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Chemical composition of size-segregated aerosol collected all year-round at Concordia Station (Dome C, Antarctica). Transport processes and climatic implications.

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Ice-core stratigraphies of chemical components of atmospheric gases and aerosols trapped in the snow layers by scavenging processes are a powerful tool in understanding past climatic and environmental changes. The deep ice core drilled at Dome C in the framework of the EPICA project
allowed reconstructing the last 8 glacial-interglacial cycles and highlightened the complex relationships between climatic forcings and environmental feedback processes.
In interpreting ice core records as a function of past climatic variations, some difficulties arise from uncertainties in considering selected chemical species as reliable markers of climatic and environmental processes and in attributing the different load and composition of aerosols over Antarctica to changes in source intensity (such as aridity, wind strength, emersion of continental platform by sea-level lowering etc..) and/or to variations in atmospheric processes (such as meridional and zonal atmospheric circulation, polar vortex intensity, scavenging efficiency, transport pathways etc..). Besides, two new aspects are actually under discussions: the possible use of Na as sea-ice cover marker (via frost flower formation on the sea-ice surface during the pack-ice formation) and the identification of continental source areas for mineral dust reaching internal regions of Antarctica during glacial and interglacial periods.
In order to better address such controversial issues, since 2005 a continuous, high temporal resolution size-segregated aerosol and surface snow sampling has been performed at Dome C (central East Antarctic Plateau, 75° 06' S, 123° 23' E), in the framework of "Station Concordia" Project (a Italian PNRA- French IPEV joint program). The chemical analysis of size-segregated aerosol and daily superficial snow samples, collected all year-round for more than 4 years, can contribute to clarify some of the above mentioned topics. In particular: the possible seasonal pattern of sea spray aerosol could be related to sea-ice formation timing and/or to changes in zonal wind intensity and atmospheric pathway; the mineralogical analysis of insoluble dust particles can allow the identification of continental sources, by comparison with soils collected in the potential source areas (PSAs); finally, the seasonal pattern of biogenic markers (such as methanesulphonic acid and non-sea-salt sulphate) can be linked to sea surface temperature, sea-ice cover and southern-hemisphere circulation modes (e.g., SOI, AAO or SAM and ACW).
As regard as depositional and post-depositional processes, the analysis of chemical markers in aerosol, superficial snow and hoar crystals, sampled contemporaneously, will allow understanding the key factors (e.g., snow acidity, solar irradiation) affecting the preservation of components reversibly fixed in the snow layers (such as, for instance, methanesulphonic acid, nitrate and chloride).
A summary of the major results from the chemical analysis of aerosol and snow collected at Dome C is here presented.