.4      9.3      4.3
    18          7.3      3.6      8.3      3.4      9.6      4.7
    19          5.6      2.9      7.6      2.4      7.9      3.9
    20          4.2      2.2      5.9      2.5      6.3      4.1
    21          2.5      1.8      4.1        2      4.5      4.9
    22            2      1.6      2.8      1.5      2.8     10.7
    23          1.6      1.3      2.4      1.1      2.5     11.9
    24          1.1      1.3      1.8        1      1.6      8.3
```

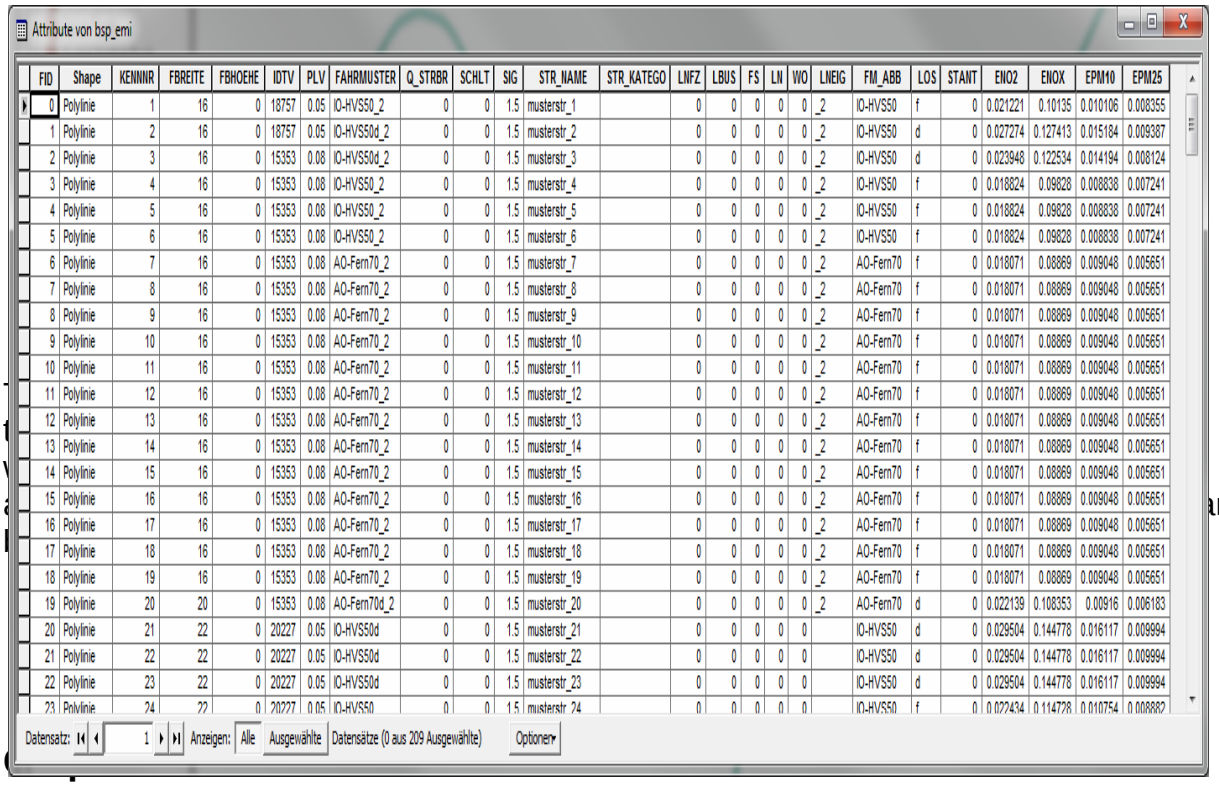
The distribution of the week cycle for all vehicles and trucks is specified in the VTG-file. In the 9th row a comment about the origin of the data can be entered.

Furthermore the day cycle has to be specified separately for all vehicles and trucks at working days (mo-fr) and at saturday and sunday.

In case a mean traffic composition is existent, the sum of the DTV mean value (mon - sun) and the sum of the DTV mean value (mon -sun) and HDV mean value (mon – sun) has to be 7.

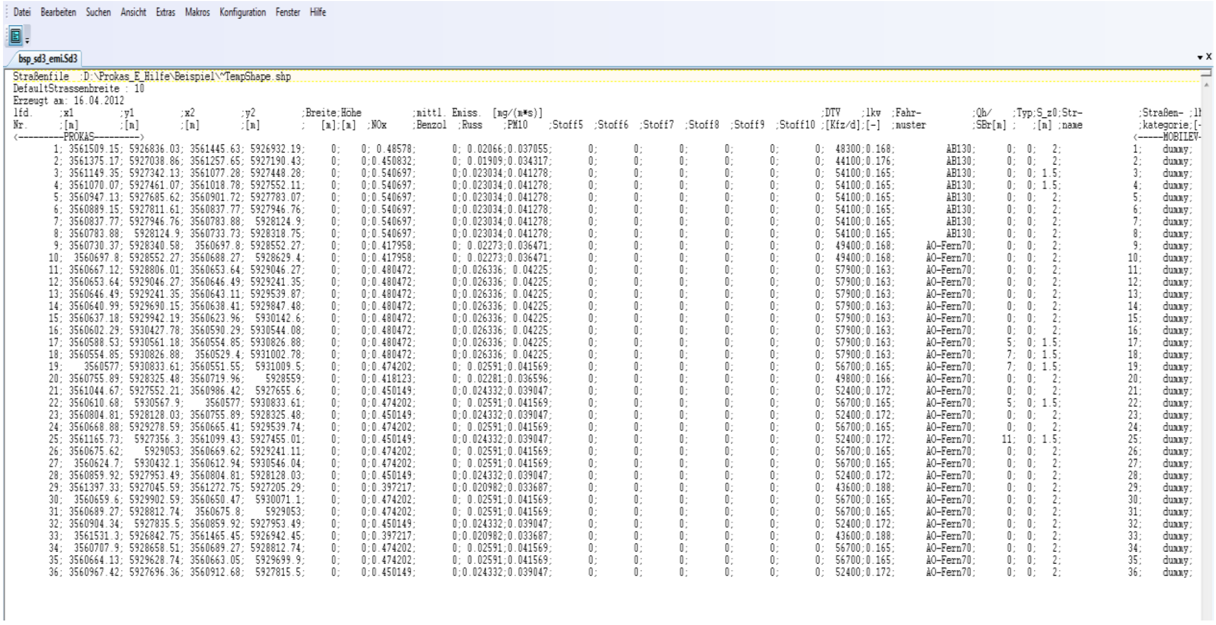
Output-shp-file

Every SHP-file consists of a file composition of *.shp, *.shx, *.dbf and others. Each of these files contains different information about the shape-file e.g. geometry, attributes. The following description of the shape-file targets the file composition.



