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Comment

## ***Interactive comment on “Indian Ocean Dipole modulated wave climate of eastern Arabian Sea” by T. R. Anoop et al.***

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Reply to the comments of Referee #2

1. This submission is concerned with the relation of wave statistics (“climate”; off the west coast of India) to the fields of sea temperature and winds, especially as related to the Indian Ocean Dipole IOD (intensity). A conclusion is that “The signature of IOD on the wave climate mainly depends on the modification of wind field induced by the phase of IOD events.” To some extent this is obvious as waves are generated by winds. The question arises of how much beyond this is found in this manuscript.

Reply: During the last two decades in the field of Oceanographic and Atmospheric research a number of studies are conducted based on the impact of IOD. But the impact

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of IOD on wave climate of eastern AS is not studied yet. Major finding of the present study is decrease of wave height during positive IOD and increase during negative IOD in eastern AS region because of turning wind pattern. This turning is due to the IOD induced temperature variability in equatorial Indian Ocean. During October, the wind from northern AS is the influential factor of IOD on the wave climate. If this wind is absent (e.g.: 1998) or deviated by any other factors (eg: 1996), the influence of IOD will diminish or is not present. Another finding of the study is that during positive phase of IOD, the sea state of eastern AS region become wave driven wind regime and during negative phase it become mixed sea state. Influence of positive IOD on wave climate is higher on southern part, but influence of negative IOD is higher in the northern part. These are included in the paper.

2. I wonder whether the attempt to relate the waves to the IOD, as distinct from the wind directly, is actually helpful. At least, it should be better motivated.

Reply: The present study is on influence of IOD on waves. Actually IOD has direct influence on the wind pattern from the northern AS. But even during comparatively strong negative event also the signature of IOD is not visible or diminishes in wave climate because of some local effect cause deviation of wind pattern (e.g.: during 1996 and 1998). Since waves have direct impact on the coastal area, we analyzed the nearshore waves.

3. The study is carried out mainly by modelling with validation using deep-water wave data for a month (only). There are years of (near-) coastal data at Ratnagiri and Honnavar which are used to find wave statistics to compare with DMI – why not also to validate the model with the same sort of statistical comparison as for the deep-water waves?

Reply: Anomaly of significant wave height (SWH) and mean wave period (MWP) at selected six locations off west coast of India are shown only for October from 1979 to 2014 and the wave data used is from ERA-I. This was not clearly mentioned earlier in

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the Figure caption. Now the Figure caption revised. Now we have added the validation of nearshore model for Ratnagiri also [Figure 3, Line 156-166].

4. There is a curious focus on October (only). Why? Apparently wind anomalies are greatest then, but (start of section 3) “The months of October and November is the calm period for the AS” so one might think that other months would be more interesting for analyzing influences on waves.

Reply: The peak month of IOD is during September to November (Saji et al., 1999). But the IOD has influence on eastern AS region only during October (see Table uploaded under supplement). Hence, in the present study we focused only on October.

More detailed points. Introduction: This could better start with some motivation for the study. If it is to understand the wave “climate” better then the motivation should be about the importance of the wave climate. The waves are driven by the winds. However the description of IOD curiously (over-) emphasizes the temperature field even though it is said (page 2474 lines 17-18) “The monsoon wind patterns in the north IO affects the spatial distribution of sea surface temperature (SST) in tropical IO”. There is some overlap between page 2474 lines 15-18 and page 2475 lines 23-26. I think the main seasonal cycle should all be described in one place, probably before discussion about the changes associated with the IOD.

Reply: Description on wave climate is now added. Paragraphs rearranged [Lines 36-55].

Page 2475 line 2. Please define what “positive” IOD means. If this means positive DMI then DMI should be defined first.

Reply: The terms are now defined [Lines 61-65].

Page 2477 line 17. Please clarify “the coupled system” (WW3 with nested SWAN) sooner than page 2478 line 7.

Reply: The word “the coupled system” removed [Lines 126].

Page 2478 lines 22-26. The WW3 comparison with observations is only for October 2009. Why not for the whole 3 months of observations? Is the comparison in November and December about the same as in October?

Reply: Our study is mainly on October only so that we carried out comparison for October. Now we have added the plot showing the comparison of model results with measured shallow water data at Ratnagiri [Figure 4, Line 156-166].

Page 2479 line 26. Better “northerly direction and going southwards again change their direction to north-westerly before..”

Reply: Corrected [Lines 194-196].

Page 2481 line 22. “greater” than what? A comparison is implied. Likewise “higher” than what. I guess in both cases the comparison is with a negative value of zonal wind component.

Reply: Corrected [Lines 248-250].

Page 2482 line 3. “Influences of IOD on the temperature variability of the north IO are shown in Fig. 6.” What is the relevance of this? If relevant, should it come earlier in the text?

Reply: To show the change in SST, SLP and wind we have included this Figure. Sentence modified to make it more clear [Lines 268-269].

Page 2483 Line 23. “The decrease of wave height” – what decrease, i.e. in what conditions? Line 26. As before, why only October? What about other months?

Reply: Sentence corrected. Since the influence is observed in October, only October included [Line 317]. For this study we considered the peak months of IOD explained by Saji et al, 1999. These months are September, October and November. But IOD influence in eastern AS region is observed only in October. Hence in this study we focused October month.

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We thank the reviewer for the comments/suggestions which improved the scientific content of the paper. The revised manuscript is uploaded under reply to the referee1 (supplement) .

Please also note the supplement to this comment:

<http://www.ocean-sci-discuss.net/12/C1485/2016/osd-12-C1485-2016-supplement.pdf>

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Interactive comment on Ocean Sci. Discuss., 12, 2473, 2015.

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