Geophysical Research Abstracts
Vol. 16, EGU2014-5887, 2014
EGU General Assembly 2014

Incorporating dynamic root growth enhances the performance of Noah-MP at two contrasting winter wheat field sites

Sebastian Gayler (1), Thomas Wöhling (1), Joachim Ingwersen (2), Hans-Dieter Wizemann (3), Kirsten Warrach-Sagi (3), Sabine Attinger (4), Thilo Streck (2), and Volker Wulmeyer (3)

(1) WESS - Water and Earth System Science Competence Cluster, c/o University of Tübingen, 72074 Tübingen, Germany , (2) Institute of Soil Science and Land Evaluation, Biogeophysics, University of Hohenheim, 70593 Stuttgart, Germany, (3) Institute of Physics and Meteorology, University of Hohenheim, 70593 Stuttgart, Germany, (4) Computational Hydrosystems, UFZ–Helmholtz Centre for Environmental Research, 04318 Leipzig, Germany

Interactions between the soil, the vegetation, and the atmospheric boundary layer require close attention when predicting water fluxes in the hydrogeosystem, agricultural systems, weather and climate. However, land-surface schemes used in large scale models continue to show deficits in consistently simulating fluxes of water and energy from the subsurface through vegetation layers to the atmosphere. In this study, the multi-physics version of the Noah land-surface model (Noah-MP) was used to identify the processes, which are most crucial for a simultaneous simulation of water and heat fluxes between land-surface and the lower atmosphere. Comprehensive field data sets of latent and sensible heat fluxes, ground heat flux, soil moisture, and leaf area index from two contrasting field sites in South-West Germany are used to assess the accuracy of simulations. It is shown that an adequate representation of vegetation-related processes is the most important control for a consistent simulation of energy and water fluxes in the soil-plant-atmosphere system. In particular, using a newly implemented sub-module to simulate root growth dynamics has enhanced the performance of Noah-MP at both field sites. We conclude that further advances in the representation of leaf area dynamics and root/soil moisture interactions are the most promising starting points for improving the simulation of feedbacks between the sub-soil, land-surface and atmosphere in fully-coupled hydrological and atmospheric models.