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The inclusion of local-scale effects within the spatial interpolation of daily precipitation in Norway

Cristian Lussana, Ole Einar Tveito, and Jean-Marie Lepioufle

Norwegian Meteorological Institute, Meteorology and Climate Department - Division for Climate Services - Section for Data and Spatial Analysis, Oslo, Norway (cristianl@met.no)

In the context of spatial interpolation, the boundaries between local-scale and large-scale effects are always difficult to identify. In the case of precipitation, the local scale can be conveniently defined as the information contained in a single observation which is difficult to predict using the neighboring observations only. This work focus on including local-scale effects in statistical interpolation of precipitation.

The MET Norway network of weather stations provides quality controlled measurements of daily accumulated precipitation with a station density adequate to describe the mesoscale. The time period considered ranges from 1981 to 2012.

The spatial interpolation method implemented is purely statistical and it is based on a two-step procedure. In the first step, a triangulation-based procedure predicts values at locations between stations. Analogously, the triangulation-based procedure is used to reconstruct the daily precipitation for each station location through a leave-one-out algorithm, each time without using the correspondent station location in the triangulation construction. In the second step, a statistical interpolation procedure is applied to adjust the precipitation field previously obtained by considering the spatial structure of the differences between observed and predicted values at neighboring station locations. The parameters for the error model used in the statistical interpolation procedure are dependent on the local station density, thus they are variable both in space and in time.

The triangulation procedure filters out the effects of the local-scale in the precipitation field, even though the filter resolution is variable in space and it depends both on local station density and local geographical properties. The statistical interpolation is then used to include plausible local effects in the final field.

After the first step and prior to the statistical interpolation, a correction for the presence of systematic local-scale features has been implemented. Furthermore, both the statistical interpolation procedure and the correction for the presence of systematic local-scale effects are tested in order to include the effect of different weather types.

In this preliminary evaluation of the final daily accumulated precipitation field quality, performed by cross-validation on the MET Norway station network and over the 1981-2012 dataset, the benefits of the overall scheme compared to a triangulation-based interpolation procedure only are discussed.