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Interactive comment on "Origin and processing of terrestrial organic carbon in the Amazon system: lignin phenols in river, shelf and fan sediments" *by* Shuwen Sun et al.

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The transport and deposition of terrestrial organic matter in the Amazon River system is an important topic as the Amazon is a globally important exporter of terrestrial carbon into the ocean. As such, lignin distribution and transport in the Amazon River has received much attention in the past but connections or direct comparisons between the fluvial system versus marine archives are rare. To fill in this gap, this paper examines the distribution of lignin phenols together with bulk OC and 13C in riverbed sediments from the Amazon mainstream and main tributaries as well as marine surface sediments from the Amazon shelf and fan. Overall, the paper is clearly written with large amounts of original data. There are some interesting findings that are unique compared with

other fluvial systems. But as I read the paper for the first time, I found myself a bit overwhelmed by the detailed description of parameters. I understand that this is partly due to the large volume of data presented in the paper. More emphases on the (statistically significant) trend or pattern (rather than the actual values) of parameters may help to organize the paper in a more digestible fashion. Also, I would expect more discussions on the implications or comparison with previous Amazonian lignin work or other fluvial systems.

Detailed comments:

Abstract Line 19: Results from this study somehow contrasts with those from some other marine environments. For instance, lignin phenols in the Washington continental shelf and slope (affected by the Columbia River) are concentrated in the sand-size sediments due to the export of plant debris (e.g., Keil et al. 1998 GCA 62, 1347-1364). Tesi et al. (2016 JGR) has also found that lignin distribution in the Siberian Shelf coincides with the distribution of coarse particles enriched in plant debris. This study, however, reports that lignin is preferentially preserved in fine particles. What characteristics of the Amazon basin make lignin distribution in particles different from that in the Washington and Siberian Shelves? Does it have anything to do with the narrow range of Al/Si ratios, indicating relatively coarse particle sizes of the studied sediments? This should be discussed in the paper.

Page 7, Line 9: why is Xingu different from the other tributaries and mainstem?

Page 8, Line 9: lignin increases with distance from the river mouthâĂŤthis is interesting. Is it statistically significant? If so, why?

Page 11, Line 1: here and the discussion below mentions that the processing of terrestrial OC is minimal in the Amazon. This contradicts with the findings by Ward et al. (2013 Nature Geoscience) that lignin is being fast degraded within the Amazon River. How do you reconcile the discrepancy? This should also be discussed in the paper.

Page 11, Line 32: it is commonly thought that OC in fine particles are more degraded. Your observation is different. Feng et al. (2015 JGR) has found that lignin phenols in the forest O horizons of the upper Amazon basin exhibit very high Ad/Al values. Does this have a play in your observation? This may also explain the constant ratios of C/V and S/V (unaffected by degradation) versus increasing Ad/Al ratios?

Page 13, Line 10: “Spatial variation” of the degradation state of lignin. . ..

References: - Feng et al. 2016 JGR has recently investigated and compiled lignin phenol distributions in the soil-river (POM & DOM)-marine sediment continuum of the Madre de Dois-Amazon system. This paper may be a good comparison to your data.

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