Geophysical Research Abstracts, Vol. 9, 09601, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09601

Combined PIXE-PIGE analysis applied to geochemical characterization of ice dust and continental sediments.

F. Marino (1, 2), S. Nava (3), M. Chiari (3), F. Lucarelli (3), M. Sala (4, 5), G. Artioli (4), V. Maggi (1), E. Castellano (2) , F. Rugi (2), R. Udisti (2).

(1) University of Milan-Bicocca, Environmental Sciences Dept. (DISAT), Milan, Italy. (2) University of Florence, Chemistry Dept., Sesto Fiorentino (FI), Italy. (3) University of Florence, Physics Dept. and INFN, Sesto Fiorentino (FI), Italy. (4) University of Milan, Earth Science Dept. (Ardito Desio), Milan, Italy. (5) MNA, Antarctic National Museum, Siena, Italy.

Geochemical characterization of atmospheric dust particles (major, trace and REE elements) deposited over the Antarctic ice sheet is extremely useful in recognizing the actual polar dust sources and, therefore, the present day and past atmospheric pathways. The climatic and environmental conditions experienced by source areas in different climatic regimes can be inferred by geochemical investigation on either ice dust and sediments (continental, fluvial or lacustrine) from the dust source areas.

The PIXE (Particle Induced X-ray Analysis) technique has proven to be a reliable tool for major and minor elements investigation of polar ice dust samples (Marino et al., submitted to EPSL).

This multielemental technique, based on energy dispersive X-ray spectrometry, was applied to the direct measurement on filters of the insoluble dust fraction (after ice melting and without any other sample pre-treatment), with analytical detection limits less than 1 ppb.

By means of the combined use of PIXE and PIGE (Particle Induced Gamma-ray Emission), particular attention was paid here to improve accuracy on quantitative determinations of lighter elements (mainly Na, Mg, consequentially Al and Si) in different sized materials. Results of measurements performed on size-selected Certified Mineral Standards (sampled as bulk – size up to $\sim$ 50 μm - and size selected $<$ 5 μm), together with the first results obtained on the finer fraction ($<$5 μm) of PSA (Potential Source Area) samples, are here presented.

Moreover, combined PIXE-PIGE measurements permitted us to evaluate the effective thickness of the different samples and hence to estimate (according to the given mineral compositions and densities for each standard analysed) the attenuation correction coefficients for the lighter elements (Na, Mg, Si, K).

This approach, with the paleoclimatic information derived from the geochemical (isotopic, major and trace elements) analysis on polar dust being compared with that obtained from continental proxy records, helps in understanding source-related environmental changes and Earth's climate system dynamics.