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Interactive comment on "Characterization of particulate organic matter in the Lena River Delta and adjacent nearshore zone, NE Siberia – Part 1: Lignin-derived phenol compositions" *by* M. Winterfeld et al.

Anonymous Referee #2

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Winterfeld et al. present an extensive set of chemical characterization of organic matter in the Lena River/delta system. The manuscript mostly focuses on the composition of lignin-derived phenols. Based on this set of biomarkers the authors attempt to characterize terrestrial organic matter provenance and degradation in the Lena River delta. The data presented are novel and interesting and the authors attempt to answer an interesting and relevant scientific question. That said, I think that the authors are not making the most out of their data. In particular, I strongly suggest that the isotopic characterization (stable isotopes and radiocarbon) presented in the companion

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paper should be added to this manuscript (instead of being presented in a separate manuscript). Indeed, there are multiple places in the discussion where the authors cannot definitively chose between a set of plausible interpretations based solely on the lignin data. Adding the additional dimension provided by the isotope data would thus be very powerful. The current manuscript is in my opinion unnecessarily lengthy and could thus accommodate the isotope data at a relatively constant length. The mixing model also needs some work, in particular the uncertainties on the composition of the endmembers must be taken into account explicitly. I also have multiple specific comments, which are listed bellow. In summary, the manuscript needs a fair amount of work (in particular incorporating the isotope data to produce a single manuscript) before it can be published in Biogeosciences but if revised appropriately I am sure it would make for a very nice contribution.

Specific comments:

P14365 L10-11: 72+12 = 84%. What about the remaining 16%?

P14369 L14: 23-72% (mean 50%): that is really low (also not really surprising as it is notoriously difficult to recover particles from GFF filters). Please comment on potential sediment fractionation effects and their implications for the chemical composition of the organic matter.

P14369 L19-21: were C and N measured on total filters or scrapped sediments?

P14370: at first you tell us that the GC-MS was run in SIM mode then a few lines later that you scanned from 50-650 amu. Which is correct?

P14374 L27-28: to the exception of the needles which fall outside the expected range of S/V values . . .

Section 3.2.3: 3 out of 6 (i.e. 50%) of the plants you measured fall outside the “fresh tissue” box drawn on fig 4A. This seems inconsistent to me. Either re-draw the “fresh tissue” box or provide a rationale explanation.

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Section 3.3: Mixing model: 1) Given that the data fall on a binary mixing line between woody gymnosperms and non woody angiosperms it would make more sense to narrow the mixing down to these 2 end members (instead of angiosperm vs gymnosperms as do P14376 L1-2). This would also make the system a lot less underdetermined. You could even use the trend displayed by the data (looks like a linear trend to me, i.e. binary mixing) to inform your choice of the possible range of endmember composition. 2) You assigned S/V and C/V to the endmembers but don't tell us what are the uncertainties on these. For instance the non-woody angiosperm field is very broad (in both S/V and C/V) and makes no sense to use a single value from the literature for its composition. Instead you should assign a range of values and propagate the uncertainties throughout the unmixing routine.

P14377 L27-29: then why do you bother describing the sigma 8 data at length in the result section?

P14378 L 5-12: this is a good illustration of why you need to rope the isotopes into the mix (so to speak).

P14378 L 18-20: it seems to me that preferential degradation of cinnamyl phenols would make the data deviate from a linear trend in the C/V vs. S/V diagram, which they don't. You can thus probably rule that out.

Section 4.2.1 and 4.2.2: C/N ratios in Buor Khaya Bay sediments are much higher (on average almost double) than in Lena River TSM!! Please tell us what this means. That's another very good example of how the isotopes would help making sense out of the data.

P14386 L1-6: that's a key limitation to your quantitative apportionment of Taiga and Tundra derived OM. Please reflect this in your conclusion (e.g. stating that "a maximum" of xx% of the OM derives from the tundra).

P14387 L17: then why is the 2011 freshet sample the second most 14C depleted

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TSM sample? Again please discuss both datasets together, this will make for a much stronger paper.

Table 2: for the August 2009 data set, how can you have n=20 for TSM and n=21 for POC and POC/PN?

Table 6: how does the C/V and S/V values you choose for non woody angiosperms compare with the average of your own measurements of plant composition?

Interactive comment on Biogeosciences Discuss., 11, 14359, 2014.