Geophysical Research Abstracts
Vol. 19, EGU2017-7896, 2017
EGU General Assembly 2017

An improved representation of the land surface temperature including the effects of vegetation in the COSMO model

Jan-Peter Schulz (1) and Gerd Vogel (2)

(1) Deutscher Wetterdienst, Research and Development, Offenbach a.M., Germany (jan-peter.schulz@dwd.de), (2) Deutscher Wetterdienst, Meteorological Observatory Lindenberg, Germany

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 amplitude of the diurnal cycle of the surface temperature simulated by the land surface scheme TERRA of the COSMO atmospheric model is systematically underestimated. In contrast, the diurnal cycles of the temperatures in the soil are overestimated, instead. This means that the other components of the surface energy balance are biased as well, for instance, the surface turbulent heat fluxes or the ground heat flux.

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, there is no representation of the vegetation in the surface energy balance. This means, there is no energy budget including a temperature for the vegetation layer. Furthermore, the insulating effects by the vegetation at the sub-canopy level are missing as well. In this work, a scheme providing both of these missing model characteristics was implemented in TERRA. As a result, the simulated diurnal amplitude of the surface temperature is increased and the one of the soil temperature is reduced, leading to better agreements with the measurements. These improvements are found in TERRA in offline mode, using Lindenberg observations, as well as in coupled mode in the atmospheric model.