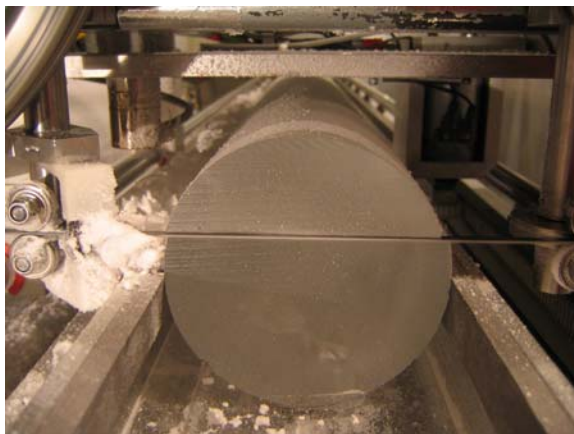
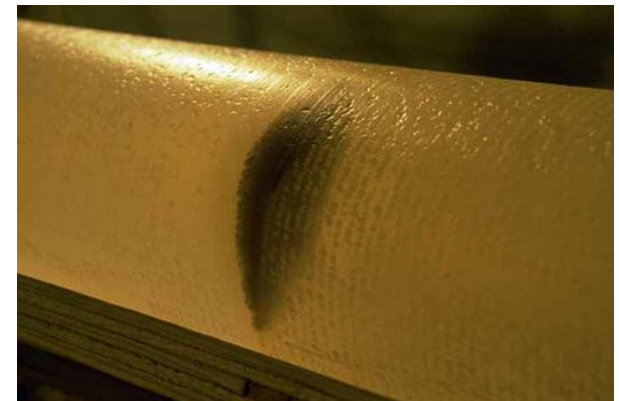


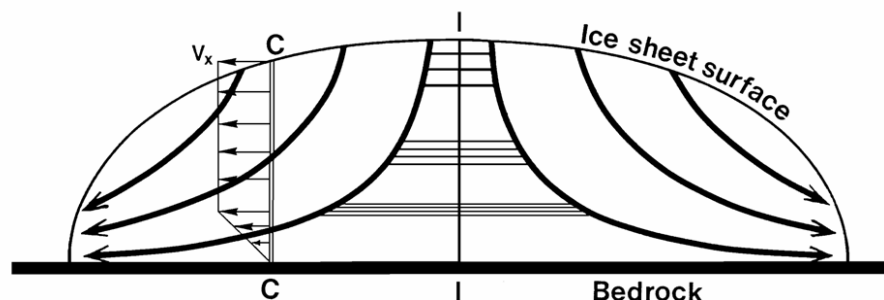
# Dating of terrestrial ice cores :

- Identify and count annual layers
- Synchronize with reference horizons
- Orbital matching/tuning
- Modelling

Z2 –  $54.5 \pm 2$  kyr BP  
(NorthAtlantic Ash Zone II)



# NorthGRIP time scale model 'ss09sea'



Two fix points:      End of Younger Dryas at 11,500 BP  
                            End of Marine Isotope Stage 5d at 110 kyr BP

Accumulation rates obtained from  $\delta^{18}\text{O}$ , assuming a relation:  $\text{Acc} = \text{Acc}_0 \cdot \exp(b \cdot \Delta\delta^{18}\text{O})$

Thinning of annual layers with depth calculated by ice-flow model

Correction for past shifts in sea water  $\delta^{18}\text{O}$

Johnsen, S.J., et al., Journal of Quaternary Science, 16 (4), 299-307, 2001.

