

Interactive comment on “Transfer of lipids through marine water columns to sediments – insights from stable and radiocarbon isotopes” by S. G. Wakeham and A. P. McNichol

Anonymous Referee #1

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This manuscript discusses the sources of organic carbon in surface sediments of Black Sea, Arabian Sea and Ross Sea. Contributions of ‘marine biomass, terrigenous vascular plant, and relict sources’ are evaluated using lipid biomarkers, stable carbon and radiocarbon analysis. To better understand the global carbon cycle and its impact on climate change, it is important to learn sources of OC in marine sediments, which is still not well-studied. Radiocarbon analysis of specific lipid biomarkers is a powerful tool for marine OC sources apportionment in the past 15 years and it is applied in this study. I realize that nice samples and data were obtained in this work, but the authors fail to show an interesting story. Some terms are not defined, some conclusions are not easy to understand because a lack of detailed explanation. The key

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points of some sections are not clear that I need to read several times to have an idea what valuable information I can obtain. The manuscript needs to be reorganized to make the manuscript easily understandable to the reader and highlighted the key points. Specific comments: Title: P9761: I suggest modification of the title. As mentioned in the abstract, the manuscript focuses on the sources of OC, but not lipid biomarker. Lipid biomarker is a tool for OC source apportionment. Abstract: P9762 Line7: What’s the definition of ‘relict sources’? P9762 Line7: ‘sediment trap material’. It takes me some time to remember that ‘sinking particulate matter’, ‘sediment trap material’, ‘particulate organic matter/POM/bulk POM’ used in this manuscript are the same thing. P9762 Line7-11: ‘Marine biomass in...respectively.’ And P9762 Line15-18: ‘These results...marine POC.’ I suggest you explain a little about how you get these conclusions, even though you have mentioned in the text. I feel that’s more important than or as important as the conclusion itself. By the way, what’s the definition of ‘pre-aged OC’? Introduction: P9763 Line9: ‘marine OC’ may contain ‘terrigenous plant and relict sediment OC’. So what’s the real meaning of ‘marine OC’ herein? One extra question: Are there any previous studies on sources of marine OC in the same study areas? Without statement of historical work, it is not clear what knowledge the present work will added. At least, I know Eglinton et al., 1997, Science also ‘combined biomarker/stable carbon/radiocarbon studies of marine particulate matter’, studying the sample area (e.g. Black Sea and Arabian Sea). Results and discussions: P9772-4 Section3.2-3.3: When compound-specific stable carbon/radiocarbon analysis of sources biomarkers is used to estimate sources of OC, why it is still necessary to measure stable carbon/radiocarbon of bulk OC? In this section, sometimes abbreviated names of the seas (BS, AS and RS) are used, sometimes non-abbreviated names are used. It takes me some time to remind what the abbreviation means, because they are not as commonly used as ‘OC’. I suggest avoid using abbreviated names of the seas since the names are actually not long. Several points make Section3.3 difficult to follow: 1) The discussion starts from BS and AS, switch to RS, back to BS and AS, again switch to RS, then to AS and RS. 2) DIC probably means dissolve inorganic car-

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bon, but it is not introduced in the text above, and the authors also don't mentioned DIC was measured before this data is showed. It is confusing that why the discussion switch to DIC herein. By the way, what's SLE (P9774, Line12 and also P9773, Line5). 3) There is no prior explanation of 'pre-bomb and post-bomb' (P9773, Line25). Even though I know the change about atmospheric ^{14}C concentrations before and after nuclear weapon test, it is still not easy to make clear what the authors intend to tell herein. P9780 Section3.6: Components of OC can vary a lot in radiocarbon age, why the radiocarbon ages of bulk OC can be used in the mass balance method?

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