

## ***Interactive comment on “Sediment release of dissolved organic matter to the oxygen minimum zone off Peru” by Alexandra N. Loginova et al.***

**Tomoko Komada (Referee)**

tkomada@sfsu.edu

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**GENERAL COMMENTS:** Benthic DOC and DON flux data are scarce, because they are difficult to obtain. The reactivity of the DOM that diffuse out of sediments is also not well constrained. This study is important in the sense that it contributes new data to both areas. However, as presented, I am not quite convinced that the conclusions drawn by the authors are fully supported by their findings.

**SPECIFIC COMMENTS:** Macrofauna are reported to be abundant in the study area. (In addition to what is discussed in the manuscript, Dale et al. (2015) mention occurrence of polychaetes at these stations, and Bohlen et al. (2011) report a bioturbation depth of 2 cm in the 11deg.S stations.) Centrifuging sediments containing macrofauna

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has been shown to elevate DOC (Martin and McCorkle 1993, L&O, 38:1464-1479; Alperin et al. 1999, 63:427-448, GCA), and most probably DON. The authors should provide some evidence that assures the reader that their pore water DOM data are free of such artifacts. The authors report very low DOC/DON ratios in the sediment, and some spikes are apparent in DOC and DON in both depth profiles and in the chamber data. While microbial processes may be behind these features, it is also entirely plausible that they were due to occurrence of macrofauna (e.g., stirring up sediment during benthic chamber deployment; getting squashed in the centrifuge). This is a very important point to consider when comparing diffusive vs net (benthic chamber) DOM fluxes.

Syringe filters can give large DOC background (and possibly DON also), but there is no mention about how the filters were cleaned. Please provide additional information showing that the data do not contain high (and variable) levels of blank.

The authors state that microbial N turnover and DOM fluxes are likely related (page 9, line 11). I wholeheartedly agree with this statement, and find that this is an area that is ripe for further study. The authors go on to discuss N dynamics quite a bit, but the problem with this is that, other than DON, none of the inorganic N data are included in this manuscript. This renders most of the nitrogen-related discussion speculative at best. The authors should either scale back on the N discussion, include the DIN data, or perhaps plan on publishing a companion paper that includes relevant DIN data. At the very least, chamber data should include nitrate, assuming that was the major electron acceptor.

The DIN data are also relevant to the extremely low DOC/DON ratios in sediments. The authors originally declare that nitrate/nitrite concentrations in sediments were negligible (bottom of page 5), then resurrect this issue as a possible explanation for the low DOC/DON ratio (bottom of page 9), only to dismiss it again (top of page 10). The authors provide a few other possible explanations for the low DOC/DON ratios, but this discussion would be a lot more convincing in the presence of a more complete DIN

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data showing that the DON values were not overestimated.

There seems to be an underlying assumption that sediment DOM is all refractory (e.g., page 1 line 5; page 2, line 21; page 11, line 15). As far as I am aware, this is not supported by the current literature. If anything, the opposite is more likely; a considerable fraction of DOM, especially near the sediment-water interface, is labile, and only a small fraction appears to be refractory (e.g., Bauer et al. 1995, *Nature* 373:686-689; Burdige et al. 2016, *GCA* 195:100-119; Komada et al. 2013, *GCA* 110:253-273). Therefore, assuming that the DOC and DON data presented here are indeed free of artifacts, it makes sense that the flux data point to microbial consumption of DOM that diffused out of the sediments. The authors should adjust the wording to better reflect the literature data.

TECHNICAL COMMENTS: I had difficulty reading Fig. 3, because the panels are so small. I am also unable to tell the difference between dark grey and blue (DOC vs DON). Black and grey arrows in Fig. 9 also look identical in color. Written English is OK, but not in publishable shape (parts that would benefit from editing are too numerous to list here). The narrative meanders in some places (e.g., discussion about DIN as I pointed out above). I also recommend streamlining the Introduction; I found the transition to DOC (line 16) a bit jarring.

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