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Modelling the Cs-137 dispersion over Europe after the Chernobyl accident

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Soon after the Chernobyl accident in April 1986 the Atmospheric Transport Model Evaluation Study (ATMES) was initiated in Vienna. Subject of the study was the validation of long-range transport models for atmospheric pollutants, published in 1992. The study was the kick-off for a rapid development of long-range dispersion models.

During the passage of the contaminated air, temporally highly resolved measurements of the Cs-137 air concentration were made at many sites in Europe. These data enable a detailed verification of the modelled air concentrations. The measured deposition data over Europe are available as maps in the caesium atlas published by Roshydromet (Moscow), Minchernobyl (Kiev), Belhydromet (Minsk) and the European Commission/JRC. These maps give an overview of the deposition patterns over Europe.

For model validation, we are collecting additionally the Cs-137 deposition data from several European countries and we will produce a gridded data set for the scientific community. This data set can be used to compare the modelled deposition with the measured one in a quantitative way.

The paper presents the first simulations of the Cs-137 dispersion and deposition over Europe modelled by FLEXPART and a comparison of the results to measurement data. FLEXPART is a Lagrangian particle dispersion model developed for regional to global transports and has been tested on ETEX and CAPTEX with good results. It simulates the transport, turbulent diffusion, dry and wet deposition, convection and radioactive decay of air pollutants released from point, line, area or volume sources. Version 6.2 with small improvements to the wet deposition parameterisation is used. FLEXPART works with meteorological input data from the ECMWF, in the case of the Chernobyl accident, we use the ERA-40 reanalyses data set and the ATMES precipitation data.

Model results will be presented for two different temporal resolutions of the input data, namely 6 and 3 hours to illustrate the influence of temporal interpolation errors.

Both results, the modelled air concentration and the modelled deposition, will be compared to measurements. For selected sites over Europe we will compare the timing of the measured air concentration with the modelled one. To check the modelled deposition we will show maps comparable to those of the Cs-Atlas and additionally a direct comparison to our gridded data set.

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