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Extreme rainfall in Serbia, May 2014, simulation using WRF NMM and RainFARM: DRIHM project

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In May 2014 Balkan region was affected with the continuous heavy rainfall, the heaviest in 120 years of recording observation, causing extensive flooding. Serbia suffered human casualties, huge infrastructure and industrial destruction and agricultural damage. Cyclone development and trajectory was very well predicted by RHMSS operational WRF NMM numerical model but extreme precipitation was not possible to predict with sufficient precision. Simulation of extreme rainfall situations using different numerical weather prediction models can indicate weakness of the model and point out importance of specified physical approach and parameterization schemes. The FP7 Distributed Research Infrastructure for Hydro-Meteorology DRIHM project gives a framework for using different models in forecasting extreme weather events. One of the DRIHM component is Rainfall Filtered Autoregressive Model RainFARM for stochastic rainfall downscaling. Objective of the DRIHM project was developing of standards and conversion of the data for seamless use of meteorological and hydrological models in flood prediction. This paper describes numerical tests and results of WRF NMM nonhydrostatic model and RainFARM downscaling applied on WRF NMM outputs. Different physics options in WRF NMM and their influence on precipitation amount were investigated. RainFARM was applied on every physical option with downscaling from 4km to 500m and 100m horizontal resolution and 100 ensemble members. We analyzed locations on the catchments in Serbia where flooding was the strongest and the most destructive. Statistical evaluation of ensemble output gives new insight into the sub scale precipitation distribution. Comparison of predicted WRF NMM precipitation amount against the observation shows good agreement. Applying RainFARM is evaluation, some of the ensemble members give an indication of extreme precipitation closer to observed values. Results are encouraging and give a space for further investigation of stochastic rainfall downscaling.