FID	Shape	KENNNR	FBREITE	FBHOEHE	IDTV	PLV	FAHRMUSTER	Q_STRBR	SCHLT	SIG	STR_NAME	STR_KATEGO	LNFZ	LBUS	FS	LN	WO	LNEIG	FM_ABB	LOS	STANT	ENO2	ENOX	EPM10	EPM25
0	Polylinie	1	16	0	18757	0.05	IO-HVS50_2	0	0	1.5	musterstr_1		0	0	0	0	0	_2	IO-HVS50	f	0	0.021221	0.10135	0.010106	0.008355
1	Polylinie	2	16	0	18757	0.05	IO-HVS50d_2	0	0	1.5	musterstr_2		0	0	0	0	0	_2	IO-HVS50	d	0	0.027274	0.127413	0.015184	0.009387
2	Polylinie	3	16	0	15353	0.08	IO-HVS50d_2	0	0	1.5	musterstr_3		0	0	0	0	0	_2	IO-HVS50	d	0	0.023948	0.122534	0.014194	0.008124
3	Polylinie	4	16	0	15353	0.08	IO-HVS50_2	0	0	1.5	musterstr_4		0	0	0	0	0	_2	IO-HVS50	f	0	0.018824	0.09828	0.008838	0.007241
4	Polylinie	5	16	0	15353	0.08	IO-HVS50_2	0	0	1.5	musterstr_5		0	0	0	0	0	_2	IO-HVS50	f	0	0.018824	0.09828	0.008838	0.007241
5	Polylinie	6	16	0	15353	0.08	IO-HVS50_2	0	0	1.5	musterstr_6		0	0	0	0	0	_2	IO-HVS50	f	0	0.018824	0.09828	0.008838	0.007241
6	Polylinie	7	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_7		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
7	Polylinie	8	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_8		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
8	Polylinie	9	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_9		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
9	Polylinie	10	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_10		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
10	Polylinie	11	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_11		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
11	Polylinie	12	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_12		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
12	Polylinie	13	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_13		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
13	Polylinie	14	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_14		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
14	Polylinie	15	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_15		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
15	Polylinie	16	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_16		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
16	Polylinie	17	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_17		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
17	Polylinie	18	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_18		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
18	Polylinie	19	16	0	15353	0.08	AO-Fern70_2	0	0	1.5	musterstr_19		0	0	0	0	0	_2	AO-Fern70	f	0	0.018071	0.08869	0.009048	0.005651
19	Polylinie	20	20	0	15353	0.08	AO-Fern70d_2	0	0	1.5	musterstr_20		0	0	0	0	0	_2	AO-Fern70	d	0	0.022139	0.108353	0.00916	0.006183
20	Polylinie	21	22	0	20227	0.05	IO-HVS50d	0	0	1.5	musterstr_21		0	0	0	0	0		IO-HVS50	d	0	0.029504	0.144778	0.016117	0.009994
21	Polylinie	22	22	0	20227	0.05	IO-HVS50d	0	0	1.5	musterstr_22		0	0	0	0	0		IO-HVS50	d	0	0.029504	0.144778	0.016117	0.009994
22	Polylinie	23	22	0	20227	0.05	IO-HVS50d	0	0	1.5	musterstr_23		0	0	0	0	0		IO-HVS50	d	0	0.029504	0.144778	0.016117	0.009994
23	Polylinie	24	22	0	20227	0.05	IO-HVS50	0	0	1.5	musterstr_24		0	0	0	0	0		IO-HVS50	f	0	0.022434	0.114738	0.010754	0.008882

In the header of the SD3-File folder directory, creation date and the default street width of 10m are displayed. Mean emission densities are displayed in the columns NOx, Benzol, Russ und PM10 accordingly to the definition in „selection of substances/columns“ in PROKAS_E emission calculation. The amount of output information also depends on the settings in „output“ like emissions for different vehicle categories and output of absolute vehicle counts.



```
Straßenfile  :D:\Prokas_E_Hilfe\Beispiel\~TempShape.shp
DefaultStrassenbreite : 10
Erzeugt am: 16.04.2012
lfd.  ;x1        ;y1        ;x2        ;y2        ;Breite;Höhe   ;mittl. Emiss.  [mg/(m*s)]                                                              ;DTV     ;lkv  ;Fahr-        ;Qh/    ;Typ;S_z0;Str-      ;Straßen-  ;lM
Nr.   ;[m]       ;[m]       ;[m]       ;[m]       ;   [m];[m]  ;NOx     ;Benzol ;Russ    ;PM10    ;Stoff5 ;Stoff6 ;Stoff7 ;Stoff8 ;Stoff9 ;Stoff10 ;[Kfz/d];[-]  ;muster       ;SBr[m] ;    ;[m] ;name      ;kategorie;[-
<---------PROKAS--------->                                                                                                                                                                              <-----MOBILEV-
 1; 3561509.15; 5926836.03; 3561445.63; 5926932.19; 0; 0; 0.48578;  0; 0.02066;0.037055; 0; 0; 0; 0; 0; 0; 48300;0.168;     AB130;  0; 0;   2;  1; dummy;
 2; 3561375.17; 5927038.86; 3561257.65; 5927190.43; 0; 0;0.450832;  0; 0.01909;0.034317; 0; 0; 0; 0; 0; 0; 44100;0.176;     AB130;  0; 0;   2;  2; dummy;
 3; 3561149.35; 5927342.13; 3561077.28; 5927448.28; 0; 0;0.540697;  0;0.023034;0.041278; 0; 0; 0; 0; 0; 0; 54100;0.165;     AB130;  0; 0; 1.5;  3; dummy;
