RECONSTRUCTION OF TRACE METAL CONTAMINATION IN COASTAL SEDIMENTS FROM CAPE CORSICA (FRANCE) DURING ANCIENT TIME

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The Mediterranean margins were characterised by intense maritime commercial exchanges since Antiquity. We conduct a sedimentological (mineralogy, fossil assemblages, C/N ratio, organic content) and geochemical (trace element concentration, Pb isotope composition) study of lagoon sediments from Cala Francese, a Roman archeological site from Cape Corsica that may have been an ancient harbour. Aims are to reconstruct history of environmental contamination in trace metals over the historical period and, to propose a paleoenvironmental reconstruction. The sedimentary column of core CF10-III is divided in 3 units: an upper clayey unit (0-80cm); a median sandy clayey unit with abundant marine plant (posidonia) remains (80-160 cm) and a lower sandy and gravelly unit (160-220 cm). Radiocarbon ages performed on macroremains in an adjacant core CF10-II suggest that the sedimentary column covers the last 6000 years, with a late Roman age (210-350 AD) obtained at 140-160 cm. In core CF10-III, Pb concentration remains low in the lower unit (10 ppm), it ranges between 30-40 ppm in the intermediate unit and then increase from 60 cm (>115 ppm). A major shift in Pb isotopic composition is observed at 60 cm, with a decrease of $^{206}Pb/^{207}Pb$ ratios from 1.193 to 1.187. Both $^{206}Pb/^{207}Pb$ and $^{208}Pb/^{206}Pb$ ratios are consistent with Pb Roman signatures [1]. A marked Zn-enrichment (from 4 to 80 ppm) is observed at 40-60 cm. Such drastic changes in trace metal content and Pb isotopic signature of sediments is consistent with Human perturbations of the environment during the Roman period. Further investigations are in progress in order to define the sediment deposition conditions and in particular to date the marine-continental transition.

[1] Véron et al., 2006. Geophys. Res. Lett. 33, doi :10.1029/2006GLR02582.

Bioaccessibility of trace metals on mining and smelting impacted dusts: importance of particle size on children exposure

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20d. Metals and human health

Located on the Bolivian Altiplano at 3750 m.a.s.l., Oruro is a mining city with a population of 200 000. The volcanic dome on which lies the city is exploited since centuries for its polymetallic ores (Sn, Ag, Zn, Cu, Pb, Sb, Au) and smelting activities (Sn, Sb) are developed in the direct vicinity of the town, and process half of Bolivia's Sn ore.

An interdisciplinary project (ToxBol) aiming at studying the origins and impacts of trace metal contamination on the environment, human health and society was initiated in 2006 in Oruro. Previous studies have shown differences in polymetallic contents between exposed and non exposed area in children's hair[1] and atmosphere[2]. Correlations were found between air particles and children's exposure except for Pb that show relative low contamination in atmosphere in comparison with children's hair content.

Dusts from football fields were collected in mining and smelting districts. Particles were separated into 5 granulometric fractions: 2000-200 (coarse sand), 200-50 (fine sand), 50-20 (coarse loam), 20-2 (fine loam) and <2 µm (clay). Bulk samples and fractions were analyzed to characterize geochemical and mineralogical dust properties. Bioaccessibility of trace metals was measured on each subsample following the UBM stomach phase procedure[3].

Results and Conclusion

Bulk samples were highly contaminated, especially in the smelting environment with up to 16000 µg/g Pb. Clay fraction was globally the most concentrated in trace metals. Bioaccessibility in bulk sample was different according to the environment: Cd>Pb>Zn>As>Sb=Sn (i.e., 84% to 1%) in smelting district and Cd>Zn>Pb=As>Sn=Sb (i.e., 86% to 1%) in mining district. Highest difference was observed for Pb (62% of bioaccessibility in mining and 13% in smelting bulk dust). Trace metals in smelting environment were globally more bioaccessible in fine sand than in clay. In mining district, fine loam and clay show the highest trace metals bioaccessibility.

Observed differences can be partly explained by mineralogical speciation of trace metals. Exposure doses of particles ingestion for children playing on the field were calculated, and show possible metal absorption higher than those recommanded by WHO.

[1]. Barbieri (2011) *Biol. Trace Elem. Res.* **139** 10-23.
[2]. Goix (2011) *Sci. Total Environ.* **412-413** 170-184.
[3]. Wragg (2011) *Sci. Total Environ.* **409** 4016-4030.