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Metals and Rare Earth Elements in polar aerosol as specific markers of natural and anthropogenic aerosol sources areas and atmospheric transport processes

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Metals and Rare Earth Elements (REEs) in the aerosol have conservative properties from the formation to the deposition and can be useful to identify and quantify their natural and anthropic sources and to study the atmospheric transport processes. In spite of their importance relatively little is known about metals and especially REEs in the Artic atmosphere due to their low concentration in such environment. The present work reports the first attempt to determine and interpret the behaviour of metals and REEs in polar aerosol at high temporal resolution. Daily PM10 samples of arctic atmospheric particulate were collected on Teflon filters, during six spring-summer campaigns, since 2010, in the laboratory of Gruvebadet in Ny Ålesund (78°56' N, 11°56' E, Svalbard Islands, Norway). Chemical analyses were carried out through Inductively Coupled Plasma Mass Spectrometer provided with a desolvation nebulizer inlet system, allowing to reduce isobaric interferences and thus to quantify trace and ultra-trace metals in very low concentration in the Arctic aerosol samples. The results are useful in order to study sources areas, transport processes and depositional effects of natural and anthropic atmospheric particulate reaching the Arctic from southern industrialized areas; moreover, the observed seasonal trends give information about the different impact of natural and anthropic emissions driven by phenomena such as the Arctic Haze and the melting of the snow. In particular Rare Earth Elements (often in the ppt range) can be considered as soil's fingerprints of the particulate source areas and their determination, together with air-mass backtrajectory analysis, allow to identify dust source areas for the arctic mineral aerosol.