 4; 3561070.07; 5927461.07; 3561018.78; 5927552.11; 0; 0;0.540697;  0;0.023034;0.041278; 0; 0; 0; 0; 0; 0; 54100;0.165;     AB130;  0; 0; 1.5;  4; dummy;
 5; 3560947.13; 5927685.62; 3560901.72; 5927783.07; 0; 0;0.540697;  0;0.023034;0.041278; 0; 0; 0; 0; 0; 0; 54100;0.165;     AB130;  0; 0;   2;  5; dummy;
 6; 3560889.15; 5927811.61; 3560837.77; 5927946.76; 0; 0;0.540697;  0;0.023034;0.041278; 0; 0; 0; 0; 0; 0; 54100;0.165;     AB130;  0; 0;   2;  6; dummy;
 7; 3560837.77; 5927946.76; 3560783.88;  5928124.9; 0; 0;0.540697;  0;0.023034;0.041278; 0; 0; 0; 0; 0; 0; 54100;0.165;     AB130;  0; 0;   2;  7; dummy;
 8; 3560783.88;  5928124.9; 3560733.73; 5928318.75; 0; 0;0.540697;  0;0.023034;0.041278; 0; 0; 0; 0; 0; 0; 54100;0.165;     AB130;  0; 0;   2;  8; dummy;
 9; 3560730.37; 5928340.58;  3560697.8; 5928552.27; 0; 0;0.417958;  0; 0.02273;0.036471; 0; 0; 0; 0; 0; 0; 49400;0.168; AO-Fern70;  0; 0;   2;  9; dummy;
10;  3560697.8; 5928552.27; 3560688.27;  5928629.4; 0; 0;0.417958;  0; 0.02273;0.036471; 0; 0; 0; 0; 0; 0; 49400;0.168; AO-Fern70;  0; 0;   2; 10; dummy;
11; 3560667.12; 5928806.01; 3560653.64; 5929046.27; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  0; 0;   2; 11; dummy;
12; 3560653.64; 5929046.27; 3560646.49; 5929241.35; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  0; 0;   2; 12; dummy;
13; 3560646.49; 5929241.35; 3560643.11; 5929539.87; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  0; 0;   2; 13; dummy;
14; 3560640.99; 5929690.15; 3560638.41; 5929847.48; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  0; 0;   2; 14; dummy;
15; 3560637.18; 5929942.19; 3560623.96;  5930142.6; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  0; 0;   2; 15; dummy;
16; 3560602.29; 5930427.78; 3560590.29; 5930544.08; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  0; 0;   2; 16; dummy;
17; 3560588.53; 5930561.18; 3560554.85; 5930826.88; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  5; 0; 1.5; 17; dummy;
18; 3560554.85; 5930826.88;  3560529.4; 5931002.78; 0; 0;0.480472;  0;0.026336; 0.04225; 0; 0; 0; 0; 0; 0; 57900;0.163; AO-Fern70;  7; 0; 1.5; 18; dummy;
19;    3560577; 5930833.61; 3560551.55;  5931009.5; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  7; 0; 1.5; 19; dummy;
20; 3560755.89; 5928325.48; 3560719.96;    5928559; 0; 0;0.418123;  0; 0.02281;0.036596; 0; 0; 0; 0; 0; 0; 49800;0.166; AO-Fern70;  0; 0;   2; 20; dummy;
21; 3561044.67; 5927552.21; 3560986.42;  5927655.6; 0; 0;0.450149;  0;0.024332;0.039047; 0; 0; 0; 0; 0; 0; 52400;0.172; AO-Fern70;  0; 0;   2; 21; dummy;
22; 3560610.68;  5930567.9;    3560577; 5930833.61; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  5; 0; 1.5; 22; dummy;
23; 3560804.81; 5928128.03; 3560755.89; 5928325.48; 0; 0;0.450149;  0;0.024332;0.039047; 0; 0; 0; 0; 0; 0; 52400;0.172; AO-Fern70;  0; 0;   2; 23; dummy;
24; 3560668.88; 5929278.59; 3560665.41; 5929539.74; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  0; 0;   2; 24; dummy;
25; 3561165.73;  5927356.3; 3561099.43; 5927455.01; 0; 0;0.450149;  0;0.024332;0.039047; 0; 0; 0; 0; 0; 0; 52400;0.172; AO-Fern70; 11; 0; 1.5; 25; dummy;
26; 3560675.62;    5929053; 3560669.62; 5929241.11; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  0; 0;   2; 26; dummy;
27;  3560624.7;  5930432.1; 3560612.94; 5930546.04; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  0; 0;   2; 27; dummy;
28; 3560859.92; 5927953.49; 3560804.81; 5928128.03; 0; 0;0.450149;  0;0.024332;0.039047; 0; 0; 0; 0; 0; 0; 52400;0.172; AO-Fern70;  0; 0;   2; 28; dummy;
29; 3561397.33; 5927045.59; 3561272.75; 5927205.29; 0; 0;0.397217;  0;0.020982;0.033687; 0; 0; 0; 0; 0; 0; 43600;0.188; AO-Fern70;  0; 0;   2; 29; dummy;
30;  3560659.6; 5929902.59; 3560650.47;  5930071.1; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  0; 0;   2; 30; dummy;
31; 3560689.27; 5928812.74;  3560675.8;    5929053; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  0; 0;   2; 31; dummy;
32; 3560904.34;  5927835.5; 3560859.92; 5927953.49; 0; 0;0.450149;  0;0.024332;0.039047; 0; 0; 0; 0; 0; 0; 52400;0.172; AO-Fern70;  0; 0;   2; 32; dummy;
33;  3561531.3; 5926842.75; 3561465.45; 5926942.45; 0; 0;0.397217;  0;0.020982;0.033687; 0; 0; 0; 0; 0; 0; 43600;0.188; AO-Fern70;  0; 0;   2; 33; dummy;
34;  3560707.9; 5928658.51; 3560689.27; 5928812.74; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  0; 0;   2; 34; dummy;
35; 3560664.13; 5929628.74; 3560663.05;  5929699.9; 0; 0;0.474202;  0; 0.02591;0.041569; 0; 0; 0; 0; 0; 0; 56700;0.165; AO-Fern70;  0; 0;   2; 35; dummy;
36; 3560967.42; 5927696.36; 3560912.68;  5927815.5; 0; 0;0.450149;  0;0.024332;0.039047; 0; 0; 0; 0; 0; 0; 52400;0.172; AO-Fern70;  0; 0;   2; 36; dummy;
```

Output-xlm-File

In *_emi.shp.xml-File all relevant settings and parameter are saved in the ESRI-Metadata-format additionally. The used files (Input-SD-file, EFT-file(s) und VTG-file) as well as the allocation of each contaminant are displayed. Furthermore the date of the creation is saved.

