RAOBCORE - new homogeneity adjustments for the global radiosonde temperature dataset

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RAOBCORE is an acronym for "RAdiosonde OBservation COrrection using REanalyses". A first version of a homogenized global radiosonde temperature dataset has been generated with RAOBCORE. It contains homogeneity adjustments for 1184 radiosonde stations for the period 1958-2004 and is available from http://www.univie.ac.at/theoret-met/research/raobcore/index.html.

It is demonstrated that many breaks in time series from raw unhomogenized radiosonde records can be effectively removed by analysing the time series of innovations from a global climate data assimilation system. The temperature innovations used are differences between radiosonde temperatures and the 6h background forecasts of the ERA-40 assimilating model. The innovations have been archived with full (6-hourly) resolution during the ECMWF 40-year reanalysis (ERA-40) from 1958-2001 and are available for almost all digitized radiosonde observations during this period. From 2001 onwards innovations from the operational ECMWF data assimilation system have been used. Their time series are analysed with a variant of the Standard Normal Homogeneity Test. The breaks found at selected well documented stations are consistent with independent estimates gained by radiosonde intercomparison experiments and intercomparisons of time series from neighbouring well documented radiosonde sites.

Trends from the homogenized temperature records are spatially much more coherent than trends from the raw records. Therefore they seem better suited for analysing climate signals in the upper atmosphere and for use as input for future climate data assimilation efforts. The cooling trend observed in the stratosphere, especially in the tropics during the period 1979-2004, is reduced significantly (by 0.2 K/decade) and agrees better with trends from MSU measurements. Trends before 1979 can be evalu-

ated mainly for the northern hemisphere. Substantial homogeneity adjustments of radiosonde temperatures (2-5 K in 50 hPa) had to be applied at several regions (France, Russia, Japan) in the pre-satellite period.

In view of these encouraging results it seems feasible to apply the method also to radiosonde wind data.

RAOBCORE also reveals problems in the satellite data assimilation during ERA-40. Some prospects for improvements of the method are discussed as well.