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Temporal variability in a stochastic precipitation field simulator

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The space-time statistics of short-term precipitation is studied for two cities in northern Europe, and related to radiosonde observations. The motivation is to construct the temporally varying parameters needed to drive a stochastic short-term precipitation generator. Moments, intermittency, semivariograms, temporal covariance and advection parameters need to be characterised in order to produce realistic scenario simulations for extreme value estimation at different scales. It is hoped that the temporal variability in these parameters can be related to radiosonde data.

Hourly values from 46 precipitation stations within a 100*130 km2 region around Copenhagen during the period 1979-2012 is analysed. Bi-daily radiosonde profiles are present from 1969 to 2006. These soundings (vertical profiles of temperature, dew point and wind vector) describe the atmospheric moisture content and convective potential of the current weather situation. Preliminary analysis show that some of the indices extracted from the 12h radiosonde data show good temporal autocorrelation, supporting interpolation to match the 1-hour precipitation data. The precipitation data show a rapidly decreasing temporal autocorrelation function (typically below 0.5 above approx. 12 km), indicating that there is a high variance fraction below scales that the station network is able to reveal.

The second data set consists of 7.5-minute C-band radar data from Trondheim, available from June 2013 to October 2015. During the 2014 and 2015 summer seasons, around 25 tipping-bucket precipitation gauges within a 15*20 km area supply observations with temporal resolution down to minute-scale. Nearby radiosonde data are available bi-daily from 1963 to 2015. These data will be explored to provide insight in high-frequency spatial and temporal variability not detectable from the long-term Copenhagen data set.

The analysis is a part of the EU-7FP project "Pearl" (http://www.pearl-fp7.eu/, Greve case study), the Norwegian RFF project "Regnbyge-3M" (http://web.rosim.no/regnbyge3m/, Trondheim case study), and the Energi Norge project "Stochastic Weather Generator". Analysis is ongoing.