



A piecewise continuous regression analysis of del 18-O Antarctic ice-core records to identify trends and timing of climate behaviour.

M. Fischer and D. Fink

Australian Nuclear Science and Technology Organisation (mjf@ansto.gov.au / Phone: +61-2971-79686)

The Southern Hemisphere INTIMATE project (INTEgration of Ice, MARine and TERrestrial records) is a core INQUA Paleoclimate Commission program which seeks to define an event stratigraphy for the Southern Hemisphere for the period 32000 - 8000 years BP. In addition to correlating various proxy continental records of environmental and climate change from Australia and New Zealand for this period, a complimentary approach is to use objective statistical techniques to analyse high resolution data sets to determine time segments which show common modes or trends of behaviour. Motivated by recent literature in segmented regression, we develop this method to investigate the presence of common modes in the timing and amplitude of oxygen isotopes in Antarctic ice-cores. Segmented (or piecewise continuous) linear regression models contain a series of linear fits to the raw data that are joined at breakpoints. The number and position of the breakpoints are simultaneously optimised, together with the regression coefficients. In this respect, the technique effectively detrends the raw data series to allow inter-comparisons with other like proxy records. This study compares how the choice of different linear models (for example, mean, weighted mean, median, and York regression models), optimisation techniques (evolutionary and colony/swarm techniques), and inference methods (different ways of bootstrapping) affect the outcomes of the piecewise regression modelling. Following optimisation, the timewise residual variance for each segment can be compared for ice-cores across the Antarctic continent. This provides a robust method to assess the reliability of the fit for different segmented linear regression models and identify common Antarctic wide modes of climate change.