News from Lohmeyer

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Dear Readers

2021 is drawing to a close and we can be thankful that the pandemic has not had any significant negative effects on our order situation or our ability to adhere to delivery dates.

To optimize our internal quality assurance procedures, we have underpinned our management handbook with a new foundation by becoming certified in accordance with ISO 9001:2015. This will enable us to deliver the quality you are accustomed to even more effectively.

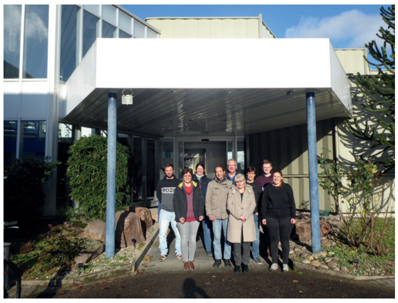
With boosted levels of expertise in our Dorsten Office, we are able to carry out investigations in the areas of shading and light immissions at a high level. In our first article, we describe methods and principles for assessing light trespass and glare effects. Glare not only stems from artificial light sources, but can also occur when sunlight is reflected from, for example, surfaces of photovoltaic installations next to highways.

In our second article, we report on the validation and further development of MISKAM, which our company has significantly advanced. In cooperation with Dr. Eichhorn, version 6.42 has now been developed, which we will deliver through WinMISKAM.

The new TA Luft regulation (Germany's air pollution regulation: Technical Instructions on Air Quality Control) will enter into force on December 1, 2021, thus also requiring the use of the latest version (version 3) of dispersion model AUSTAL for producing expert reports. The WinAUSTAL Pro interface developed by us has been adjusted accordingly. In the last article, we report on changes and developments.

In line with the motto that there is magic in every new beginning, all three of our branch offices are moving to new premises. The Dresden Office already made the move in August 2020, the Karlsruhe Office moved a few doors down in October 2021 and the Dorsten Office will relocate to Bochum in January 2022. A chance for a new beginning: Out with the old, in with the new! With all this in mind, it's safe to say that we have positive expectations for 2022.

I wish you all a joyful and peaceful Christmas season and a happy new year. Stay healthy.



New office at Karlsruhe "An der Rossweid 15"

Yours sincerely

BRIEF SUMMARY OF CURRENT

- The announced update of Handbook Emission Factors for Road Transport (HBEFA) 4.2 has been available as a beta version for test applications since the beginning of November and holds great promise that a new working basis will be published soon as a result. In light of the effects of the diesel scandal and the considerable increases in NO_x emission factors (HBEFA4.1) as a result, the new version is expected to reflect a trend towards reductions in NO_x emissions and direct NO_2 emissions for selected vehicle categories.

- The report "Verbesserung der NO_2-Modellierung mit HBEFA4.1" ("Improvement in NO_2 modeling with HBEFA 4.1") has now been published ([German Environment Agency [UBA] text 118/2021]). The aim of the project carried out by our office for the Environment Agency was to review and improve NO_2 immissions modeling on the basis of emissions from HBEFA 4.1 in the direct vicinity of streets. In implementing the immissions modeling we focused in particular on the conversion of NO to NO_2 and submitted recommendations for better describing these processes in dispersion models.

- The amended Ordinance on Small and Medium-Sized Firing Installations (First Ordinance on the Implementation of the Federal Immission Control Act) will enter into force on January 1, 2022 following approval by the Federal Council on September 17, 2021. This is relevant for replanning devices for discharging gases from solid fuel firing installations – we would be pleased to help you to professionally calculate stack heights pursuant to the amended First Ordinance on the Implementation of the Federal Immission Control Act.

CONTENT

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LIGHT IMMISSIONS

Pursuant to the Federal Immission Control Act (BImSchG), light immissions are considered to have harmful effects on the environment if, according to their nature, extent or duration, they are liable to cause hazards, considerable disadvantages and/or considerable nuisance to the general public or the neighborhood. Light immissions may be caused by direct light sources, such as the sun, illuminated advertising or headlights from cars, or by indirect light sources, such as reflections from glass façades or PV installations. The key prerequisite for determining whether light immissions have occurred is that there must be a line of sight between the observer and the source of the glare.

