

## ***Interactive comment on “Extreme water levels, waves and coastal impacts during a severe tropical cyclone in Northeast Australia: a case study for cross-sector data sharing” by Thomas R. Mortlock et al.***

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We thank the reviewer for their thoughtful review of our manuscript. We have addressed each of the reviewer’s comments point-by-point below:

1. “. . .it would be nice to have the ratio between the contribution of waves to water levels (setup + runup) and significant wave height.”

This is a good point that we agree makes a useful addition to the paper. We have included this information as an extra column in Table 4, with a footnote for descrip-

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tion. We have also included a short discussion on the findings, in the last paragraph in section 5.3, and the forth paragraph in the conclusions. An extra reference (Nott, 2003) has been added. We find wave runup to be, on average, 18 % of the offshore significant wave height which is consistent with previous studies. There was, however, large variation between sites based on wave exposure.

2. “Is there for Debbie any offshore measurement for waves and storm tide? Maybe from satellite altimeters?”

Satellite altimetry-derived wave height and sea level measurements are indeed available for the Australian region. However, we feel the addition of this information is outside the scope of the paper for two reasons. The first is that the focus of the paper is on hydrodynamic drivers and impacts in the coastal zone, and at this location, shallow to intermediate water depths extend across the wide GBR shelf to approximately 100 km offshore. Thus, the value added by including altimetric deep-water wave height data in terms of coastal impacts is questionable. The second is that a core aim of this paper is to demonstrate the power of data sharing in a post-disaster environment. All data analysed in this study has been collected and shared amongst the contributing partners and our preference is to limit the analysis to this. Even with this arbitrary limit, we believe it constitutes a substantial body of work.

3. “Pag 5, line 20, how can the authors be sure that the tidal gauges don’t measure some wave setup?”

This is a pertinent point, and something that was mentioned during internal review but appears to have not been discussed in the text. The four tide gauges used in this study (Mackay, Laguna Quays, Shute Harbour and Bowen) are installed by Queensland Government sufficiently far outside the wave breaking zone to not include wave setup, under normal circumstances. They are also all installed on pier or wharf locations which are typically sheltered from wave breaking by design. However, it is true that under extreme conditions there may be a small component of wave setup that is captured

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in a time-averaged sense at the gauges. Our knowledge of these locations makes us believe the contribution would be minimal. We have now updated the text to include consideration of this point, as an additional paragraph in section 3.1.

4. “formula (2): I would suggest either to indicate with beta the slope, either to put tan beta in parenthesis.”

Equation 2 has now been updated accordingly.

5. “pag 6, line 33: is it possible that with such extreme Hs, at 35m depth you already significant wave breaking?”

We believe not. Wave breaking usually occurs at a height-to-depth ratio of approximately 0.7, meaning that even the highest Hmax value inferred in this study (approx. 10 m) would begin to break in around 14 m of water depth. This is safely shoreward of the Mackay buoy in 35 m water depth. For wave breaking to occur at the shallower buoy locations (e.g. Hay Point at 10 m water depth) waves would need to be 7 m or greater. However, only wave heights < 4 m were recorded at this location – suggesting all buoy data represents a shoaled but unbroken wave climate.

Words to this effect have been added in section 3.3 and as an additional paragraph in section 5.2 to clarify this for the reader.

6. “formula 8: wouldn't it more proper to call this measure the "total energy released per unit coast length"”

This definition has been added to the text below Eq. 8.

7. “pag 12, line 30: just as a matter of speculation, is it possible that the overestimation could be also due to a contribution of wave setup in the measurements of some gauges”

The consideration of wave setup inclusion in the storm tide gauge data has been addressed in response to reviewer's comment #3. The potential effect of this with regard

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to calculation of R2% we believe to be negligible because of all the gauges analysed, the most sheltered of these (Laguna Quays) was used as a surrogate storm tide measurement for the three beach study sites. Inaccuracies in the parameterization of the beach slope would have a far larger effect on R2%, as we have discussed in the paper.

8. “figure 1: . . . It would be nice to have a legend explaining what the dots and patterns are”.

A legend has now been added to figure 1.

9. “figure 2: legend missing”

Legends have now been added to figure 2.

10. “figure 3: the legend should explain also what the dashed lines represent”

Legend has been extended to include dashed lines.

11. “figure 4: given the orientation of the coast, I believe it would be clearer to show A B and C in the right side, D in the left side of the figure (maybe write on the top East and West, rather than North and South)”

The orientation of the coast is North-South, not East-West. Gauges 'A' to 'C' are indeed south of the cyclone eye and 'D' is north of the eye. Thus, the labelling and sequence is correct here.

12. “figures 5 and 6, I would write the name of the location in the figures after A B C and D”

Names have been added to A B C D plate titles in Figure 5, and A B C plates in Figure 6.

13. “figure 6, legend is missing”

No space for legend in Figure 6, so each item has been annotated on the plot to fully describe meaning.

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14. "figure 8: add legend, and write the name of the location close to the panel id"

Legend and location names have been added to Figure 8.

All these changes have been actioned and will appear in the final version of the manuscript.

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