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# Mineralogical composition of EPICA Dome C aeolian ice core dust

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Optimization of analytical procedures for mineralogical characterization of aeolian ice core dust trapped in Antarctic ice has been developed in this work. The analytical protocol includes X-Ray Powder Diffraction (XRPD) and High Resolution-Transmission Electron Microscopy (HR-TEM) coupled to Energy Dispersive-X-Ray Fluorescence (ED-XRF) techniques. This procedure has been applied on small East Antarctic ice core samples; in particular, samples from the EPICA-Dome C (EDC, 75°06'S; 123°21'E) ice core have been selected from the last two climatic cycles.

In parallel, similar mineralogical characterization was performed on dust and sediment samples from potential source areas (onwards PSA) as South America (SSA), South Africa (SSAf), Australia (AUS), New Zealand (NZ), and Antarctica (ANT). These PSA samples are the same used for Sr and Nd isotope geochemistry (Delmonte et al., 2004; Revel-Rolland et al., 2006).

Implicit in this approach is to consider the Sr and Nd isotopic composition of dust as tracer for dust provenance, and the mineralogical composition of dust from PSAs and from ice cores as indicator for dust source weathering and environment. Therefore dust mineralogy provides important complementary information which cannot be detected from isotope geochemistry alone, and ideally these two methods must be used in combination.

Results from the present work on the EDC ice core, obtained by coupling powder and single crystal investigations, confirm and improve the pioneer results obtained on the "old" Dome C and on the Vostok ice cores using electron microscopy (Gaudichet et al., 1986 and 1988).
XRPD and HR-TEM results revealed that the mineral dust reaching inland East Antarctica during glacial periods is composed mainly by chlorite, mica, illite-smectite, quartz and feldspar, while during interglacials a significant decrease in the concentration of illite-smectite and chlorite can be observed along with an increase of mica and presence of kaolinite.

The mineralogical characterization of the fine size fraction (below 5 micron) of selected Southern Hemisphere aeolian sediments highlights that smectite and feldspar are characteristic for SSA and ANT sediments, chlorite for SSA, ANT and NZ sediments, and kaolinite for AUS and SSAf sediments. Overall, illite and quartz represent the most common minerals in the Southern Hemisphere dust source areas.

Comparison of EDC ice core dust with PSAs collected in the Southern Hemisphere continental lands confirm that SSA can be considered the most probable dust source for dust over the East Antarctic interior during the glacial periods, while the mineralogical evidence observed for interglacials indicates a mixed provenance from SSA and likely AUS during warm periods.

This work highlights the utility of XRPD coupled with HR-TEM to help in the interpretation of dust transport and deposition from the continental source regions the Antarctic continent, and the potential to understand the environmental conditions at the source regions themselves.