

Interactive comment on “Are tidal predictions a good guide to future extremes? – a critique of the Witness King Tides Project” by John Hunter

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I thank Ben Hague for his comments and am gratified that he feels that the manuscript is "an important contribution to the coastal inundation literature". However, he claims that "the definition of 'success' of Witness King Tides has been too narrowly defined, especially when viewed from the perspective as a mechanism to generate coastal inundation impact information". I would argue that the manuscript does not attempt to define the "success" of Witness King Tides (WKT) but rather to indicate places where the observed sea level on the "WKT Day" is unlikely to be "unusually high" (see below for my discussion of "unusually high") with the result that none of the stated objectives could be properly met. I do not attempt to discuss any other attributes which could contribute to the "success" of a WKT project, nor suggest any other ways in which a

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WKT project could be deemed "unsuccessful".

There are two readily-accessible definitions of the purposes of Witness King Tides, firstly from the website www.kingtides.net:

"We are citizen scientists, capturing data and images showing what the future sea levels will be and what is at risk. The King Tides Project helps people all over the world understand how sea level rise will impact their lives.

King Tides photos are used several ways to help people:

1. Document current flood risk in coastal areas. 2. Visualize the impacts of future sea level rise in their community. 3. Ground-truth and validate climate change models by comparing model predictions with the high-tide reality. 4. Serve as a living record of change for future generations."

Secondly, from the report of the first WKT project by Watson and Fraser (Watson and Fraser, 2009; reference in main manuscript), which defined the two "primary objectives" as:

- * identifying areas vulnerable to tidal inundation, capturing the tide level against revetments, seawalls, jetties and other marine infrastructure; and
- * raising awareness throughout the wider community about the current projections for sea level rise to the end of the century (approximately 90 cm)."

It is clear from the above that the success of a single WKT project requires (among other things) that the maximum sea level on a "WKT day" is unusually high. Given that WKT projects are generally only carried out once per year in any one location, I imply by "unusually high" that the maximum sea level on a "WKT day" is among the highest for the year. WKT makes the assumption that the day of highest predicted tide of the year is a good proxy for a day when the observed sea level is "unusually high" - the manuscript questions this assumption and indicates places where it is probably valid and places where it is not. This is the primary aim of the paper.

The reviewer indicates numerous aspects of WKT that I do not discuss (or intend to discuss) in the manuscript, for example:

(1) "..... the appropriateness of using a single 'WKT day' per year (as opposed to once-a-month or once-a-decade, for example) in the metrics defined has not been discussed."

It isn't discussed because the aim of the manuscript is not to redesign WKT. At least in Australia, this is the way in which WKT started out (in most location, there was one "WKT Day" per year). Unfortunately, the history of WKT both in Australia and globally has been quite poorly documented and it is difficult to get an overall picture of what projects have actually occurred, where and when.

(2) "The existence or value of coastal assets that are impacted by king tides (e.g. Hanslow et al. 2018) (have) also not been considered in the assessment of the suitability of sites for WKT locations."

Again, consideration of coastal assets was not an aim of the manuscript.

(3) "These are both important factors to consider when assessing the success of a coastal monitoring program."

The reviewer appears to believe that the main aim of the paper is to provide a comprehensive assessment of WKT. It is not. It is to investigate one critical requirement for a WKT to have some hope of success - as noted above, it is that the maximum sea level on a "WKT day" is "unusually high". If this requirement is not met (and the manuscript indicates likely places where this might be so) then it can be reasonably argued that the WKT project will fail, in that the resultant images become no more useful than images of random high tides. Indeed, the manuscript warns that such cases could well negate the stated aims of WKT of "raising awareness about the current projections for sea level rise" and to "visualize the impacts of future sea level rise" (see above), by noting that "a significant negative storm surge on a WKT Day may well give the unintended

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message that the impact of sea-level rise is likely to be unimportant" (page 1, lines 22-23).

(4) "Concerningly, the results of this study could be (mis)interpreted to suggest that we only need to monitor coastal impacts at locations where inundation is tide-dominated."

The manuscript indicates "regions where a WKT project may be successful, in the sense that the day of highest predicted tide for the year (the WKT Day) would yield an observed level comparable with the maximum observed level for the year" (page 16, lines 7-9). Essentially, WKT works well in tide-dominated regions and poorly in regions not dominated by the tide. It seems a strange leap of logic to suggest that "we only need to monitor coastal impacts at locations where inundation is tide-dominated" just because WKT only works well in these regions. The manuscript even suggests (page 16, lines 13-15) an alternative strategy to WKT for possible use in regions where WKT may not work well.

(5) "I would however suggest that the aim of future programs is to capture any day where coastal inundation occurs, rather than the highest annual sea level. This will ensure a focus on coastal inundation impacts, rather than simply extreme sea levels."

This is exactly what the suggested alternative strategy (page 16, lines 13-15) would do.

(6) "It would have been interesting to further explore whether tidal range is a key factor in this analysis. For example, are low ratios due to infrequent storm surges or because tidal range is large? This could be useful to investigate due to its implications in the changing predictability of coastal inundation and potentially highlight locations where increases in tide-dominated inundation are most pronounced, and hence help identify candidate locations for future monitoring efforts."

Yes - it could be useful but does not, alas, fall within the scope or aims of this manuscript.

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