Comparison of two flood forecasting approaches over High Atlas Mountains basins in Morocco

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This study aims to compare flood forecasting approaches adapted to the context of Morocco, for two catchments (Rheraya and Ourika) located in the High Atlas Mountains. We evaluated the performances of flash-flood forecasts using two approaches; one relying on event-based hydrological modelling, and the second, a generalized least squares regression model linking event rainfall, antecedent soil moisture and runoff. The meteorological forecasts considered were provided by the AROME (Application of Research to Operations at Mesoscale), ALADIN (Aire Limited Dynamic Adaptation International Development) and WRF (Weather Research and Forecasting) models. For both approaches, three soil moisture data sources (in-situ measurements, ESA-CCI remote sensing data and ERA5 reanalysis) were compared to estimate the initial soil wetness conditions before flood events. Results showed that the AROME and WRF models better simulate precipitation amounts than ALADIN, mostly due to their better ability to reproduce convective events. The comparison between the two flood forecasting approaches showed that the regression model outperforms the hydrological model-based approach, due to fewer calibration parameters and a better robustness. The best results were obtained with the combination of the WRF forecasts with antecedent soil moisture from ERA5. This type of approach needs to be tested in other basins of North Africa where data are available, in order to develop flood forecasting in these regions, which are strongly vulnerable to flash floods.