EMS Annual Meeting Abstracts
Vol. 16, EMS2019-508-1, 2019

Towards a Convective Scale Reanalysis for a river catchment with TerrSysMP

Clarissa Figura (1,2), Andreas Hense (1), Jan Dominik Keller (1,3,4), Clemens Simmer (1,2), Insa Thiele-Eich (1,2), Sabrina Wahl (1,4), Martin Wittenbrink (1,4)

(1) Rheinische Friedrich-Wilhelms-Universität Bonn, Institut für Geowissenschaften und Meteorologie, Bonn, Germany (clarissa.figura@uni-bonn.de), (2) Transregional Collaborative Research Centre 32, (3) Deutscher Wetterdienst, Offenbach, Germany, (4) Hans-Ertel Centre for Weather Research

Reanalysis data sets at catchment scale are of increasing interest for a wide range of hydrological and agricultural applications. Since these data sets combine measurements and model simulations, they allow for a comprehensive monitoring and evaluation of hydrological processes. However, current reanalysis data sets do not yet include a coupled modeling approach of atmosphere, land surface and subsurface which is expected to significantly improve the representation of hydrological processes. We therefore combine a fully coupled terrestrial model framework in convection-permitting mode and a data assimilation scheme in order to setup a coupled reanalysis for the terrestrial system.

We present results from our simulations combining the Terrestrial Systems Modeling Platform (TerrSysMP) and the KENDA LETKF data assimilation scheme. TerrSysMP has the capability to exchange the relevant state vectors between the soil, vegetation and the atmosphere in either direction, thus representing a fully coupled terrestrial model approach. We employ this system to a domain covering the Rur river catchment at resolutions of 1 km in the atmosphere and 500 m for the land surface and subsurface for a summer period, including several convective events. In order to assess the effect of data assimilation, we conduct simulations with and without the assimilation of radar reflectivities.

Preliminary results show a positive effect of the coupled approach compared to atmosphere only simulations. Here, the evaluation focuses on the impact of radar assimilation on the hydrologically relevant parameters from the atmosphere to the subsurface. Of special interest is the evolution of convective events with regard to the memory effect of the subsurface with and without data assimilation in the atmosphere.