



## Dissolved organic carbon in the Mediterranean Sea

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Dissolved organic carbon (DOC) data, collected in the period 1999-2006, are reported and discussed in order to investigate DOC distribution and dynamics in key points of Mediterranean Sea (Gibraltar Strait, Alboran Sea, Balearic Sea, Gulf of Lion, Ligurian Sea, Algero-Provençal Basin, Sardinian Channel, Tyrrhenian Sea, Sicily Strait, Ionian, Adriatic and Cretan Sea). Aim of the work was the estimation of DOC export from surface to deep waters and the evaluation of DOC budget in the Mediterranean. Mediterranean Sea can be considered as a laboratory for the study of thermohaline circulation and biogeochemical cycles. In fact, here, the main processes, occurring in the ocean, can be observed on reduced spatial and temporal scales. In general, DOC concentrations ranged from 33  $\mu\text{M}$  to 142  $\mu\text{M}$ , these values are comparable to those reported for the ocean, even if with a different distribution in the water column. A relationship between DOC vertical profiles and hydrological characteristics of the different study areas was found. DOC was almost uniformly distributed in the intermediate and deep waters in areas where the vertical mixing dominated. Instead, when the horizontal transport was the main process, DOC vertical distribution was quite different, with a minimum (about 40  $\mu\text{M}$ ) in correspondence to the Levantine intermediate water (LIW), and an increase toward the bottom in the recently ventilated waters (until 90  $\mu\text{M}$ ). These trends underline the role of physical pump in regulating DOC distribution in the water column, particularly in the Mediterranean Sea. A large amount of semi-labile DOC (more than 50% of total pool) can be transported from surface to deep layers, in the formation sites of deep waters, such as the Gulf of Lion and the Adriatic Sea, in winter. The decrease of DOC with the increase of the age of a water mass, as observed in the core of LIW, can be mainly explained by DOC mineralization operated by bacteria. DOC concentrations in Mediterranean deep waters are higher (in some case twice) than those reported for oceanic deep waters. This can be related to the different time scale of the vertical mixing. About every year the deep waters of

Mediterranean Sea receive a new contribution from the surface, with a consequent enrichment in DOC, while the oceanic deep waters have an average age of millennia, as consequence DOC in the deep oceanic layers is about totally represented by the refractory pool. These observations suggest: (1) DOC distribution is strictly linked to water masses circulation; (2) a large amount of semi-labile DOC is transported from surface to deep waters and, as consequence, it determines a sequestration of carbon for a time of about 100 years; (3) the availability of a high portion of semi-labile DOC in the deep waters might induce important consequences in deep water ecosystems; (4) DOC export at depth strictly links surface processes and deep water ecosystems functioning.