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Comment on nhess-2021-161

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Community comment on "Development of damage curves for buildings near La Rochelle during Storm Xynthia based on insurance claims and hydrodynamic simulations" by Manuel Andres Diaz Loaiza et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-161-CC1, 2021

In this paper by Loaiza et al., the authors apply the Delft3D model to hindcast the sea state, water levels and flooding depths associated with the storm Xynthia, to further derive damage curves in the region of La Rochelle, France. Although this topic is relevant in a context of increasing flooding risks due to sea-level rise and increase in population along the coasts, the authors by-passed several studies explaining the key mechanisms that drove the large surge associated with Xynthia. As a consequence, their model underestimates the maximum water levels reached during Xynthia by almost half a meter in la Rochelle (and not 0.36 m a stated in their paper, there is also an error in the vertical referencing). Below is a list of suggestions that could contribute to improve this paper:

-Replacing Xynthia in the context of other storms in the Bay of Biscay would be useful. Breilh et al. (2014) reviewed the major flooding events that affected this region over the last centuries while Bulteau et al. (2015) performed a detailed statistical analysis of the return period associated with the water level reached during Xynthia in La Rochelle.

- In addition to the phasing between between the surge peak and the high spring tide, the key point of Xynthia was that the particular track of the storm from SW to NE induced a young sea state, which strongly enhanced the surface stress and drove a surge abnormally high with respect to the wind speed. In Bertin et al. (2015), one can see that using a bulk parameterization to compute the surface stress (e.g. Pond and Pickard, 1983) results in an underestimation of the peak surge by 0.4 m, as in the present study. As Delft3D is already coupled with the SWAN model, the authors could easily use a wave-dependent parameterization to compute the surface stress, such as the one proposed by Donelan et al. (1993).

- In Bertin et al. (2014), we performed a high resolution hindcast of the flooding associated with Xynthia, using a unique unstructured grid covering the whole NE Atlantic Ocean with a grid size locally reaching 3 m at the location of the dikes and natural barriers. In this study, we showed that such a fine resolution was required to represent the coastal barriers adequately. We further showed that the major flooding associated with Xynthia lowered the water level seaward by up to 1 m in estuaries, compared to a simulation where the flooding would not be represented. This important result suggests

that one-way nesting approaches would result in pessimistic flooding predictions. The authors should better explain their nesting procedure and possibly discuss the limitations of using a one-way nesting if it is the case.

I hope that the authors will find these comments useful, sincerely,

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