



# Integration of Ice-core Marine and Terrestrial records (INTIMATE\*)

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\*INTIMATE is a core-project of the INQUA Palaeoclimate commission: <http://www.geo.uu.nl/fg/intimate>

## INTRODUCTION

The time period from 30-8 ka cal. BP covers the Last Glacial-Interglacial Transition (LGIT), and includes the Last Termination as recognised in the North Atlantic region. The rapid climate changes that occurred during the LGIT, have stimulated the palaeoclimate research community to study this period intensively. This is not only because it provides the opportunity to investigate the nature of the climate changes in high-resolution, but also to test hypotheses on the mechanisms behind the abrupt changes using palaeoclimate modelling. This makes the LGIT one of the most thoroughly investigated of all geological episodes. The principal objective of the INTIMATE project of the INQUA Palaeoclimate Commission is to synthesise marine, terrestrial, and ice-core data for the Last Glacial-Interglacial Transition. For correlation, precise dating of the records from the different realms is imperative. The development of an event-stratigraphy for the Last Glacial-Interglacial Transition (Björck *et al.*, 1998) provided a template to compare other, independently dated, palaeoclimate records with the high-resolution Greenland oxygen isotope records.

## RECENT DEVELOPMENTS

The event-stratigraphy has recently been refined and updated to the new NGRIP record using the GICC05 timescale (Lowe *et al.*, 2008), which will be used by the Northern Hemisphere INTIMATE project (see figure 1). An additional basis for correlation in for instance the North Atlantic region is provided by tephrochronology. Both visible and microtephras form valuable time-parallel marked horizons in marine and terrestrial sediments, and also in the ice-core record (Lowe *et al.*, 2008). See also the posters by Pyne-O'Donnell *et al.* and Eiriksson *et al.* in this session. Although the North Atlantic region seems to record the climate changes as seen in Greenland, clear differences can be observed in the registration of the climate signal between the southern and northern Hemispheres (see Figure 2). The Antarctic Cold Reversal (ACR) began more than 1000 years before the onset of the Younger Dryas in the north, but not in direct 'anti-phase' with the Bølling-Allerød (GI-1) warming in the north. The term 'Mystery Interval' (Denton *et al.*, 2006) indicates that there are substantial issues that remain to be solved.

