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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 the Referee #1

The authors investigate wave climate in the Arabian Sea and find that this climate is correlated with the Indian Ocean Dipole (IOD). Hence, there is an inter-annual component within the time series of wave height and wind speed. The analysis is carried using a combination of measured and model data. Wind and wave climate is, at present, an area of significant interest and this paper is a useful addition. I recommend publication, subject to the authors addressing the issues raised below. 1. The review section does not mention the very extensive wind and wave climate studies which have been undertaken using satellite data. These are particularly relevant to this study area. I

suggest that the following references are included and discussed. Young (1994) – the first global study of wave climate from satellite measurements. Zieger et al (2014) – a study of trends in wind speed and wave height with a focus on particular regions, including the Arabian Sea.

Reply: Review section modified. Suggested references are now added. [Line 34-35;ÂňÂň 169-170]

2. If the climate is linked to the IOD, as noted, it means that the waves are largely locally generated and, hence, remotely generated swell is small. The authors should note this fact. Perhaps a reference to Young et al. (2013) would be useful as this paper looks at the decay rates of swell. Reply: Yes. The wave climate of Ratnagiri is wind-sea dominated in during October-November (Glejin et al., 2013). This is now added also the reference to Young et al. (2013) is added [Line 251-262] 3. The authors use a blended dataset consisting of ERA-40 for the period 1958-1978 and ERA-Interim for the period 1979-2014. The differences between these datasets have been widely reported. What impact does this have on the analysis? Is there a discontinuity in the time series in 1978/79?ÂňÂň Reply: The performance of ERA-40 based on ERA-I is validated and found that the error in ERA-40 will not affect significantly our result. The ERA-40 is available from September 1957 to August 2002 and ERA-I is available from 1979 near to present. In this study, ERA-40 wind data for October is used from 1958 to 1978 and from 1979 to 2014 ERA-I is used. Hence, there is no discontinuity in data. Now we have added a Figure showing the cross comparison of October wind data from ERA-40 and ERA-I for the period 1979 to 2001 [Figure 2, Line 120-123].

4. In the model analysis the authors use WAVEWATCH in deep water and SWAN in finite depth water. These models have different wave generation and dissipation source terms. Does this inconsistence cause any issues? It is probable that wave generation is not an issue as the domains used for SWAN are small and hence only shallow water transformation may be significant. Reply: Agreed with the reviewer. Since we are concerned about the wave characteristics nearshore, wave transformation is sig-

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nificant. We have selected widely used WAVEWATCH III and SWAN model. Even though both model differ in the terms of generation and dissipation terms, the main aim is to get the nearshore wave characteristics and to get the realistic boundary condition, which is derived by the coupling of these models. The special feature of the SWAN model, in comparison with WAVEWATCH III, is its ability to simulate more accurately the wave processes in shallow water and coastal zone. Hence, here in our study WAVEWATCH III is implemented as deep water model which generates waves and the output from WAVEWATCH III is adopted as boundary conditions along the grid of SWAN (the nearshore model at higher resolution).Generally, the deep water boundary of the SWAN nest must be located in WAVEWATCH III where shallow water effects do not dominate (to avoid too large discontinuities between the two models). We have taken care of this point by making sure that the seaward boundary is large enough for not including the shallow water effects. Bottom friction and the quadruplet wave-wave interactions in WAVEWATCH III are parameterized in the same way as SWAN based on Hasselman et al. [1973] and Hasselman et al.[1985] respectively. We have also made sure that spatial and spectral resolution to be same since a factor of two or three can make a difference in result. Reference: Booij, N., Ris, R. C. & Holthuijsen, L. H. [1999] “A third-generation wave model for coastal region, part I: Model description and validation,”J. Geophys. Res.104(C4), 7649–7666 Hasselmann, K., Barnett, T. P., Bouws, E., Carlson, H., Cartwright, D. E., Enke, K., Ewing, J. A., Gienapp, H., Hasselmann, D. E., Kruseman, P., Meerburg, A., Muüller, P., Ol-bers, D. J., Richter, K., Sell, W., and Walden, H.: Measurements of wind-wave growth andswell decay during the Joint North Sea Wave Project (JONSWAP), Deutsche Hydrographische Zeitschrift, 8, 95 pp., 1973 Hasselmann, S., K. Hasselmann, J.H. Allender, and T.P . Barnett, \Computations and parameterizations of the linear energy transfer in a gravity wavespectrum, II, Parameterizations of the nonlinear transfer for application in wavemodels", J. Phys. Oceanogr., 15: 1378-1391 (1985) Tolman, H. L.: User manual and system documentation of WAVEWATCH III TM version 3.14. Tech. Note., 276, National Oceanic and Atmospheric Administration, National Weather Service, Maryland,

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USA NOAA/NWS/NCEP/MMAB, 194 pp., 2009

5. The model validation shown in Figure 2 is only for a period of 1 month. Why do the authors not include statistics for a longer period (at least 1 year)? Reply: We are studying the influence of IOD on wave climate of eastern AS during October only. Hence, we compared the model results with measured data for deep water in October only. But for shallow water we compared data for September, October and November [Line 156-166].

We thank the reviewer for the suggestion/comments which improved the scientific content of the paper. The revised manuscript is uploaded under supplement.

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/12/C1481/2016/osd-12-C1481-2016-supplement.pdf

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