

Interactive comment on “Seasonal stratification and property distributions in a tropical estuary (Cochin estuary, west coast, India)” by A. Shivaprasad et al.

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Comment: (1) One major drawback of this paper is the lack of velocity data in studying stratification/mixing processes. The authors say that they have compensated this with PEA calculation. But a quantitative explanation is needed.

REPLY: Thank you for your critical comments. It is true that quantified results of the whole estuary would allow deeper understanding into the prevailing mechanisms in Cochin estuary in order to compare with results elsewhere. Hence, we have quantitatively explained the results by computing the PEA longitudinally for varying runoff

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conditions.

Comment (2) Potential energy anomaly computed for a single fixed station is not going to represent the whole estuary when figures of longitudinal section of salinities depict large spatial variations in stratification. This has to be explained.

REPLY: In accordance with the reviewer's suggestion, we have computed PEA from the density profiles of spring phase of intrusion survey (Synoptic observation -section 2.2) for the months July 2008, August 2008, November 2008 and March 2009 which are shown in (Figure 9 -Please also note the figures to this comment). These months are characterised by south-west monsoon, north-east monsoon and dry period, respectively. The results obtained were in strong agreement with our longitudinal synoptic observations of salinity which are incorporated in the revised manuscript. The spatial variations in PEA plainly depict the changes in stratification due to bathymetry and seasonal river discharge. During July, the PEA also reached the maximum value of 128.3 J/M³ near the inlets whereas all the other stations remained well mixed (PEA~0). In August also, similar character was observed with high values of PEA 113.2 J/M³ near the inlets. Then river discharge was reduced to 3.34% in November. This resulted in the longitudinal dispersion of the salinity field and the PEA in the upstream of the system increased to 68.2 J/M³. Later during the dry period (March), discharge was only 1.4%. Therefore, the tidal actions dominated in the system which subsequently turned to well mixed and the average energy required to mix the water column in the estuary was 33.8 J/M³.

Comment (3) The stability factor needs to be computed for all stations to represent seasonal stratification.

REPLY: The stability factor is computed for all stations to represent seasonal stratification. The spatial variation in the potential energy anomaly is shown in Fig. 9. The potential energy anomaly (PEA) increases with increasing river discharges, specifically to the inlet regions in the south-west monsoon and north-east monsoon periods.

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Comment (4) Sec 2.2 Synoptic Observations, page 8, line 7: Write flushing time equation separately from text and give an equation number.

REPLY: It has been separately incorporated in the revised manuscript

Comment (5) Sec 3.1.4 Stability factor and stratification parameter, page 10-11: Only results should be described here. Detailed explanation of PEA and stratification parameter should be written in sec. 4 Discussions and Summary.

REPLY: It has been incorporated in the revised manuscript

Technical corrections: Technical comment(1) Sec 3.1.2 Temperature, page 9, line 18: Correct the grammar mistake.

REPLY: The sentence is corrected as The vertical distribution of temperature is as shown in Figs. 4–7. A pronounced surface to bottom difference in temperature was absent during spring and neap tidal phases in dry season

Technical comment(2) Acknowledgments, page 19, line 9-10 : Repetition of sentence on line 3-4.

REPLY: Repetition of sentence can be removed in the revised manuscript

Technical comment(3) In Figure 2b: The scale of X-axis starts from January to December but you have written in the legend Jun 2008 to May 2009. Please start the scale of X-axis from Jun 2008.

REPLY: Figure 2b (Please also note the figures to this comment) as rearranged as follows; it has been rectified in revised manuscript

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/9/C5291/2012/hessd-9-C5291-2012-supplement.pdf>

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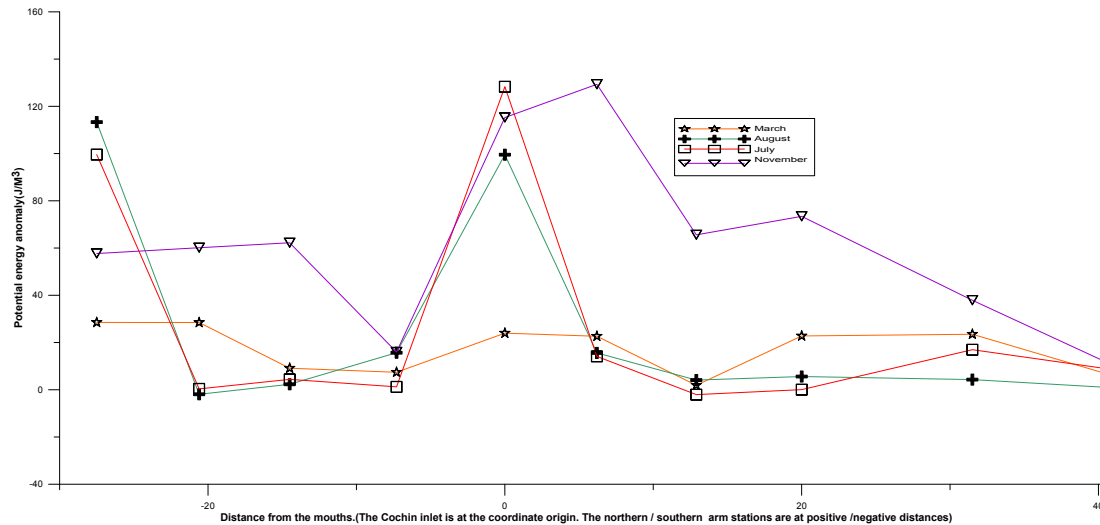


Fig. 1. Spatial variation in the potential energy anomaly (The months are characterised by south-west monsoon (July-August), north-east monsoon (November) and dry period (March))

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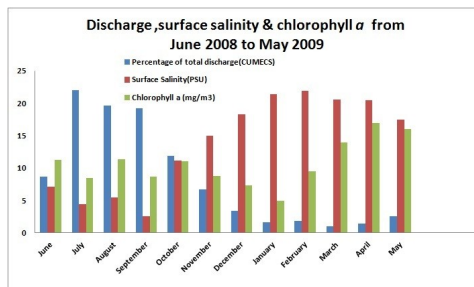


Fig. 2. Monthly river discharge, surface salinity, surface chlorophyll a starting from June 2008 and finishing May 2009.