Geophysical Research Abstracts
Vol. 13, EGU2011-2994-1, 2011
EGU General Assembly 2011

Atmospheric carbon dioxide from 115,000 to 38,000 years BP and its implications for changes in the carbon cycle

Bernhard Bereiter, Dieter Lüthi, Michael Siegrist, Thomas F. Stocker, and Hubertus Fischer

Climate and Environmental Physics, Physics Institute, University of Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland, and Oeschger Centre for Climate Change Research, University of Bern, Switzerland

The relationships between temperature changes in the southern hemisphere (AIM-events), abrupt climate changes in the northern hemisphere (DO-events) and atmospheric CO_2 concentrations during the last glacial period provide insight in the natural carbon cycle on millennial timescales. From the long-term evolution of the CO_2 concentration over the period of the last glacial inception, hints about how the carbon cycle adjusted to glacial conditions can be deduced. We present two overlapping atmospheric CO_2 records with sub-millennial resolution from two different Antarctic ice cores (Talos Dome and EPICA Dronning Maud Land) covering the time period from 38,000 to 115,000 years BP to investigate the carbon cycle under these two aspects. The availability of highly resolved records of the methane concentration from both cores together with the characteristic that methane marks the onset of DO-events with a very pronounced and sharp increase allows us to synchronize the two data sets over the period of the overlap and compare the relationship between DO-events and CO_2 evolution with a minimum of temporal uncertainty. First, the data confirm the strong link of AIM-events and CO_2 during the whole period of the record. Second, the high-resolution data indicate that the onset of DO-events is not always coincident with the CO_2 maxima between 38,000 to 60,000 years BP (MIS 3) as described previously. On the other hand, such a synchronism is confirmed for earlier DO-events between 70,000 and 115,000 years BP (MIS 5). This different behavior of the CO_2 concentration during the millennial scale events together with sediment proxies for ocean circulation and carbon stock changes over the period of the record, leads us to the hypothesis that this difference may be associated with a mode change of the meridional overturning circulation of the Atlantic ocean at the transition from MIS 5 to 4, which results in different contributions of the ocean carbon stock to the atmospheric CO_2 concentration during DO-events.