There are currently no investigations into the effects of or legally binding provisions for assessing light immissions. Instead, the light immissions directive of the joint committee of the German federal government and German states on immissions control (Bund/Länder-Arbeitsgemeinschaft für Immissionsschutz (LAI); LAI, 2015) is used to assess the level of nuisance.

Light immissions may have the following impacts:

Light trespass: This occurs when light shines into living areas, particularly into bedrooms, but also into living rooms, terraces or balconies, leading to a restricted use of these living areas. In this regard, LAI specifies immission reference values of average illuminance which should not be exceeded after dark. This excludes public street lighting, as well as temporary light, such as from traffic.

Glare: Generally speaking, glare causes a temporary malfunction of the eye which prevents the person affected from recognizing things that they have to or want to see (ARGE, 2007). Glare resulting from powerful light sources in the neighborhood may have distorting effects even if there is not an excessive intrusion of light owing to the light sources being far away.

Relevant immission locations under immission control law are living rooms, bedrooms, classrooms, offices and workspaces (LAI, 2015). Outdoor areas connected to buildings (e.g. outdoor terraces and balconies) should also be treated as worthy of protection. However, street areas are not defined as immission locations.

Light reflected from free-standing PV installations erected next to highways and federal roads may cause glare for road users and thus impair road traffic safety (see **Fig. 1**).

According to LAI, if the astronomically maximum possible glare duration due to light reflected from PV installations amounts to more than 30 minutes a day or 30 hours a year, this can cause a considerable nuisance.

For Quickly driving past road users, free-standing PV installations can result in a flicker effect, caused by light reflected from PV modules arranged one behind the other. A **flicker effect** describes glare caused by quickly changing light intensities. As there is no benchmark for assessing flicker effects caused by the reflection of sunlight from PV installations, the provisions in guideline CIE 88:2004 "Guide for the Lighting of Road Tunnels and Underpasses" (CIE, 2004) are used as assessment criteria. In its guideline CIE 88:2004, the International Commission on Illumination describes the assessment of flicker effects using flicker frequency and the duration of the effect.

For projects that could lead to light immissions in the neighborhood, Lohmeyer GmbH can carry out an expert assessment of whether such projects would cause considerable nuisance. If necessary, specific measures will be devised to avoid harmful light immissions.

Light immissions are calculated using our own specially designed software, which takes into account a three-dimensional site and building model, structures on the surface (e.g. vegetation) and the sources of the glare (e.g. lamps, PV installations).

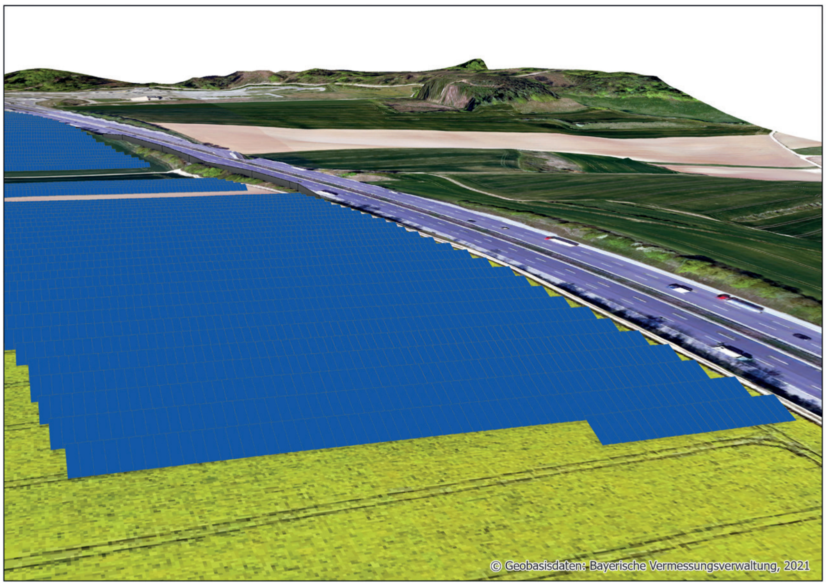

Fig. 1: Example of a free-standing PV installation next to a highway

References:

Joint committee on immissions control (LAI, 2015): Hinweise zur Messung, Beurteilung und Minderung von Lichtimmissionen der Bundesländer (Guidelines on measuring, assessing and reducing light immissions of federal states), November 2015.

