Interactive comment on "Assessment of reliability of extreme wave height prediction models" *by* Satish Samayam et al.

Satish Samayam et al.

sasraj@iitm.ac.in

Comment: The name of the Oceans or Seas may be mentioned, instead of continent or country, as we are dealing with ocean waves.

Reply: The suggestion will be incorporated in the revised version of the manuscript.

Comment: Pg5, Ln 136-137: provide a few important references to the statement

Reply: The following two references will be added in the text. Sanil Kumar V, Muhammed Naseef T, (2015). Performance of ERA-Interim wave data in the nearshore waters around India, J. Atmos. Ocean. Technol., vol.32(6); 2015; 1257-1269 P.R.Shanas and V. Sanil kumar, Comparison of ERA-Interim waves with buoy data in eastern Arabian sea during high waves, Indian journal of Marine sciences vol.43(7),

July 2014,pp.

Comment: Section 2.2.2: Buoy data: If buoy data of the Indian Ocean is used, the details should be given.

Reply: The buoy data for the Indian Ocean has not been used in this study. The Indian Buoy data is very scarce and the length of buoy measurements is limited to 4 or 5 years which is insufficient for extreme wave analysis.

Comment: Section 3.5: may be reduced, and only the important details of the method may be given.

Reply: Authors agree with the reviewer's comment and in the revised version of the manuscript section 3.5 will be reduced including the key concepts of the method.

Comment: Section 4.4: It is not clear which datasets are used for this estimation. As stated earlier this method considers wave height estimation during storm events, and ERA data may not give accurate results for extreme events. As all the regions considered in this study are prone to extreme events, authors should clearly comment on this aspect in the text.

Discussion for Reply: Table 5 in the manuscript provides the datasets used for this estimation along with the related parameters of the ETS model. The ETS associated with a particular storm is achieved by means of two parameters: the triangle height a and its base b. Where a is the intensity parameter which is equal to the maximum significant wave height i.e., height of the peak during the actual storm. As mentioned by the reviewer when ETS method is used for the extreme wave analysis for ERA-Interim data, it resulted in an underestimation as given in the table below. This will be addressed in the manuscript.

Comment: Pg. 17, Para 1: As you have considered long term data, 6 h time interval is sufficient for extreme wave analysis. If so, 6 hly data may not be the reason for under prediction. Accordingly, the end part of the para may be modified. Yes, the

main drawback of ERA-I is that it does not capture the cyclonic events, and that is the important aspect to be considered in this study. As this study has utilised long term buoy data, important conclusions can be drawn from all four methods used in this study.

Reply: Figure shows the comparison of time series of the significant wave heights at Alghero from buoy measurements (red curve), from ERA-Interim wave hindcast measurements (green curve) during the cyclonic month of December 1999. This comprehensive comparison has been carried out by extracting the ERA-Interim data of resolution 0.125ox0.125o nearest to the selected buoy locations. From the figure we can see that the maximum Hs observed for ERA-interim data is 7.51m which is lower than 9.88m, maximum Hs that is measured by the buoy. For this location, the maximum wave height obtained from ERA-interim and that with buoy measurements show considerable variation. From this comparison of time series it can be observed that the simulated ERA-Interim data under predicts the high wave events especially during cyclones. We have shown the comparison of the return values obtained from the buoys and ERA-Interim at the same locations with different sampling interval in Table 6 and Table 7 of manuscript. From the results, the under prediction of ERA-Interim is witnessed for all the locations. So, it is justified to state the lower sampling rates of ERA-Interim data eventually results in the underestimation of extreme wave heights.

Comment: Pg. 17, Ln 484: " 30, 100 year extreme wave estimates"?? I suppose it is 30 and 100 years; if so, add 'and'.

Reply: The correction will be incorporated in the revised version of the manuscript.

Comment: Pg 17, Para 3: The reasons for not discussing 100 yr results may be provided.

Reply: The 100 yr results were discussed in Pg.18, Ln 510-516 of the manuscript.

