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Intercomparison of spatialisation methods of daily precipitations over France

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Météo-France DCLIM has developped during the last years different spatialisation methods for daily precipitations over France and has implemented an methodic experiment of intercomparison of performances of these methods.
The methods tested here are developped for climatological needs (not real time). They are based on a network of approximatively 4500 daily rain gauge observations over continental France, including manual rain gauges available only with a delay of one month. The average density is one for 120 km2.
Data of 24 hydrological radars delivering rainfall estimates on a 1 km grid was also used.
The two methods we were most interested in, are based on an association of rain gauge data and radar data.
Radar data needs first a pre-processing. Daily accumulation of the radar estimate is first calibrated with the rain gauges data. This calibration is different from operational real time production of radar rainfall estimate because it gains benefit of the complete rain gauge network available with delay and because it's a local calibration for each radar pixel using information on a radius of 30 km.
The first spatialisation method using rain gauge data and radar data is kriging with external drift (the radar data being the secondary variable). This KED is independant for each radar domain (for convenience of the stability of the variogram at this scale of space). The final product is a mosaïc of the sub-domains.
The second spatialisation method is a thin splate splines method in a 3 dimensional space, the radar data being the third dimension. This method has a smoothing parameter adjusted to a minimal root mean squared errror after cross-validation iterations. This product is, once again, first produced for each radar domain and then a mosaïc is assembled.
Several other methods were also tested. One is based on ordinary kriging of rain gauge data alone and is considered here as a crude reference method. Another product is coming from an operational french atmospheric model on a 8 km resolution grid. Another method is an operational french product combining rain gauges and rada data but processing differently the convective precipitation part and the large scale part. And finally, another product using orography parameters and specifically oriented to rainfall for high elevation mountain was included in the experiment.
All the methods were produced with the same inputs (rain gauges and radar) and intercomparison was on the same periods (years 2010 and 2011) and on the same grids (1km, 5km and 8 km). A random sample of 420 rain gauges was before put aside for validation scores.
Many different scores were computed to cover the different aspects of the performances and specificaly adapted to rainfall data: RMSE (on root squared transformed data), relative bias, contingence table for low of for hard precipitations and deduced skill scores (HKS, HSS, SEEPS).
One interesting conclusion is the fact that, in all cases, introducing radar data improves the performances of the methods. We tried to analyse differences according to the seasons, the orography, the convective or non convective precipitation type, the specificity of the mediterranean climate. The radar data was in all cases an source of improvement. However, there is limitation: radar data must be of sufficient quality and it's not yet the case for areas of high elevation on the Alps and the Pyrenees.
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