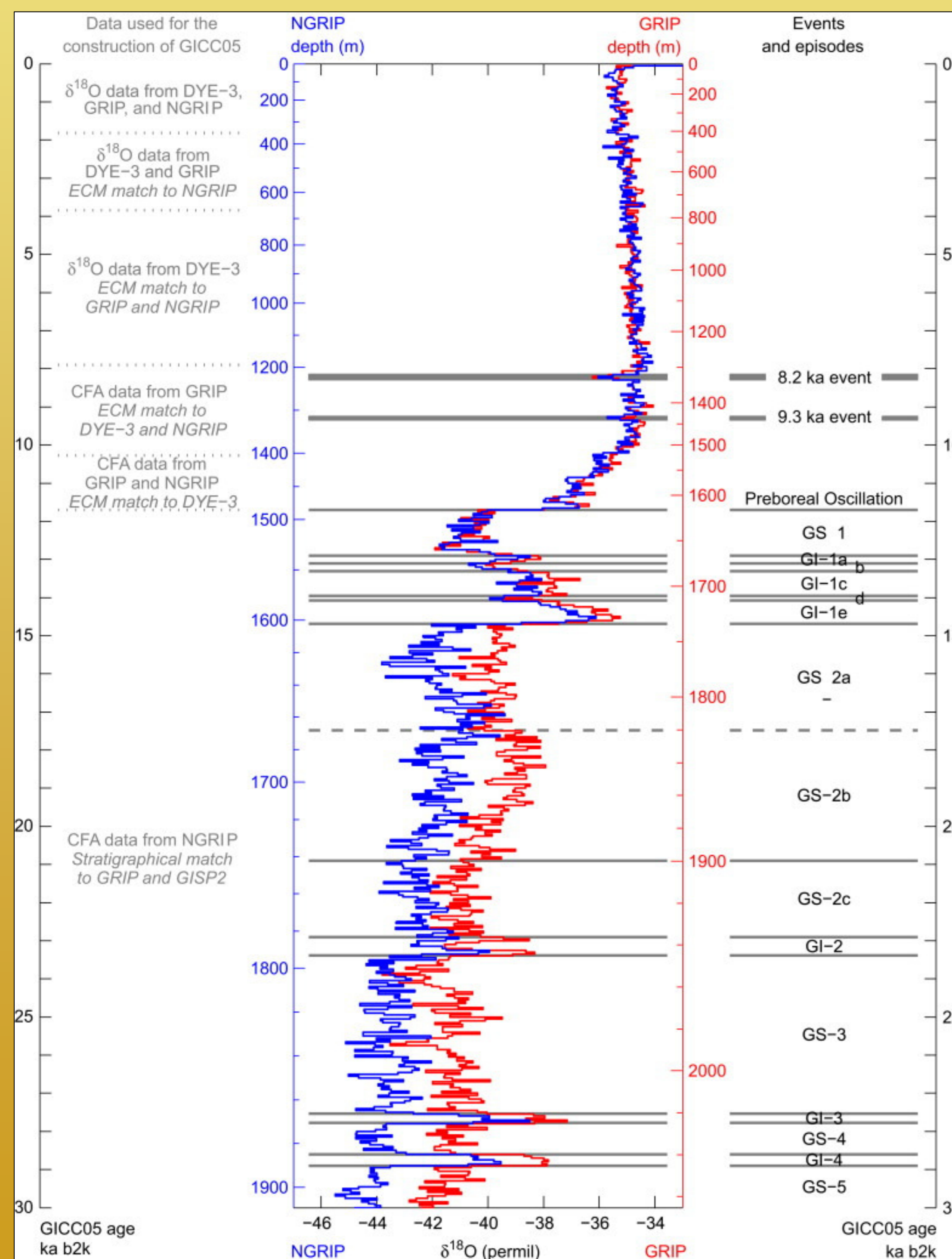


Figure 1: Comparison of the  $\delta^{18}O$  records for the NGRIP and GRIP ice-core records for the last 30,000 years at a 50-year resolution, showing the INTIMATE event stratigraphy in the right-hand column (Lowe *et al.*, 2008).

## FUTURE WORK

The specific goals of the Northern Hemisphere INTIMATE project, in close collaboration with the Southern Hemisphere INTIMATE project, are:

- explore the potentials of time-stratigraphic marker horizons in ice-core, marine, and terrestrial records over the last 30 ka;
- reduce the uncertainties in timing of events for the different environments, (e.g. spatial and temporal differences in marine reservoir ages);
- determine spatial patterns of events and gradients in subject regions;
- compare the results from the spatial and temporal reconstructions with palaeoclimate model results;
- to examine the (global) correlation of abrupt climatic events over the time period from 30 ka.

INTIMATE is a scientific network bringing together scientists working on the causes and consequences of the climate and environmental changes during the Last Glacial-Interglacial Transition. For more information about the project contact Wim Hoek.

Within the framework of INTIMATE, regular workshops are held which focus on the correlation of records, mechanisms of rapid climate change and understanding of sea – ice – atmosphere interactions during the Last Glacial-Interglacial Transition. The 10th INTIMATE Workshop will take place at the University of Oxford in September 2008 and will be hosted by the Research Laboratory for Archaeology and St Antony's College (<http://www.rlaha.ox.ac.uk/INTIMATE/intimate.html>).

For more information on the workshop contact Simon Blockley ([simon.blockley@rlaha.ox.ac.uk](mailto:simon.blockley@rlaha.ox.ac.uk), but also around somewhere here in Vienna).

