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Interactive comment on “Evolution of cyclonic eddies and biogenic fluxes in the northern Bay of Bengal” by M. Nuncio and S. Prasanna Kumar

Anonymous Referee #1

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Although I think that the premise of the paper which attempts to link mesoscale eddies to biogenic fluxes collected in sediment traps is important as well as interesting, a great deal of work would be required to make it more robust. The authors have been addressing the problem of comparable carbon fluxes in the Bay of Bengal and Arabian Sea in spite of considerably lower productivity in the Bay of Bengal for several years. In several papers they have explored the possibility of eddies as a mechanism to fertilize the euphotic zone by eroding into persistent stratification from river runoff. Their attempt to explore the variability in carbon fluxes is the logical next step in their continuing work so this paper would have been a good opportunity to summarize the past work and lead it to the present conclusions. However the authors have not made any effort to summarize their previous work which would not only enhance the value of the paper but also bring the reader up to date on the work that has been undertaken. Very

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little effort has been made to give details on the sediment trap data e.g. where it was downloaded from, how it was collected and how the samples were processed. All that we know is the type of trap, the location, depth and the total biogenic flux. The only reference Unger et al. (2003) is missing from the list of references. Is this data open source? The trap is actually NBBT-N not NBBT as mentioned in this paper. Unger et al. (2003) suggested that enhanced fluxes at NBBT-N during the Southwest monsoon were the result of nutrient enrichment from the large river runoff during the southwest season which is not farfetched considering the amount of runoff from the three major river systems. This was indicated by the strong signal of freshwater that masked the signature of the northern eddy in Prassana Kumar et al. (2004) and the shoaling of the Mixed Layer at the open ocean eddy location as well as the elevated nutrient concentrations. Also as noted in Prassana Kumar et al. (2004) as well as by other workers is that light limitation curtails primary production in the north even if nutrients are available. So in spite of the high nutrients possibly pumped by eddies, PP could still be light limited. To imply that the negative sea level indicates a cold core eddy which pumps nutrients into the euphotic zone, which in turn enhances phytoplankton productivity and consequently carbon fluxes to the deep depths requires we ignore light limitation, influence of rivers, horizontal advection etc. It would have been more plausible if the workers had shown at least some ocean color images for 1998 and co-registered SST images for the period of their study. Vinayachandran et al. (2003) used ocean color to track eddies in winter but this study has not referenced. Two important aspects that the authors surprisingly failed to address is 1) the seminal paper of Ittekkot et al. (1991) and others that followed which suggest that organic matter maybe ballasted by heavier lithogenic material which enables it to sink faster. 2) The other is the work of Stoll et al. (2007) which uses the material from the same sediment traps including NBBT-N to identify certain regime indicators that show that peak organic carbon export precedes cyclonic eddy pumping. Perhaps a closer look at the relationship of these indicators with evolution and movement of the cold core eddy towards the trap would yield a better picture than the one presented in this paper. Also some studies that link meso scale

eddies to enhanced fluxes could have been referenced. Other comments include: 1. I am not sure I agree with the comment that there is no seasonality in phytoplankton biomass or productivity. Other studies have shown it. 2.Fig. 3, 4, 5 should have been extended to 95oE so we can see the situation when the northwest vs northeast eddy is dominant. 3.There are a lot of spelling and grammatical errors which need to be corrected. 4.Hovmuller should be capitalized 5.Pg 22 rephrase sentence "Once formed, they translated to the trap location leading to the enhanced downward biogenic flux" and replace 'translated' with a more appropriate word. 6.Edit the sentence" It is well known that these Kelvin wave radiate upwelling Rossby waves in to the interior ocean".

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