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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 #2

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The Wakeham and McNichol paper examines the stable and radiocarbon composition of a quite wide range of lipid biomarkers from a unique set of marine particulate samples, including both water column particles and surface sediments from the Black Sea, Arabian Sea and Ross Sea with contrasting oceanic settings. Both the sample set and the compound-specific 14C data are very precious, given the laborious nature and stringent analytical standard required for this type of analysis. Some of the results are the first attempt applied to the specific environment and will add valuable information on the source and fate of lipid compounds in the ocean. In this regard, the paper is very worthy of publication.

The authors further attempt to constrain the relative inputs of marine, terrigenous, and

relict OC sources by utilizing a multiparameter mixing model. While this approach has been used in quite many papers previously, it is not very clearly explained here, particularly the end-member values. For instance, both Cadded and Cother are mentionedâĂŤwhat's the difference? Does Cadded include both CT and CR? If so, why is Δ14Cadded assumed to equal Δ14Crelict? I think this needs to be clarified as it has a decisive effect on the result of the mixing model solution.

Also, on Page 9780, it says "the small differences in δ13C coupled with significant error make it difficult to use the stable isotopic composition as a discriminating factor in determining the sources of the bulk material". But it seems that δ13C values in Table 4 are still used for the calculations. Why so? How are the δ13C values chosen?

Finally, as compared with marine-derived lipids, terrestrially derived lipids are relatively poorly represented in Tables 1-3 with only 3 compound classesâĂŤalthough they are probably the most abundant and workable types in the solvent extractable lipids. But considering the large range of Δ14C values found for various marine lipids (in Arabian Sea, for example), how much confidence do you have in having these three types of lipids to represent the average 14C content terrestrial OC? As compared with marine biota, lipids are a relatively smaller component in the terrestrial biomass or OC. Some recent work has shown that other major terrestrial biopolymers (lignin) may have different 14C ages in surface sediments. How will this affect the end-member values and hence the result of the mixing model?

Specific comment: Page 9771, Line 15: Pearson and Eglinton (2000) is not found in the references.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/11/C4598/2014/bgd-11-C4598-2014-supplement.pdf

Interactive comment on Biogeosciences Discuss., 11, 9761, 2014.