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Homogenization of Antarctic Radiosonde Temperature Time Series using ERA-Interim Innovation Statistics

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RAOBCORE (Radiosonde Observation Correction using Reanalysis) is a method to homogenize radiosonde temperature time series and was developed at the Institute for Meteorology and Geophysics at the University of Vienna by Leopold Haimberger. RAOBCORE uses differences between the observations and the background forecast from ERA-40 reanalyses (so-called innovations) to find and correct artificial breaks. This worked insufficiently in the antarctic, because there is a too strong Brewer-Dobson circulation in ERA-40 during the last years, which led to vertically inconsistent temperature trends in the polar regions, especially in the antarctic. There is a very strong annual cycle in the ERA-40 innovations for antarctic radiosonde stations and the inhomogeneities in the background forecast caused by changes in the available satellite data are larger than in the global mean. Meanwhile the new ERA-Interim reanalysis is available and it is much more homogenous in the antarctic region and therefore a better reference for homogenizing radiosonde data since 1989. The annual cycle is much smaller in ERA-Interim than in ERA-40 innovations and the vertical structure of the temperature trends is more realistic.

In the new RAOBCORE version breaks in antarctic radiosonde temperature time series are only corrected if at least five surrounding antarctic stations are available as a reference for calculating the break size. Breaks prior to 1989 are practically not correctable without neighbour stations, because ERA-40 innovations are still used until 1989 and the background forecast has large inhomogeneities due to changes in satellite data. The effect of the improvement in the correction calculation for antarctic stations and using ERA-Interim innovations on homogenization of the antarctic radiosonde temperature time series was investigated.

With the new corrections the time series correspond much better to the antarctic mean and the spatial homogeneity of radiosonde temperature trends is improved. The break size calculation method has more influence for breaks prior to 1989 than in the ERA-Interim period.