PAHs in sediment cores from an estuary in south of Brazil

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The temporal and spatial distribution of 14 selected PAHs, amongst the 16 priority pollutants have been analysed in the estuarine system of Guaratuba Bay, Paraná State, in the south region of Brazil. Two dated sediment cores of approximately 40 cm each were collected on the inner sector and close to the mouth to the sea of the estuary, which is approximately 15 km long. The sedimentation rate is estimated to be 6.1 mm/year and 5.2 mm/year accordingly to ^{210}Pb and ^{137}Cs geochronologies, respectively (Sanders *et al*., 2006). The surrounding region is not highly industrialised, with agriculture of banana and rice being the main economic activities, followed by fishery, aquaculture and tourism, the latter suffering a rapid increase in the past years due to the scenic landscape of the region. A moderate drainage basin encompasses the estuary, consisting of 1,724 km^2 and two main rivers alone, Cubatão and São João, introduce as much as 80 m^3/s of freshwater into the bay. Despite of that, it is well known that PAH are ubiquitous contaminants in the environment and the use of marine sediments to reveal levels of environmental quality have been extensively reported in the literature, as they are a sink for such hydrophobic compounds. In order to quantify the distribution of PAHs along the sedimentary record, the following individual compounds were analysed in 21 sections of the cores: naphthalene, acenaphthylene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenzo[ah]anthracene, benzo[ghi]perylene and indeno-[1,2,3cd]pyrene. The analyses were carried out using a HPLC coupled with a fluorescence detector. The total PAH concentration ranged from 1.5 to 3,126.8 ng/g (mean 494.9) of dry weight, and the PAHs up to four rings were the most abundant. Among these, phenanthrene and fluoranthene showed the highest concentrations. Apparently, diagenetic processes, rather than petrogenic or pyrogenic inputs, play an important role in the distribution of phenanthrene along the sedimentary column, as proposed by Wakeham *et al*. (1980).

References

Sanders, C.J., Santos, I.R., Silva-Filho, E.V. and Patchineelam, S.R., (2006), *Mar. Poll. Bull.* **52**. 1085-1089.

Wakeham, S.G., Schaffner, C., and Giger, W., (1980), *Geochim. Cosmochim. Acta*, **44**. 415-429

Pb isotope provenance study of Irish Bronze Age gold using LA-ICP-MS

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The Bronze Age is seen to represent a critical stage in European prehistory because of the widespread deployment of a range of distinctive materials (e.g. amber, jet, gold) in the construction of different social identities including strategies of status differentiation. Understanding the control of access to these materials and their trade and exchange is key to understanding the new social structures that arise. In Ireland, the deposition in lakes and bogs of large gold artefacts such as lunulae and torcs is one of the most striking features of the Bronze Age. But many of these artefacts are without context, having been found by turf cutters, or lack any associated archaeology. While it is clear gold is an important and special material, it is difficult to integrate the artefactual evidence with what is known of the archaeology and social structure of the Bronze Age.

Here we present the preliminary results of a lead isotope study of Irish Bronze Age gold artefacts using the novel technique of laser ablation ICP-MS. We show that the lead isotope variation in Ireland is sufficient to differentiate sources of gold, and that the required precision of lead isotope measurements can be attained for the necessarily small samples from artefacts using laser ablation. In Late Bronze Age artefacts, where the gold has been alloyed with copper, lead mixing lines can be obtained, which may allow the sourcing of both the copper and the gold.

These and future results will complement existing microchemical studies that have suggested changing access to gold resources through the Irish Bronze Age, and will provide the basis for models of gold procurement, trade and exchange.