

Interactive
Comment

Interactive comment on “An ensemble study of extreme North Sea storm surges in a changing climate” by A. Sterl et al.

Anonymous Referee #2

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General comments

In this manuscript, an ensemble methodology is used to study the impact of climate change on extreme water level in North Sea. The topics should justify a publication in Ocean Science. In addition, as far as I can see, the method used in the study is appropriate for this kind of study.

My first comment is about the title of this paper. The major analysis of this manuscript is focused on the water level (or sea level) instead of storm surge. The author only discussed the storm surge and tide in section 5 as a “by-product”. A more appropriate title should be chosen.

The storm surge model description is not very clear. In Section 2.1, the model descrip-

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tion is very brief, and it leaves important details out. e.g. For the tidal forcing in the lateral boundary, which dataset is used for this model? TPXO6.2 or FES2004, or some else? Which harmonics constituents are used? Is river outflow accounted for in any way? All the above factors are very important for the storm surge study.

My main concern is about directly using the GCM outputs to drive the high resolution storm surge model. The author evaluated the extreme wind speed. However, how about the mean sea level pressure? The inverted barometer effect is another important factor for storm surge. If the coarse GCM cannot produce the reliable low pressure system, how can the author convince the reader to believe that the WAQUA is capable of simulating storm surge using coarse resolution GCM forcing?

In Section 2.3, the author said they interpolate ERA40 data to ESSENCE resolution, then use it to drive WAQUA model. If my understanding is right, all the forcing data should be interpolated to WAQUA resolution (~ 8km) to drive the WAQUA model. Therefore, why the author firstly interpolate ERA40 data (~125km) to ESSENCE resolution (~220km), then interpolate to WAQUA resolution (~8km)? Why not directly interpolate from ERA40 resolution to WAQUA resolution (~8km)? Some bias can be induced by the author's interpolation sequence and some detail information maybe lost during the interpolation from high ERA40 resolution to coarse ESSENCE resolution. I may miss an important point here, but the author need clarify this.

I would recommend publication with some minor changes.

Some smaller comments:

Page 1038, Line 9: Suggest "European Centre for Median-Range Weather Forecasts (ECMWF)"

Define models and systems like WASA, ESSENCE etc. when they first appear in the text for sufficient any reader not familiar with these systems.

Interactive comment on Ocean Sci. Discuss., 6, 1031, 2009.

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