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Comment on bg-2020-486

Anonymous Referee #1

Referee comment on "Reviews and syntheses: Physical and biogeochemical processes associated with upwelling in the Indian Ocean" by Puthenveetil Narayana Menon Vinayachandran et al., Biogeosciences Discuss.,
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Comment on "Reviews and syntheses: Physical and biogeochemical processes associated with upwelling in the Indian Ocean"

by Puthenveetil Narayana Menon Vinayachandran, Yukio Masumoto, Mike Roberts, Jenny Hugget, Issufo Halo, Abhisek Chatterjee, Prakash Amol, Garuda V. M. Gupta, Arvind Singh, Arnab Mukherjee, Satya Prakash, Lynnath E. Beckley, Eric Jordan Raes, Raleigh Hood

General comments:

This review provides a comprehensive overview on the physical dynamics in upwelling regions and the resulting interplay with biogeochemical processes in the entire Indian Ocean based on observations and model results. Variability of upwelling has a strong impact on climate-relevant trace gases as well as biogeochemical processes both having an effect in many ways on one of the most densely populated regions. Upwelling processes in the Indian Ocean are still less well understood than in the other major oceans, therefore the topic is highly relevant.

The manuscript is well organized, structured and (mainly) easy to read. The authors address main upwelling regions in the Indian Ocean giving a historical background, an overview about recent observations (characteristic of upwelling and impact on physical parameter), present status of modelling these upwelling systems and their upwelling mechanisms, and their impact on marine ecosystems and biogeochemistry. My main

concerns are related to the figures, which lack in care and precision and make the text sometimes hard to follow. I would also highly recommend a schematic figure for the different monsoon phases, that summarizes the main upwelling regions together with the monsoonal winds.

I recommend publication of this manuscript after minor revision. I will leave my comments below in the specific comments.

Specific comments:

-line992: Upwelling cannot be driven by primary production, it is the other way round.

Figure 2: Port Elizabeth (PE), Port Alfred (PA) and Agulhas Bank are mentioned in the figure caption but not in the figure. It would be easier to follow the descriptions in the text, if some geographical points would be marked in the figure or the latitude-longitude needs to be mentioned in the text.

Figure 3: "C.T" and "P.E." are marked in the figure but not explained in the text/figure caption.

Figure 4: X-axes (longitude) and y-axes (latitude) should be labelled. The font/scales of the colorbars are hard to read/recognize. Acronyms "LHS" and "RHS" should be explained.

Figure 5: Please mark the Transkei shelf in the figure.

Figure 6: I would recommend to label the x-axes of the lower panels as well.

Figure 8: The titles of the figures are hard to read and a scale vector for the wind stress is missing. I also would recommend to mark the respective months ("JAN", "JUL", "APR", "OCT") in the figures. The colorbar is very tiny as well as the font/scales. The unit for the wind stress curl is missing as well.

Figure 9: This figure would improve a lot and the paragraph relating to this figure would be much easier to follow if some geographical points would be marked in the figure such as: Angoche (or Nampula), Sofala Bank (or Ponta Zavora), Inhambane, Delagoa Bright, Maputo.

Figure 10: Please mark in the figure the geographical points you are referring to in the text.

Figure 11: Please mark in the figure the geographical points (Tanzania, Kenya) you are referring to in the text. Please label the currents also in the lower panel.

Figure caption: correct "southeast" to "southwest". Please refer to the contour lines.

Figure 12: 12a, b: What does the color shade show? A scale vector for the surface currents is missing. 12b: correct "SEM" to "SWM".

12c, d: Please also mark the respective monsoon phase (NEM) in the figures as in 12a,b. The text would be easier to follow if country borders are drawn in the figures. I would also recommend to label the colorbars with the respective unit.

Figure 13: Please mark a-d in the figure as you are referring to in the figure caption and in the text.

Figure 15: The x-axes of 15c should have the same scale as 15a-b, d-e.

Figure 17: The font of the colorbar is hard to read and the unit is missing.

Figure 18: Could you give the approximate latitude of the hydrographic sections? "approximately midway of the east coast" is not very precise.

Technical corrections:

-line 121: typo: correct "Northeasterly" to "northeasterly"

-l156: typo: correct "IIOE-2 (2015-2010)"

-l236: typo: "day1" should say "day⁻¹"

-l289: typo: correct "Current" to "current"

-l429: Do you mean "vertical suction"?

-460: The acronym MC has not been explained yet.

-l482: typo: correct "water" to "Water"

-l495: The terms "northeast orientation" and "southeast orientation" are misleading. Better: "northeasterly winds" and "southeasterly winds" or "southwest directions" and "northwest direction"

-l515: The acronym EMC has not been explained yet.

-l565: typo: correct "southeast" to "southwest"

-l566 and more: correct "SEM" to "SWM"

-l594: typo: correct "North-East Monsoonal" to "northeast monsoonal" or use the acronym "NEM"

-l635: correct "move" to "moves"

l636: correct "recirculate" to "recirculates"

-l643: correct "forms" to "form"

-l654: correct "migrate" to "migrates"

-l664: correct "result" to "results"

-l680: typo: delete "the" in "the another"

-l702: typo: correct "study" to "studies"

-l710: correct "of" to "off"

-l747: correct "crossshore" to "cross-shore"

-l788: typo: correct "21oC"

-l790: correct "in the shelf" "on the shelf"

-l930: The term "peak" is associated with a maximum, maybe "minima" is a better term.

-l998: The paragraphs have the wrong order: paragraph 2.7.5 precedes 2.7.4.

-l1044: "Figure 16" should be in bold.

-l1225: typo: correct "Joshnson" to "Johnson"

-l1229: correct "Oxygen minimum zone" to "oxygen minimum zone" or "OMZ"

-l1249: "belief" – I would prefer "assumption"

-l1294: correct "Srilanka"

-l1356: correct "appear" to "appears"

-l1425: "Other early studies..." This sentence is very long and hard to follow, please rephrase.

-l1635: Figure 26 does not show wind.

-l1740: correct "tolarger"

-1747: correct the semicolon

-l1752: correct "are caused" to "is caused"

-l1771: What do you mean with "high temporal and temporal resolution", please rephrase.