Comment: Section 6: As the results of ERA-I are showing underestimation, and use of

ERA-I is not the objective of the study, it may be brought down. Before that results of other data sets may be provided in the conclusion. Also, results of ETS method are not mentioned in the conclusion. It is worth to mention which method has given the best results for the datasets. Comment: In the abstract it is stated that four models have been used, and the results are inter compared, and from that the best model is chosen for the present work. But, in the text, that part is missing. While revising the MS, this aspect may be looked into, and accordingly, the conclusion can be drawn. Then it is possible to state that which method or analysis provides the best results. It may also be noted that the datasets used for this study are from three different Oceans.

Reply for both the comments: Comparing the buoy return value estimates with the respective ERA-Interim estimates at the same location, we see that the ERA-Interim estimates are lower than those of the buoy estimates. It is possible to develop a linear association between the ERA-Interim and buoy estimates to overcome this underestimation in the future studies. This can be done by comparing the buoy return value estimates with the respective ERA-Interim estimates at several locations to maximize the number of data points used to estimate the linear association. The text related to the results of ETS will be added in the revised manuscript. This study focuses only on the estimation of the extreme significant wave heights. The analyses carried out and results produced will aid in the development of a 100-year extreme wave map for the Indian water domain. We have considered four different approaches to the return values estimation, all of them have their own advantages and shortcomings. But polynomial approximation method showed the consistency in 30 and 100-yr estimated return values for both simulated ERA-Interim and buoy wave height datasets, and hence identified as a general and reliable extreme value estimation method for Indian water region. This was already explained in Pg.19 Ln 547-551 of the manuscript.

Comment: "Buoy data" may be written as "buoy data" in the entire manuscript.

Reply: The correction will be incorporated in the revised version of the manuscript.

Comment: Figure 1: Only the location map of IO is shown; what about buoy locations in the other Oceans?

Reply: We have removed the Figures to reduce the size of the Manuscript. If necessary these figures will be incorporated in the revised version of the manuscript.

Comment: Figure 6: It is good to present the results of both the datasets in one figure with different colours; it gives better visual interpretation to the readers.

Reply: Thank you for your comment. A figure for each considered site will be included in the revised manuscript.

Technical corrections: Pg 1, Ln 17: Replace 'water' with Ocean Pg.16: Ln 446: Replace Al. with al. Pg. 16: Ln 466-467: This is repetition, and may be deleted from any one place.

Reply: These corrections will be incorporated in the revised version of the manuscript.

Table: Percentage of variation of 100 year return value estimates from measured maximum wave height (%)

Data	ETS
ERA IN-1	4
ERA IN-2	0
ERA IN-3	-9
ERA IN-4	-1
NOAA 44005	6
ERA 44005	2
NOAA 46050	-2
ERA 46050	2
RON Alghero	27
ERA Alghero	16

Fig. 1.
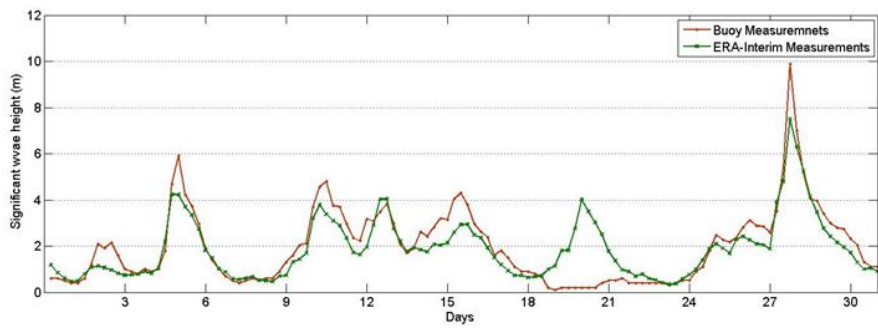
Figure: Comparison of ERA-Interim data with buoy data for a cyclonic month at Alghero

Fig. 2.