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Assessment of subdaily precipitation from the ALARO-0 model at different spatial resolutions

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A recent study on the evaluation of 30 year summer precipitation (1961-1990) over Belgium from the ALARO-0 model, has demonstrated that the new parameterizations within the model that are centered around an improved convection and cloud scheme, are responsible for a correct simulation of extreme daily precipitation at various horizontal resolutions of 40 km, 10 km and 4 km. In this work, the ability of the ALARO-0 model to simulate precipitation at subdaily timescales is assessed through comparison with a precipitation time series of 10 minute rainfall data recorded at the Royal Meteorological Institute of Belgium at Uccle (Brussels). First results show for the 30-year averaged hourly summer precipitation values an improvement in the representation of the daily cycle of convection for the higher resolution model simulations (10 and 4 km).

Subsequently, this study is extended to a validation by means of temporally high-resolution observational data. The Generalized Extreme Value (GEV) distribution is fitted to the annual precipitation maxima and intensities for different aggregation times. It is known that the estimated GEV parameters such as the location and scale parameter, have a power law of the aggregation times. This means that if the parameter values are known for one particular aggregation time, they are also known for all other aggregation times only by applying a scaling factor. It is found that the observed scaling properties are very well reproduced by the highest resolution simulation at 4 km. From this scaling property Intensity-Duration-Frequency (IDF) relations can directly be derived. Based on hourly precipitation from a two times 30-year dynamical downscaling simulation (1961-1990 and 2071-2100) with the ALARO-0 model driven by CMIP3 global climate model output, future changes in subdaily precipitation (extremes) under the A1B scenario are also assessed.