Relationship between palaeoclimate and diagenesis intensity in sediments from transitional environments: The Galician Rías (NW Spain)

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Sediments of coastal areas such as the Galician Rías Baixas (NW Iberian Peninsula), where land and sea interdigitate, are a valuable source of information, since their high sedimentation rates (3-6 mm yr^{-1}) [1] facilitate studies of high resolution. In addition, their position under the influence of both land and sea leads to their exhibiting patterns of interaction between both environments that can help discriminate among local, regional and global climate processes. The Galician coast is one of the regions of the world with most intense coastal upwelling. This, together with continental inputs makes the organic matter contents of sediments from the Rias Baixas to be very high [2], which favour intense diagenetic processes. The intensity of these processes is not only controlled by the organic matter concentrations but also by the relative proportion of oceanic (labile) and terrestrial (refractory) organic matter. Changes in early diagenesis can throw light on the degree of oceanic influence in the Ría, and hence on changes in the circulation and ventilation of its water masses and/or the climate on shore.

In this study on sediment cores taken in the outer Ría de Muros, the combined use of textural analysis, magnetic properties ($\varkappa$, ARM/SIRM, MDF) and geochemical parameters (total concentrations of diagenetically stable and mobile elements in sediment and pore water) allowed the identification of a current redox front and two palaeosedimentary redox fronts. These fronts originated during periods of high marine/terrestrial organic matter ratio (as inferred from the TOC/TN ratio and $\delta^{13}C$). The chronological framework established by ^{14}C dating allowed correlating these fronts to known periods of increased upwelling and reduced continental input due to colder, drier climates in the northwestern Iberian Peninsula, namely the Little Ice Age, the Dark Ages, and the first cold period of the Upper Holocene.

[1] Álvarez-Iglesias, Quintana, Rubio & Pérez-Arlucea (2007) *Journal of Environmental Radioactivity* **98** (3), 229-250 [2] Vilas, Bernabeu & Méndez (2005) *Journal of Marine Systems* **54**, 261-276.

Melting properties of chondritic mantle to the core-mantle boundary

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A large proportion of our planet has experienced melting in the course of its accretion history. In the modern Earth, partial melting in the lowermost mantle is also suggested based on seismic observations of ultra-low velocity zones. The melting properties of the deep mantle thus has major consequences for the existence and survival of chemical heterogeneities in the Earth mantle and, more generally, for our knowledge of mantle dynamics.

Melting curves and Fe partition coefficient have been investigated in a chondritic-mantle material using the laser-heated diamond anvil cell (LH-DAC) at P-T conditions corresponding to the entire Earth's lower mantle. Two different *in situ* synchrotron radiation techniques have been used to infer melting properties *in situ*; X-ray diffraction and X-ray fluorescence spectroscopy.

At core-mantle boundary pressure (135 GPa), the chondritic-mantle solidus and liquidus reach 4150 (±150) K and 4725 (±150) K, respectively. These temperatures are significantly higher than most of estimations of the mantle geotherm. Therefore, partial melting in the D"-layer most certainly indicates chemical heterogeneities with high concentration of fusible elements.

Our observations of a high liquidus as well as a large temperature gap between solidus and liquidus temperatures have important implications for the properties of the magma ocean during accretion. Not only complete melting of the lower mantle would require excessively high temperatures, but also, partial melting should take place over a much larger depth interval than previously thought.

Finally, we provide distribution maps of elements (Ca and Fe) and phases (Mg-Pv, liquid) in our samples which have encountered partially molten at the lower mantle P-T conditions. The Fe partitioning coefficients extracted from these maps show a large preference of Fe for the liquid phase. This behavior is compatible with the production of high density liquids, which can be related to sinking down of liquid phases.