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An evaluation of the simulated bare soil evaporation of an atmospheric model

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Land surface processes have a significant impact on near-surface atmospheric phenomena. They determine, among others, near-surface sensible and latent heat fluxes and the radiation budget, and thus influence atmosphere and land characteristics, such as temperature and humidity, the structure of the planetary boundary layer, and even cloud formation processes. It is therefore important to simulate the land surface processes in atmospheric models as realistically as possible.

Verifications have shown that the bare soil evaporation computed by the land surface scheme TERRA of the COSMO atmospheric model is systematically overestimated. Since this flux is part of the surface water and energy balance it affects, for instance, the other components of the turbulent heat fluxes as well as the soil water content and the surface temperature.

Data from the Meteorological Observatory Lindenberg of the German Meteorological Service were used to analyse this model behaviour. In the standard model configuration of TERRA, the formulation of bare soil evaporation is based on the Biosphere Atmosphere Transfer Scheme (BATS), following the work by R. E. Dickinson. In order to reduce the excessive evaporation simulated by BATS, other formulations for the bare soil evaporation were tested in TERRA. In turned out that a scheme based on a resistance formulation efficiently reduces the simulated vapour flux, leading to a better agreement with the measurements.