



Dispersion modeling of accidental releases of toxic gases - Sensitivity study and optimization of the meteorological input

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Several air dispersion models are available for prediction and simulation of the hazard areas associated with accidental releases of toxic gases. The most model packages (commercial or free of charge) include a chemical database, an intuitive graphical user interface (GUI) and automated graphical output for effective presentation of results. The models are designed especially for analyzing different accidental toxic release scenarios (“worst-case scenarios”), preparing emergency response plans and optimal countermeasures as well as for real-time risk assessment and management.

Uncertainties in the meteorological input together with incorrect estimates of the source play a critical role for the model results.

The research project RETOMOD (reference scenarios calculations for toxic gas releases – model systems and their utility for the fire brigade) was conducted by the Central Institute for Meteorology and Geodynamics (ZAMG) in cooperation with the Vienna fire brigade, OMV Refining & Marketing GmbH and Synex Ries & Greßlehner GmbH. RETOMOD was funded by the KIRAS safety research program at the Austrian Ministry of Transport, Innovation and Technology (www.kiras.at). The main tasks of this project were

1. Sensitivity study and optimization of the meteorological input for modeling of the hazard areas (human exposure) during the accidental toxic releases.
2. Comparison of several model packages (based on reference scenarios) in order to estimate the utility for the fire brigades.

This presentation gives a short introduction to the project and presents the results of task 1 (meteorological input). The results of task 2 are presented by Stenzel and Baumann-Stanzer in this session. For the aim of this project, the observation-based analysis and forecasting system INCA, developed in the Central Institute for Meteorology and Geodynamics (ZAMG) was used. INCA (Integrated Nowcasting through Comprehensive Analysis) data were calculated with 1 km horizontal resolution and based on the weather forecast model ALADIN. The meteorological field's analysis with INCA include: Temperature, Humidity, Wind, Precipitation and Cloudiness. In the frame of the project INCA data were compared with measurements conducted at traffic-near sites. INCA analysis and very short term forecast fields (up to 6 hours) are found to be an advanced possibility to provide on-line meteorological input for the model package used by the fire brigade.

Nevertheless a high degree of caution in the interpretation of the model results is required – especially in the case of very slow wind speeds, very stable atmospheric condition, and flow deflection by buildings in the urban area or by complex topography.