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Interactive comment on "Eddy-induced Track Reversal and Upper Ocean Physical-Biogeochemical Response of Tropical Cyclone Madi in the Bay of Bengal" *by* Riyanka Roy Chowdhury et al.

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Reply to the Comments of Anonymous Referee #1 posted on 11 March 2019

General Comment

âĂć Referee's General Comment

I am grateful for the authors' replies. Although the presentation of the paper might havebeen improved, I can not confirm it at the present moment, because I cannot find

therevised paper in the web now. Therefore, my comments are only for the replies.

Author's Response

We have gone through the comments of the Referee#1 very carefully. In fact, there are 4 comments this time and we addressed them point-by-point in the following section. However, all the 4 points broadly converge to Referee's reviews about (1) role of cold core eddy in controlling/arresting the northward movement of cyclone Madi and (2) how the present study on the out-gassing of CO_2 is quantitatively different from that of earlier studies.

(1) Role of cold core eddy in controlling/arresting the northward movement of cyclone Madi It is unfortunate that Referee#1 still remains unconvinced about the role of cold core eddy in controlling the northward movement of the cyclone.

To quantify the eddy's contribution to the intensity of the cyclone Madi, we have calculated the eddy feedback factor following Wu et al. (2007). The analysis showed (for details see following section on Reply to Reviewer's specific comments) that from 7th to 8th December when the system intensified from CS to VSCS and was passing through the warm patch associated with warm core eddy (see spatial maps of OHC at Fig.2 & positive SLA at Fig.3 of un corrected manuscript) the eddy feedback factor was positive and amounted to 59%. Thereafter, when the cyclone passed over the cold patch associated with cold core eddy during 9thand 10th December, the eddy feedback factor was negative and 69%. Thus, this analysis quantifies the contribution of both warm and cold core eddies; when cyclone passed through the warm patch the system intensified from CS to VSCS and its translation speed increased (see Table 1), while when it passed over the cold patch from 9th to 10th the system slowed down and its northward movement was arrested as noted under the section 2.3. We have elaborated the methodology of computation of eddy feedback factor under the "Response to specific comments" with a new diagram. The modification to the manuscript is also indicated there. We hope this will convince the Reviewer#1

2) How the present study on the out-gassing of CO_2 is quantitatively different from that of earlier studies Based on the Reviewer's comment, in order to compare our CO_2 flux with that of previous studies, we have recomputed the CO_2 flux along Track 1, Track 2 and Boxes A and B in mmolper meter square per day. While re-computing CO_2 flux we noticed a bug in our previous calculation, which we rectified. The newly calculated values showed a cyclone-induced CO_2 out-gassing which was about 4-times greater than the pre-cyclone values along Track 1 and in Box B. The impact of CO_2 out-gassing in Box A and along Track 2 were much smaller as when the cyclone was in this box and was passing through this track it was in a formative and dissipative stage respectively.

Several studies have demonstrated that the passage of a tropical cyclone can lead to enormous amount of CO_2 flux from the ocean surface to the atmosphere. For example, based on observation from Sargasso Sea during summer 1995 Bates et al. (1998) showed that hurricanes accounted for nearly 55% of the CO_2 flux into the atmosphere, while based on moored buoy data from the East China Sea Nemoto et al. (2009) reported a 60% contribution from typhoon in summer. In the eastern Arabian Sea Byju and Prasanna Kumar (2011) noted that cyclone Phyan emitted $\sim$8 mmol m2 day1 of CO_2 from ocean to atmosphere accounting for $\sim$85% of the total out-gassing for the month of November (climatology) calculated by Takahashi et al. (2009). Our study show that during cyclone Madi (6-12 Dec) Maximum CO_2 flux observed was 13 mmol m-2 day-1. Tropical cyclones have significant impact on the carbon cycle in the Bay of Bengal (Ye et al., 2019). Based on their study cyclone Hudhud and cyclone Roanu formed over the Bay of Bengal enhanced CO_2 efflux (18.49 $\pm$ 3.70 mmol CO_2 m-2 day-1) and (19.08 $\pm$ 3.82 mmol CO_2 m-2 day-1) due to wind effect during the storm.

We have elaborated this under Response to specific comments with a new diagram. The modification to the manuscript is also indicated there.

Reply to the Specific Comments of Reviewer#1 along with figures and Table is uploaded as Supplement pdf.

Please also note the supplement to this comment:
https://www.ocean-sci-discuss.net/os-2018-133/os-2018-133-SC2-supplement.pdf

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