Natural Hazards
and Earth System
Sciences

Discussions

Interactive comment on "Estimation of insurance related losses resulting from coastal flooding in France" *by* J. P. Naulin et al.

J. P. Naulin et al.

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Dear editor

Please find enclosed the corrections for our paper "Estimation of insurance related losses resulting from coastal flooding in France". We would like to thank you for the extension of the deadline for the submission of our corrections.

We are also grateful to the reviewer for their valuable comments. We have tried to take into account their questions and suggestions in order to improve the paper. You will find below the answers to the comments.

We stay at your disposal in case any questions arise.

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Kind regards

Anonymous Referee #1

General comment 1 :

- We have tried to replace gray literature, technical reports and French papers with international references. There are still two references in French that are difficult to replace: FFSA (2011) for the cost of Xynthia and SHOM (2012) for the tide amplitude in France. We have also tried to improve the English and to avoid repetitions in the text.

General comment 2 :

- In effect, the limitation of water level due to flooding, as presented in Bertin et al. 2014, may impact our model. A paragraph has been added in section 2.2 to discuss this problematic. It is possible that Previmer locally overestimates water levels given the fact that it does not permit to represent flooding. However, in our case, this overestimation appears to be compensated by the meteorological data used for Xynthia and, eventually, by the water levels adjustment and the spatial resolution of 250 meters.

- The adjustment realized to correct water levels on the basis of the observations was described in section 2.1.1

General comment 3 :

- We have tried to precise this part. The WWIII model used by Previmer simulates the refraction phenomenon, but the spatial resolution does not always permit an accurate representation of local refraction at the coast. For the moment, the actual model does not take into account for the reverse shoaling effects. It could be interesting, in the future, to use the correction of H0 proposed in Lecacheux et al. 2012 in order to be in the conditions of the Stockdon et al. (2006) formulae (deep water and waves perpendicular to the coast).

Abstract, L.5: in regions where tides are large, a storm surge by itself is not a hazard;

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the hazard originates from the resulting water level (tide+surge).

- The fact that water levels result from the simultaneous occurrence of the tide and the storm surge was specified.

P2812, L.21: were atmospheric conditions really "extreme" during Xynthia? How do wind speed compare to those of recent extreme storms such as Haiyan?

- The term "extreme" was replaced by "severe" that seems more adapted to the situation given wind speeds are moderate by comparison with tropical cyclones such as Haiyan. The wind speeds of Xynthia were mentioned in the text.

P2814, L3-7: several studies conducted in the US over the last 5 years showed that it was nowadays possible to simulate storm surges and coastal flooding at regional scale using unstructured-grid models with massive parallel techniques (e.g; Bunya et al., 2010). Although requiring large computational resources, this kind of approach should be mentioned as possible alternatives.

- The approach of Bunya et al. (2010) was mentioned in the introduction

P2816, L19-25: see previous general comment on the limitation of water levels due to massive flooding.

- See response to general comment 2. We have tried to discuss the problem in the discussion of the model results

P2817, L14-16: what are the spatial resolutions of these two atmospheric models?

- The spatial resolution was indicated for the different inputs.

P2817, L17-19: for which period were obtained these values? Please try to provide more details when the reference corresponds to grey literature. - The results presented in Muller et al. 2014 have been mentioned as well as the hourly time step.

P2817, L20-21: are you talking about reproducing water levels of the associated flood-

ing during Xynthia? Is coastal flooding represented in the Previmer operational system?

- In effect, it is an error. The right term is "water level" and not "inundated areas"

P2819, L16: How wave setup can be computed from a spectral wave model? - Bertin at al. (2015) use actually a coupling between the spectral wave model WWM and the SELFE hydrodynamic model to estimate wave setup. The paper was reformulated in order to detail this aspect.

P2820, L16-17: why not using a LIDAR-based DTM? Is this data not existing or available in France?

- In France, there is an available Lidar-based DTM called RGE-Alti. However, this data, which has a resolution of one or 5 meters, represent a heavy investment for private companies, especially at a large scale. Another product called Litto-3D is currently being realized specifically for the coast to provide a continual sea-land elevation. This product is composed by the RGE alti for the land, but will be free. The RGE ALTI DTM was used in the study to evaluate the quality of the used DEM. As it was mentioned in the paper, the implementation of Lidar data in the model will necessitate important works that will constitute the continuation of the work.

P2821, L10-11: Could you try to better quantify the model skill, e.g. using the fit measurement of Aronica et al. (2002) or other appropriate metrics?

- The test proposed by Aronica et al. (2002) and used in Bertin et al. (2014) was implemented. However, this test is sensitive to the extension of the total area. The extension considered was the terrestrial part of the DEM grid used by the inundation model

P2821, L27: how do you know that water levels are underestimated by 0.4 m? Is there a tide gauge there?

- In fact, the 40 centimeters correspond to the difference between the simulations re-

alized with ARPEGE and the one based on AROME meteorological model. We have modified the text to be more accurate.

P2825, L1: the dikes are probably narrower than the 25 m resolution of the DTM.

- Indeed, it is probably the origin of the underestimation. This aspect was added to the text.

P2827, L2: Is that really extrapolated or interpolated? Is that reasonable to interpolate storm surge values between tide gauges?

- The term interpolated is effectively more adapted. We have tried to explain that, even if this interpolation is imperfect, it allows to give an idea of the magnitude of the event along the coastline and, thus, to compensate the hazard model limitations.

R. Schwarze (Referee)

Since the submission of the first paper, works has been undertaken to improve the damage model. We have found that one important parameter was not taken into account by the model: the number of days for which insurance prime was computed. Indeed, the insured value is computed initially for the number of subscripted days and thus it is important to extrapolate this number to the year in order to estimate the global insured value. Given the results, some new destruction functions and claim probabilities were computed.

The results of this new calibration drastically improved the results of the damage model as it is presented in table 3. In order to comfort our model, another historical event was added: Lothar and Martin (1999). Figure 8 was replaced by a table (3) that seems, from our point of view, more adapted to the situation.

Lastly, some reformulations have been done in order to avoid repetitions as it was suggested in the review.

Please also note the supplement to this comment:

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http://www.nat-hazards-earth-syst-sci-discuss.net/3/C2789/2015/nhessd-3-C2789-2015-supplement.pdf

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