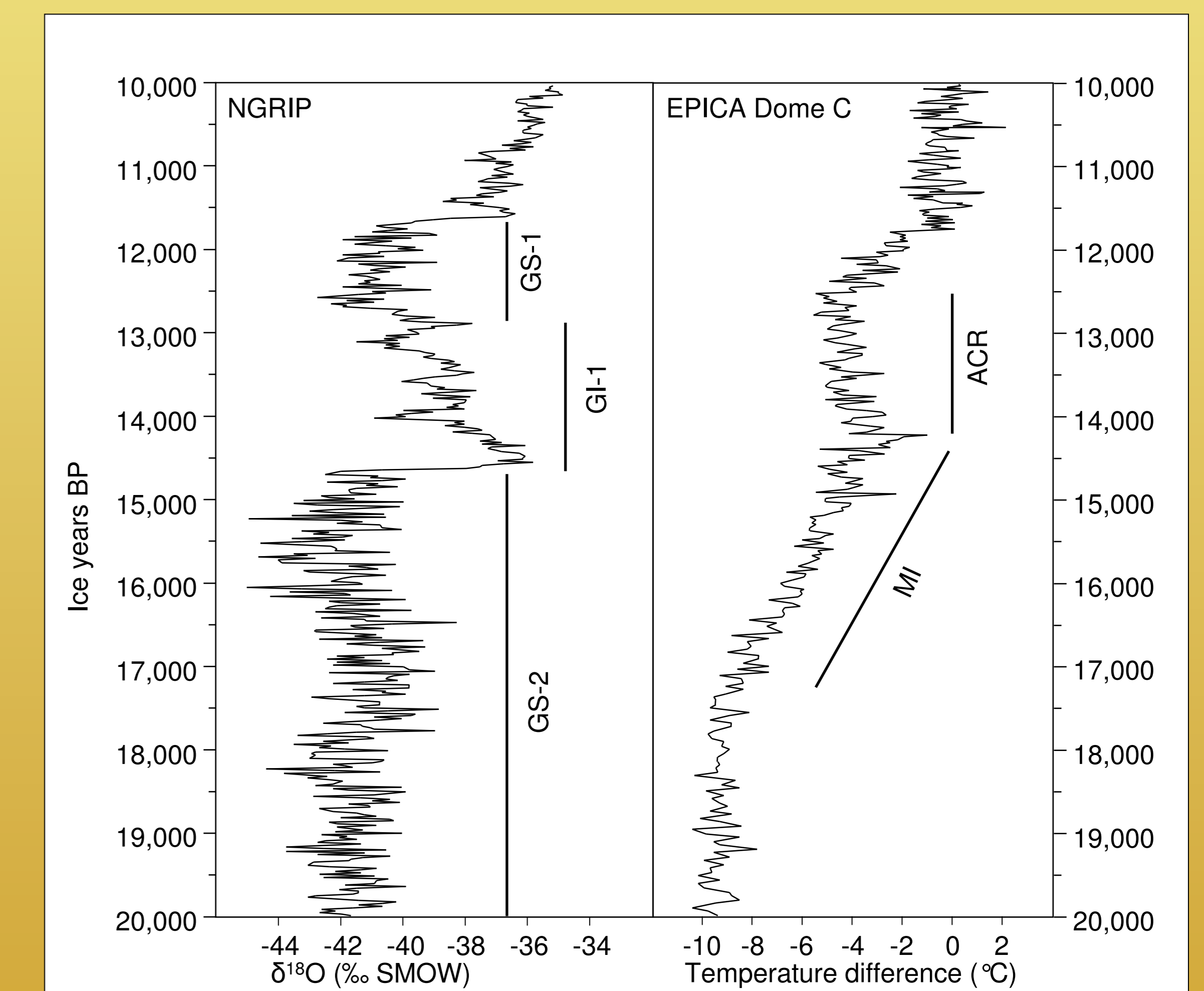


Figure 2 Comparison of the Greenland NGRIP oxygen isotope record (after Rasmussen *et al.*, 2006 and Lowe *et al.*, 2008) and the inferred temperature difference record from the Antarctic EPICA Dome C record (Jouzel *et al.*, 2007). The Greenland Isotope events (GS-1, GI-1 and GS2) are clearly not coinciding with the Antarctic Cold Reversal (ACR) and Mystery Interval (MI).

## References:

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- Lowe *et al.* (2008) Precise dating and correlation of events in the North Atlantic region during the Last Termination: a revised protocol recommended by the INTIMATE group. *Quaternary Science Reviews*, 27, 6-17.
- Rasmussen *et al.* (2006) A new Greenland ice core chronology for the last glacial termination. *Journal of Geophysical Research*, 111, D06102, doi:10.1029/2005JD006079.