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Interactive comment on "Self-Organizing Maps approaches to analyze extremes of multivariate wave climate" *by* F. Barbariol et al.

F. Barbariol et al.

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We thank the Referee for the comments and advices that will certainly improve the quality of our work. Comments are reported below, followed by our responses (*italics*: Referee's comment, **AR**: Authors' Response).

The paper 'Self-Organizing Maps approaches to analyze extremes of multivariate wave climate' by Barbariol, Falcieri, Scotton, Benetazzo, Carniel and Sclavo, deals with a SOM mapping technique, to assess and describe the multivariate sea climate. The analysis is performed on a long wave time series of data, collected off shore Venice at the Acqua Alta oceanographic tower. The multivariate sea state presentation is a key topic in the OS, the technique here proposed (SOM) is well supported by the literature

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and is well presented. The analysis is performed on the entire data set and on several sub set of data, and the differences are discussed. The paper is suitable for publication on Ocean Sciences after several small discussion and correction on the actual version of the paper.

- *Some other methodologies and techniques are used in the description and estimation of joint probability dependence among variables. Of particular interest is the use of copulas. Several application on this application on sea state variables can be found in literature, i.e. De Michele et al., 2007, (De Michele, G. Salvadori, G. Passoni, R. Vezzoli. A multivariate model of sea storms using copulas. Coastal Engineering, 54, (10), 2007, 734-751) and more recently in Masina et al., 2015 (Masina M., Lamberti A., and Archetti R. Coastal flooding: A copula based approach for estimating the joint probability of water levels and waves. Coastal Engineering, 97, 2015, 37-52). A comment is welcome.*

  AR: We appreciate the Referee's suggestion, because it gives us the opportunity of enriching the description of the theoretical framework and of the alternatives to estimate joint probability distributions. We will thus include a comment in the revised manuscript about the possibility of estimating joint probability distributions using copulas and the reference to the papers indicated by the Referee.

- *More in detail, the authors select and discuss the results on several storms, for example considering the first data set and SOM application (page 1981-1982), the authors discuss the storm with Hs= 4.46 m, 6.7 s, 275°N; and results are presented in Fig.5 (and later in Fig. 8 and Fig. 11). Can the authors give more information on the date of the events? Why this event is here discussed and how was selected? What #118 BMU refers to?*

  AR: The series shown in Figure 5, Figure 8 and Figure 11 occurred in the period from November 26th 1983 15.00UTC to December 14th 1983 03.00UTC. In the revised manuscript the time axis will show the days of the year 1983, to allow a

easier identification of the events. The series has been chosen because it was representative of sea states well reproduced by the traditional SOM technique (i.e. likely Hs) and, at the same time, of sea states that are not properly reproduced due to the limitations pointed out in the SOM technique (i.e. extreme Hs). The #118 BMU refers to one of the 169 (=13x13) BMUs composing the output map and representing the analysed sea states. In particular, #118 refers to the position occupied by the BMU having the highest Hs, which indeed is placed at the first row and tenth column (the BMUs' numbering starts at the top-left cell and proceeds from top to bottom over map rows and then from left to right over map columns). We thank the Referee, because actually this was not well explained in the manuscript. Hence, we will provide a better explanation in the revised version.

- *In Fig. 10 and Fig. 13 the right panels present the map for the highest values, so for the extreme events. I suggest to create new color palettes for the right panels, both for Hs and %, in order to better present the results for the extremes.*

AR: Thanks for the suggestion that we will try to follow by adding two new color palettes for each of the mentioned Figures describing the right panels.

- *Line 9 page 1981: 0.36 s, seems to be a mistake, and the correct value is 3.6 s, please review this value.*

AR: Yes, it is definitely a mistake. Thanks for having noticed it. We will correct it in the revised manuscript.

Interactive comment on Ocean Sci. Discuss., 12, 1971, 2015.

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