Geophysical Research Abstracts, Vol. 7, 05376, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05376

Spectral power analysis of chloride, nitrate and sulphate stratigraphies along the last 800 kyr and their relationship with climate forcing factors

S. Becagli (1), E. Castellano (1,2), M. Severi (1,2), R. Traversi (1), R. Udisti (1), J.R. Petit (3), M. De. Angelis (3), B. Delmonte (4), H. Fischer (5), J.P. Steffensen (6), M. Bigler (6,7), M. Hutterli (7), R. Röthlisberger (7), M. Hansson (8), E. Wolff (9).

(1) Dept. of Chemistry, University of Florence, Italy, (2) MNA, University of Siena, Italy, (3) LGGE - CNRS, Saint-Martin d'Heres, France, (4) Dept. Environmental Sciences, University of Milano-Bicocca, Italy, (5) AWI, Bremerhaven, Germany, (6) Niels Bohr Institute, University of Copenhagen, Denmark, (7) University of Bern, Switzerland, (8) Dept. of Physical Geography and Quaternary Geology, University of Stockholm, Sweden, (9) BAS, Cambridge, UK.

(udisti@unifi.it)

In the framework of the EPICA Project, Fast Ion Chromatographic (FIC) analysis of the ice core drilled at Dome C (up to 3190 m) yielded a continuous high-resolution record of Cl^-, NO_3^- and SO_4^{2-}, spanning the last 800 kyr and covering the last 9 glacial-interglacial cycles. About 140,000 data for each component, with resolution ranging from 2 to 4 cm (1.5 to 25 years), were performed in the field and in the AWI (Germany) cold laboratory on continuously melted firn and ice core sections.

Due to the key role played by MIS 11 as a boundary stage between the different dominance of orbital forcing on the climate cycles, spectral density analysis was applied to Cl^-, NO_3^- and SO_4^{2-} stratigraphies before and after MIS 11 (about 400 kyr Before Present - BP).

The spectrograms were obtained on averaged (100 years) data. This time interval is sufficiently long to smooth high-frequency noise (such as volcanic spikes, for instance) but significantly shorter than the expected periodicities driven by the orbital forcing.

For the last 400 kyr, the three components show the same periodicities as observed in

the isotopic temperature, dust and sodium spectrograms of the Vostok ice core, with distinct peaks at 100, 40, and minor peaks at 22 and 19 kyr, corresponding to the Earth's orbit eccentricity (100 kyr), axis obliquity (41 kyr) and equinoctial precession (23 and 19 kyr) cycles. Additionally, a 29-kyr periodicity is identified in the Dome C chemical profiles that seems to have a counterpart in the power spectrum of the Vostok records.

Before MIS 11, all the mentioned periodicities were confirmed with the exception of the 40-kyr periods, which was shifted towards a longer period (50-kyr) for all the analysed compounds. If confirmed by the spectral analysis carried out on the δD profile, this periodicity shift, in contrast with the persistence of the 100- and 22-kyr periods, could be of interest in understanding the orbital climatic forcing befor and after MIS 11.