

Interactive comment on “Storm surge forecasting: quantifying errors arising from the double-counting of radiational tides” by Joanne Williams et al.

Anonymous Referee #2

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General Comments

The paper covers a topic that is interesting scientifically and important for storm surge modelling and forecasting, in particular for forecasts systems where the surge plus tide-surge interaction are added to tidal predictions. The paper describes the magnitude of errors that may arise from different processes omitted from some forecasting systems. The methodology is clear and valid. I recommend accepting the paper for publication following minor revisions, which are mostly structural and grammatical.

Specific Comments

The title implies the primary focus for the paper is the effect of radiational tides on surge
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forecasts, but the paper covers a number of considerations for storm surge forecasting and navigational chart datums (LAT, HAT). There are inconsistencies in the ‘message’, for example in the abstract and headings discussing HAT, when in fact a discussion of HAT and LAT is made. I recommend amending the title to cover the full content of the paper; for example “Errors arising from the treatment of radiational tides in storm surge forecasting and tide-based datums”. Also, given the structure of the paper follows a report style, a walk through the paper structure at the end of the Introduction (Page 2, Ln 11) would be very useful.

The numerical model is forced by ECMWF ERA-Interim wind fields with a resolution of 6 hours. It is my understanding that the storm surge numerical model will therefore lack some of the ‘peakiness’ in surge and high-frequency oscillations in the modelled tide+surge total water level (Ws) compared with tide gauge observations (at hourly or higher frequency sampling; Wg). Can the authors comment on the effective frequency of the surge signal by their use of a numerical model and can they quantify the effect on tide magnitude and phase estimation, e.g. quarter-diurnal shallow-water tidal constituents? I would imagine, since the numerical model will underestimate the total power in the signal, versus observations, that the double-counting of meteorological effects in the harmonic prediction are even larger than presented here. This extra work is not necessary for publication but would be interesting.

Pg 5 Ln 8: Please explain what Byrne and Flowerdew were pointing out, and hence why this fortnightly periodic error is important.

Minor typographical and grammatical notes

Please be consistent with “tide gauge”, “storm surge” or “gauge”, “surge”.

Please be consistent between numerical model run labels “surge+tide” and “tide-only” (there are many references to “surge” which could be mis-understood as surge-only as the phraseology is not clearly introduced in the Introduction).

Pg 1 Ln 3: Suggest “In some storm surge forecasting systems, a regional model is run twice: once as tide-only, . . . , and again as tide-and-surge, ... ”

Pg 1 Ln 8: Suggest change “key constituents” to “major constituents”

Pg 1 Ln9/10: Suggest the authors emphasise why HAT and LAT are important. Suggest change “We also quantify the extent to which the Highest Astronomical Tide, which is derived from...” to “ We also quantify the extent to which tide levels used in navigation datums and design heights, the Lowest and Highest Astronomical Tides (which are derived ...)”

Pg 2 Ln 4: Please reference Appendix A; else there is no citation or reference to the GSTM development and version in the main text.

Pg 2 Chapter 2: The notation is quite confusing. A notation table as an Appendix would be useful, clarifying what denotes total water level, tide and surge from what denotes numerical model or tide gauge observations and harmonic predictions.

For much of Chapter 2, the authors are clearly discussing the UK system. Can you make it clear ‘we use’ is specifically referring to the operational system in the UK. Where a methodology is typically followed by the sea level community, make that clear; for example, on Page 2 Ln 29+, “The choice and number of tidal constituents determined by harmonic analysis are typically chosen according to the length and frequency of data available”

Pg 7 Figure 4. Cyan line with baseline at 2.2 m has no label (total?), please check the labels.

Pg 7 Ln 1: Change “effected” to “affected”

Pg 8 Ln 2: Change “Vector differences . . . is . . .” to “A vector difference of . . . in S2 is . . .”

Pg 10 Chapter 4. Change heading to also include Lowest Astronomical Tide, or simply

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refer to tide-based datums

Author Contributions refer to Verlaan, who is not an author, so perhaps provide institution for completeness/clarity.

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