# Reconstructions of past accumulation rate

An example from the EPICA Dome C core, the Eastantarctic plateau (Cauquoin et al 2015)

- 1) Assuming a physical link between moisture content and temperature of air masses:

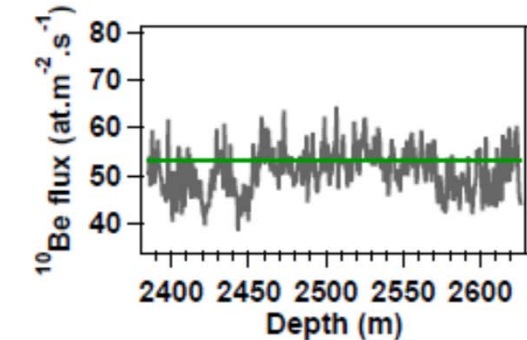
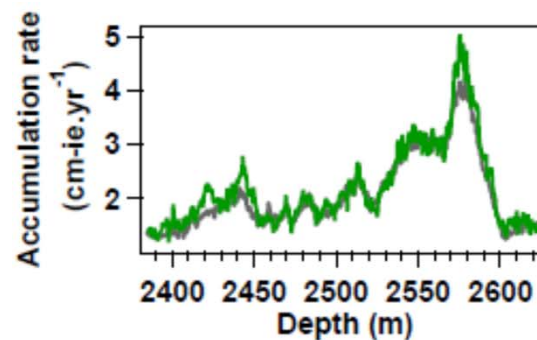
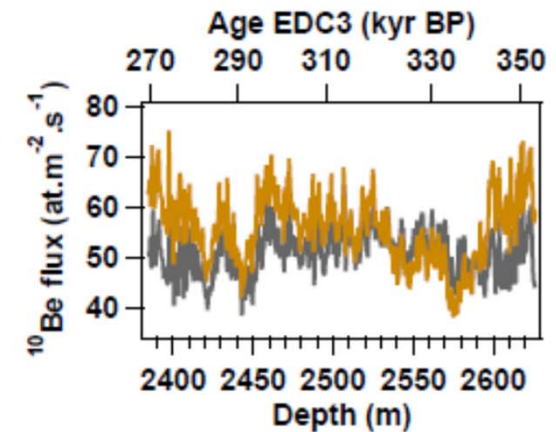
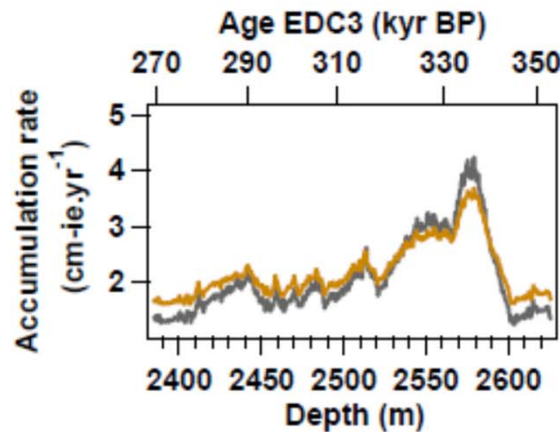
$$Acc = Acc_0 \cdot \exp(b \cdot \Delta\delta^{18}O)$$

- 2) Using  $^{10}Be$  and assuming a constant deposition flux.  $^{10}Be$  is produced by cosmic rays interacting with the atmosphere.

