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Solubility of aerosol trace elements: sources and deposition fluxes in the Canary Region

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To date there have been no long-term aerosol studies in the Canary Basin, and current estimates of soluble fluxes of Al, Mn, Fe, P and N for the region are based on limited data available from several oceanographic research cruises which have crossed the region during large transects of the Atlantic Ocean. In this study, aerosol samples have been collected at two stations on the island of Gran Canaria regularly since 2006 (Taliarte, at sea level, and Pico de la Gorra, at 1930 m altitude). Samples have been analysed for total and soluble trace metals (Al, Mn, Fe, Co, Cu and Ti). The high temporal resolution of this dataset represents a valuable contribution to the understanding of aerosol deposition of trace metals to the region.

Solubility measurements from acetate buffer leaching experiments showed the same tendency in the percentage of soluble metals in the samples: a higher percentage solubility of metals in anthropogenic aerosols and at low dust loading. Moreover, categorisation of aerosol samples with a continental African origin according to air-mass back-trajectories (North of Africa, Central and Western Sahara and Sahel) showed a decreasing tendency in the percentage of soluble Al and Fe to the south. In addition, factors that can affect the percentage solubility values for crustal elements and comparisons with different methods were studied. Freezing the samples stored affects the measurements of Al and Fe solubility. This last result is important for the design of future aerosol sampling programmes and aerosol solubility experiments.

Flux estimates for aerosol-derived soluble metals reveal that phosphate is highly depleted relative to Fe and N when compared with Redfield values. It appears that aerosol deposition is an important source of N and trace metals (Fe, Co, Mn and Al) to the NE subtropical Atlantic Ocean.

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