Geophysical Research Abstracts
Vol. 17, EGU2015-5678, 2015
EGU General Assembly 2015

Evaluation of moisture sources of the Central European summer flood of May/June 2013 based on an ensemble of regional climate model simulations

Fanni D. Kelemen (1), Patrick Ludwig (1), Mark Reyers (1), Sven Ulbrich (1), Joaquim G. Pinto (1,2)

(1) Institute for Geophysics and Meteorology, University of Cologne, Cologne, Germany (fkelemen@uni-koeln.de), (2) Department of Meteorology, University of Reading, Reading, United Kingdom

In May/June 2013, heavy precipitation hit Central Europe, triggering damaging floods both on the Danube and on Elbe basins. In this study, we perform a detailed analysis of the synoptic development of the event based on an ensemble of regional climate model simulations performed with the COSMO-CLM. Simulations are performed with reanalysis data boundary conditions in multiple set-ups and horizontal resolutions of 0.375° and 0.125°. In particular, the aim is to identify potential moisture sources, and how they contributed to the event quantitatively. A control simulation with undisturbed (reanalysis) boundary conditions and sensitivity experiments with modified evaporation characteristics are performed to distinguish the role of moisture evaporated from marine and land areas. To keep the structure of the simulations close to reality as possible, spectral nudging is applied on the upper level atmospheric wind fields. For all simulations, the synoptic situations and cyclone tracks are evaluated against an independent reanalysis dataset, and simulated precipitation amounts are validated against E-OBS precipitation data. In general, the upper level atmospheric characteristics, which trigger the cyclones, are similar in the simulations compared to the reanalysis. Moreover, the time evolution of the precipitation event is well simulated. Nevertheless there are some differences in the spatial and temporal distribution of the precipitation. In both, the reanalysis and the control simulation, the cyclones relevant for this event were moving westward (retrograde movement), counterclockwise from the Mediterranean region over Eastern Europe towards the northern slopes of the Alps. The pre-existing moist soil over East and Central Europe and the circulation associated with the cyclones contributed to intense evapotranspiration, and thus the westward propagating cyclones brought a lot of moisture along their tracks towards Central Europe. The sensitivity studies performed with COSMO-CLM indicate that, while the main part of the moisture evaporated over land, other moisture sources like e.g. the Mediterranean Sea and the Black Sea were also important to the occurrence and intensity of this heavy precipitation event.