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Estimation of catchment wetness for the Wupper River Basin, Germany

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Spatial distribution of soil wetness and precipitation plays a central role in flood forecasting. In the frame of the Horizon 2020 project BINGO (Bringing INnovation to onGOing water management), the combination of radar data and satellite and reanalysis products with ground data is currently under investigation to enhance the operational flood forecasting model at the Wupper Association, Germany. With this purpose, a soil moisture monitoring network is being installed in the Wupper River Basin. Soil moisture ground data will be used together with near-real time soil moisture remote sensing products (e.g., SMAP) in order to obtain high resolution, spatially distributed soil moisture for middle-sized catchments (100 to 1000 km^2). The spatial distribution of precipitation is currently determined with weather radar measurements from the German Weather Service. The accuracy of radar measurements can be improved if the dependence of the drop size distribution (DSD) on radar Z-R relationship is known. The drop size distribution will be assessed with disdrometers and correlated to the radar reflectivity. Daily records of long duration precipitation time series (i.e. over 100 years) are being analysed for the regionalisation of precipitation scenarios and identification of past weather extremes and anomalies due to climate change. Daily precipitation records are taken as reference for comparison with continuous observations from paper charts and data loggers. The resulting ground precipitation time series will be utilised to post-process radar measurements. The interrelation between high temporal and spatial resolution of radar data with precipitation ground data will be investigated to establish a rain distribution pattern. Precipitation and soil wetness indices will be combined to create rainfall and soil wetness warning thresholds. Past flood scenarios will be generated using a detailed hydrological model consisting of several drained (urban) and natural areas. Input precipitation and model generated soil wetness will be correlated to flood thresholds derived from historical events. Short-term (decadal) climate projections will be used as input for hydrological modelling, which will serve to determine future discharge and soil moisture trends.