

Interactive comment on “Short-term fate of phytodetritus across the Arabian Sea Oxygen Minimum Zone” by J. H. Andersson et al.

Anonymous Referee #2

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General Comments

The paper describes intensive field experiments to quantify the fate of carbon in phytodetritus on the sea floor at different depths across the well known oxygen minimum zone in the Arabian Sea. The experiments used carefully recovered cores that were incubated after the addition of C13 labeled algal material. The experiment was well thought out and the methods were meticulously designed to measure all components of the system so as to produce quantitative results. The importance of precise measurements is clear when, after 5 days, the majority of all the labeled material was unaltered. Never the less, they were able to follow the labeled 13C in several different carbon pools. It is difficult to make this type of experiment to measure rate processes at the sea floor, so these results are important and are appropriate for BGD.

Specific Comments

Of course, experiments seldom go flawlessly and this was no exception. One of the goals was to make similar carbon cycle measurements in situ using a benthic chamber. This would allow the validation of ship board incubation experiments, which is an important step. Some benthic chamber measurements were made, but the patchiness of phytodetritus distribution was too great to make statistically valid comparisons with results from core incubations. This point needs to be made a little more clearly (see suggested changes in wording in notes below) because I kept hoping to see more chamber results and comparisons, but little more was said. Nothing was mentioned in conclusions or the abstract, so I finally realized I was not going to hear any more about it. Still, the results of this work are important and should be published. Given the quantitative details in methods and results, I expected a few more quantitative statements in conclusions and the abstract. Even if limited to stating that a range of only X to Y% of the algal carbon added was processed after 5 days. Figure 8 nicely shows the percent of algal C13 respired as a function of depth. This combines the effects of temperature and oxygen concentration. What would a similar plot look like with percent algal C13 respired versus temperature? Might such graphs help to sort out the impact of each component, especially where the O2 level (and temperature to a lesser degree) at 140m was so different post monsoon?

Another potentially important variable that was not controlled, and barely mentioned, is pressure. On page 2502/4 there was a brief mention of a potential impact of decompression on the sediment during retrieval. This, of course, was the reason to make simultaneous in situ measurements with the chambers to test this, and other, variables. That aspect of the work was not successful, but there should be some discussion based on existing literature of whether or not pressure is likely to be an important variable for carbon recycling.

Regarding the title of the paper, I suggest adding that it is the short term fate of seafloor phytodetritus that is being studied. After reading the title I was expecting to read about

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decomposition of phytodetritus sinking through the oxygen minimum zone, another interesting topic. I was straightened out in the second sentence of the abstract, but the title should clearly state the purpose of the paper.

In the introduction it is stated that, Primary productivity increases dramatically in these two periods due to higher nutrient levels, caused primarily through coastal upwelling of nutrient rich waters and subsequent advection by large scale circulation. While it is true that coastal upwelling drives primary productivity during the southwest monsoon, the coast experiences downwelling during the northeast monsoon. It is the open ocean divergence due to gradients in the wind field and general circulation that provides upwelling of nutrients during that time of year. This needs correcting.

Technical corrections:

Title Short term fate of seafloor phytodetritus8230;

2494/6 dark incubated

2494/24 setting to the seafloor

2494/26 on to > by

2495/1 of sediment processes (not measures)

2495/2 have revealed inconclusive results „ inconclusive about what?

2495/13 through > by

2495/22 water masses

2495/26 has yet

2496/11 foraminifera (n)

2502/19 prominent and dominated

2503/7 the in situ incubation (the) chamber

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4, S1490–S1493, 2007

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2503/9 introduces too large an uncertainty

2503/10 8220;chamber area to conclusively compare with results from core incubations8221;

2503/11 poses

2506/18 (x) water

2506/20 locations

2507/2 from 16 degrees C in situ to a temperature8230;.

2507/7 (Table 1)

2508/4 at the surface after 5 days

2513 Table 1. Bottom water temperature and oxygen concentration (were) taken from CTD

Fig. 1 I do not remember reading any comments about how different cores AB were at 140m 8211; maybe I missed it

Fig. 5 Symbols need legend. None of the figures have an open circle as a symbol as shown here at 140m.

Fig. 6 Experiments at (four) five different8230;

Fig. 8 Interpolated percentage of total 8230; used for station 1850 during the post monsoon cruise.

Legend, when was the in situ measurement made?

Fig. 9 Interpolated percentage of total . . .

Interactive comment on Biogeosciences Discuss., 4, 2493, 2007.

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