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Modelling of atmospheric dispersion and deposition in industrial areas of southern Vietnam – Comparison of different modeling approaches –

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Modelling of atmospheric dispersion processes is necessary in order to follow national or international instructions on air quality control. A variety of different models and turbulence parameterizations exists to calculate atmospheric dispersion of emissions in the near field of industrial sources. The aim of this study is the intercomparison of two different dispersion models used in Vietnam and Germany.

For Vietnam a Gaussian type of model is used based on the Pasquill turbulence parameters whereas in Germany Appendix 3 of the German regulation "Technical Instruction on Air Quality Control" (TA Luft) demands for dispersion calculations a Lagrangian particle model in compliance with the German guideline VDI 3945 Part 3 [1]. For Germany time series or statistics of meteorological parameters like diffusion category, wind speed and wind direction are used to calculate the distribution of ground level concentration of emissions (e.g. SO_2, NOX, particulate matter), Vietnamese calculations are focused on specified case studies of single meteorological conditions.

For normalized source terms and five different source heights covering typical stack heights in industrial areas of the Thi Vai region (southern Vietnam), both types of models have been used for specified meteorological conditions covering unstable, neutral as well as stable atmospheric stratifications. The comparison of the two types of models is focused on the maximum concentration of a pollutant and the distance at which this concentration occurs.

It could be shown that based on the Lagrangian particle model including turbulence parameterization based on Monin Obukhov similarity theory the results of the Gaussian model for low release heights in an area with low roughness length can be reproduced within some 10 %, larger deviations up to a factor of two have been found for extreme stable and unstable stratification of the atmosphere. The same holds for elevated releases in an area with high roughness length.

The Lagrangian model has in addition been validated against different dispersion experiments. It shows a satisfactory performance compared to the (Gaussian) model and experimental results with varying boundary conditions (emission height, roughness length) being independent of specific dispersion experiments, which have been the basic input to the specific dispersion parameters of a Gaussian model.