Review of egusphere-2025-1255-manuscript-version2I: mpacts of eutrophication and deoxygenation on the sediment biogeochemistry in the Sea of Marmara by Akçay et al.

This paper presents important new data on the chemical state of the water column and pore waters and solid state geochemistry of sediments, in three areas: Çınarcık Basin, Izmit Bay and the southern Marmara in the Sea of Marmara. Using these data, the authors address to effects of eutrophication and its feedback on the redox conditions and benthic cycling of nutrients from the sediment to bottom waters under hypoxic or anoxic/hypoxic bottom water conditions of the Çınarcık Basin and Izmit Bay and under oxic conditions in the southern Marmara.

Considering the siginifican new data on the water column and recent sediments, I support the publication of this manuscript. However, I have concerns about some of interpretations and conclusions regarding the diagenetic processes, which are listed below:

(1) Very little information are provided on the lithology of cores (i.e. grain-size parameters, total inorganic carbon, colour). Moreover, there is inconsistency between the brown colour reported for the upper part of the cores and the interpretation of anoxic/dyscoxic bottom water depositional conditions, based on the geochemical data of cores in the Çınarcık Basin and İzmit Bay cores.

(2) While cores a given area display different geochemical properties, the interpretations and discussion are generalized for the area as whole. For example, while pore water data for different cores in the İzmit Gulf or Çınarcık Basin display different redox conditions, the reader is given the impression that the deposition took place under anoxic conditions at all sites.

(3) The temporal changes in the SMTZ depth in the Sea of Marmara and their relation to the eutrophication are based on comparison of pore water geochemistry of cores from previous studies from widely different locations in the three areas. In the Sea of Marmara, the SMTZ depth spatially varies from seafloor (0 mbsf) to 7.5 mbsf according to the previous studies (Halbach et al., 2004; Çağatay et al., 2004; Tryom et al., 2010; Ruffine et al., 2018), while the shallowest SMTZ observed the cores of this study is 45 cmbsf in the İzmit Bay core IZ-30 (Fig. 7). Even in this core, the suboxic/sulfate reduction boundary is located at 20 cmbsf, and therefore, none of the multi cores shows evidence of deposition anoxic/suboxic bottom water conditions.
The authors should consider that the SMTZ depth in the Sea of Marmara is controlled not only by the DO content of the bottom waters, but also other factors such upward methane flux and sedimentation rates. The upward methane flux is in turn related to tectonic activity and gas hydrate dissociation, which might be controlled by global warming of the bottom waters and hydrostatic pressure changes). The methane flux in the Çınarcık Basin and İzmit Bay would be locally different, being the highest near the active faults, where the SMTZ occurs at or near the seafloor (see recent studies by Bourry, 2012; Crémier et al. 2012; Çağatay et al. 2018).

(4) The source of Mg and Ca: The authors consider the source of these elements to be the diagenetic dissolution of minerals in the sediment, but the downward decreasing profiles indicate that the source is the overlying seawater, and that the sink is carbonate deposition, most likely at or near the SMTZ. The source of K is also likely to be seawater and the sink is the clay mineral illite (via adsorption). Please see and cite some published papers on the topic.
(5) The content of subsection 2.1 is related to the cores and has nothing to do with the heading (The study area).I suggest that the authors merge subsections 2.1 and 2.2 under the materials and methods section.
(6) Terminology: In the text, and in particular subsection 3.3. Sediment Organic Matter Geochemistry, there are some unconventional terms, such as “undisturbed accumulations of particulates”. I wonder if this meant for mass flow deposition, which are mainly caused by seismic activity in the Sea of Marmara. Hence, possible presence of mass flow units in the studied multi-cores should be considered, especially in cores from the Çınarcık Basin and central basin of the Izmit Bay, where such units resulting from the recent earthquakes (e.g. 1999 Izmit Eartquake) have been previously reported (Sarı and Çağatay, 2006; Çağatay et al., 2012; Drab et al., 2015; Arslan Kaya, et al., 2022). This again bring out the importance of detailed lithological core descriptions.
(7) The manuscript needs some improvement to the English language. For consistency, please replace “Marmara Sea” with “Sea of Marmara” (as in the title)

The above concerns and other details are marked in the annotated pdf file of the manuscript. I hope the authors find the suggestions and comments useful for revision of this interesting manuscript.

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