

TOWARD A SEDIMENTARY ORGANIC CARBON BUDGET FOR THE WESTERN ADRIATIC SEA

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Introduction

The extent of the settling particulate organic carbon (OC) which escapes resuspension and bacterial degradation is ultimately buried and will be partially preserved in the sediments. Therefore, they act as a sink for the fraction of CO₂ fixed by primary production. The estimate of the OC burial in the western Adriatic continental shelf can be considered as a first step toward the calculation of a global carbon budget for the Adriatic. In this regard, a review of all available OC data has been undertaken in the framework of VECTOR project. The final aim to be achieved in the project Subtask 6.1.8 is the coupling between OC contents in surficial sediment and mass accumulation rates in order to estimate the sedimentary OC mass balance.

Analytical methods

C_{org} was determined in sediments by a CHNS-O elemental analyser Fison (Italy) mod. EA1108, after removal of carbonates with concentrated HCl 1 N (Hedges and Stern, 1984). N_{tot} was determined following the same procedure, without acidification. Reproducibility was 2-3%. ²¹⁰Pb and ¹³⁷Cs radionuclides were determined by

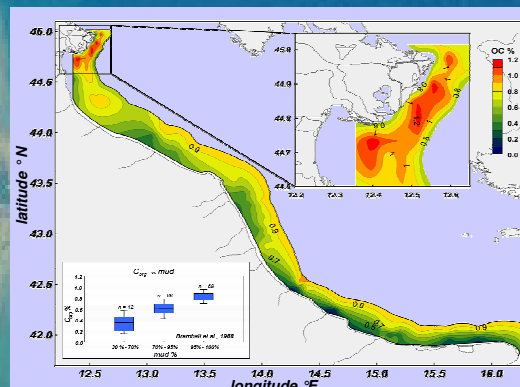
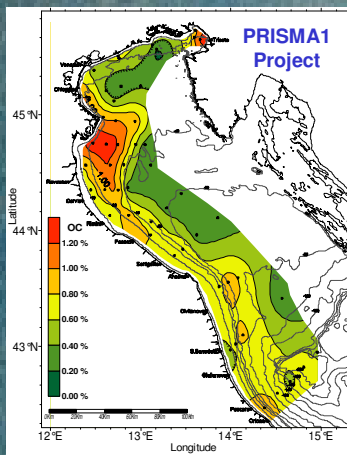
Data sources

In the last 20 years, mass accumulation rates were obtained from ²¹⁰Pb and ¹³⁷Cs activity-depth profiles in a suite of papers with different purposes. Among these, Frignani et al. (2005) and Palinkas et al. (2006, 2007) show the most extended areal coverage (>210 sites). On the other hand, OC contents in sediments were measured over the years to assess sediment composition and biogeochemical characteristics, estimate the effects of eutrophication and understand the relationships with pollutant concentrations. In particular, within the PRISMA1 project, OC contents were determined in surface and subsurface sediments covering an extensive area of the Adriatic platform. Several oceanographic cruises, carried out in the framework of US- and EU-funded projects EUOSTRATAFORM (2000-2005) to study the prodelta of the Po River and the Adriatic shelf, allowed the collection and analysis of 430 surface sediments. Major results have been reported in Tesi et al. (2006, 2007) and Miserocchi et al. (2007).

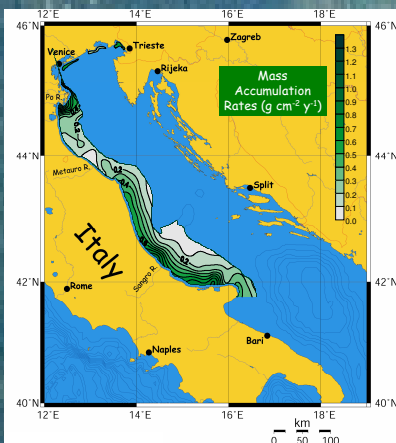
Distribution of organic carbon in surficial sediment

The highest accumulation areas of organic carbon are found in the zone influenced by rivers as the gulf of Trieste (Isonzo river), the Adige and Brenta rivers prodeltas, the Po prodelta, and the southern zone subject to Appennine rivers discharges.

OC contents higher than 1% compose a concentrated depocenter developing around the delta, probably as a result of high and rapid sediment accumulation enhanced by large rapidly sinking flocs (Fox, Hill, Milligan, & Boldrin, 2004). Southwards in the central Adriatic the OC contents show a narrower variability range (0.33-0.97%). On the shelf, OC values increase only along a narrow belt parallel to the coastline as the settling particulate matter is hydraulically sorted according to grain size: coastal sands, mud and silt further offshore (Brambati, Ciabatti, Fanzutti, Marabini, & Marocco, 1983). The deposition of the fine particle which have the richest content of OC determines the enrichment of organic matter in the sediments.



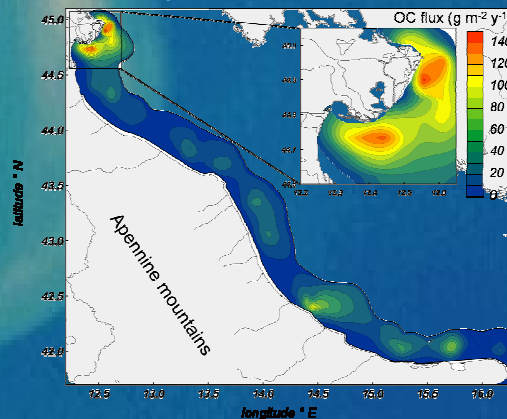
Mass accumulation rates



Several depocentres with high mass accumulation rates are evident in the northernmost coastal zone of the Adriatic, in the Po river prodelta and along a narrow belt between Ancona and Gargano promontory, as found by Frignani and coworkers (2005) with sedimentation rates ranging from 0.025 to 4.8 cm s⁻¹ and mass accumulation rates from 0.03 to 6.6 g cm⁻² y⁻¹.

Organic carbon accumulation rates reach the highest values in two depocentres of the Po prodelta with fluxes up to 140 g m⁻² y⁻¹ and in several depocentres along the coast. Till Gargano promontory.

Organic carbon accumulation rate



Future work

The future work will be addressed to the merging of the existing data set of organic carbon in surficial sediment and of the mass accumulation rates in order to calculate the organic carbon accumulation flux in the Adriatic platform and possibly to estimate the fraction ultimately buried in the sediment.

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