



HIRLAM Regional 3D-VAR and MESAN down-scaling re-analyses for the recent 20 year period in the FP7 EURO4M project

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In the EURO4M project, SMHI has produced a 22 km grid resolution re-analysis for a large European-North Atlantic area for most of the 1989-2010 period. It will be completed early 2014. ERA-Interim re-analyses are used in two ways: for the lateral boundaries and for a novel large scale forcing in the 3D-VAR minimisation. There is an extra cost function, J_k , measuring the distance to the ERA 500 hPa vorticity in the largest scales. The soil and snow properties over Sahara and Greenland, respectively have been corrected in the HIRLAM Reference system. Ice cover has been taken from ERA-Interim.

There has been extensive evaluation at SMHI of a) analysis and forecast increments b) differences of analyses and first guess to observations and c) difference statistics with respect to ERA-Interim and d) validation against satellite and precipitation analyses by other partners.

The evaluation shows that there is a model drift in the HIRLAM system but it is corrected in the analyses and the assimilation is stable. There are clear benefits due to the high horizontal resolution in the HIRLAM fields compared with ERA-Interim.

The second step in the SMHI re-analysis consists of downscaling the HIRLAM 22 km fields to 5 km and 2 dimensional meso-scale analyses of precipitation, near surface temperature, humidity and wind. The SMHI MESAN system has been enhanced in the downscaling, particularly for wind, and 5 km analyses for most of the 20 years are being produced this year.

MESAN uses specially adapted structure functions in its analysis and for the new MESCAN system developed at Météo France. An ensemble based variational method has been developed to replace the Optimum Interpolation method.