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Forecasting the weather
- ensemble techniques
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Mean wind speed and wind gust interpolation with French network and Arome model data

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Application for poster session CL5 Climatological references mapping, spatial interpolation and GIS Analysis

Title: Mean wind speed and wind gust interpolation with French network and Arome model data.

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A method for spatial interpolation of mean wind speed and wind gust was tested after the storm Xynthia over France the 28th February 2010. The selected method is in two steps, first a multiple regression then a kriging of residues of this regression.
We start with hourly observations of mean wind speed and wind gust at synoptic and automatic stations of continental France. After withdrawal of poor quality data and unrepresentative stations, around 450 points of measurement are kept with the current network which represents an average of a station for a square of side 35 km. The candidates predictors are coming from data of the model Arome and from Digital Terrain Model (DTM). The target grid is the same as the operational products of the model Arome with a 0,025dg regular resolution. The DTM is the one from the project SRTM adapted to the 0.025 grid.
The predictors finally selected from Arome for the regression are the following: mean wind speed at 10 m, gust, wind stress, mean wind speed at 850 hPa and 500 hPa, MSLP. The predictors coming from the DTM are: elevation, zonal and meridian components of the slope vector, coefficient of concavity/convexity, standard deviation of elevation of neighboring points. After the multiple regression, we have a residue at each point of observation. We realise an ordinary kriging of these residues onto the 0,025dg grid to spatialized them. Then we sum the part coming from the regression and the part coming from the kriging.
To validate the method, we drive the process with 90% of the observation (learning sample) and compute the performance on the remaining 10% (test sample). The RMSE scores for the day of the storm Xynthia (24 hourly maps) vary around 1,5 m/s for mean wind speed and 2,5 m/s for the gust. The mean relative error is around 20 and 30% of the observed measurement if we take all values but only around 10 and 20% if we focus only on the observation above 16m/s (about 60 km/h).
This result is interesting but leaves an important uncertainty. To strengthen the validation, we processed a set of dates in 2010 for which we had strong winds over France: 30th of March, 4th of May, 14th of July, 8th and 10th of November. The result is the best possible with this method of regression+kriging, considering the network of observations available. The data of the model Arome brings an important contribution to the quality of the result. The performance is significantly improved when considering the synoptic network for which there is an assimilation in Arome.