

Lithogenic and anthropogenic trace elements footprint in the estuarine sediments of the Artabro Gulf Rias (NW Iberian Peninsula)

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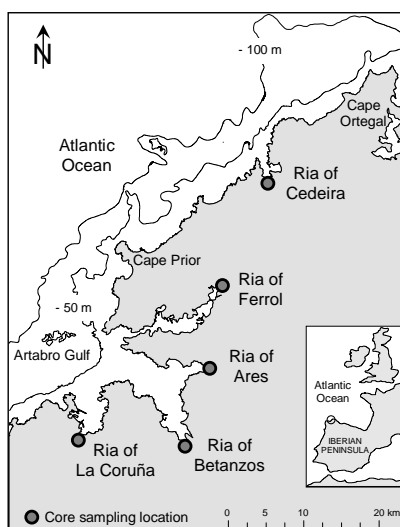
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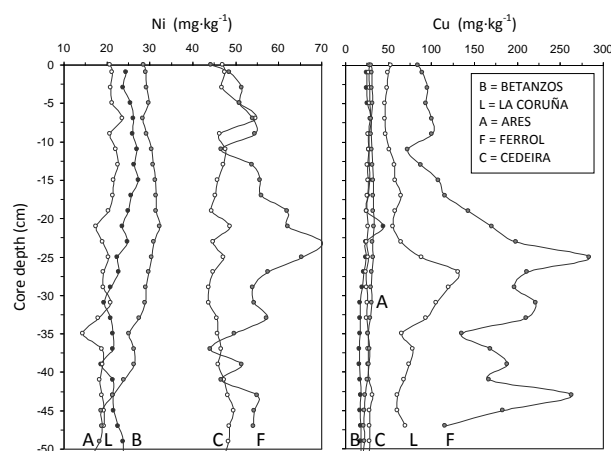
Introduction: Rias are incised valleys where the freshwater-seawater transitional boundary varies with environmental changes. The estuarine sediments is thus a biogeochemical dynamic reservoir where trace elements (TEs) derived from lithogenic sources mix with TEs from anthropogenic origin [1]. This work reports the depth variations of As, Cd, Cr, Cu, Ni, Pb, V and Zn concentrations in sediment cores of five rias from the northwestern coast of Galicia, and identifies natural *versus* anthropogenic footprints characteristics of each system.

Methods: The Rias of Cedeira (C), Ferrol (F), Ares (A), Betanzos (B) and La-Coruña (L), located in the northwestern coast of Galicia, are surrounded by different lithogenic domains and under the influence, of anthropogenic activities related to cities, industries and harbors.



On July 2012, five inter-tidal muddy sediment cores were collected in the inner part of the Rias, sliced *in situ* in 25 layers of 2-cm thickness, stored in pre-cleaned plastic zip bags, and kept at 4° C. After drying at 45±5° C, Al was determined after complete digestion [2] by FAAS (Perkin Elmer AA100) and TEs according to [3] using a quadrupole ICP-MS (Thermo Elemental, X-Series). Coefficients of variation for element counts were lower than 1%. Determined and certified values of TEs of the certified reference material PACS-2 and BCR 701 were not statistically different (t-student; $\alpha=0.05$).

Results: TE contents ($\text{mg}\cdot\text{kg}^{-1}$) in the five cores varied within the following ranges: 47(A)-125(F)·10³ Al, 9(A)-34(L) As, 0.1(B,A)-1.8(F) Cd, 27(A)-142(F) Cr, 12(A)-451(L) Cu, 10(A)-89(F) Ni, 14(B)-279(L) Pb, 44(A)-141(F) V and 43(A)-686(L) Zn (see ria codes).



In general TE contents were lower in estuarine sediments from the Ares Ria and higher in Ferrol and La-Coruña Rias. Maximum Cu concentrations of Cu were registered in Ferrol and of Pb and Zn in La-Coruña.

Discussion: Most TEs in sediments of the rias of Ares, Betanzos and Cedeira reflect the prevalence of lithogenic contributions, according to unpolluted [4] and Earth Crust references [5]. Elevated Cr and Ni contents in Cedeira are a footprint of chromites from the Ortigueira Geological Complex [6]. High values of Cu, Zn Cd and Pb in Ferrol and La Coruña Rias evidenced severe contamination associated with historical industrial activities.

This study was supported by CTM2011-28792-C02 project financed by Spanish MINECO.

References: [1] Förstner (1984) *Metals in the Hydrocycle*; [2] Rantala and Loring (1975) *At Absorpt Newsletter* **14**:117-120; [3] Caetano et al. (2008). *Sci Total Environ* **390**:466-474; [4] Prego and Cobelo-García (2003) *Environ Pollut* **121**:425-452; [5] Rudnick (2007) *Treatise on Geochemistry*, chap. 3.01; [6] Bernárdez et al. (2012) *Mar Geol* **291-294**:63-72.