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A New Method for Testing Depth-Age Models and the Impact of Sampling Strategies

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This study examines how ice core sample resolution and temperature information recovery are linked. New ice core instrument techniques can allow for very high resolution sampling of physical and chemical constituents. These new advances suggest a new need to understand what information can be gleaned from high resolution ice core observations. We present a new method which will aid decision making about instrument specifications, and ice core allocations, for sampling stable water isotopes in ice cores (Sime *et al.* submitted).

ECMWF ERA-40 year reanalysis time series of temperature and precipitation are converted to 'pseudo core' depth-series. The sampled temperature values are compared with the original time series. This quantifies how ice core sample resolution affects potential temperature recovery. Pseudo core temperatures are transferred back onto time using three different depth-age transfer assumptions: (1) a perfect depth-age model; (2) a depth-age model constructed from a single or dual annual tie-points; and (3) a cross-dated depth-age model.

We show firstly, that the mean seasonal temperature cycle must be removed to allow accurate assessment of anomaly recovery potential. Secondly, for perfectly dated cores, some Antarctic Peninsula sites need around 5-15 samples per year, for reasonable sub-annual temperature reconstructions. Thirdly, we show very high frequency anomaly recovery may be possible, where 50-90 samples per year can be recovered (and where ice cores can be near-perfectly dated).

These initial finding suggest that their is some potential in very high resolution multi-ice-core study of centennial-scale Antarctic Peninsula climate (Sime *et al.* 2009, Sime *et al.* submitted).

Sime, L. C., G. J. Marshall, R. Mulvaney, and E. R. Thomas (2009), *Interpreting temperature information from ice cores along the Antarctic Peninsula: ERA40 analysis*, **Geophys. Res. Lett.**, 36, L18801, doi:10.1029/2009GL038982.

Sime, L. C. Lang, N. Thomas, E. R. Benton, A. K. Abram, N. J. and Mulvaney, R. (submitted) *Sampling Water Isotopes along the Antarctic Peninsula: Pseudo Cores and Ice Cores* **Journal of Geophysical Research - Atmospheres**