Geophysical Research Abstracts
Vol. 15, EGU2013-4057, 2013
EGU General Assembly 2013

Analysis of extreme rain and flood events using a regional hydrologically enhanced hydrometeorological system

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Keywords: flood, extreme rain, model, routing

Evidence is showing that global warming or climate change has a direct influence on changes in precipitation and the hydrological cycle. Extreme weather events such as heavy rainfall and flooding are projected to become much more frequent as climate warms. Regional hydrometeorological system model which couples the atmosphere with physical and gridded based surface hydrology provide efficient predictions for extreme hydrological events. This modeling system can be used for flood forecasting and warning issues as they provide continuous monitoring of precipitation over large areas at high spatial resolution. This study examines the performance of the Weather Research and Forecasting (WRF-Hydro) model that performs the terrain, sub-terrain, and channel routing in producing streamflow from WRF-derived forcing of extreme precipitation events. The capability of the system with different options such as data assimilation is tested for number of flood events observed in basins of western Black Sea Region in Turkey. Rainfall event structures and associated flood responses are evaluated with gauge and satellite-derived precipitation and measured streamflow values. The modeling system shows skills in capturing the spatial and temporal structure of extreme rainfall events and resulted flood hydrographs. High-resolution routing modules activated in the model enhance the simulated discharges.