IV ROSS SEA CONFERENCE 2023

Università degli Studi di Napoli "Parthenope"
Via Amm. F. Acton, 38 - 80133 Napoli, ITALY
3-7 July 2023, Via Acton 38, Naples-Italy

Topic: Emerging chemicals and pollutants

Francisco Ardini

ABSTRACT Subject :

Highlighting distributions and potential origins of major and trace elements in the atmospheric and marine systems of the Ross Sea

Abstract 10/02/2023 17:54:47

Antarctica is a vast area which is crucial for the understanding of the history of the climate of our planet and the impact of the human activities on the environment. In fact, its remoteness makes the Antarctic continent an ideal natural laboratory to examine the origin, the transport routes and the fate of the pollutants reaching the area. The transportation and the distribution of the pollutants are influenced by processes involving the atmosphere, the marine system and the water-air interface. In particular, atmospheric aerosol and marine suspended particulate matter (SPM) constitute important long-range carriers of contaminants. Trace elements (TEs) represent a vast and variegate group of chemicals with different roles, typically distinguished as essential (e.g. Fe, Cu, Zn) or toxic elements (e.g. Cd, Hg, Pb). TEs are characterized by a complex biogeochemical cycle, with different origins and ways of global transfer. They are typically transported to Antarctica through the atmosphere, bounded to particulate matter, or via marine currents, as SPM provides adsorption sites for trace metals and can act as metal carrier. Moreover, their distribution in seawater is highly dependent on the factors controlling the dissolved/particulate partition. Therefore, the study of the distribution of TEs in different environmental compartments can provide considerable insight into their cycling through the Antarctic environment. In the framework of the project PROPOSE ("Processes controlling the presence and distribution of pollutants in Ross Sea Area") of the Italian National Research Program in Antarctica (PNRA), the atmospheric and marine system of the Ross Sea was investigated during Austral Summer 2019-2020 as a part of an oceanographic campaign on board the R/V Laura Bassi. In particular, PM10 was collected on cellulose membranes during the whole campaign, including the crossing from and to New Zealand, with temporal resolution varying from 4 to 12 days. In addition, seawater was collected at six stations at different depths by a Teflon GO-FLO bottle; the samples were filtered on polycarbonate membranes in order to separate the dissolved and particulate phases. All the samples were stored at -20 °C and then analyzed by inductively coupled plasma techniques after proper treatment. The considered analytes were Al, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sn, Sr, V, Zn and Pb isotope ratios. The results show values generally in agreement with data from literature for the Ross Sea. The data treatment and visualization allowed to evaluate marine and/or crustal enrichments, depth distributions for seawater, and spatial and temporal trends for PM10, highlighting different origins for the considered elements.