Output Report.xls-File

A *emi_report.xls file is created in addition to the SD-file. This file serves as a control and log-file and can be used as a master for a report table. It contains a summary of the emission calculation e.g. the used traffic situation with a description and summarized emission factors.

The *emi_report.xls contains the following worksheets:

- „PROKAS_E_report", with all relevant files, settings and entries of the error checking list
- „Emission factors", report table with used emission factors separately for substances and traffic situations for light and heavy vehicles in mg/km.
- „TS_description", report table with descriptions of the used traffic situation according to HBEFA 3.1

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Loh3dViewer

This 3D viewer displays object file as a three-dimensional model. Below the buttons in the top bar of the window *Loh3dViewer* are explained.

Open file

The button *Open…* opens a Windows window in which those file is selected to be opened and displayed in the viewer. To the required file can be navigated. The search can be restricted to a specific type of file that is selected in the drop-down list *Files of type*.
The following file formats (according to the program) can be displayed by the viewer:

- All files (show all file types available for selection)
- *.glsm (GLSScene Mesh)
- *.obj (WaveFront model file)
- *.objf (Stripe model file)
- *.stl (Stereolithography files; default)
- *.lwo (Lightwave3D object file, version 6.0 or above)
- *.q3bsp (Quake3 BSP files)
- *.bsp (BSP files)
- *.oct (FSRad OCT files)
- *.ms3d (MilkShape3D files)
- *.nmf (NormalMapper files)
- *.md3 (MD3 files)
- *.3ds (3D studio files)
- *.prj (3D Studio project files)
- *.md2 (Quake II model files)
- *.smd (Half-Life SMD files)
- *.tin (Triangular Irregular Network)
- *.ply (Stanford triangle format)
- *.gts (GNU Triangulated Surface)
- *.wrl (VRML files)
- *.md5mesh (Doom3 mesh files)
- *.md5anim (Doom3 animation files)

In the status bar at the bottom of the window *Loh3dViewer* the number of calculated triangles is visible as well as the path of the loaded file from which the model is displayed in the window.

Save file

The button *Save as…* opens a Windows window, where the name of the file to be saved is specified. There can be selected the file path where the new file should be saved. It can also be navigated to an already existing file which is overwritten on demand. The search can be restricted to a specific type of file that is selected in the drop-down list *Files of type*.
The model can be saved as one of the following file formats (according to the program):

- *.glsm (GLSScene Mesh)
- *.obj (WaveFront modell file)
- *.objf (Stripe model file)
- *.stl (Stereolithography files; default)
- *.nmf (NormalMapper files)
- *.smd (Half-Life SMD files)

Image export

The button *Export…* opens a Windows window in which the name of the file to be exported is specified. There can be selected the file path, where the new file should be saved. It also can be navigated to an already existing file which is overwritten on demand. The search can be restricted to a specific type of file that is selected in the drop-down list *Files of type*.
The model can be saved as one of the following file formats (according to the program):

- *.jpg (JPEG; default)
- *.bmp (Bitmap)
- *.png (PortableNetworkGraphic)
- *.wmf (WindowsMetaFile)

Reset view

Via the button *Reset view* the initial view of the model is restored. This diagonal view of the model is also displayed in the viewer immediately after opening the model.

Zoom in

The button *Zoom In* will zoom into the model, this means that the viewer comes closer and closer to the model, the more often he clicks on the button.

Zoom out

The button *Zoom Out* will zoom out from the model, this means that the viewer moves away from the model, the more often he clicks on the button.

Mouse navigation

The navigation in the model can also be done by using the computer mouse in addition to the zoom buttons.

- Zooming in and out can be made using the scroll wheel of the mouse. Rolling the scroll wheel forward means zooming out and rolling backward means zooming in.
- For rotating the model around the center of the existing coordinate system in the horizontal and vertical

directions, the pressed left mouse button can be used.
- Using the pressed right mouse button the model can be moved in a newly created coordinate system to the right, left, up and down – similar to the mouse movement. At the same time can thus also be zooming.
- If simultaneously the right mouse button and the *X* button on the computer keyboard are held down, there is a shift on the x-axis (red line).
- If simultaneously the right mouse button and the *Y* button on the computer keyboard are held down, there is a shift on the y-axis (green line).
- If simultaneously the right mouse button and the *Z* button on the computer keyboard are held down, there is a shift on the z-axis (blue line).

Show shadow

If the button *Lighting* is enabled, a shadow will be displayed in the model, this is already preset. This simplifies the orientation in the model, because the building edges can be detected better. The button is highlighted white during activation the shadows. If this is not the case, the shadow has been disabled. Now building edges are difficult to detect.

Show Extend

If the button *Show Extend* is enabled, the extension of the model will be displayed by blue lines which form a box around the model. This is already preset. In this case the button is highlighted white. If the extension of the model should not be shown, the button has to be disabled.

Show Grid

If the button *Show Grid* is enabled, the base of the model extension will be displayed as regular grid. If the Grid should not be shown, the button has to be disabled.

Show Axes

If the button *Show Axes* is enabled, the coordinate axes will be displayed in the model, this is already preset. In this case the button is highlighted white. The x-axis is shown as a red, the y-axis as a green and the z-axis as a blue line. This helps in the orientation during the rotation of the model. If the axes should not be shown, the button has to be disabled.

Smooth Shading

If the button *Smooth Shading* is enabled, soft shades will be displayed in the model, this is already preset. In this case the button is highlighted white. This button can only be disabled if either the buttons **Shading with lines** or **Wireframes** has been activated.

Shading with lines

If the button *Shading with lines* is enabled, essential lines of the triangulation will be displayed in the model. In this case the button is highlighted white. This button can only be disabled if either the buttons **Smooth Shading** or **Wireframes** has been activated.

Wireframes

If the button *Wireframes* is enabled, the Triangulated Irregular Network (TIN) is displayed in the model. In this case the button is highlighted white. This button can only be disabled if either the buttons **Shading with lines** or **Smooth Shading** has been activated. If the shadow is activated simultaneously there will be displayed no shadow, but the grid as a black line complex.

Object color

Via the button *Object color* the color hue of the model is selected. By clicking this button an additional window opens. There, a basic color from the color palette, a color previously defined by the user or a color chosen from the color scale can be selected. Furthermore, define a color by using the RGB color code (red, green, blue) or the HSV color space (hue, saturation, value) is possible.

