Itrax™ Core Scanner as a quick screening tool for polluted coastal sediments

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The traditional techniques for the study of chemical composition of sediment cores, are, among others, the X-ray fluorescence (XRF) and the spectrometry (ICP) applied on discrete samples. The development of non-destructive continuous analysis as the XRF scanners as the Itrax™ core scanner [1], which analyses humid core-sections with a millimetric resolution, have supposed a great advance in the study of sediments and rocks. These instruments are able to detect the majority of the elements from the Al to the U, in a low concentration, depending on the acquisition conditions.
Until now, the majority of the works with these scanners have been focused on palaeoceanographic or palaeoclimatic reconstructions, both in marine and continental sediments, being much more scarce the studies based on discrimination of pollution.

We have analysed with the ITRAX from the University of Vigo and varying time-acquisition conditions, sediment cores from the inner Galician Rías Baixas (NW Spain). These are highly organic, but not very heavily polluted environments, however ITRAX was able to detect Hg concentrations lesser than 0.6 μg g^{-1} and Cd concentrations in the order of 1 μg g^{-1}. These values were confirmed by total digestion and subsequent analysis by ICP and by conventional XRF of pressed pellets, obtaining a good relationship for most of the trace elements (Zn, Pb, Cu, etc.) and confirming the presence of Cd and Hg. Pollution by these elements was restricted to the upper 10-15 cm, approximately ranged between 30-50 yr based on ^{210}Pb and ^{137}Cs datings obtained by gamma spectrometry. Only Pb and Hg showed concentrations above the sediment quality guidelines that could be associated with measures of adverse effects. Several sequential extraction protocols (BCR and NWR) of selected samples were also applied in order to get information about the bioavailability of these elements. The data confirms the predominance of oxides and residual fractions in the case of Pb and oxidizable forms (organic-matter and sulphides) in the case of Hg. Our results confirms that ITRAX represent a fast and high-resolution tool for identify pollution in these environments not heavily affected.

[1] Croudace *et al*. (2006). Geol. Soc. Spec. Publ. **267**: 51-63.
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Aerosol ageing and effect on their optical properties by a new broadband aerosols spectrometer

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The optical properties of complex aerosols, important in determining their radiative forcing in the atmosphere and, subsequently, their impact on climate, are extensively examined. There is an abundance of natural and anthropogenic organic compounds in the atmosphere that can be released as primary aerosols or form secondary organic aerosols (SOAs) via photochemical reactions with OH, NO_3, and O_3.

Aerosols can undergo further processing in the atmosphere with oxidizing species, changing the chemical, physical, and optical properties of the particles. Particle internal structure and composition have important implications for their optical properties. Despite their acknowledged importance, the internal structures of aerosols, mechanisms of formation, atmospheric aging, and heterogeneous reactivity remain poorly understood and yet their environmental role cannot be quantitatively determined.

In this talk we will describe new studies that investigate the changes in optical properties of different model aerosols. We will describe a new broadband aerosol spectrometer that can retrieve aerosol optical properties between 360 and 420 nm, a less explored wavelength range. As examples, we will present the effect of nitration of organic aerosols on aerosol absorption, and the effect of aging on the optical properties of SOA that form from the ozonolysis of biogenic and anthropogenic VOCs. The effect of structure on the optical properties, and how core/shell structure differs from homogenous structure will be demonstrated.

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