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Atmosphere/snow transfer studies by all year-round aerosol, hoar and snow layers sampling at Dome C, East Antarctica

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Paleoclimate and paleoenvironmental studies require the knowledge of present-day atmospheric load and chemical composition and of the processes occurring at the atmosphere/snow interface and affecting chemical species and isotopic ratios: wet and dry deposition, gas-adsorption, post-depositional re-emission or transformation, sublimation/re-condensation and migration or diffusion in the firn and ice layers. Only after the assessment of reliable air/snow two-ways transfer functions, the changes observed in the ice-core chemical stratigraphies can be ascribed to real variations in the atmospheric load of the aerosol components due to variations of their sources intensity and/or transport efficiency.

In this framework, an all-year-round collection of size-segregated aerosol and hoar and superficial snow samples was carried out during the 2004/05 and 2005/06 summer campaigns and following winter-over periods (2005 and 2006) at Dome C, thanks to the support of the Italian-French base “Concordia Station”. Aerosol samples were collected by different devices: a filter-sandwich system, able to separate a coarse and a fine aerosol fraction (nominal cut-off 3.0 or 5.0 um); low volume samplers equipped with different cut-off heads (PM10, PM2.5 and PM1.0) and a multistage sequential impactor, able to segregate aerosol particles in 8 size classes (10 to 0.4 um). In both the campaigns, in parallel with aerosol sampling, fresh or superficial snow and frag-

ile hoar crystals were also sampled in different conditions of solar irradiation. Fresh (when occurring) and superficial snow was collected twice a day (in correspondence with maximum and minimum solar irradiance) or every two days in dark periods (full winter), in order to study the daily variations of snow cover chemical composition.

Aerosol and snow samples were analysed by ion chromatography for main inorganic anions and cations, methanesulphonate and some short-chain carboxylic acids. The analysis was performed both on-site and in Florence labs in order to assess possible contamination or component loss effects occurred during storage and shipment of the samples.

The comparison between aerosol, hoar and superficial snow chemical composition has provided information about depositional (wet and dry deposition, gas uptake) and post-depositional (sublimation/recondensation and photolysis) processes.