

Ice core evidence of 200 years of Antarctic climate change and its connections with the Southern Annular Mode

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A sparse network of meteorological observations in Antarctica extends back only to the late 1950s, making it difficult to characterize Antarctica's climate behavior in the context of natural climate variability and global warming. We show that composites of stable isotope (δD and $\delta^{18}O$) time series from several sub-annually dated ice cores closely track 40 years of interannual variations and trends in the instrumental record of Antarctic mean temperatures. Using this calibration, we construct a temperature history since 1800 from ice cores. This time series, representing Antarctic temperatures (especially outside of the Peninsula), has a much smaller positive trend since the 1850s than is seen in the global and Southern Hemispheric means of instrumental records. An independent, station-based reconstruction of the Southern Annular Mode (SAM) since 1905 is also presented. The relationship between the reconstructed SAM and the reconstructed temperature time series is consistent with that observed between the actual modern indices, although both reconstructions have relatively high uncertainties at this stage.