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Interactive comment on "Long-term variability of the South Adriatic circulation and phytoplankton biomass in relation to large-scale climatic pattern" *by* L. Shabrang et al.

Anonymous Referee #2

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General Comments:

The main aim of this manuscript is the study of the interannual variability of the South Adriatic Gyre intensity. The authors attempt to link a long distance climatic index as NAO with the interannual variability of Southern Adriatic circulation and phytoplankton biomass. They also relate wind vorticity in South Adriatic and "advected" vorticity from the Ionian sea with the current vorticity in the South Adriatic Gyre as well as phytoplankton biomass with the frequency of winter northerly winds. In order to do so, they use satellite data for the wind, the absolute geostrophic velocity and chlorophyll concentration, applying a simple statistical approach (correlation coefficient). In the text there are some vague conclusions, which are not supported by convenient dynamic

analysis, or figures, they are not based on valid assumptions and they are not clearly outlined. In some cases the results are not sufficient to support the interpretations and conclusions and some statements regarding data shown in figures are not obvious and concise for the reader.

Statistical high correlation coefficient of even lagged correlation coefficient does not necessarily imply a dynamic link between 2 parameters. Furthermore in most cases the calculated correlation coefficient is low and without any reference to its statistical significance. Moreover there is no comparison of the findings with other higher resolution data or results from interannual numerical simulations of the basin (e.g. Mantziafou et al 2008, Janekovic et al 2014), whose setup includes all the basin dynamics. In conclusion, my opinion is that the manuscript needs major revision.

Specific comments:

p. 205, lines 21-22. Dense water formation takes place in small spatial and temporal scales. Interannual dense water formation rates, among other, are related to the number and intensity of the high frequency events of the atmospheric forcing (air-sea heat fluxes and wind) during winter, which are smoothed out in the current analysis (spatial and temporal averages and high frequency filtering) as well as the preconditioning of the area. The intensity of the gyre, which is a related to convection in the center of SAG, is the outcome of the interaction of all the above (and actually much more) forcings with the SAG circulation. The authors should rephrase the text : “the interannual variability of the dense water formation rate is due to the combination of two factors: winter air sea heat fluxes and the intensity of the SAG” accordingly and include references of relative studies (eg. Mertens, C., Schott, F., 1998.) The authors should also include and explain in section 3 (Data and Methods) the way they calculate mean values of wind stress? In fig. 6 parallel wind stress vectors give high wind stress curl. How can this be explained?

p. 209 line 26 : How is it justified that the wind speed 5m/s is the threshold in generating

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vertical mixing? (Northerly winds with wind speed higher than 1m/s (p. 209, line 3) or 5m/s (line 25) are taken into account?

p.212 lines 5-16 :There is no figure or calculation to support this argument. There is no apparent stronger correlation between wind curl and current vorticity in the period 1997-2006.

p.212 : Correlation of NAO and wind stress curl is very low and I don't find any similarity between fig.3 and fig.5a.

p.213. The authors find that positive NAO phase is correlated to a) weaker positive vorticity and thus weaker cyclonic circulation in the SAG and at the same time to b) higher frequency of cold northerly winds and maximum convection in SAG. These results are contradictory. These two correlations have opposite impact to the intensity of convection in the center of SAG.

p.211, lines 19-25 : Maximum correlation between wind stress and current vorticity in SAG does not coincide the center of the SaG where correlation coefficient from -0.4 to 0.4 exist and the authors' conclusion that the most important mechanism responsible for the variations of the current vorticity is the wind stress cannot be justified.

p.212 top: The maximum lagged correlation between the spatially averaged vorticity in the northern Ionian and the south Adriatic is very low (0.4) and no comment on its significance is mentioned so how can the authors draw any conclusion about the advection of the vorticity from Ionian?

p.214: What is the unit of the frequency of days with northerly winds during winter in figure 7? How many days is 0.1 (10% of the whole winter days, namely 9 days?). Moreover, northerly winds are the winds within 2nd and 3rd quadrants, namely 180 degrees width? Isn't this too much? Please clarify the reasoning of your choices.

How is the phytoplankton biomass correlated to NAO, as this is implied at the title of the manuscript? This last section, according also to authors, needs more detailed analysis

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in order to reach concise and substantial conclusions and it can be eliminated.

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