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Interactive comment on "Self-Organizing Maps approaches to analyze extremes of multivariate wave climate" *by* 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 (Barbariol et al.)" presents several interesting strategies to deal with extremes using SOM due to its visualization properties. The best solutions seem to be the TSOM and POT-SOM. However, the POT-SOM presents the disadvantage of the extreme data discontinuity in order to reproduce the time series and probability density. Both methods require working with two SOMs.

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- *Have been analyzed if a SOM of a higher size (e.g. 25 x 25, more clusters than two SOMs of 13x13) might detect extremes with a similar range of variation of Hs? A preselection using MDA to avoid many clusters in areas with high data density could have a more significant effect in a SOM of a higher size.*

  AR: According to the intuition, the larger the number of prototypes, the better the representation of a sample. Hence, we verified that a higher size (e.g. 25x25) SOM can produce a wider range of extremes with respect to that used in the paper (i.e. 13x13): the units' maximum Hs is 3.56 m instead of 2.75 m. In the same map configuration (i.e. 25x25), MDA preselection can further widen this range towards extremes, being 3.63 m the units' maximum Hs obtained with an 80% reduction of the sample (using MDA) and 3.66 m the units' maximum Hs with a 40% reduction. This has the effect of reducing the absolute error on 99th percentile of Hs (1% with 80% reduction and 11% with 40% reduction). However, the most extreme sea states are still far to be properly represented (we recall that the most extreme sea state observed had Hs = 5.23 m). In addition and most important, if a larger number of elements in the map can improve the SOM performance shown in the paper, it will certainly worsen the readability of the map and the possibility of extracting quantitative information from the map. Indeed, considering for instance the 25x25 map, sea states at a site would be represented by 625 typical sea states: a huge number that is hardly manageable for a practical classification of the possible conditions. This is the reason why, to our best knowledge, the most of the applications of SOM in the wave analysis are performed with maps in the range of 13x13 to 15x15 elements, which allow an easy visual extraction of quantitative information from the map (i.e. the reason for using SOM instead of other techniques). Hence, the approach we propose in the paper try to improve the extremes representation while conserving at the same time the more practical readability of SOM map with a small number of elements. In addition, the proposed approach is independent from the number of elements that are used in the SOM map. However, we will add a discussion about this point

OSD

12, C1220–C1222, 2015

in the revised manuscript and we thank the Referee for having pointed it out.

- *One suggestion is not used "BMU" to refer to centroid, prototype. BMU is "the neuron whose weight vector is the closest to the input vector" during the training process and in the final classification. BMU is a term related to each input data.*

  AR: We thank the Referee for the suggestion that we accept. Hence, in the revised manuscript we will change "BMU" into "units" when referring to the centroids (i.e. the elements) that constitute the map.

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