

**Improved representation of forecast error dynamics
using an increased size for ensemble 4D-Var data assimilation at Météo-France**

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Assimilation of observations in numerical prediction models, such as the Météo-France global ARPEGE system, relies on accurate description of spatial correlations of forecast errors, as these allow observations to be spatialized. The estimation of these correlations is currently based on an ensemble data assimilation system containing 6 perturbed 4D-Var members and a temporal average over the 4 most recent days. This provides about one hundred forecasts in order to estimate correlations, which are recomputed once a day.

A new version of the ARPEGE ensemble 4D-Var assimilation has been developed, based on 25 members, a temporal average reduced to one day and a half (instead of 4 days), and an update of correlations every 6 hours (instead of 24 hours).

The figure illustrates that a more frequent update of correlations enables to account for the geographical variations of horizontal correlations length scales, estimated on 15 November 2013 at 06UTC and at 12UTC respectively. One can observe in particular that these length scales evolve significantly over 6 hours in this area, which is linked, among other things, to the displacement of low pressure systems.

Impact studies indicate that this improved representation of correlations, associated to the increase of ensemble size, allows improved forecast quality. This new version of the ensemble assimilation also allows the 35 members of the ARPEGE ensemble prediction system to be better initialized, by providing 25 independent initial perturbations.

These evolutions will be part of the version of the ARPEGE system which will be made operational in 2015.

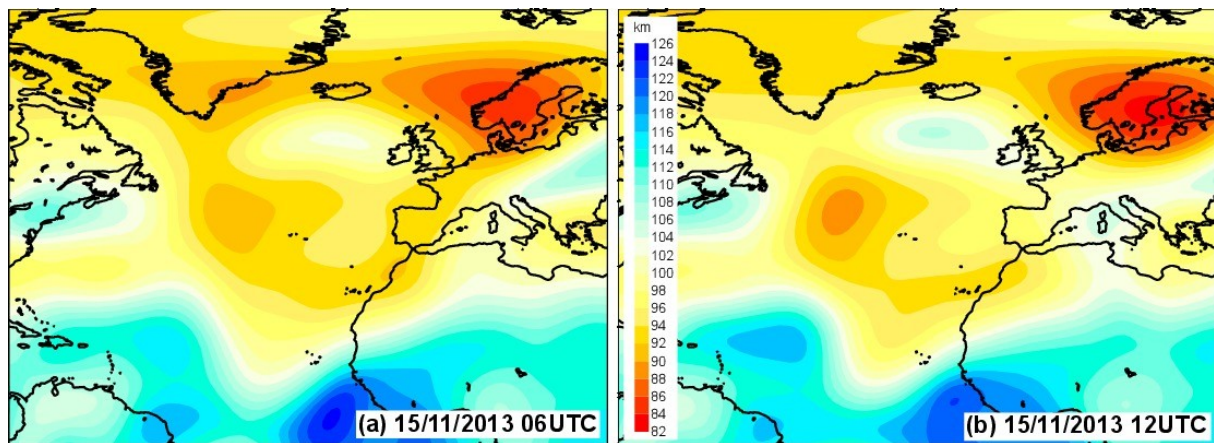


Figure 1 : Horizontal length scales of forecast correlations errors of wind near 300 hPa (9.2 km height, colour shading, in km), estimated 15 November 2013 at 06UTC (a) and at 12UTC (b). The length scale of a local correlation function is a measure of its spatial extension.

References :

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