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Biogeosciences Discussions

Interactive comment on "A comparative study of biological production in eastern boundary upwelling systems using an artificial neural network" *by* Z. Lachkar and N. Gruber

Anonymous Referee #2

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Authors use a complex but powerful tool to analyse and compare biological production in the four major eastern boundary upwelling systems. Given the complexity of non-linear interactions between the variables considered as drivers responsible of the Net Primary Production (NPP), the method, Self-Organizing Map and Hierarchical Agglomerative Clustering, seems to be adequate. Nevertheless, results found are descriptive, i.e. cannot be used to argue that one variable "inhibits" another one. Furthermore, EKE is estimated in the region from 150km to 500km from the shore, missing the coastal strip where most of the upwelling takes places and where the highest EKE values are found. On one hand coastal altimetry data can be trusted much closer than 150km. On the other hand, methods have been proposed to merge different altimetry datasets and

recover more realistic SSH data up to the coast. Therefore, I would like to recommend the article for its publication after the two issues commented above are considered.

A list of minor comments follows:

P. 9902 L 9: direction of alongshore winds is crucial to "enhancing NPP effect".

P.9903 L. 24: there are more works than those cited that compared the 4 EBUS (for example Chaingeau et al, JPO 2009 used satellite altimetry data up to the coast and compared eddy activity in the four EBUS).

P. 9904 L16-19: Gruber et al 2011 is now published. I suggest highlighting here that your major finding in Gruber et al 2011 is that mesoscale eddy activity may reduce NPP rather than what is expressed.

P. 9905 L 25-26: there are two Lachkar and Gruber 2011 in the references, please specify which one is cited here.

P. 9906 L24-26: Please precise how and with which data do you estimate the upwelling index (UWI). Upwelling might be critically underestimated if you used the monthly time series cited on L 6-7.

P. 9907 L. 10-12: The wording here is somehow confusing. Upwelling in the EBUS regions is mainly due to persistent upwelling-favorable winds, not to the current systems. L. 13-14: A large amount of EKE will not be considered by not taking into account the nearshore 150km strip. The comparison with other datasets which do include the nearshore strip does not seems too fair to me. L 15-17: Bathymetry does not vary with time. Please indicate how you arranged datasets to enter to the SOM algorithm.

Fig. 6: Distribution patterns in sub-figures b), c) and d) do not suggest being limited by the dotted line representing inhibition. At least c) and d) suggest two different linear patterns for different values of the x axis. I wonder how sensible is the SHW parameter to the 150km EKE blanked region. Is the austral-summer/boreal-winter effect taken into account? NPP has a clear seasonality which is almost out of phase following seasons

according to which hemisphere is considered. Does this matter when entering the time series to the SOM algorithm?

P9912, L 9: please check sub-title (based ON). L20-24: the largest the branch in the dendrogram plot, the more likely are the two clusters merged? If so, why all branches are cut at the “same height”?

P9914 L1: “...the weakest wind forcing contain primarily winter observations...” Here is the first time a reference to the time of the year is taken into account in the discussion of the results. Again: is time considered as a variable?

Figure 12: arrows are different in length. Does it means something?

Figure 13: would you add information about r2? intermediate and weak conditions looks far from being close to a linear fit.

Discussion section: “inhibition”: this is a statistical analysis. Fig. 6 suggests that when EKE or MLD has large values, NPP is low. But I don’t see any causality evidence to proclaim those factors as inhibitors of NPP. It would be the same as arguing that correlation between two variables implies causation (which is not necessarily true).

Interactive comment on Biogeosciences Discuss., 8, 9901, 2011.