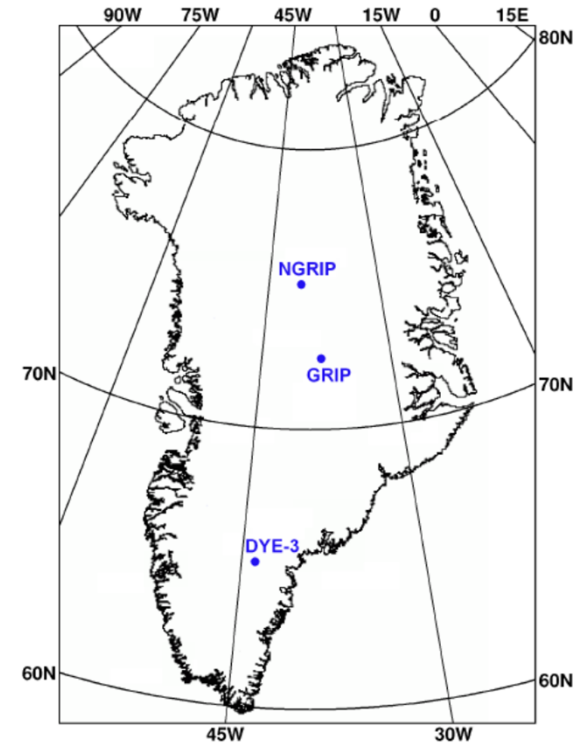
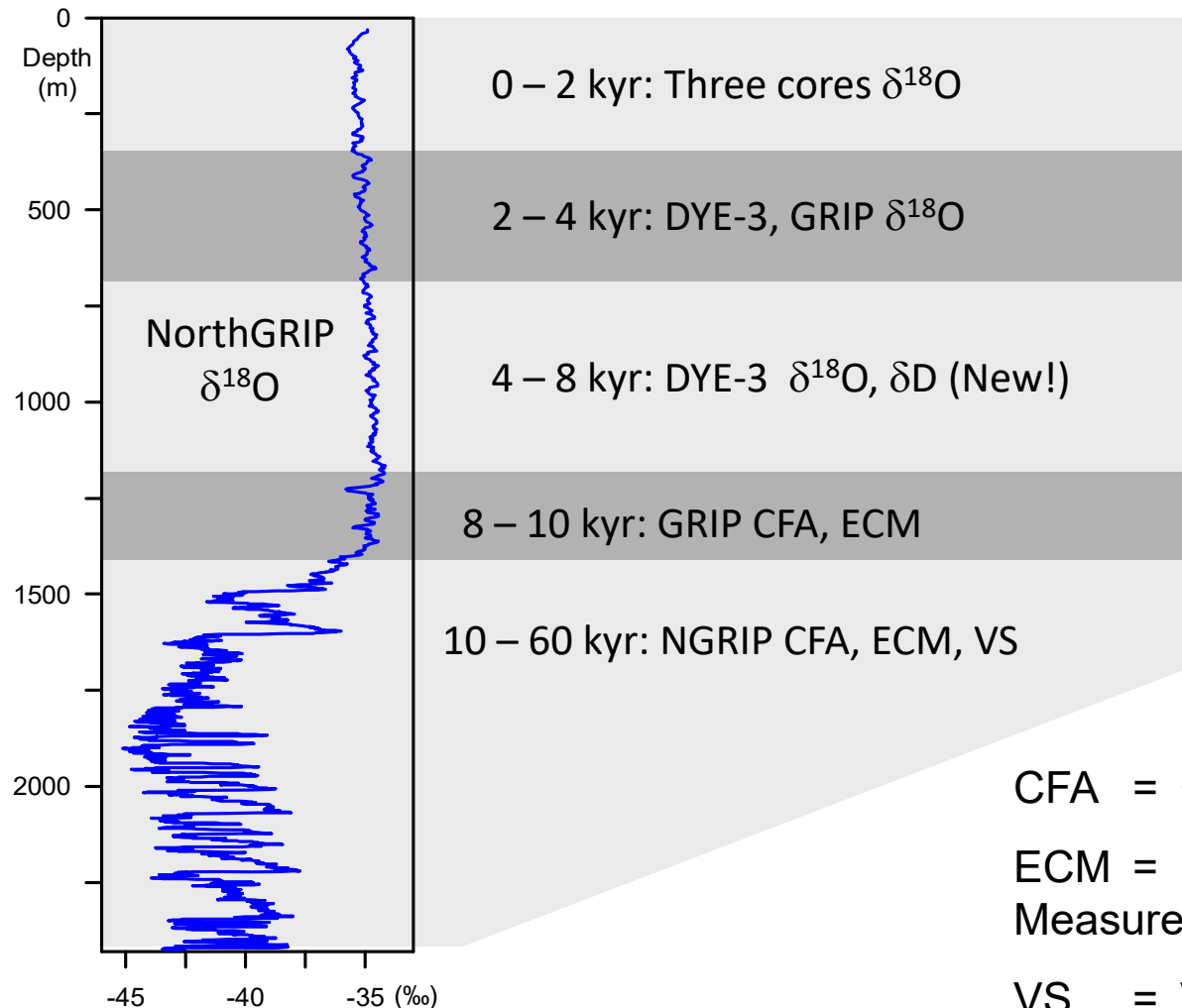
Variations in  $^{10}Be$  flux are linked to variations in

