

Interactive comment on “Biogeochemical processes in sediments of the Manfredonia Gulf (Southern Adriatic Sea): early diagenesis of carbon and nutrient and benthic exchange” by F. Spagnoli et al.

Anonymous Referee #1

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General comments

This contribution reports data collected during two cruises to two stations in the Gulf of Manfredonia in the southern Adriatic. The authors report data on sediment porosity, organic carbon content, C/N ratios, radioisotope profiles, oxygen penetration, nutrient concentration profiles, iron, manganese and sulfate and total CO₂.

I cannot recommend a publication of this study, and I suggest that the authors rewrite the manuscript. A clear objective of the study needs to be formulated that can be addressed with the data set. In the methods section detail is missing on the analytical methods, the number of replicates and the instrumentation used. One summer and one winter cruise certainly are not sufficient to present a “seasonal” study. Likewise, two sets of pore water solute profile will not be sufficient for an assessment of the

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biogeochemical processes that control early diagenesis in the study area. I strongly suggest that the authors add data that support the existing data set and that show the variability of the measured parameters over space and time. The discussion of the data should include work that has been published on diagenesis in Adriatic sediments, and this may also strengthen possible interpretations of the data set.

Specific comments

In general, this could be a useful dataset for the characterization of the biogeochemical processes taking place in these sediments. However, the authors limited the discussion to the description of the results, a thorough interpretation of the data and a link of the data set to existing literature is missing. At this point, the manuscript reads more like a cruise report and this applies also to some of the phrasing (e.g. oxygen uptake was pretty similar throughout the year”).

A working hypothesis is missing and the main goal of the research is not clear. The objective stated in the abstract: “to understand the mechanisms responsible of the recycle of carbon and nutrients at the sediment-water interface and to understand the role of sediments in nutrients mass balance in coastal water” could not be achieved with the two cruises (winter and summer) to two different stations in the Gulf. Because there is no indication on the spatial and temporal variability of the sedimentary profiles and the chamber data, it is not possible to extract significant trends or differences between stations or seasons.

Nevertheless, the authors for instance state that “the pore water profiles display a marked seasonality” and “in S2 (station 2), the oxygen uptake was pretty similar throughout the year” (2 chambers deployed 2 times a year!).

With respect to the pore water profiles, the authors came to the conclusion that “in the Gulf of Manfredonia diagenesis of organic matter progresses through oxygen respiration, denitrification, manganese and iron reduction, while sulphate reduction and methanogenesis do not take place”. It is very unlikely that sulphate reduction was not

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a major process in the decomposition of the sedimentary organic matter. Although the interpretation of the profiles is difficult due to the lack of replicates or error margins, sulfate seems to decrease in both stations and both seasons by tens of millimoles L⁻¹ over the sediment depth investigated, while the gradients observed for iron, manganese and nitrate remain in the $\mu\text{mol L}^{-1}$ range for the same depth interval.

The chamber data also raise important questions that were not addressed by the authors: The oxygen fluxes to the sediments at S1 were higher in winter, which is unusual because temperatures, organic matter input and microbial activity are lower, and the reported flux of more than 500 mmol m⁻² d⁻¹ is extremely high and seems unrealistic for a sediment, where organic carbon is mostly <1%. At the same time, the CO₂ flux from the sediment is rather low and no explanation is given for this mismatch.

There are numerous spelling errors in the manuscript, which could easily be omitted.

Interactive comment on Biogeosciences Discussions, 1, 803, 2004.

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