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High resolution simulation of extreme precipitation and evaluation of its variability for the flood risk management using the Lokal-Modell

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A necessary requirement for extreme flood events is long-lasting and/or intensive precipitation. The detailed knowledge of the distribution, intensity and spatiotemporal variability of precipitation is a fundamental prerequisite for hydrological flood modelling and subsequent operational flood risk management. For hydrological modelling, temporal and spatial high resolution precipitation data can be provided through meteorological models, where all meteorological scales from synoptical to regional and local scales (catchments of small rivers) are considered simultaneously. To eliminate the scale discontinuity especially on the regional scale between meteorological (several kilometres) and hydrological modelling (few hundreds of metres) and to capture convective processes and orographic effects properly, high spatial and temporal resolution modelling is necessary.

By way of example the Elbe river flooding event of 2002 in eastern Germany is used for sensitivity studies conducted with the Lokal-Modell of the German Weather Service (DWD). These included the effect of changes in time step, orographic filtering and different large-scale initial and boundary data (GME and ECMWF). To evaluate the variability of precipitation, temperature and humidity fields, modified in a physically consistent way (increased up to 5 K and 50%, respectively) were used as initial and boundary data. This should simulate a warmer and more humid atmosphere. Additionally, the synoptic fields were shifted against the orography in four directions at different scales up to 20 grid points (approx. 150 km). The impact of these modifications on the precipitation fields will be discussed. Using the fields as input for hydrological models, scenarios of what might happen if the weather conditions vary

in a reasonable way can be provided and be put to good use for preventive flood risk management.