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Interactive comment on "Wave energy dissipation in the mangrove vegetation off Mumbai, India" *by* Samiksha S. Volvaiker et al.

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Summary

This manuscript presents modelling and observations of how mangroves dissipate incoming wave energy. Authors use a combination of local wave modelling and pressure level sensors are combined to study the dissipation of energy, when surface waves approaching the coast pass through an area of vegetation. The study is focussed on an area of mangrove forest in Mumbai. The authors discuss how waves are affected by interactions with different kinds of vegetation / parts of the same plant. A sensitivity study is performed of how characteristics of plants affect wave attenuation. Different

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Discussion paper

methods of calculation for Cd are also tried.

Overview This is a well written paper on a topic and geographical area which has not been well studied. There is limited observation data, over a very short window. It could be strengthened by looking at different periods, otherwise the statements about extreme events are just speculation.

Major issues

During the short window of observations, the waves were very low. Therefore we cannot draw conclusions about the dissipation of extreme wave conditions. Also, the tidal range meant that waves are only present for a fraction of the observation period. (I suppose this is obvious as the mangroves habitat is inter-tidal) but a longer period of observations, with variable wave conditions might have benefited the study. Would you like to speculate on how extreme events like cyclones might differ from the results you have shown here?

In the conclusion you state that "this study has potential of improving the quality of wave prediction in vegetation areas, especially during monsoon season and extreme weather events". I think this a very strong statement to end on, because you have so far only shown skill in representing low waves, and their propagation through mangroves. I don't think this paper has yet demonstrated the effectiveness of the model at high wave / deep inundation which would occur during monsoon conditions. Suggest if you wanted to add a section speculating on this, it would be nice to see, but you would need to observe, or at least model an extreme event with high waves. It would also be interesting to see how well this model behaves during a large storm- surge, when the waves are approaching the mangrove on a higher background water level. I expect that this would change which parts of the plants are submerged, and thus the drag effects calculated.

Minor corrections

P2 L36-38 focus of the study - suggest moving this line to section 2.

use of hectares (P4 L17 - can we have SI unit, or square km instead?)

P4: please state the water depth at each observation site P1 (offshore) to P4 inshore. Maybe give the min/max water depth over a tidal / spring-neap cycle?

in section 3.3 please explain first that the model you are using to focus on the mangroves is SWAN. Then separate out the description of the WaveWatch Indian Ocean model. Reading it right now, it looks at first reading as if the IO model is also SWAN.

Add a reference for the ERA-I winds (Dee et al. 2011)

P5 L8 "ERA-I winds..." repetition. cut this, and move the spatial resolution to L3/4 above.

P7 MIKE 21 inbuilt global tide model. What is this? Can you provide a reference?

P8 L4 "The model results..." suggest change to "The SWAN only model results..." as we were just taking about WW3. This section is talking about the stand-alone SWAN, without swells from the WW3 model.

P8 L20 repetition of "vegetation parameters" suggest changing the end of sentence to "sensitivity to presence of vegetation"

P9 L28-30, Explain that Fig 9. shows a comparison of consecutive days, at similar phases of the tide. This is important as it makes the results more comparable. Also important to note that the spectral shape, and wave period remain the same, and just wave heights are attenuated. Could even plot the spectra in Fig. 9 on 2 different vertical axes (with peaks scaled to be equal), so we can examine the shape more closely?

Acknowledgements the NIO contribution number is missing

Some typographic errors, mostly with whitespaces missing around brackets. E.g. P3 L22 "..coast atleast during.." P4 L2. P4 L25. P5 L6. P7 L28 (upto 52%) -> (up to 52%)

P8 L33. P9 L4. P10 L8

Extra reference Dee, D., S. Uppala, A. Simmons, P. Berrisford, P. Poli, S. Kobayashi, U. Andrae, M. Balmaseda, G. Balsamo, P. Bauer, and P. Bechtold (2011), The ERA-Interim reanalysis: Configuration and performance of the data assimilation system., Quart. J. Royal Met. Soc., 137, 553–597.

problems with formatting refs. P11 L23 and L25 Maxda Missing ref. to MIKE tidal model

Swap ordering of figures, so they appear relative to where they are mentioned in the text. Swap Fig 1 and 2.

Figure 1: this is a very large nesting ratio, going from 0.5 degree resolution Indian Ocean WW3 to 1 minute SWAN model. Is this likely to be a problem? Why was the larger IO domain chosen, would it be better to have an intermediate step?

Figure 2: How does the algorithm distinguish between mangroves and other vegetation?

Figure 4: clarify caption. Is this showing observations of SWH and MIKE modelled tidal water levels? Ditto figure 5: are these showing observations only, not model? Please add both points and lines to both plots. Also, in Fig 5. Is it 3 measurement sites, not 4?

Figure 6: strong linear relationship, somewhat undermined in e.g. panels (c) and (f) because of zero waves skewing the fit. maybe remove these points? If there is zero wave height, but still positive water depth, then what is happening at these times in P3?

Figure 7. Clarify caption to read "SWAN wave height attenuation..."

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