

## ***Interactive comment on “Sea-level rise along the Emilia-Romagna coast (Northern Italy) at 2100: scenarios and impacts” by Luisa Perini et al.***

### **Anonymous Referee #1**

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It is an interesting paper that illustrates the consequences of mean sea level rise and storminess on the coastal areas of Emilia-Romagna in terms of land loss. The paper is logically structured and the methodology seems adequate (but I cannot make comments on the flood model because I don't know it). Unfortunately, the paper often contains confusing terminology that makes it hard to understand. This problem should be solved before the paper can be published.

Main problems.

a) The authors use 'sea level' both for a long term (multi-decadal) mean and a short-term (e.g. hourly) value, as in the case of storm surges. For instance at page 3, line 19, the meaning is 'mean sea level', like at page 9, line 8 (case CS1), where the full 'mean sea level' is used. By contrast, at page 6, line 18, the meaning is 'sea level height'

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relative to a known reference. As another example, at page 10, line 5, the authors only consider storm surges, while case CS2 also includes the wave effect. Definitions should be clear and used consistently. Note that Sect. 2.2 should involve the ‘mean sea level’.

b) The use of ‘wave’ is also often unclear. For instance, ‘storm waves’ at page 6, line 19 are clearly wind waves, while ‘meteo-marine wave’ and ‘specific waves’ (same page, line 30) are undefined. Please specify when wind waves or any other wave type are involved.

c) The authors deal with both storm surges and wind waves (case CS2). Sect. 2.3 is devoted to storm surges, but something about wind waves is also included. This is confusing because the role of wind waves is first mentioned explicitly only at page 10, line 16. The authors might consider to deal with storminess in general, that is both storm surges and wind waves (see page 8, line 23), and introduce the subject accordingly.

Specific comments.

Page 1, line 1: Are there any reasons to neglect natural land subsidence?

Page 1, line 13: Please clarify that ‘(in\_CoastFlood)’ is the name of the model. The missing reference, the different typos and the brackets are confusing.

Page 4, Lines 15-16: ‘some cases . . . sometimes’ is redundant.

Pages 5-6, Sect. 2.2: The discussion of mean sea-level changes over thousands of years is not crucial for present and future variations. By contrast, there is no discussion on the mean sea level variations during the last 100 years or so, when also anthropogenic subsidence occurred.

Page 6, lines 17, 30: The exact meaning of ‘meteo-marine’ is unclear in this context. I guess that the authors mean ‘the sea level changes component related to the atmospheric forcing’, which includes both wind and atmospheric pressure (not men-

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tioned). This component is the 'residual sea level' also known as the 'meteorological tide'. Moreover, is this the 'non-tidal residual' at line 26?

Page 6, line 27: Please quote the reference to which the reported heights are measured.

Page 6, lines 29-31: Unclear. I understand (but I am not sure) that the observed sea level can differ from the forecast represented by the astronomical tide plus the residual sea level ('meteo-marine wave' is bad terminology). The difference does not occur because of local morphology and specific waves, but because the model used for the predictions is not good enough. For instance, it may not include the correct basin bathymetry and coastal morphology, or the atmospheric forcing is too coarse. Anyway, the sentences can be dropped.

Page 6, line 32: Both waves and tides are mentioned. It is not clear what 'tides' mean here.

Page 7, line 6: Do the authors mean Adriatic instead of Italy?

Page 8, line 5: Unclear sentence. What are 'the E-R coast values'?

Page 9, line 14: The IPCC mean sea level rise projections are made for 2081-2100 (central year 2090.5) relative to 1986-2005 (central year 1995.5) (page 7, line 26), that is a 95-year time period, but the authors use a 85-year period. Is that a mistype?

Page 12, line 9: Is 'sea-level component' quoted in comparison to subsidence? Please clarify.

Page 14, line 29: Does the model include wind waves set up? These are not mentioned here, while they seem to have been at Page 10, line 16, when they are distinct from the surge.

Page 15, line 33: The authors should not only say that subsidence rates are assumed unchanged in the 21st century, but also the storminess characteristic.

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Page 21, Fig. 2: Please say if the zero height in the map corresponds to the 1986-2005 mean sea level (the IPCC start time), to the zero of the Italian geodetic network or to another thing. I also suggest to use a colour palette that highlights the altitude differences in the low-lying areas. Probably, a 0 m contour could also be useful.

Pages 26-30, Fig. 7-11: The coloured areas are often small compared to the whole figure and most of them are barely visible. Can the authors improve their visibility?

Page 33, Table 4: In the text (page 10) rare events have a return period »100 years, not >100.

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