

## ***Interactive comment on “On the improvement of waves and storm surge hindcasts by downscaled atmospheric forcing: Application to historical storms” by Émilie Bresson et al.***

### **Anonymous Referee #2**

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The authors have attempted to present the results of an atmospheric downscaling with application to wave and storm surge hindcasting. It is indeed a very laudable project as it is well known that global atmospheric reanalyses currently available struggle to provide a good estimation of storm wind intensity, and hence waves and storm surge conditions needed to evaluate future hazards. This manuscript however reads more like a technical report than a paper suitable for a journal. It is my opinion that upon some restructuring, a clearer separation of the narrative (selected cases) from the statistical analysis it should become suitable for publication. Two separate areas were analysed (the French Coast up to the southern North Sea and the Bulgarian coast). Nevertheless, the manuscript currently feels like two separate papers written by two

C1

separate teams. It will greatly benefit if this duality was removed as much as possible and one common narrative was presented. Specific comments: Introduction: The downscaling of ECMWF reanalysis has been done before, For instance the Norwegian NORA-10 based on ERA-40: Reistad, M., Ø. Breivik, H. Haakenstad, O. J. Aarnes, B. R. Furevik, and J. Bidlot (2011), A high-resolution hindcast of wind and waves for the North Sea, the Norwegian Sea, and the Barents Sea, *J. Geophys. Res.*, 116, C05019, doi:10.1029/2010JC006402. Page 2, line 18: "extreme convective systems" . This seems to imply that only convective systems have very strong winds. Deep winter lows will produce very high winds but they are not necessarily what would be described as convective systems Page 3, section 2.1: Can you be more specific on the interpolation method. ECMWF uses a spectral representation of their atmospheric fields with grid point representation for the surface fields (and a few others). What was done exactly? What about the vertical? Later it is mentioned that the 6 first hours of each forecast were discarded to avoid spin-up effect. How does this 6 hour window relate to the interpolation method? Why not 3 hours, instead? Does it have any impact on the results? Page 4, line 3: both ERA-40 and ERA-Interim were reanalysis for land and waves as well atmosphere, just as ERA-20C. Section 3.3: What is the justification of not coupling the storm surge model with the wave model. There are ample evidence that it is beneficial to both surge and waves hindcast. See for instance Bertin et al. (2015). Xavier Bertin, Kai Li, Aron Roland, Jean-Raymond Bidlot. 2015: The contribution of short-waves in storm surges: Two case studies in the Bay of Biscay. *Continental Shelf Research* 96, 1-15.

Section 4: It is not clear which is time discretisation of the different forcing. ERA-Interim analysis data are 6-hourly and could be supplemented with 3-hourly forecasts to yield 3-hourly forcing. The down-scaled D1 and D2 fields, I assume are hourly. Consolidate and summarise the statistical analysis by avoiding to show statistics on very short time series but rather on the full sample and use instead the few selected cases as qualitative examples on the type of differences that was obtained.

C2

