Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06802, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06802
EGU General Assembly 2008


# First mineralogical and crystallographic results on dust from the EPICA – Dome C ice core

M. Sala (1,2), M. Dapiaggi (1), B. Delmonte (2), G. Artioli (3), F. Marino (2,4), V. Maggi (2), J. R. Petit (5)

(1) Dept. of Earth Science "A. Desio", University of Milan, Milan, Italy, (2) Dept. of Environmental Science (DISAT), University of Milano-Bicocca, Milan, Italy, (3) Dept. of Geoscience, University of Padova, Padova, Italy, (4) Dept. of Chemistry, University of Florence, Sesto Fiorentino (Florence), Italy, (5) LGGE – CNRS, Saint Martin d'Hères, France (marco.sala1@unimi.it / Phone: +39 02 6448 2846 Fax: +39 02 6448 2895)

Polar ice cores are a natural and undisturbed archive providing key information for the assessment of climatic and atmospheric changes occurred in the late Quaternary at different timescales (Petit et al., 1999; EPICA Comm., 2004; NGRIP Project members, 2004; Watanabe et al., 2003). In particular, aeolian dust trapped in Antarctic ice cores represents an important proxy for tracking past changes in atmospheric circulation, hydrological cycle, transport and climate conditions in the Southern Hemisphere.

We investigate the mineralogical composition of mineral particles archived in ice cores in order to get paleo - environmental information which are complementary to other techniques. The first Electron Microscope observation from Vostok and from the old Dome C ice cores showed the presence of clays as major mineral phases (i.e. illite, kaolinite, smectite and chlorite), associated to K - feldspar and quartz (Gaudichet et al., 1986, 1988, 1992; Briat et al., 1982). The $^{87}Sr/^{86}Sr$ *versus* $^{143}Nd/^{144}Nd$ isotopic signature of the mineral particles indicates a prevailing provenance of the aeolian dust from southern South America during glacial times (Delmonte et al., 2007; Basile et al., 1997), an evidence confirmed also by major element analyses from PIXE (Proton Induced X - Ray Emission; Marino et al., *submitted*) and by some very recent field investigations on south American sediments and dust (Gaiero, 2007). Conversely, a different source mixing likely occurred during late Quaternary interglacials (Delmonte

et al., 2007).

In this work we present the first mineralogical and crystallochemical results on Antarctic ice dust coupling X – Ray Powder Diffraction (XRPD) and High Resolution – Transmission Electron Microscope (HR – TEM) techniques following the procedure described in Dapiaggi et al. (2007) and Sala et al. (*submitted*). The ice samples were selected from the EPICA – Dome C ice core (EDC; 75°06' S, 123°24' E, 3233 m a.s.l., mean annual accumulation rate 2.7 g $cm^{-2}yr^{-1}$) and span the last 200.000 years from the Marine Isotopic Stage (MIS) 6 to the Holocene. The diffraction patterns show a common mineral composition for glacial ice core dust (i.e. quartz, K-feldspar, chlorite, mica, talc, amphibole and plagioclase) with the exception of calcite that was detected only in EDC – MIS 6; moreover we can't exclude presence both for chlorite and kaolinite. The Interglacial samples show some difficulties in diffraction peak identification due to the extremely low concentration of mineral dust trapped in the ice. Only the sample from the MIS 3 allows qualitative identification on mica, talc, quartz, plagioclase and kaolinite. Some crystallochemical analyses were performed on Glacial and Interglacial Aeolian mineral particles by HR – TEM equipped with EDS spectrometer. The electron microscope data show the presence both of micro and sub-micro metric dust particles, both mono and polycrystalline materials. Crystallographic results were obtained on quartz, biotite, muscovite, calcite, microcline, talc, kaolinite and a few other phases.

A cross checked analyses between XRPD and HR – TEM technique allow us to define the mineralogical and crystallochemical composition of the Antarctic ice dust. The electron microscope data provide additional crystallographic information on a single particles that support and confirm the mineral phases identified by XRPD.