

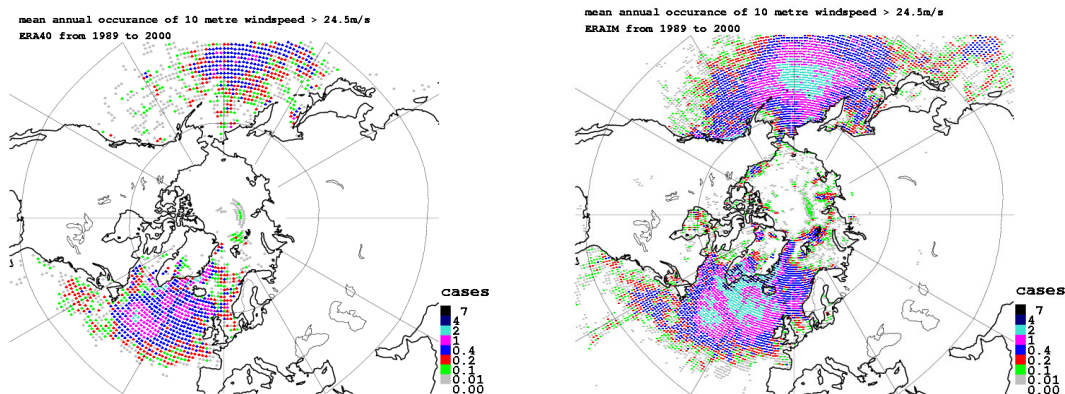
Windstorm frequency in ERA-40 and ERA-Interim
Per Källberg
(per.kallberg@smhi.se)
Swedish Meteorological and Hydrological Institute
SE-60176 Norrköping, Sweden

In a joint European project (Preview/Windstorm) multi-ensemble forecasts of severe windstorm events were made for the winter seasons 2006-2007 and 2007-2008. Web-based forecasts were provided for about 200 sites in Europe, targeted directly at local end-users in the various national civil protection agencies. To estimate possible damages to be expected from a predicted windstorm event, end-users benefit from information on the climatic occurrence of events of similar magnitude in the past. ERA-40 was selected to be the basis for historical windstorm information at the selected sites.

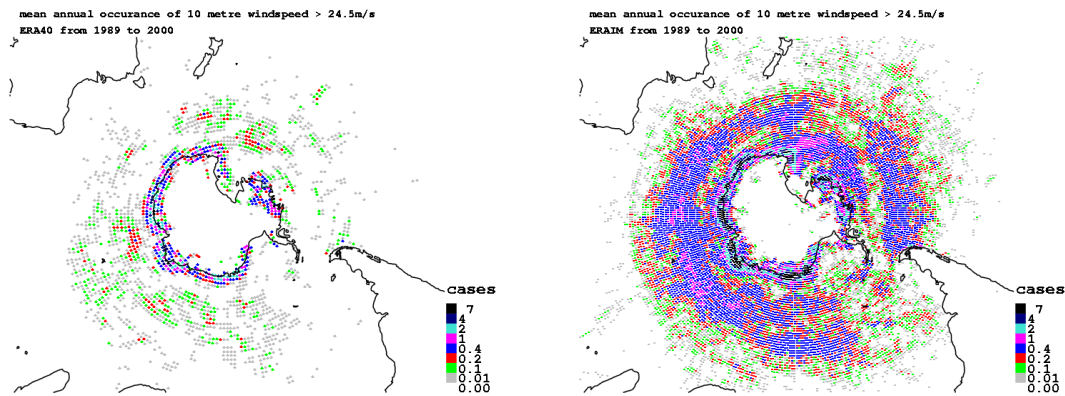
With its spatial and temporal resolution of 125km/6hours the ERA-40 analyses can not be expected to provide the full magnitude of windstorms. The windstorm frequency statistics assembled from ERA-40 for the 200 sites was found to underestimate strong winds when compared with available observations.

With the advent of the new ERA-Interim reanalysis it is interesting to compare the windstorm frequencies in the two re-analyses. ERA-Interim is made with a higher resolution, ~80 km compared to the ~125km of ERA-40. Also, ERA-Interim is made with 4-dimensional variational analysis (ERA-40 was 3-dimensional) and with an upgraded analysis system and forecast model. In particular a new variational bias-control of satellite radiances has been introduced. (see Uppala & al., Dee & al. and Kobayashi & al. at this Conference for details about ERA-Interim). The same observations were presented to both data assimilations.

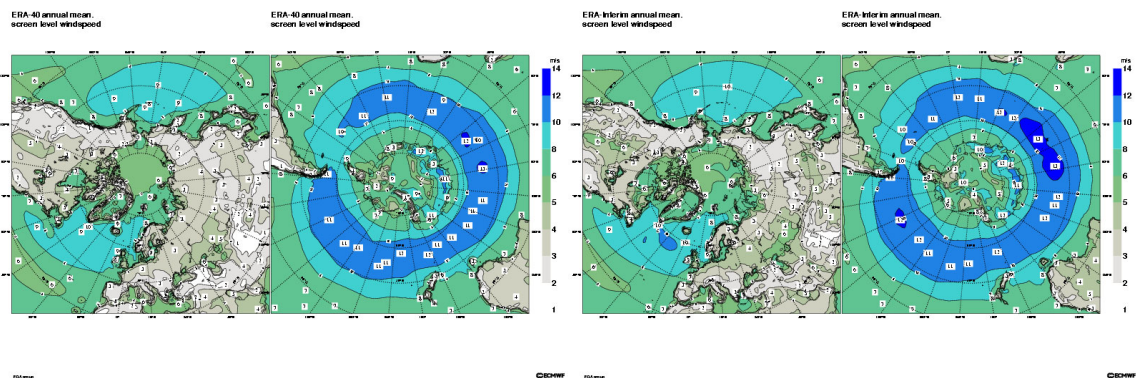
The frequency of very high 10-metre wind-speed is quite different in the two reanalyses. The two maps below show the annual mean counts of winds exceeding 24.5 m/sec ('storm force 10' on the Beaufort scale) on the northern hemisphere. The map on the left shows ERA-40 and the map on the right ERA-Interim. All occasions with speed exceeding the force 10 limit were counted over the years 1989-1998 and normalized to 'per year'. The coloured dots show the counts in the original model ('reduced Gaussian') geometries.



In the southern hemisphere the differences between the two reanalyses are even larger. Also note the high frequency of storm force winds near the Antarctic coast in the ERA-Interim analyses (to the right)



Although the storm force counts are so different in the two reanalyses, the mean wind-speed is not that dissimilar. This is seen in the last two maps where ERA-40 is on the left and ERA-Interim on the right.



Conclusion:

The two ECMWF reanalyses, ERA-40 and ERA-Interim are quite different with respect to the frequency of high ('storm force') 10-metre wind speed. The mean over the ten years 1989-1998 is not too dissimilar, while the windstorm frequencies are very different. There are two important differences between ERA-40 and ERA-Interim that may contribute.

- The ERA-40 resolution was somewhat lower (~125km) than that of ERA-Interim (~80km)
- The analysis technique is 4D-Var in ERA-Interim and 3D-Var in ERA-40
- A new bias-correction method for satellite radiances was used for ERA-Interim.

Without further experimentation it is not possible to determine the major reason for the differences.