

## ***Interactive comment on “Occurrence, sources and transport pathways of natural and anthropogenic hydrocarbons in deep-sea sediments of the Eastern Mediterranean Sea” by C. Parinos et al.***

**Anonymous Referee #2**

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Review of the manuscript “Occurrence, sources and transport pathways of natural and anthropogenic hydrocarbons in deep-sea sediments of the Eastern Mediterranean Sea” by Parinos et al. (BGD 9, 18999-18038).

This is a nice and important manuscript reporting and discussing the occurrence of a number of families of hydrocarbons in the Eastern Mediterranean Sediments. The manuscript is generally well written, but the discussion could be improved in some sections. Specifically, the authors do not account for the different processes affecting the transport of hydrocarbons, and modifying the pattern of hydrocarbons during transport. I suggest that the manuscript can be accepted after the moderate modifications noted

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below.

Specific comments.

- Since the authors aim at providing new knowledge and clues about the “pathways” affecting hydrocarbons, my impression is that the literature covered is not comprehensive. One cannot study pathways without assessing or considering what happens in the water column. I would consider previous work by Tsapakis et al. EST, 2006, Berrojalbiz et al. GBC 2011 and references there in, among others, in addition to the papers cited by the authors.

- The authors discuss some spatial patterns of the concentrations as ng g<sup>-1</sup>. It is also shown that these concentrations are correlated with the OC content. Which is the spatial variability of the concentrations normalized by organic carbon? This could give more information than the sediment normalized concentrations. Also, I wonder if the concentrations normalized by OC increase with depth, and with the estimated post deposition time. As OC is remineralized, the concentrations of some compounds, such as some heavy PAHs may increase since they are more persistent. Generally speaking, I think that post depositional processes could be better assessed with this data set, that what is done in its present version.

- The discussion on sources is superficial, in part because the authors do not take into consideration the modifications of the hydrocarbon profiles during their transport in the water column. Several studies have shown the modification of the abundance of lighter PAHs and alkanes (Lipiatou et al. Mar. Chem. 1993, Dachs et al. eST 1997, Dachs et al. Mar. Chem 1999). In addition, the relative abundance of vertical fluxes is different depending on the chemical. For example, sources of phenanthrene to the water column (atmospheric) are orders of magnitude higher than their vertical flux in the water column (and reflected in the sediment) (See Tsapakis et al. 2006). Then, it is erroneous, or precipitate, when the authors state that pyrolytic sources of PAHs dominante. It may depend on the compound. I suggest discussing the potential modifications of the

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pattern of PAHs, alkanes and other hydrocarbons during transport, and then making statements about potential sources. Distribution of hydrocarbons at surface waters for this region can be found in the literature in some cases, and for the other compounds may not be significantly different than in other parts of the Mediterranean or other oligotrophic seas. In addition, chemicals such as phenanthrene can indeed originate from fossil fuels, but there are a number of reports suggesting it could have a biogenic marine or terrestrial source (Nizzetto et al. EST 2008, Cabrerizo et al. EST 2011). Taking into account the short half-lives of phenanthrene in the environment, it is difficult to justify its environmental occurrence only from anthropogenic sources.

- I suggest to perform a principal component analysis of the data set, and see if the authors obtain new information.

- Maybe Canyons play an important role, as it has been suggested before, but It is difficult to me to quantify the importance of this process, since dense shelf water transport occurs intermittently, and other transport processes occur all the time.

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Interactive comment on Biogeosciences Discuss., 9, 17999, 2012.