Geophysical Research Abstracts
Vol. 14, EGU2012-5265, 2012
EGU General Assembly 2012

On the Delta-depth along the EPICA Dome C ice core

F. Parrenin, S. Barker, T. Blunier, J. Chappellaz, V. Masson-Delmotte, J. Jouzel, A. Landais, J. Schwander, and D. Veres

CNRS/LGGE, St Martin d Heres, France (parrenin@ujf-grenoble.fr, 00 33 476824201)

We compare a variety of methods for estimating the gas/ice depth offset (Δdepth) at EPICA Dome C (East Antarctica). 1) Purely based on modelling efforts Δdepth can be estimated combining a firn densification with a ice flow model. Observations allow direct and indirect estimate of Δdepth. 2) δ15N gives directly the diffusive column height from which Δdepth can be estimated using an ice flow model. 3) Using δ15N as a gas phase temperature proxy and assuming that CH4 changes in concert to temperature changes gives a direct observation of Δdepth ; 4) ice and gas synchronisation of the EDC ice core to the NorthGRIP, EDML and TALDICE ice cores shifts the Δdepth estimates into climatic regions where the firn model is proven to give reliable results. However, this method is rather indirect. ; 5) the bipolar seesaw hypothesis allows to convert Antarctic temperature proxies into a Greenland temperature curve. Again assuming that CH4 is basically a northern temperature signal we are able to obtain an estimate of Δdepth.

The bipolar seesaw antiphase relationship is generally supported by the ice-gas cross synchronisation to the NGRIP, EDML and TALDICE ice cores. We therefore judge method 5 as reliable. Consequently and confirmed by corroborative evidence the glaciological model overestimates the glacial Δdepth at EDC and we suggested that it is due to an overestimation of the glacial Close Off Depth by the firn densification model. In contrast we find that the glaciological model underestimates the Δdepth during termination II.

Applying the bipolar seesaw hypothesis to the deeper secton of the core can help improving our reconstruction of the thinning function and thus of the EDC age scale.