Background color

Via the button *Background color* the color hue of the background is selected. By clicking this button an additional window opens. There, a basic color from the color palette, a color previously defined by the user or a color chosen from the color scale can be selected. Furthermore, define a color by using the RGB color code (red, green, blue) or the HSV color space (hue, saturation, value) is possible.

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RosePlot

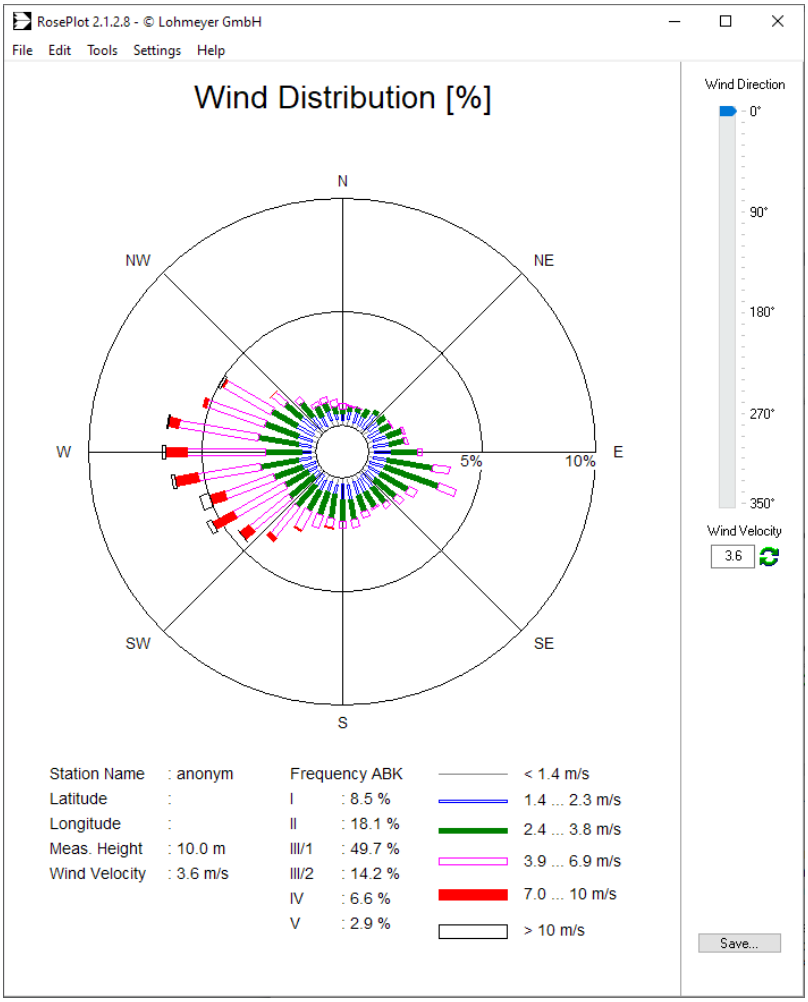
Software for graphical representation and processing of meteorological time series and statistics.

Files of the formats *.aks, *.akt, *.akterm, *.tal, as well as other wind distributions of the formats *.wnd, *.met and meteo.def can be displayed and saved as graphic (*.wmf, *.bmp, *.jpg). With an import module it is possible to convert measurement time series in to the usual data formats AKS and AKTerm. Depending on available data it is possible to convert the dispersion categories after Klug/Manier out of Monin-Obukhov-Lengths, cloud cover data or global radiation and air pressure data using different algorithms. Averaging to hourly values is also possible.

In addition, RosePlot offers the possibility to directly import uSonic-3 files or meteorological time series published by the DWD (ftp://opendata.dwd.de/climate_environment/CDC). In RosePlot the VDI 3782 Blatt 6 “Environmental meteorology - Atmospheric dispersion; determination of the dispersion categories implemented according to Klug / Manier models” is implemented. RosePlot is available in German and English.

RosePlot program control

In the menu “File” wind distributions can be opened, imported, exported or printed as a picture. Files of the format *.aks, as well as other wind distributions of the formats *.wnd, *.met and meteo.def can be opened.



The wind distribution is displayed in percentage as a wind rose. Wind speed is characterized in certain colors and line widths like in the legend on the left side below. The frequencies of dispersion classes will be read out and displayed in the middle below.

The "Import time series" option in the "File" menu item can be used to generate an AKTerm file from meteorological time series.

If pure wind data should be visualized without determination of dispersion categories, please choose “Visualize time series”.

Editing of the dispersion class statistics can be started in the menu “Edit”. Using the slide control „Wind Direction” on the right side, turns the angle of the whole wind distribution. By changing the mean wind velocity the frequencies of the dispersion classes will be adapted. If you want to

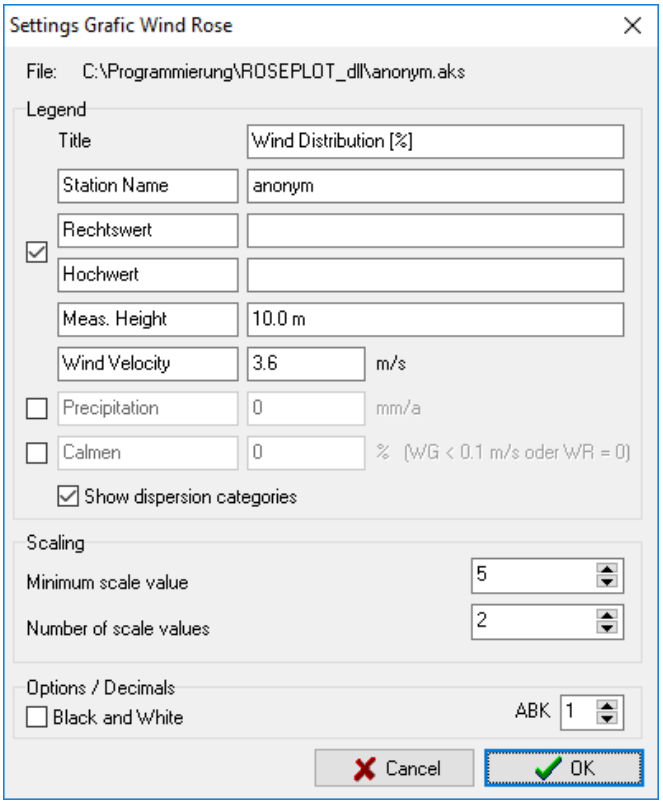
change wind direction and wind velocity, keep in mind that the wind direction must be changed first. By clicking on the button „Save“ you can store the file in the project directory.

