In situ monitoring for studying the seasonal pattern of dissolved oxygen in a sandy beach of the Aquitaine coast (France)

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Despite low concentrations of organic matter and associated reactive compounds, sandy sediments of tidal beaches are now considered as biogeochemical bioreactor [1]. Tidal beaches are affected by an intense advective transport of seawater during each tide: during floods, seawater penetrates sandy sediments, bringing dissolved oxygen and marine organic matter in the pore space. The aim of this study is to determine how dissolved oxygen evolves in pore waters along the year and how this evolution is linked to physical forcing such as tide and swell. Autonomous sensors were buried into sediment during 3 to 14 days on the Truc Vert beach (Aquitaine, France) every 3 months. Dissolved oxygen concentration (measured with Aanderaa optodes and NKE data loggers), temperature, salinity and pressure were recorded with a high frequency (from 2 to 10 minutes) at the top of the water table (30-50 cm below sediment surface). The data showed that dissolved oxygen depletions occurred in pore waters and that the intensity of these depletions varied seasonally. Indeed, dissolved oxygen concentration was influenced by the intensity of coastal planktonic primary production. Plankton from the near coastal ocean is the main source of organic matter entering sands. Degradation of this organic matter by respiration processes in the sediment significantly decreased the dissolved oxygen concentration in the pore waters. Strong depletions of dissolved oxygen were observed during spring, with some anoxic events. Furthermore, high frequency recordings highlighted the strong influence of tidal forcing on the benthic dynamic of dissolved oxygen in sands. Swell breaking generated episodic rises in the dissolved oxygen concentration during ebb tides. This in situ study demonstrated how physical (tide and swell) and biogeochemical (respiration) processes may control dissolved oxygen dynamics in intertidal sandy beaches.

[1] Anschutz et al. (2009) Estuar. Coast. Shelf Sci. **84**, 84-90.

Evaluating meteorites using LA-ICPMS: 'Lovina' test case

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'Lovina' was found on a beach in Bali, Indonesia in January, 1981 appearing as a football-sized 8.2 kg weathered iron. Lovina was originally classified as an ungrouped ataxite on the basis of petrography and geochemistry [1,2] but was found to have virtually no record of exposure to cosmic rays [3] so its meteoritic status was in question. Here we measure the Pb isotopic composition (IC) of troilite nodules in Lovina in an effort to determine its source.

Pb and U isotopes were analyzed in 10 randomly chosen troilite nodules on a Lovina polished thin-section, by a VG PQ ExCell ICP-MS and UP-213 laser ablation system. Data were acquired on 100 um spots at 70% power and 10Hz. Surface Pb was ablated off each nodule by rastering 4x over an area larger than the spots (raster 4-5 'lines' spaced 30 um apart at 70%, 10 Hz at 120 um/sec speed). Mass fractionation for Pb (~1%) was corrected based on NIST-610.

No U was detected in any of the trolite nodules. 207Pb/206Pb ratios (Figure 1) for all 10 analyses fall in the range expected for modern terrestrial Pb [4-7] and are distinctly below the primordial CDT Pb composition of meteoritic troilite [8]. We conclude that the Pb in Lovina troilite is consistent with a terrestrial source. Lovina's origin remains unclear, but it does not appear to be a meteorite. Despite the relatively poor precision of LA-ICPMS, this rapid and cheap technique may also be useful for identifying meteoritic phases most amenable to U-Pb geochronology.

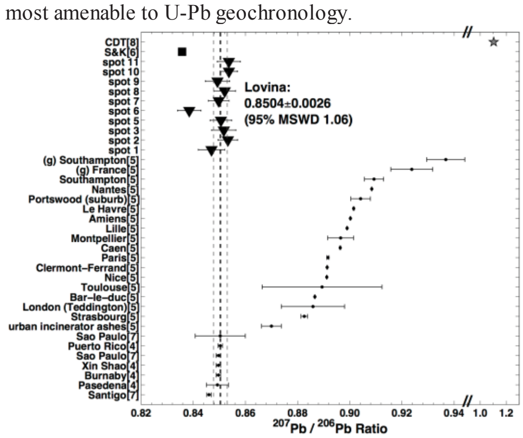

Figure 1: Pb IC of Lovina troilite nodules (triangles) compared to [6], terrestrial airborne particulates and gasoline (g) Pb sources [4,5,7] and Canyon Diablo Troilite (CDT) [8]. Note the break and change in ^{207}Pb/^{206}Pb axis scale for plotted CDT.

[1] Met. Bulletin 93 (2008) *MAPS* **43**, 571-642. [2] Flemming et al (2008) *LPSC* **39**, 2412. [3] Nishiizumi & Caffee (2011) *MetSoc* **74**, 5485. [4] Bollhofer & Rosman (2001) *GCA* **65**, 1727-1740. [5] Monna et al (1997) *Env.Sci.Tech*. **31**, 2277-2286. [6] Stacey & Kramers (1975) *EPSL* **26**, 207-221. [7] Bollhofer & Rosman (2000) *GCA* **64**, 3251-3262. [8] Tatsumoto et al (1973) *Science* **180**, 1279.