

Insights into 20th-Century Antarctic and global climate change from ITASE (and other) high-resolution stable isotope records

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In this presentation I will highlight three recent papers that make use of the detailed, well-dated ice core stable isotope records from ITASE and related projects. I will then discuss how these new records may be incorporated into modeling studies. The new records fill in a large data gap in meteorological observations that has complicated the understanding of climate variability and the detection of climate change over the Antarctic as a whole, and particularly the West Antarctic ice sheet. In the first paper (Schneider et al., 2006), we presented an annual-resolution reconstruction of Antarctic mean surface temperatures over the past two centuries. The reconstruction shows large year-to-year and decadal scale variability connected to the Southern Annular Mode, but also a detectable 20th Century warming trend. In the second paper (Schneider and Noone, 2007), we evaluated the covariance of water isotope records in a global network of ice cores spanning twentieth-century climate change. It was found that while Greenland and Antarctic isotope records have distinctive signals, when analyzing globally distributed records collectively, clear signals of the major patterns of global climate variability emerge. These include the signatures of ENSO, the Northern and Southern Annular modes, and the 20th-century warming trend. In the most recent paper (Schneider and Steig, 2008), we combine several West Antarctic records into a stack spanning the 20th-Century. We find very large anomalies during the 1936-45 decade. This period was previously known to have been warm at high Northern latitudes, but was unknown in the high Southern latitudes. Our record shows warmth in the West Antarctic that we hypothesize was driven by the large 1939-42 El Nino event that was unprecedented in its long duration (3 years). These results suggest that tropical warming, whether associated with an El Nino event or with long-term climate change, exerts a strong influence on West Antarctic climate.

Schneider, D.P., E.J. Steig, T. van Ommen, D. Dixon, P.A. Mayewski, J. Jones, and C. Bitz, 2006: Antarctic temperatures over the past two centuries from ice cores, *Geophysical Research Letters*, 33, doi:10.1029/2006GL027057.

Schneider, D.P., and D.C. Noone, 2007: Spatial covariance of water isotope records in a global network of ice cores spanning twentieth-century climate change, *Journal of Geophysical Research*, 112, D18105, doi:10.1029/2007JD008652.

Schneider D.P., and E.J. Steig, 2008: Ice cores record significant 1940s Antarctic warmth related to tropical climate variability, *Proceedings of the National Academy of Sciences*, in press 7/2008.