Geophysical Research Abstracts,
Vol. 11, EGU2009-12052-1, 2009
EGU General Assembly 2009

Carbon Biogeochemistry in Subtidal Estuarine Sediments

M. Nogueira, G. Cabeçadas, and M. J. Brogueira
INRB/IPIMAR, U-AMB, Lisbon, Portugal (mnog@ipimar.pt/+351213015948)

Over the last two decades, several studies concerning dissolved organic carbon (DOC) distribution in sediments have been published covering deep ocean, continental margins, salt marshes and shallow estuaries areas. Still, little is known about DOC biogeochemistry of subtidal sediments specially in mesotidal estuaries.

Sediments cores were collected in July 2001 and October 2003, in Sado estuary, a lagoon type mesotidal estuary located in the Iberian Peninsula,at the centre of Portugal, subjected to moderate anthropogenic pressure with an annual average flow of 5 m^3s^{-1}. Duplicate cores were sliced under nitrogen atmosphere, in layers of 1-2 cm thickness and analysed for carbon and nitrogen content, as well as other interpretative parameters. Also each layer was centrifuged to obtain pore waters, for DOC and nutrient analysis.

Sediment composition reflects the high dynamics of this estuary, changing over the two years; in July 01 sediments were sandy at the top 5-10 cm followed by muddy sand sediments in the lower layers, while in October 03 each core was just muddy or muddy sand sediment. Results show that vertical distributions of carbon and nitrogen content in particles as well as nutrient pore waters are quite different when comparing both seasons, mainly due to the characteristic nature of each core. July 01 sediments, have low carbon and nitrogen content, pore waters are poor in ammonium and phosphate, have less silicate but are high in nitrate when compared to October 03 sediments. Also, calculated benthic fluxes show that October 03 sediments are releasing an average concentration of 0.01 mmol $m^{-2}d^{-1}$ of phosphate, 2.16 mmol $m^{-2}d^{-1}$ of ammonium and 0.36 mmol m^{-2} d^{-1} of silicate to the water column and retaining 0.37 mmol $m^{-2}d^{-1}$ of nitrate, while in July 01 though phosphate release is not significant, an average of 0.10 mmol m^{-2} d^{-1} of ammonium, 0.02 mmol m^{-2} d^{-1} of silicate and also nitrate (0.01 mmol m^{-2} d^{-1}) release to water column was observed.

Regarding DOC vertical distributions, statistically results show no difference between both seasons. Concentrations obtained ranged between 2.3 mM and 11 mM. Redox condition of each core was assessed by their respective DOC profile: sediments were oxic and anoxic in July 01 and anoxic and bioirrigated/bioturbated in October 03. In general no relation was observed between organic carbon content and DOC suggesting that DOC accumulation observed in vertical profiles was not due to the degradation/mineralization of sedimentary organic matter pointing to other sources and processes of accumulation. Calculated benthic fluxes were found to be always positive reaching values up to 5.2 mmol m^{-2} d^{-1} in October 03 and 0.5 mmol m^{-2} d^{-1} in July 01. Thus, in this estuarine system, subtidal sediments are internal sources of carbon as well of some nutrients to the water column. The magnitude of their impact seems to be closely related to redox condition and composition: anoxic muddy sediments show higher benthic fluxes.

Moreover the nature of the organic material presented in sediments was assessed by C/N ratio, which gave an indication that in July 01 the organic matter is essentially from phytoplankton origin and as been mineralized in the system for a while, where in October 03 organic matter is from estuarine as well as from terrestrial origin, depending on the location of the cores.