ARGE Monitoring PV-Anlagen (2007): Leitfaden zur Berücksichtigung von Umweltbelangen bei der Planung von PV-Freiflächenanlagen (Guidelines for taking into account environmental matters in planning free-standing PV installations), Hannover, November 27, 2007.

International Commission on Illumination (CIE, 2004): Technical Report "Guide for the Lighting of Road Tunnels and Underpasses", CIE 88:2004 2nd edition.

Contact person: M.Sc. Sandra Deimel

MISKAM 6.42 VALIDATED IN ACCORDANCE WITH STANDARD VDI 3783 PART 9 (2017)

Standard for evaluating flow around buildings and obstacles VDI 3782 Part 9 (2017) describes model tests for prognostic microscale wind field models in chapter 4 to be undertaken by model developers. For validation purposes specifically, model results are to be compared with measurements, other model results and analytical solutions for selected test cases (for test case data sheets, see annex E of the standard).

MISKAM version 6.42 was released in October 2021. This version meets all of the requirements laid down in chapter 4 of the standard, and in particular all test cases listed, and has therefore been validated in accordance with the above-mentioned VDI standard. Developer of the MISKAM model Dr. Eichhorn has developed a corresponding validation protocol.

In contrast to the version that has been published since 2014, MISKAM 6.3, version 6.4 onward includes the turbulence model of Kato and Launder (1993) instead of that of Lopez et al. (2005) as default model. With the Kato and Launder turbulence model (and likewise with the standard k-ε turbulence model that can be selected in MISKAM), MISKAM also meets test case c5. Test case c5, also referred to as the Michelstadt case, is a data set compiled by the Environmental Wind Tunnel Laboratory (EWTL) of the University of Hamburg within the scope of a complex building development. (**Fig. 1**)

The measurement data are stored in

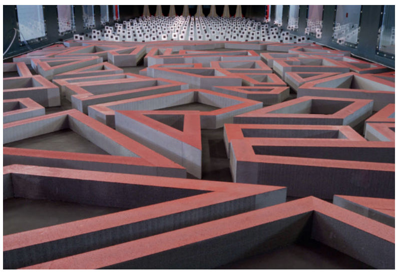

Fig. 1: Model of the Michelstadt case in the Environmental Wind Tunnel Laboratory (EWTL) of the University of Hamburg. Image source: EWTL

the CEDVAL-LES database (http://www.mi.uni-hamburg.de/cedval-les). CEDVAL-LES classifies test cases on the basis of complexity, from 0 (no buildings) to 4 (realistic urban geometry). Test case c5 is classified as having a complexity level of 3 (realistic but idealized urban geometry). The building configuration for this case is shown in **Fig. 2**. The buildings have heights of 15, 18 or 24 m. All roofs are idealized as flat roofs. Profile measurements were carried out up to a height of 110 m in 40 locations, measurements above roofs were carried out at 2 heights (27 and 30 m) in 181 locations, and measurements in the street canyon were carried out at 3 heights (2, 9 and 18 m) in 324 locations (see **Fig. 2**). The data set contains the relevant horizontal components of wind velocity.

Furthermore, MISKAM version 6.42 enables users to select a roughness length for the lateral flow profile that is no longer limited by the vertical calculation grid selected, but results from the specific requirements, e.g. 2 m for a consistent urban characterization. Despite this improvement, users are still strongly advised to select a MISKAM calculation area that is horizontally significantly larger than the actual area under investigation or evaluation, i.e. to enlarge this inner area to include the surrounding area and the building structures there.

