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Discussions

Interactive comment on "Use of historical information in extreme surge frequency estimation: case of the marine flooding on the La Rochelle site in France" *by* Y. Hamdi et al.

X. Bertin

xbertin@univ-lr.fr

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The approach presented in this study by Hamdi et al. proposes to take advantage of historical information to improve the statistical modeling of extreme storm surges. This type of approach appears very relevant because determining return periods of extreme sea levels and surges from tide gauge data only entails several difficulties. Firstly, only a few tide gauge stations have time series long enough to perform reliable statistics. This problem is illustrated in the data that the authors used for La Rochelle, which only includes about 31 years of cumulated data over the period 1941-2014. Secondly, the occurrence of gaps in the data may not be random and on the contrary more frequent

during extreme events due to instruments malfunctioning. Thus, Breilh et al. (2014) reported that storm Martin, which severely hit the central part of the Bay of Biscay in late December 1999, induced a power failure in La Rochelle so that the tide gauge was not operating at the time of the storm peak. However, combining historical archives and numerical modeling, Breilh et al. (2014) suggested that the associated high tide storm surge would have exceeded 2.0 m, which is probably one of the largest storm surge to have affected this area over the 20th century. One can reasonably expect that ignoring such an event in storm surge statistics would affect the determination of the corresponding return periods significantly. In this sense, the method proposed by Hamdi et al. appears very relevant and would probably yield much more realistic estimates for the return period of extreme surges compared to analysis relying on tide gauge data only. However, the historical values that the authors used to feed their statistical model are of the order of 1.0 m, which appears weak compared to the ones identified in Breilh et al. (2014), summarized in table 1 attached to this text. As a consequence, it would be very interesting that the authors perform again their analysis including the data of Breilh et al. (2014).

In this table, the measured value (a) corresponds to the maximum observed value minus the predicted high tide. The modeled values (b) correspond to numerical hindcast using a fully coupled wave-circulation model forced directly with observed sea-level pressure and winds. Estimated values for hold harbor (c) were obtained using a conservative approach combining archives mentioning the flooding of the streets surrounding the historical harbor of La Rochelle and their height deduced from a LIDAR survey. Estimated values for La Pallice correspond to values obtained in (c) and corrected from the surge difference between the two sites as computed with the model. "na" stands for non available data.

Reference:

Breilh, J.F., Bertin, X., Chaumillon, E., Giloy, N. and Sauzeau, T, 2014. How frequent is storm-induced flooding in the central part of the Bay of Biscay ? Global and Planetary

Change 122, 161-175.

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Date		1924/01/09	1940/11/16	1941/02/16	1957/02/15	1999/12/27	2010/02/28
High tide surge	a-Measured	na	na	na	na	na	153 cm
	b-Modeled	na	na	131 cm	105 cm	211 cm	148 cm
	c-Estimated hold harbour	>160 cm	>190 cm	>167 cm	>108 cm	>220 cm	110 cm
	d-Estimated La Pallice	na	na	>142 cm	>93 cm	> 195 cm	>95 cm

Fig. 1.