- 1) the geomagnetic field,
- 2) solar activity

Reconstructed accumulation rate      Corresponding  $^{10}Be$  flux



# The Greenland Ice Core Chronology 2005 (GICC05)



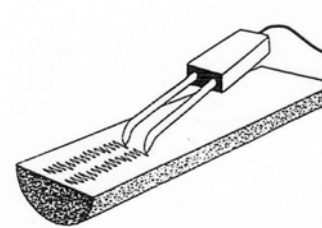
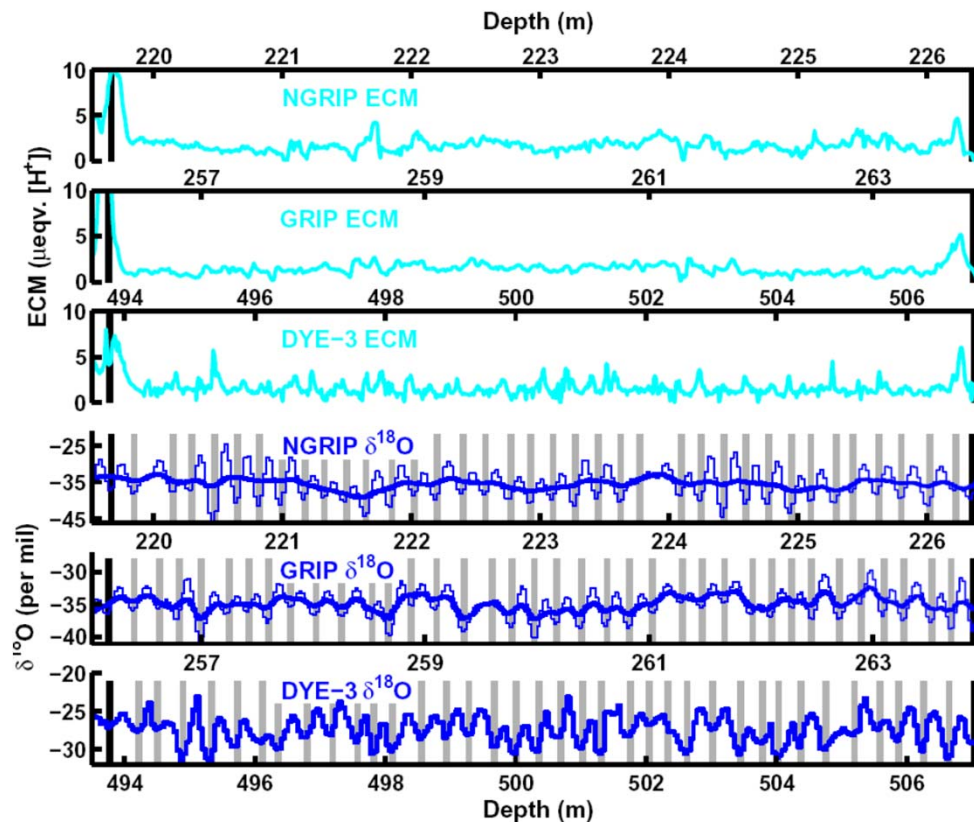
CFA = Continuous Flow Analysis