It is possible to resize the Wind Rose Window and it is possible to export the wind rose as a graphic file (*.wmf, *.bmp, *.jpg).

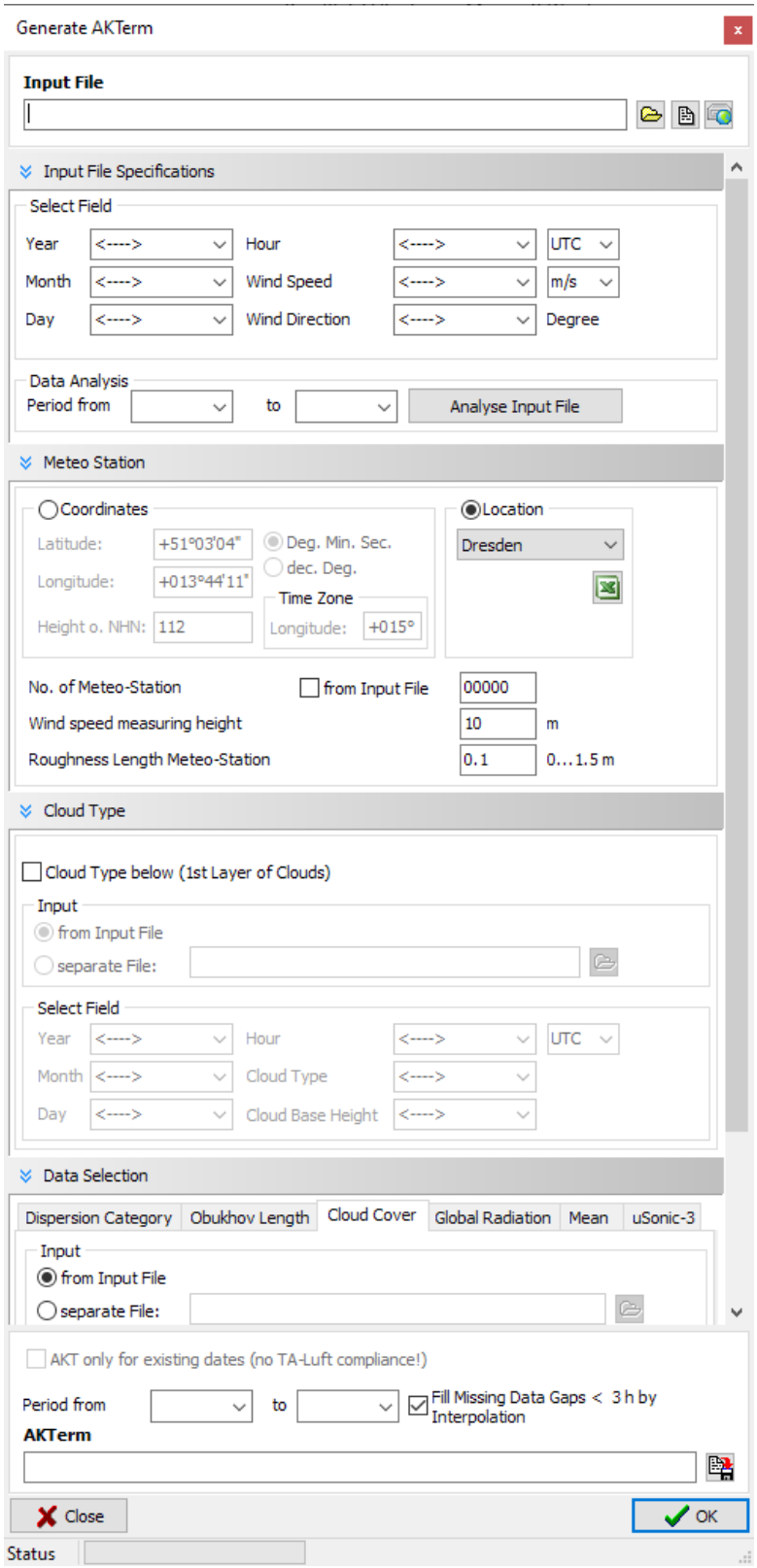
Short Cuts: Ctrl + D = Print
Ctrl + E = Export Graphic File
Ctrl + C = Copy image to Clipboard

- If you resize the dialog, please remark, the Graphic size will only be rescaled when changing the windows height.

In the "Settings | Graphics" menu item (alternatively double-clicking or right-clicking on the window) you can make settings for displaying the wind distribution. The size of the graphic representation can be scaled in addition to editing the title and legend, measuring height, altitude (mNN), period and wind speed.
In the "Scaling" input area, the scaling of the wind rose can be changed by the parameters smallest scaling value and number of scaling values. The number of decimal places of the percentage dispersion category statistics can be defined under "ABK". There is also the possibility to display the graphic in black and white.



