

Interactive comment on “Mapping wave set-up near a complex geometric urban coastline” by T. Soomere et al.

Anonymous Referee #1

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General comments:

This paper present the wave setup climatology for the Baltic Sea employing a wave generation/propagation model in combination with wave setup parameterizations. I think that the topic is suitable for the NHESS journal. However, a significant improvement is required before acceptance.

My major comments are: (i) the lack of the wave hindcast model validation at nearshore locations that provides confidence in the setup results here presented; and a (ii) more rigorous analysis of the simulated results (i.e., from 30-yr setup calculations obtain return periods and analyzed the trends).

Furthermore, the use of some parameterizations from the literatura needs to be further clarified/revise. For instance, the wave breaking index gamma=0.8 might be valid for monochromatic waves, whereas irregular waves (significant wave height breaking index value) can be significantly smaller (see Lentz and Raubeneheimer 1999; Raubeneheimer et al. 2001). Finally, the writing needs to be improved and a more comprehensive literatura review is required (some examples are included below). The use of some awkward/missleading phrases should be avoided. Moreover, consistency on the variables is necessary.

Specific comments:

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Lines 13-1.- The sentence: “This process results in a decrease in the average water level (set-down) in areas of reduced depth (Dean and Dalrymple, 1991).” is not necessarily true (e.g. maximum setup occurs near the shoreline where the depth is very small) and hence need to be revised.

1625 Lines 16-17.- The sentence: “...wave-driven set-up is a strongly nonlinear phenomenon within the surf zone...” needs to be revised. The wave breaking is strongly nonlinear. However, with a suitable parameterization of wave dissipation inside the surfzone results of wave setup can be obtained. Moreover, the wave setup can be derived from linear wave theory with reasonable results.

1653 Lines 1-3.- Revise the work by Apotsos et al. [2007, JGR-Oceans] who found that wave setup can increase owing to increase bottom friction (e.g. roughness). Please also revise Feddersen [2004, Coastal Engineering, Volume 51, Pages 473-481] in order to have a more comprehensive literatura review. The later work discuss the role of wave directional spread in radiation stress, and hence setup, not accounted for in the present work.

Lines 11-15 Decrease in mean water level are due to radiation stress gradients not mass transport. Lines 16-17.- Include the reference for this sentence: “For example, in

Florida wave set-up may form 30 % to 60 % of the total 100 yr storm surge."

1654 Line 5-6 Change the Word "unfortunate" Line 17 change "form" by "contribute"

Section 2.1 A model validation at nearshore locations is missing. I believed that it is necessary to show that wave transformation is well reproduced since is critical for the wave-setup estimation.

1661 Please be consistent with the nomenclature. The significant wave height is referred as "Hs" in 1659/Line-5 and as "h_s" in 1661/Line 16 which confuses with water depth h. They should be all capital "H" and hence for the significant wave height at 10 m water depth can be used H_s10. Please also revise equations (1)-(6) accordingly.

Line 21.- The breaking index of $\gamma=0.8$ might be valid for monochromatic waves. However, for irregular waves the ratio of significant wave height and water depth is smaller (e.g., see Lentz and Raubenheimer 1999, JGR; Raubenheimer et al. 2001, JGR) with typical values of $\gamma_s=0.5$. The authors should revise the breaking index value since is critical for the setup estimation or at least give an indication of how sensitive their results are to this value.

1662 Line 1.- The assumption (1) is neither valid nor necessary. The authors should consider the significant wave height by employing a breaking index more suitable for irregular wave conditions.

3. Results

Conduct a probabilistic analysis of the 30-yr wave setup time series (i.e., return periods). Also, you can check if there is any trend (significant at 95%) at any location.

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