ERA-Data for Range Tests in Marine-Meteorological Data Quality Check Programs

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Operational quality control of marine-meteorological in situ observations

At the German Meteorological Service (Deutscher Wetterdienst, DWD) in Hamburg, marine-meteorological data, measured by ships, buoys or other platforms from all parts of the world's oceans are operationally quality checked.

An important tool for the error diagnostics is the climate comparison test. This has been done by checking the recorded parameters against the appropriate climate extremes basing on ship's and buoy's measurements. Up to now, these ranges have been defined for 5° x 5° grid boxes by the maximum and minimum values of in situ data stored in the DWD archives. As the data base is unevenly distributed in space and time, this method is not feasible in many sea areas. However, for standardized quality checks, a defined climatology is a basic prerequisite.

Reanalyses provide improved climate ranges

Consistent climatologies can better be deduced from reanalyses data which are evenly distributed in space and time. Therefore tests have been made with the ECMWF 40 Year Reanalysis (ERA-40). As first step, for each month and parameter absolute minima and maxima were determined for 1° x 1° grid boxes. The climate ranges are define d by the extremes enlarged by one standard deviation taking 1961 to 2000 as reference period. The use of these ranges for quality control gives good results for air temperature checks by showing an increased number of erroneous data, see Fig. 1.

The air temperature checks are improved by using ERA-40-data. However, minima of sea surface pressure data are insufficiently reproduced.

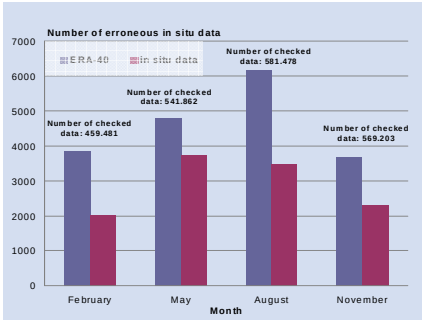

Fig. 1: *Comparison of monthly numbers of 2 m air temperature errors found by climate checks based on ERA-40-data and in situ observations for the period 1951-2000*

Differences between ERA Interim and ERA-40 extreme value ranges

Comparisons show no substantial differences between ERA Interim and ERA-40 extreme value ranges for the 2 m-temperature and the sea surface temperature. For high wind speed and intense low pressure systems major differences between ERA-40 and the ERA Interim ranges can regionally be found (Fig. 2a, b), especially in the southern middle latitude.

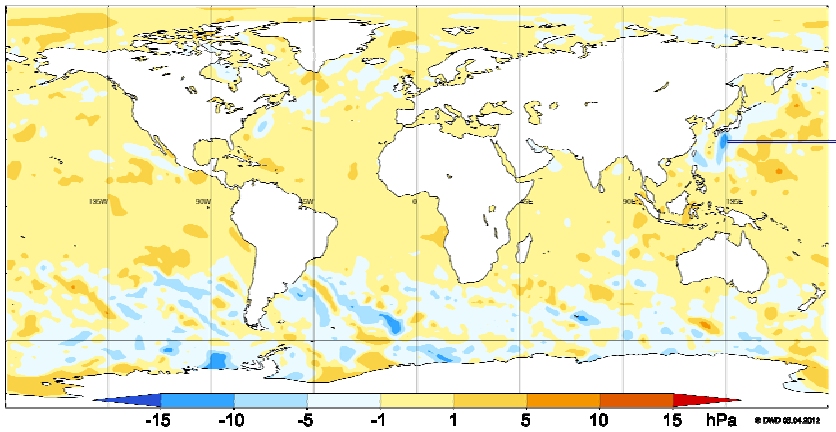

Fig. 2a*: Sea level pressure differences between grid box minima of ERA Interim and ERA-40 in July, 1981 -2000.*

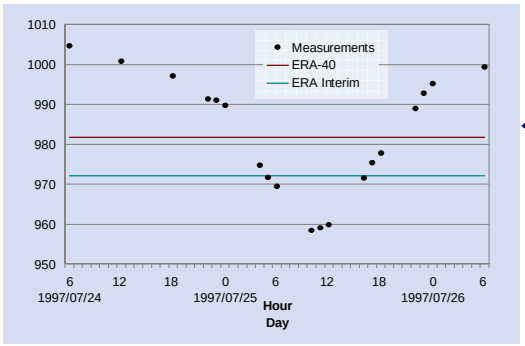

Fig. 2b: *Sea level pressure data of an automatic measuring station (position 28.9°N; 134.9°E) and absolute mini mum values for July of ERA-40- and ERA Interim between 1981 and 2000 in the corresponding 1°x 1°grid box.*

ERA Interim-data provides improved results

New ranges basing on the higher resoluted ERA Interim output for the period 1981 to 2010 have been tested. As the examples in Figure 3 show, the extremes of ERA Interim deviate obviously less than those of ERA-40 from measured pressure minima. The correctness of each minimum was individually confirmed.

Consequently, ERA Interim extreme value ranges will be used for the operational quality control of marine-meteorological in situ observations in future.

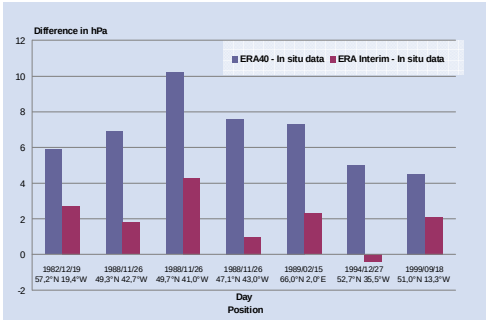

Fig. 3: *Differences between absolute ERA-40 resp. ERA Interim minima and 1°x 1°boxes for the period 1981-2000 and measured minimum of sea level pressure .*

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