ECM = Electrical Conductivity  
Measurement

VS = Visual Stratigraphy

# Datasets and acknowledgements

## DYE-3, GRIP, and NorthGRIP stable isotopes and Electrical Conductivity Measurements (ECM)



Claus U. Hammer

Dorthe Dahl-Jensen

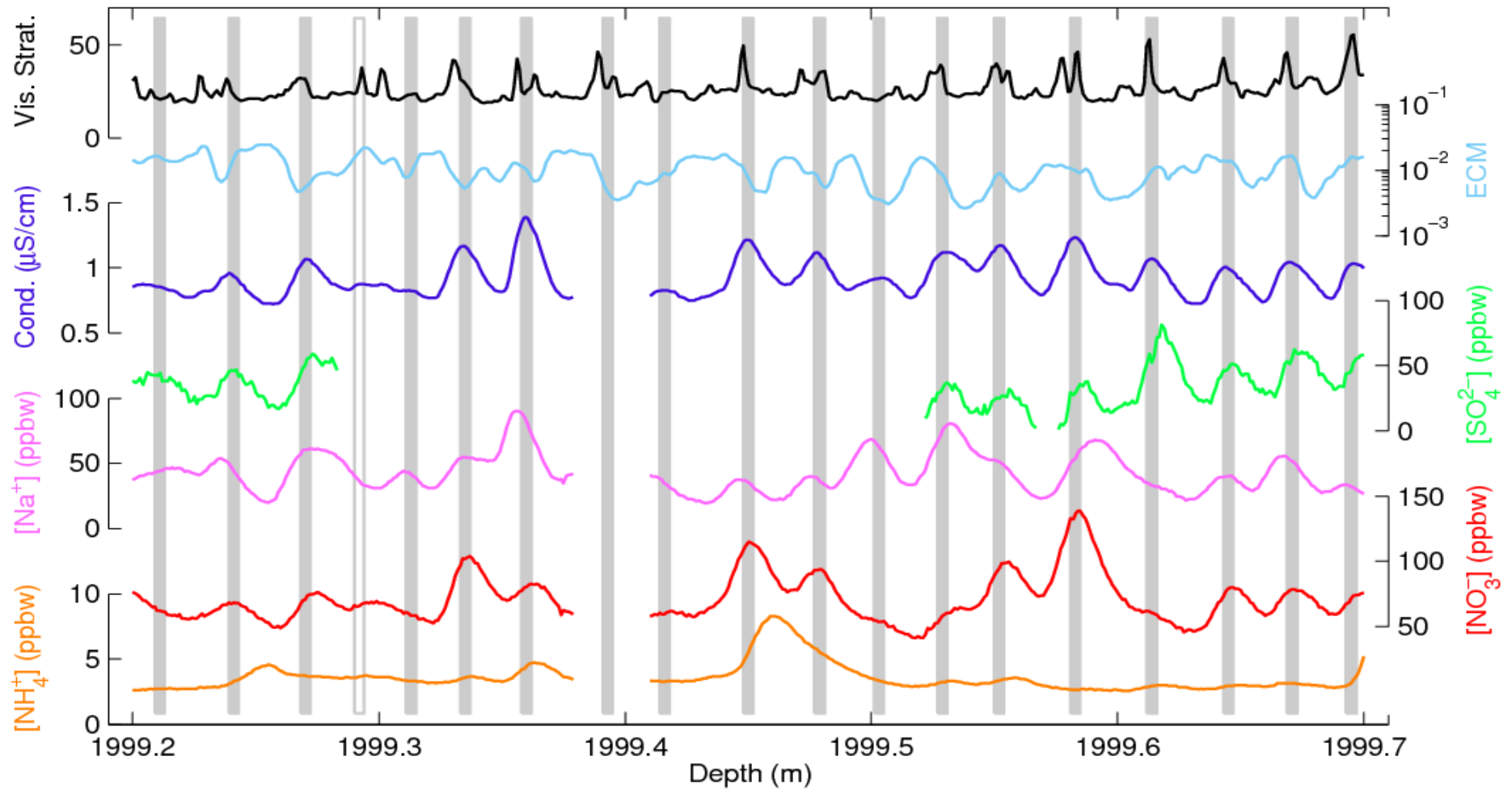
Dansgaard et al., *Nature*, 364 (6434), 218-220, 1993

