Geophysical Research Abstracts, Vol. 7, 06492, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06492

Organic matter composition in marine sediments off the Tagus River

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The shelf off the Tagus river mouth serves as a depocenter for large amounts of sediment material derived from the watershed of the Tagus River on the Iberian peninsula. The delivered sediments accumulate as an extensive Holocene mud field in front of the river mouth. Its properties, particularly the stable isotopic composition and C/N content of its organic matter, can be used for reconstructing past changes in fluvial sediment supply. Based on the observation that different source pools of organic matter (e.g. marine, terrigenous, C3-, C4-plants) comprise specific ranges of C/N ratio, δ^{13}C and δ^{15}N, these parameters can be used for provenance analysis. Changes in the relative proportions of terrestrial and marine organic matter can eventually be deciphered with respect to climatic and vegetational changes in the hinterland.

Surface samples from the estuary, the prodelta and the northern and southern shelf have been mapped in terms of their C_{org} /N, δ^{13}C and δ^{15}N signals. C/N ratios show a distinctive terrestrial signal around the river mouth, extending 20 to 50km offshore. The values are lower than terrestrial C/N values reported from other studies. This may result from incorporation of estuarine autochthonous production, which typically has a low C/N ratio, or from a large portion of clay, containing high amounts of NH_4. A similar explanation may be valid for the δ^{15}N distribution, which shows higher values inside the estuary. δ^{13}C in surface samples shows a shallow gradient from terrestrial to marine values. The gradient is probably controlled by mixing of fluvial and marine

water masses in the estuary, as is suggested by an increased salinity up to the upper estuary.

Additionally four gravity cores from the shelf area have been measured (XRF, magnetic susceptibility) and correlated to existing data, revealing a sedimentation rate of averagely 1.3m/kyr close to the river mouth. A significant decrease in magnetic susceptibility by a factor of four and a threefold increase in Ca/Fe ratio around 1500 yr BP indicate a lower iron input, suggesting a decreased terrestrial sediment supply. Core GeoB8903 (water depth 102m) supports this by a slight $\delta^{13}C_{org}$ increase (from -24 ‰ to -23.5 ‰) at the same level. Simultaneously however, C_{org} /N ratios and $\delta^{15}N$ shift to more terrestrial values (from 8.4 to 9.5 and from 5.5 ‰ to 5 ‰, respectively). This inconsistency can be due to adsorption effects of NH_4^+ to clay minerals, as described for surface sediments, which will be accounted for by grain size analysis.