Geophysical Research Abstracts,
Vol. 11, EGU2009-8907, 2009
EGU General Assembly 2009

Lack of Southern Ocean paleoproductivity changes in biogenic aerosol records in the EPICA ice cores

P. Kaufmann (1), F. Fundel (2), H. Fischer (1,2), E. Wolff (3), M. Hansson (4), R. Udisti (5), J.P. Steffensen (6), M. De Angelis (7), and D. Wagenbach (8)

(1) University of Bern, Climate and Environmental Physics, Physics Institute, University of Bern, Switzerland (hubertus.fischer@climate.unibe.ch), (2) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven Germany, (3) British Antarctic Survey, Cambridge, U.K., (4) Department of Physical Geography and Quaternary Geology, Stockholm University, Sweden, (5) Department of Chemistry, University of Florence, Italy, (6) Niels Bohr Institute, University of Copenhagen, Denmark, (7) Laboratoire de Glaciologie et Géophysique de l'Environnement (LGGE), CNRS-UJF, Saint-Martin-d'Hères, France, (8) Institute for Environmental Physics, University of Heidelberg, Germany

The Southern Ocean (SO) has been recognized as a key player in explaining glacial/interglacial carbon dioxide changes. In general two principal hypotheses have been put forward to explain a glacial drawdown of carbon dioxide in the SO: a) changes in SO overturning circulation and b) an enhanced biological export production in the SO due to iron fertilization. The latter is suggested by the 20 times higher glacial dust flux found in Antarctic ice cores. However, observational evidence for an enhanced biological productivity in the glacial SO is controversial and modeling studies show only a limited capacity of additional carbon uptake by iron fertilization.

Here we present the first high-precision records of biogenic ammonium from the two EPICA ice cores reflecting biomass production in the SO. These records show essential no glacial/interglacial change in ammonium deposition fluxes indicating no change in atmospheric ammonium concentrations and, thus, also little change in the biological productivity in SO surface waters in the glacial. The result from the ammonium record is corroborated by the lack of glacial/interglacial changes in biogenic sulfate, essentially reflecting DMS producing plankton species in the seasonal sea ice zone.

Both ammonium and sulfate fluxes show secondary changes on the order of 20-30%, which are within the uncertainty of the accumulation rate estimate used to calculate deposition fluxes. Nevertheless we investigate in how far these minor changes may be related to dust deposition, sea ice coverage as well as aerosol transport.