Import meteorological time series



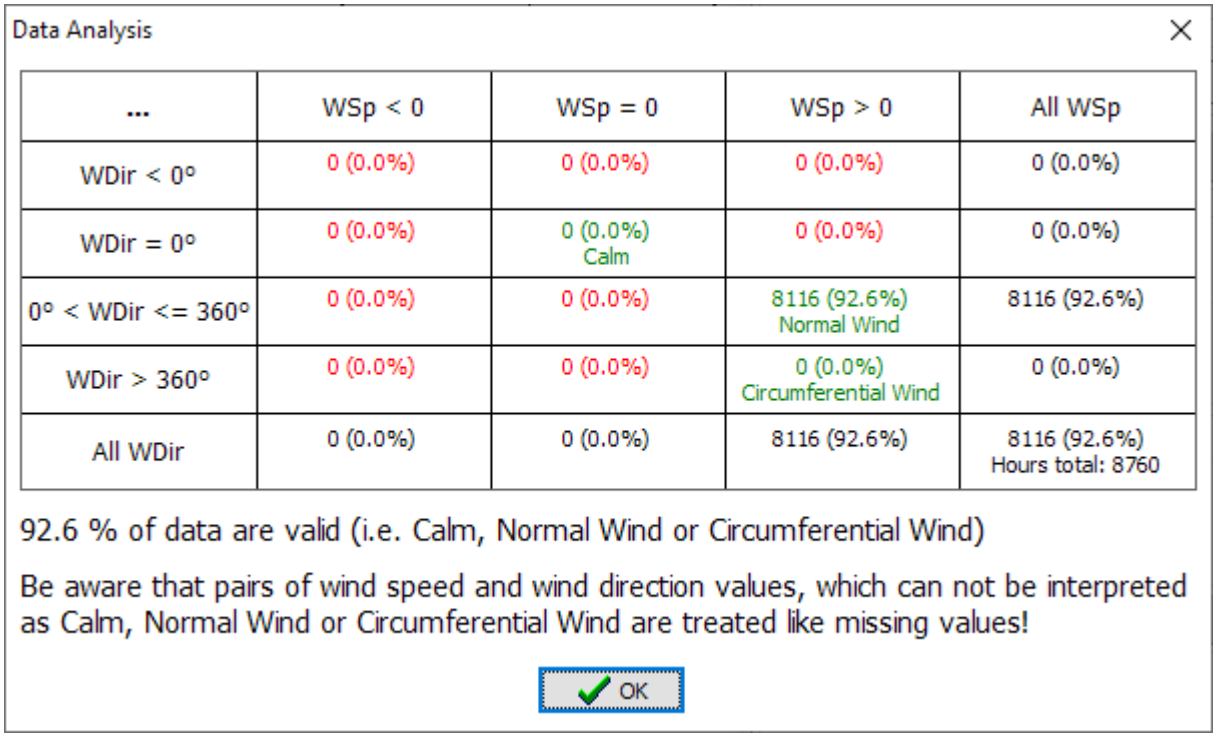
Open the menu item “File” and select “Import time series”. Generating of a meteorological time series needs of at least one input file in the format *.csv (semicolon separated), *.txt (DWD format), *.met (OML-Highway format) or *.dat (uSonic-3 Format). The input file must contain hourly data

of wind direction and wind velocity. The columns of the input file with the according information can be chosen with the drop down lists. In case the columns of the input file are already named similar the field names list, the allocation will be done automatically.

Field names list: 'YEAR', 'MONTH', 'DAY', 'HOUR' or 'MEASURE_DATE', 'WSPEED', 'WDIR', 'MOL', 'TCC', 'GR', 'AP', 'DC'

If the date and time are to be read from a column with the format YYYYMMDDHH (ex: 2015070508 = 05.07.2015 8 o'clock), this column must be selected in the selection fields "Year", "Month", "Day" and "Hour".
By default imported time stamps will be interpreted as UTC. By changing the combo box selection also „MEZ“ is possible. In this case all time stamps will be set back 1 hour, in order to get UTC which is required in AKTerm file format. If there are time stamps with hours 1 to 24 instead of the expected range from 0 to 2, they will be set back 1 hour automatically, independently of combo box selection.

Missing values are detected by the character -999. For the wind data it is recommended to do a data analysis (clicking on “Analyse Input File”) for the respective period. In a matrix counts of combinations of wind speed and wind direction depending on range are shown. Only the green marked ranges („Normal Wind“, „Calm“, „Circumferential Wind“) will be interpreted and processed by Roseplot as valid data.



Furthermore it’s necessary to specify data for the determination of the atmospheric stability conditions. Depending on the available data set 5 possiblities are given for the determination. The first possibility is to load the Dispesion category as itself. Reading in a Monin-Obukhov-Length time series is the second way to determine stability conditions. The third way is reading in cloud cover data. This information can be also imported from a separate file. The fourth possibility is to import global radiation data and fifth is the import of uSonic data. Keep in mind that the third and fourth option demand location information. In case the location name is not listed on the right side,

specify geographic coordinates on the right side. This information is necessary due to derive sunrise and sunset times, which are a precondition for the determination of stability conditions.

The specification of the station ID, roughness length, measuring height of the measuring station and the selected year for the AKTerm file are obligatory. Station ID, roughness length and measuring height of the measuring station can be specified in the station list.

In addition, RosePlot offers the possibility to directly import uSonic-3 files or meteorological time series published by the DWD (ftp://opendata.dwd.de/climate_environment/CDC).

The "Mean" tab allows the calculation of hourly average values from meteorological time series, eg from 10 min values. The "Minimum valid Values" can be used to determine the number of values for an average value. At 50% 10 min values must have at least 3 values in order to calculate the mean value (otherwise missing value). In the output field "Qutput (* .csv)", the file name for the mean value file is specified and can be changed. The hourly file generated in this way can then be used as "input file" to generate a AKTerm.

To start the generation select a directory and define a name for the output file.

Furthermore the time period (one or several years) for importing should be selected.

Short gaps of measuring values (< 3 hours) will be closed by “TA Luft” compliant interpolation by default.

By checking the box „AKTerm for existing dates exclusively (no TA-Luft-compliance!)' only the valid records of input file will be included (no filling of time gaps).

Additional interfaces to different formats (e.g. import of other models such as the mesoscale prognostic wind field model METRAS or the microscale forecast wind field model MISKAM) can be programmed on request.

File Formats

AKTerm

Format: ASCII

The wind situation will be considered in the form of a dispersion category time series. This file has information line by line about the date, time, wind direction, wind speed, dispersion category according to Klug/Manier, Turner category and ww-key number.

Two formats are supported.

1.) This format is used by the DWD since 01.04.1998.

The format of the file is shown in the following lines:

```
10999199501010002111 3480
10999199501010102212 3480
10999199501010202613 3480
10999199501010302713 3425
10999199501010402512 34  0
10999199501010502512 34  0
10999199501010602514 34  3
10999199501010702512 3480
...
```

An AKTerm is a text file, which includes one line with 24 Sting characters for each continuous hour of the year. For each parameter are reserved digits which should not be separated by a blank. Only no values can be stored with blanks. Each character means:

Parameter	Position of digits	required
number of meteorological station	1 to 5	no
Date (JJJJMMTTSS)	6 to 15	yes
Interpolation identification	16	no
Wind direction (deca degree)	17 to 18	yes
Wind speed (notes)	19 to 20	yes
Klug/Manier class (1..6)	21	yes
Turner class	22	no
ww key	23 to 24, the weather as two figure number.	no

2.) This format is used by the DWD since 01.04.2002.

This file consists of a header and a data set. In the header there are maximum 5 comment lines starting with a star '*'. If the password precipitation (or the password Niederschlag) is specified in the first comment line of the AKTerm, the precipitation intensity and the associated quality byte are expected in the 17th and 18th data columns. A line with the calculated anemometer height for different roughness lengths follows after the comment lines. It starts with the character string

```
+ Anemometerhoehen (0.1 m):
```

followed by the 9 integer anemometer heights in the unit 0.1m (for each, 4 characters without leading zero, separated with a blank), which are related to the roughness lengths 0.01 to 2 m according to the appendix 3 of the TA Luft.

