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Title

**Nordic research on uncertainty of atmospheric dispersion prediction
for nuclear emergency preparedness**

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Text

Atmospheric dispersion model calculations for radionuclides released from a nuclear accident provide information on possible contamination levels and radiation hazards thereby facilitating decisions on protective actions. This is implemented for emergency management through the use of Decision Support Systems (DSSs).

Recent developments in numerical weather prediction modelling include probabilistic forecasting techniques addressing the inherent uncertainties. This approach may be taken over by atmospheric dispersion modelling. Today, however, most nuclear DSSs do not take uncertainties into account, but merely allow for presentation of a single deterministic plume hoping, or expecting, that the prediction is ‘realistic’.

In the NKS research project ‘Meteorological Uncertainty of atmospheric Dispersion model results’ (MUD), the uncertainties of atmospheric dispersion model calculations were investigated as well as means for incorporating the uncertainties into DSSs, allowing for the presentation of uncertainties to decision makers in a comprehensible manner. The MUD methodology has been implemented operationally in the Danish setup providing long-range atmospheric dispersion modelling for the Danish Emergency Management Agency (DEMA).

In a following project ‘Fukushima Accident: UNcertainty of Atmospheric dispersion modelling’ (FAUNA), the MUD methodology was applied to the Fukushima Daiichi nuclear accident, and the influence of meteorological uncertainties on real-time assessments of atmospheric dispersion and deposition was investigated, imitating real-time emergency management. The project examined how predictions with uncertainty estimates can be presented to experts as well as to decision makers in a manner that meets requirements of both the experts using the DSS and the decision makers relying on practical decision support.

A third project ‘MEteorological uncertainty of ShOrt-range dispersion’ (MESO) addressed two items: (i) to study uncertainties of short-range atmospheric dispersion forecasting involving the use of NWP model data only, and (ii) to study hindcasting including the combined use of NWP model data and weather radar data.

In the presentation, the methodology developed will be described, and results of MUD, FAUNA and MESO presented. In addition, an outlook will be given to a proposed project ‘Added Value of uncertainty Estimates of SOurce term and Meteorology’ (AVESOME), in which source term uncertainty and its interaction with the meteorological uncertainty will be studied as well as possibilities for implementation in DSSs.