Johnsen et al., *JQS*, 16 (4), 299-307, 2001

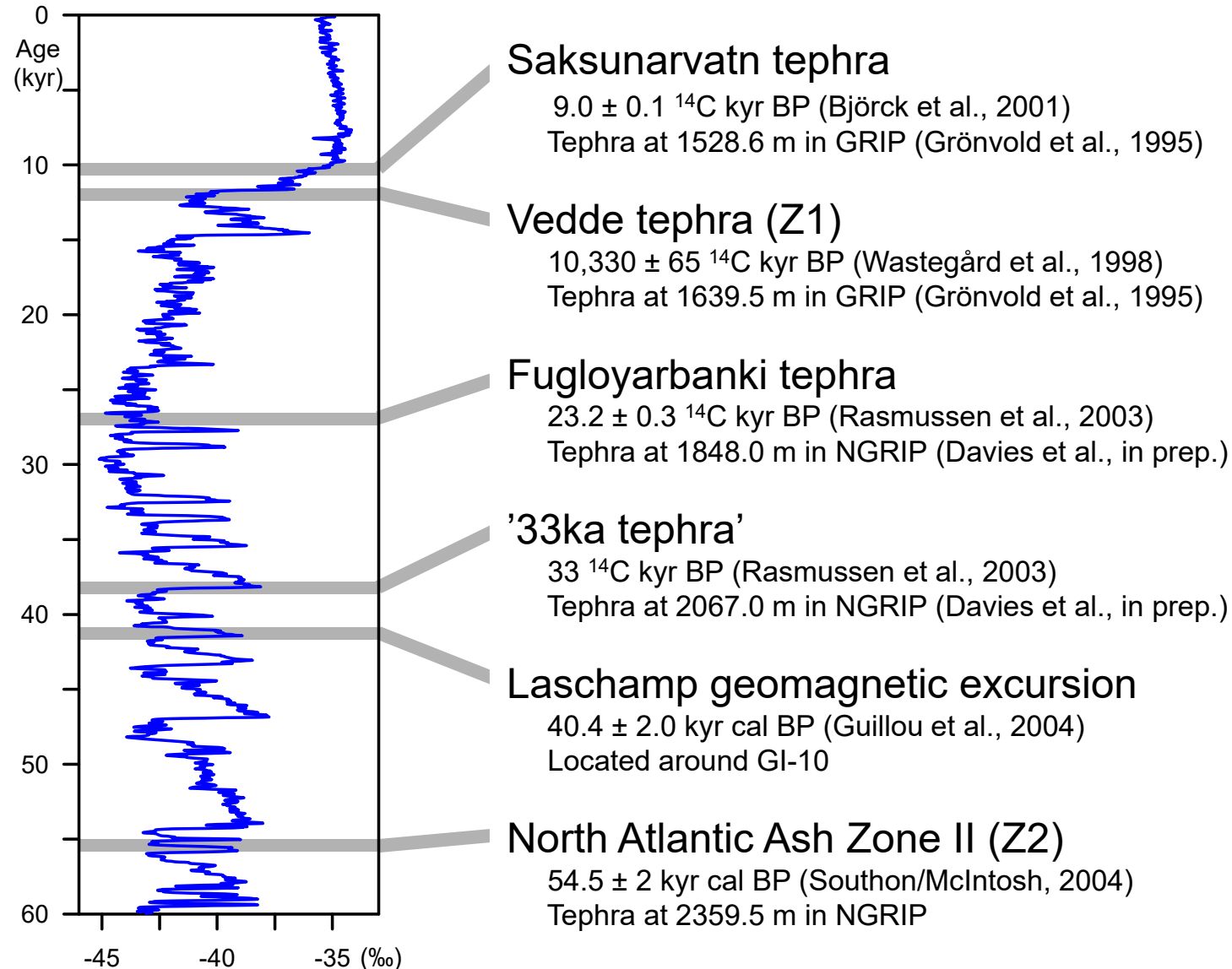
NorthGRIP Members, *Nature*, 431, 147-151, 2004

Vinther et al., *JGR*, doi:10.1029/2005JD006921, 2006

# Annual layer counting in a mild glacial period Greenland Interstadial 7 (GI-7), 35 kyr BP



# Reference horizons



# GICC05 – Radiometric ages