The data set includes lines with 16 entries each. They are separated by one single blank.

Sample:

```
* AKTERM Time series, International broadcast service, Nairobi.
(KB1A)
* Period 01/1995 to 12/1995
* Data of Timbuktu, 11.04.2002
+ Anemometerhoehen (0.1 m):   32   41   57   74   98  144  200
244  283
AK 10999 1995 01 01 00 00 1 1 210  56 1 3 1 -999 9
AK 10999 1995 01 01 01 00 1 1 220  64 1 3 1 -999 9
AK 10999 1995 01 01 02 00 1 1 260  68 1 3 1 -999 9
AK 10999 1995 01 01 03 00 1 1 270  65 1 3 1 -999 9
AK 10999 1995 01 01 04 00 1 1 250  64 1 3 1 -999 9
```

```
AK 10999 1995 01 01 05 00 1 1 250  64 1 3 1 -999 9
...
```

The entries mean:

Significance	Position of digits	Value range
Data Identifier	1 to 2	AK
Station number	4 to 8	00001 – 99999
Year	10 to 13	1800 – 2...
Month	15 to 16	1 – 12
Day	18 to 19	1 – 31
Hour	21 to 22	0 – 23
Numerical empty field	24 to 25	0
Quality byte (QDD - Wind direction)	27	0, 1, 2, 9
Quality byte (QFF - Wind speed)	29	0, 1, 2, 3,9
Wind speed	31 to 33	0 – 360, 999
Wind speed	35 to 37	0 – 999
Quality byte (value status)	39	0 – 5, 9
Dispersion category according to Klug/Manier 41	41	1 – 7, 9
Quality byte (value status)	43	0, 1, 9
Mixture layer height (m)	45 to 48	0 – 9999
Quality byte (value status)	50	0 – 5, 9
Precipitation	52 to 54	001 – 989, 990 – 999
Quality byte (QPP - Precipitation)	55	1, 9

The quality byte of the wind direction can assume the following values:

QDD	Significance
0	Wind direction in deca degrees
1	Wind direction in degrees, original in deca degrees
2	Wind direction in degrees, original in degrees
9	Wind direction is missing

The quality byte of the wind speed can assume the following values:

QFF	Significance
0	Wind speed in nodes
1	Wind speed in 0.1 m/s, original in 0.1 m/s
2	Wind speed in 0.1 m/s, original in nodes (0.514 m/s)
3	Wind speed in 0.1 m/s, original in m/s
9	Wind speed is missing

The data of hourly precipitation is encoded with a 3-digit number according to the “Synop” key of the DWD:

Value	Significance
001	1 mm
002	2 mm
…	
988	988 mm
989	989 mm or more
990	Traces of precipitation, not measurable (<0,05 mm)
991	0.1 mm
992	0.2 mm
…	
999	0.9 mm

The quality byte of the precipitation can assume the following values:

QPP	Bedeutung
1	Precipitation information available
9	Precipitation information not available or implausible

An entry of the dispersion category according to Klug/Manier is 7, if the dispersion category cannot to be defined. The failure identifier is 9.

The time is given in UTC (GMT). If the data are representative for a period of one hour, the entered time will be the end of the hour.

Reading Conventions in RosePlot (check in the given order):

No.	condition	result
1	wind speed < 0	missing data
2	QFF = 9 or QFF < 0 or QFF > 3	missing data
3	wind direction < 0	missing data
4	QDD = 9 or QDD < 0 or QDD > 2	missing data
5	dispersion category > 7 or dispersion category < 1	missing data
6	dispersion category = 7	
	WG <= 2.3	dispersion category = 1
	WG > 2.3 und WG <= 3.8	dispersion category = 2
	WG > 3.8	dispersion category = 3
7	QPP <> 1	precipitation = 0
8	wind speed < 0.1 oder wind direction = 0	doldrums (calm)
9	wind direction (Degree * 10^{-1}) = 99	circulating wind

AUSTAL2000 interprets data sets as invalid or as be missing, if the value of Klug/Manier is 0.

Austal2000 ignores the Turner category and the ww-key number.

AKS file

Format: ASCII

The wind conditions are accepted in the form of a dispersion class statistics in the format of TA Luft. The file contains data about frequencies of wind direction, wind speed and dispersion classes in 1/100 per mille. For all wind directions in batches of 10-degree steps each, the wind speed classes' frequency in 9 levels and the dispersion classes' frequency in 6 groups are given. The file format is presented in the following table for the first dispersion class.

Extract from a Wind Dispersion Classes Statistics File:

```
Anemometer 10 m  3.6 m/s
anonym
TA Luft
KLUG/MANIER
JAHR ALLE FAELLE
   151   38   88   38   25   63   75   13    0    0   38   13   50   ...
   138   46   69   92   57   92   92   92   80   23   34   23   69   ...
    34  161  103  218  115  172  126  115  103   80  126   92   46   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
    83   83   59   71  119    0  107   59   71   47   12   59   47   ...
   115   57   69  115   92   80   69  184  115   69   69   46   69   ...
    23   34  103  138  126   57  126  184  253  218  230  115  103   ...
    23   80  172   92  126  161  218  207  494  505  608  367  253   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
     0    0    0    0    0    0    0    0    0    0    0    0    0   ...
   ...  ...  ...  ...  ...  ...  ...  ...  ...  ...  ...  ...  ...
```

The header of the file must consist of 5 lines. The word "TA Luft" or "TA-Luft" must appear in the third line. All other entries of the first 5 lines are optional.

From the 6th row on are given the frequencies of each case. AUSTAL2000 accepts and recognizes statistics divided in groups of 10 degrees each. Therefore, the data must be presented in the following form:

Columns: Wind direction: from10 to 360 degrees in groups of 10 degrees each; and

Rows: arranged by wind speeds, calculation values according to TA Luft,
i. e. 1; 1.5; 2.3; 4.5; 6; 7.5; 9; 12 m/s
and then in blocks for each dispersion class I, II, III/1, III/2, IV, V.

All frequencies must be given in 1/100 pro mille, i.e. the sum of the frequencies = 100 000.

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