Antarctic tropospheric temperature trends in reanalyses and radiosonde data

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The Antarctic and subantarctic regions pose many problems for data collection, reanalyses and numerical modelling. The weather and climate in these domains are strongly influenced by complex topography, a range of atmosphere-ice-ocean interactions, intense inversions, strong baroclinicity, katabatic flow, etc. and, partly because of their remoteness, are poorly serviced by *in situ* observations. Many studies have made assessments of the quality of reanalysis products in the Antarctic region. For example, Bracegirdle et al. (2012) compared surface and radiosonde data from staffed Antarctic observation stations with output from five modern reanalyses for the period 1979-2008.

The radiosonde network in Antarctica provides a key data source for assessing analysis products and determining the nature of trends. A coherent Antarctic radiosonde network commenced in 1957-8, and the SCAR READER project (Turner et al. 2004) assembled these in convenient form and also undertook intensive (though basic) quality control of these records. More recently a number of groups have produced 'homogenised' sets of these observations which, in various ways, have accounted for changes in radiosonde type or observing practice over time. These sets include HadAT2 (Thorne et al. 2005), RICH-obs and RICH-tau (Haimberger et al. 2008), RAOBCORE (Haimberger et al. 2012), and IUK (Sherwood et al. 2008).

We have taken the seasonal **means** over these homogenised sets ('HOMOG'), and further averaged their 500hPa temperature over the eight available stations for the extended period 1961-2010 (other levels are considered in Screen and Simmonds (2012)). Fig. 1 shows these times series, and makes clear that their overall trends differ from those gleaned from the 1971–2003 period alone. The seasonal 1961-2010 temperature trends in both READER and HOMOG are all positive and all are significant with the exception of HOMOG in summer ($p = 0.12$).

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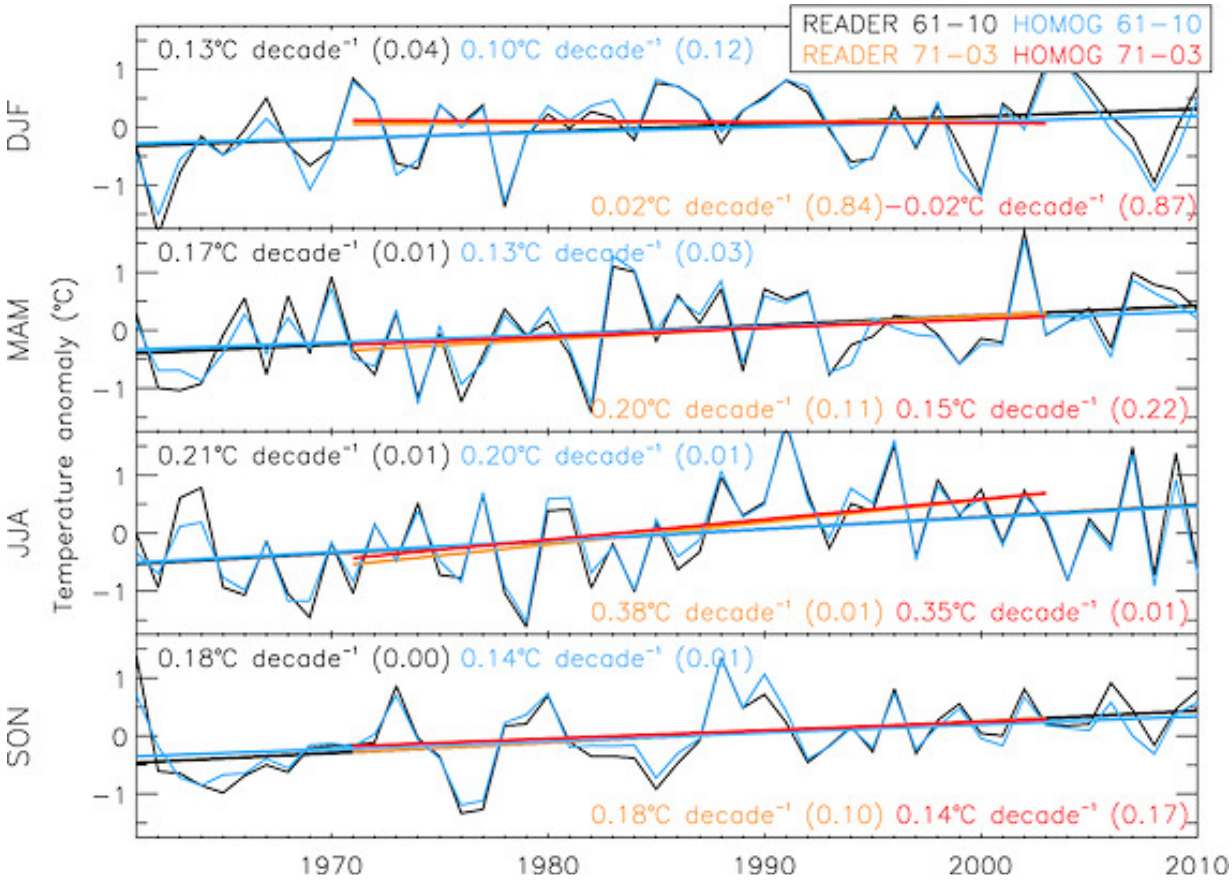

Figure 1: Seasonal multistation-mean 500 hPa temperature time series for READER (black) and HOMOG (blue). Also shown are the linear trends over two time periods, 1961–2010 and 1971–2003. The coloured numbers provide the regression slopes and their statistical significance (p; in parentheses).