Lastly, it should be noted that it is not possible to deduce, on the basis of the successful validation pursuant to VDI 3783 Part 9 (2017) of a prognostic microscale wind field model, the level of quality with regard to any dispersion model integrated in the flow model or carried out subsequently. It would therefore be of help (see Flassak and Lorentz, 2021) to draw up an evaluation guideline for building-resolved dispersion models.

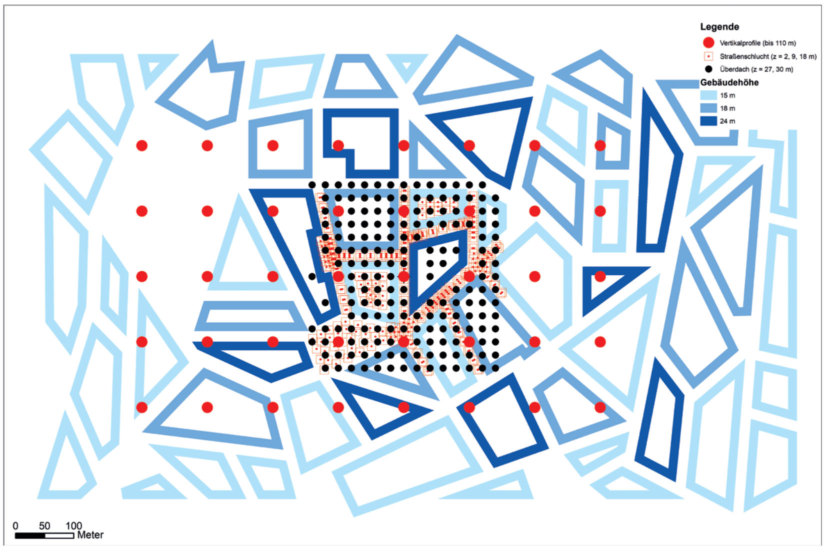

Fig. 2: Building configuration and measurement locations of horizontal components of wind velocity for the Michelstadt case (test case c5 of VDI 3783 Part 9 (2017))

References:

Flassak, Th. and Lorentz, H. (2021): Comparison of the microscale flow and dispersion model MISKAM against a new wind tunnel validation dataset for an idealized built-up area. 20th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, June 14-18, 2021. Tartu, Estonia.

Kato, M. und B.E. Launder (1993): The modelling of turbulent flow around stationary and vibrating square cylinders. Proceedings of the 9th Symposium on Turbulent Shear Flows, Kyoto, August 1993, pp. 10.4.1-10.4.6.

Lopez, S.D., Lüpkes, C. and K.H. Schlünzen, (2005): The effect of different k-ε-closures on the results of a microscale model for the flow in the obstacle layer. Meteorol. Zeitschrift, 14, 839-848.

Contact person: Dr.-Ing. Thomas Flassak

REVISED VERSION OF TA LUFT AND UPDATE OF WINAUSTAL WITH AUSTAL VERSION 3

The new version of the Technical Instructions on Air Quality Control (TA Luft), the central air quality management framework in relation to installations in Germany requiring permission under immission control law, entered into force on December 1, 2021. It was published in edition No. 48–54 of the Joint Ministerial Gazette on September 14, 2021.

Following the new version of TA Luft and the associated update of AUSTAL - a reference implementation, made available by the German Environment Agency of the dispersion model pursuant to TA Luft (2021), annex 2 - program interface WinAUSTAL also had to be updated accordingly.

WinAUSTAL was released more than 20 years ago and has been developed on an ongoing basis ever since. Its intuitive, layer-based and project-related user interface provides interfaces to standard GIS formats.

The requirements arising from the main amendments to the new TA Luft version for dispersion calculations and the program interface WinAUSTAL are presented below.

