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Wet deposition simulations based on meteorological objective analysis

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Wet deposition is an important removal process in the pollution budget in the atmosphere. Hydrometeors scavenge particles below rainy clouds, gaseous pollutant and aerosol particles are bound to moist air in clouds or fog. The correct description of clouds, their extension and the effective rainfall are therefore of paramount importance in order to obtain a correct chemical air pollution mass balance. Prognostic weather prediction models simulate next to rainfall all necessary atmospheric fields such as water content in air and clouds, vertical velocities and cloud cover for a detailed description of the pollutants' wet chemistry. Prognostic weather prediction models, at the same time, often fail to describe the elemental rain field over- or underestimating heavily precipitation rates in different regions. Thus, rain measurements are needed to countercheck the models' performance. The object of this paper is to present wet depositions simulated with chemistry transport model (CTM) REM_CALGRID (RCG) on different scales and to compare them with measurements. The meteorological driver TRAMPER of the CTM is based on an optimum interpolation scheme developed by Reimer et al., 1992 at FU-Berlin and takes into account SYNOP-readings. Thus, the output-field represents rain and cloud-cover as realistic as possible. Deposition validation has shown that RCG is able to reproduce correctly amount and spatial distribution of sulphur and nitrogen over different years and different regions, using simple scavenging coefficients for gases and particles. Thus, we suggest that a good description of meteorological precipitation fields and a correct localisation of clouds based on observations are adequate to simulate wet depositions. Wet deposition data are needed in order to evaluate the impact on different eco-systems. Thus, the local character is one of the main aspects. Furthermore, Langer et al. (2005) at FU-Berlin have shown that

the usage of Satellite Data and the parameterisations of cloud types lead to improved precipitation fields. Also, the analysis of vertical rain rate profiles from a micro-rain-radar, undertaken at the Institute of Meteorology, has led to a better understanding of rain fields and of rain droplets evaporation. These approaches are going to be developed further and will be incorporated in the TRAMPER-RCG-system for an improved description of rain and cloud fields, and therefore for an improved wet deposition simulation, spatially as well as temporally.