PORE WATER DISTRIBUTION OF FE, MN AND DOC IN SEDIMENTS OF A SEMI-ENCLOSED BAY IN THE ISLAND OF LESVOS, GREECE

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Abstract

Sediment cores collected from two stations in the Bay of Kalloni revealed anoxic conditions near the sediment-water interface. The combination of anoxic sediments with an oxygenated water column can be attributed to episodic transport of organic material to the Bay, through river discharges, which is also reflected in the profiles of dissolved organic carbon concentrations.

Keywords : Iron, Manganese, anoxic sediments, Greece

The Bay of Kalloni (island of Lesvos, Aegean Sea) is a semi-enclosed shallow water body (Figure 1) with signs of environmental degradation (water coloring, planktonic proliferation, benthic community disturbance) because of the increased input of organic matter and nutrients from the land (1). Nutrient concentrations are not seriously enhanced and therefore the Bay cannot be considered as eutrophic since it shows a good rehabilitation capacity.

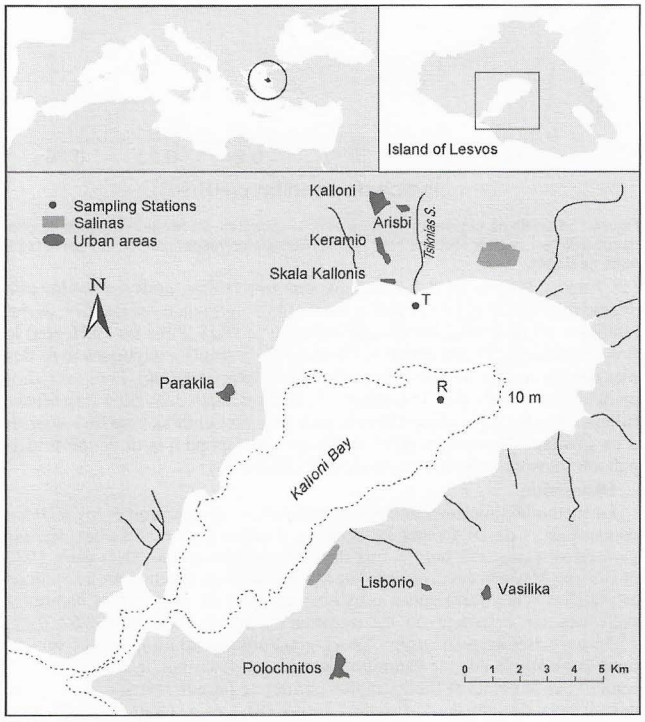

Figure 1 The study area and sampling sites

In the present study sediment cores were collected from the stations R and T in the Bay (Figure 1). At Station R (depth 13 m) the core was homogenous and fine-grained (97.6% ± 1.7% in the silt+clay fraction [< 63 _m]) containing relatively low concentrations of organic carbon (1.03% ± 0.12%). At station T, in front of the mouth of the stream Tsiknias (depth 3 m), the core was coarser (21.2% ± 11.2% in the silt+clay fraction). Organic carbon content was 1.4% ± 0.29%. The cores were sectioned and analyzed for Fe, Mn and organic carbon in the pore water.

At station R, dissolved Mn concentration in pore waters had a maximum at 2 cm below the surface, an observation which is attributed to a redox minimum in that depth, while dissolved Fe showed a maximum at 14 cm below the surface. The dissolved organic carbon content fluctuated greatly in the first 10 cm of the core, with a maximum at 8 cm (Figure 2a). In core T the reduction zones were more compressed, since the Mn maximum was located at the very surface of the sediment (Figure 2b). Dissolved organic carbon distribution present two maxima, at 8cm and 20 cm below the sediment surface.

Considering that, (a) the sediments in both the coastal and the deep stations are anoxic near or at the surface, (b) the organic carbon content of the sediments is not high, (c) the water column is well oxygenated although the Bay presents signs of ecological disturbance, we can assume that organic matter reaches the sediments in fluxes due to the intermittent flow of the local streams and the seasonal productivity of the Bay. Following its deposition organic matter degradation may lead to dissolved oxygen and dissolved organic matter depletion (2) in the pore water until the next episodic deposition, which will be superimposed on the previous layer of partially oxidized material, initiates a new cycle. The sequence of different episodic events could lead to a sequence of higher and lower DOC concentrations, similar to that presented in Fig. 2a.

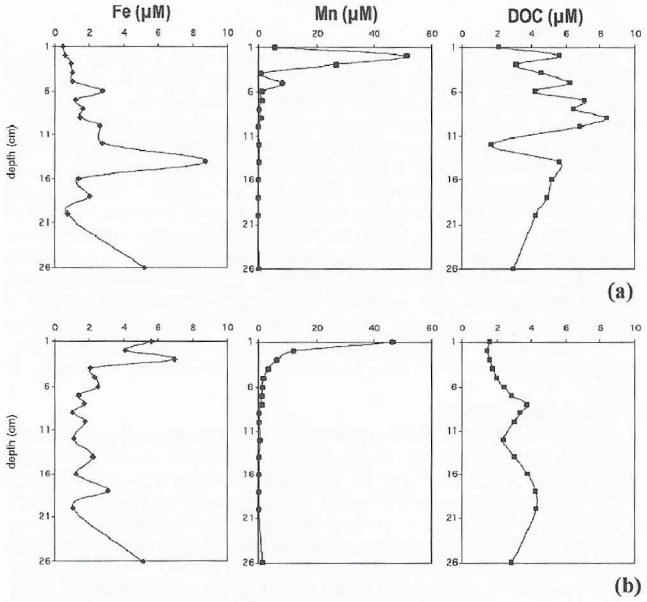

Figure 2. Fe, Mn and DOC profiles in cores R (a) and T (b).

References

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