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Spatio-temporal characteristics of extreme precipitation from RCMs and NWPs on different scales

Emma Dybro Thomassen (1,2), Hjalte Jomo Danielsen Sørup (1), Ole Bøssing Christensen (2), Peter L Langen (2), and Karsten Arnbjerg-Nielsen (1)

(1) Department of Environmental Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark (edth@env.dtu.dk), (2) Danish Meteorological Institute, Copenhagen, Denmark

It is believed that the development of convection-permitting Regional Climate Models (RCMs) at a spatial scale of a few kilometers will enable a better description of precipitation extremes at the sub-hourly scale. This study examines the spatio-temporal characteristics of extreme precipitation based on model output with varying scales from 0.75km to 12km. Hourly model output from RCMs and Numerical Weather Predictions (NWPs) is used to determine the added benefit in describing properties of extreme events of increased resolution. RCM-downscaled reanalyses of current climate are used in order to compare differences in spatio-temporal properties between RCMs and NWPs. The study area covers the mainland of Denmark.

Extreme events are identified, based on the maximum intensity grid cell for each time step over the available data periods and sampled by a Peak Over Threshold method. This method ensures that the sampled extreme events are most likely to be convective events. Due to the dynamics of convective events it is expected that the description of these events will benefit most from a higher resolution. The spatial correlations of the sampled extreme event are compared between the different resolutions.

Each extreme event is characterised by means of 16 variables describing the spatio-temporal properties of the events, e.g. duration, maximum volume, spatial coverage and heterogeneity, and movement of cells. In the time step with the maximum intensity, each event is further described with five variables describing the number and variation of intensity of the present rain cells given a threshold. The added benefit of increased resolution is then quantified by comparison to statistical properties of observed extreme precipitation for the same region.