Optical properties of aerosols with organic components using cavity ring down spectrometry

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Atmospheric aerosols affect Earth's climate in direct and indirect manners. The direct effect of aerosols on climate is by scattering and/or absorbing incoming solar and outgoing terrestrial radiation, which strongly modify Earth's radiation budget. These climatic effects depend on the chemical composition, size and morphology.

We will present laboratory studies aiming at understanding how the organic components of atmospheric aerosols affect scattering and absorption. We will present the use of cavity ring down (CRD) spectrometer to derive the extinction and complex refractive index of aerosols containing a significant organic component. We will present results on aerosol particles containing humic like substances (HULIS). HULIS are a common component of aerosols in the atmosphere. They contribute to the CCN activity, hygroscopic properties and the density of aerosols. In addition, HULIS absorb throughout the visible range, and hence contribute to the direct climatic effect of aerosols. The absorption by organic aerosols is largely unaccounted for in models. Specifically, we will present how the absorption of aerosols containing HULIS and inorganic salts varies with wavelength, test various optical mixing rules and will present results on the extinction of core-shell model and soot aerosols. Finally, a new continuous wave CRD system will be presented.

Environmental geochemistry of volcanic ashes from the Southern Puna, NW Argentina

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Twenty-one rhyolitic volcanic ash deposits were sampled in the Southern Puna plateau (NW Argentina). The goal of this study is contribute to define a specific analytical methodology for environmental characterization of volcanic ash, as well as recognize the geochemical impact of such materials on the environment mainly on natural water. The SEM examination allows recognize the ash by the presence of glass shards. In addition, the coupling with EDX spectrometry provides a complementary way to identify compositionally glass and crystalline phases and to compare ashes of different eruptions. Whole rock geochemistry and two types types of leachates (deionised water and nitric acid) were performed on these samples allowing to follow the environmental behaviour of about 50 major and trace elements. The analyses were carried out by ICP-OES and ICP-MS.

Significant differences have been reported in the two types of leachates with, generally, higher concentrations in the acid leachate, whereas Si and B were enriched in water leachate. Both leaching results have demonstrated high levels of Ca, Na, and Si as the most abundant cations, while SO_4 and Cl are the most abundant anions. High concentrations of B, Co, Cu, Ni, Rb, V, and Zn were also reported in both leachates, while only high levels of As, Br, Cs, Mo, Pb, and Se were observed in acid leachate. The comparison of the leachates and the bulk compositions of the ash (expressed as Relative Mass Leached, RML, %) shows in acid leachates a high mobility (40-90%) for P and Zn, and a moderate mobility (20-40%) was presented by Ca, Ni, Cu, and As. In water leachate, the behaviour is more complex with a large variability between ash samples. In general, the RMLs are lower than 20% for water leachates. However, in some ashes some elements risen 40-90% RML (P, Sb, and Zn).

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