- Current austal.exe (version 3.1.2) in program folder
- The dispersion program now requires austal.txt as the input file, but Austal2000.txt can still be read and saved as austal.txt
- Additional substances added to source strength input:
  - PM2.5 (substance pm25-1)
  - Species-specific weighting factor odor 0.65 (odor_065)
  - Benzo(a)pyrene (bap), with 5 grain size classes
  - Bio-aerosols (bae), with 5 grain size classes
  - Dioxine (dx), with 5 grain size classes and equivalent factors pursuant to table 19, annex 4, TA Luft
- Omission of species-specific weighting factors odor 0.4 and 0.6 (odor_040, odor_060)
- Addition of selection dialog for precipitation time series
- Adjustment of input dialog for stack gas plume rise:
  - Omission of input parameters for stack gas plume rise pursuant to VDI 3782 Part 3 (1985)
  - Addition of input parameters for stack gas plume rise pursuant to VDI 3782 Part 3 (2019 draft) The basis of this standard is the integral plume rise model for dry and wet plumes PLURIS (Janicke and Janicke, 2001).
  - The possibility to enter the parameters additive velocity and time scale for determining stack gas plume rise pursuant to VDI 3945 Part 3 (2000) remains. However, the time scale parameter (see VDI 3945 Part 3, section D5) has been redefined from sq to ts in austal.txt.

In addition, Corine Land Cover was replaced by LBM-DE, the digital land cover model for Germany, for determining surface roughness as part of the TA Luft amendment. Access to land cover data is, as before, automated via dispersion program AUSTAL in conjunction with the roughness register. Input and calculations also remain possible with UTM zone 33 codes in principle, but roughness will not be calculated automatically when these codes are used.

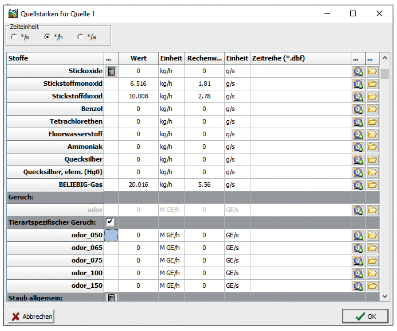

Fig. 1: Input mask for odor emissions in the updated WinAUSTAL

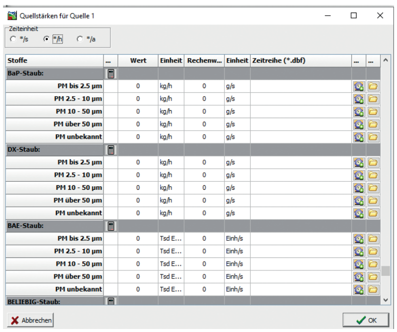

Fig. 2: Input mask for the new substances in the updated WinAUSTAL

As a new feature, the programs for determining emission-related stack heights pursuant to TA Luft No. 5.5.2.2 BESMIN (individual stack) and BESMAX (superimposition pertaining to multiple stacks) can be controlled via the WinAUSTAL interface and filled out or synchronized with input data for AUSTAL.

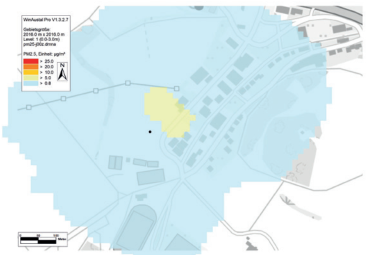

Fig. 3: Presentation of results for particulate matter PM2.5 in the updated WinAUSTAL

The updated WinAUSTAL is available now.

The AUSTAL program package with the current handbook can be found at https://www.umweltbundesamt.de/themen/luft/regelungen-strategien/ausbreitungsmodelle-fuer-anlagenbezogene/download-0.

Further information can be found at www.lohmeyer.de/winaustalpro.

References:

Janicke, U., Janicke, L. (2001): A three-dimensional plume rise model for dry and wet plumes. Atmospheric Environment 35, 877-890.

Contact person: Dipl.-Geogr. Diana Bretschneider, Dipl.-Geogr. Tilo Hoffmann