Geophysical Research Abstracts
Vol. 14, EGU2012-9559, 2012
EGU General Assembly 2012

Climate change impact on medium and small sized river catchments in Germany: An ensemble assessment

I. Ott (1), D. Düthmann (2), J. Liebert (3), P. Berg (4), H. Feldmann (4), J. Ihringer (3), H. Kunstmann (1,5), B. Merz (2), G. Schädler (4), and S. Wagner (5)

(1) University of Augsburg, Institute of Geography, Augsburg, Germany, (2) Geoforschungszentrum Potsdam, Potsdam, Germany, (3) Karlsruhe Institute of Technology, IWG, Karlsruhe, Germany, (4) Karlsruhe Institute of Technology, IMK-TRO, Karlsruhe, Germany, (5) Karlsruhe Institute of Technology, IMK-IFU, Garmisch-Partenkirchen, Germany

This study investigates the impact of climate change on three small to medium sized river catchments in Germany using a high-resolution RCM ensemble of seven kilometers spatial resolution. The three catchments represent the characteristic hydrology of the alpine Southern Germany (Ammer) and more sub-mountainous regions in the Eastern (Mulde) and Western (Ruhr) parts.

Possible changes in discharge characteristics and flood risk for the near future are examined. The ensemble approach in this project additionally allows the evaluation of the uncertainties in the future projections. With two global climate models (ECHAM5, CCCma3), three realisations of ECHAM5, two regional climate models (CLM, WRF) and three hydrological models (PRMS, SWIM and WaSiM-ETH), discharge of the three catchments is simulated and analyzed. Thereby, each catchment is simulated by two different hydrological models. Both global climate models (GCMs) are driven by the emission scenario A1B and the simulation period includes the years 1971-2000 as control period and 2021-2050 for the scenario.

The results project that only the Ruhr catchment in the West of Germany will be subjected to higher flood hazard. The simulated significant future increases of the mean monthly maximum discharges are up to 20% in winter and summer. In spring and autumn, increase of flood hazard is less pronounced. For the other two catchments in the East and South of Germany, the flood hazard is projected to stay at the current level. The Ammer catchment shows statistical non-significant increasing flooding risks in winter and decreasing tendencies in summer. There are also no statistically significant changes projected for the Mulde catchment, although small increases can be seen in summer and autumn.

The ensemble approach with different GCMs, high-resolution regional climate models (RCMs) and hydrological models allows the analysis of uncertainties and their attribution within the flood risk predictions. Major uncertainties of the model chain are revealed for the summer half-year, primarily due to the different results of the RCMs. During the winter season, the GCMs and the different realisations, representing natural variability, cause most uncertainty in the future projections. The impact of the hydrological models is comparable with the RCMs in winter and GCMs in summer.