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Ocean Science Discussions

Interactive comment on "Net primary productivity, upwelling and coastal currents in the Gulf of Ulloa, Baja California, Mexico" *by* E. González-Rodríguez et al.

Anonymous Referee #1

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Overview: A multi-year study of net primary productivity, in a strong upwelling region seen off the Pacific Coast of Baja California. The paper draws together data from a wide range of sources, including satellite imagery data (MODIS & SEAWifS), Satellite scatterometer data (QUIKSCAT), AVISO sea level anomaly data, and modelled data (HYCOM/ MODIS based VGPM). The discussion attempts to link these sources of data to explain satellite observed productivity phenomena in the Gulf of Ulloa, between Jan 2003 and December 2007.

Review comments: This paper uses satellite derived observations of seasonally variable meridional currents and how these affect regional primary productivity in the re-

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Interactive Discussion

Discussion Paper

gion. It is also suggested that increased net primary productivity is directly linked to a stronger wind stress curl, and inversely proportional to a poleward alongshore current. The author has highlighted these relationships with harmonic analysis. The subject itself is of interest due to the limited previous research conducted in the Gulf of Ulloa region. Generally, the writing style of the paper could be improved, and would benefit from the rewording of sections- such as the abstract from line 6 onwards. Punctuation and grammar are broadly satisfactory, with a few examples needing revision.

The work is interesting, and there is certainly a reasonable story in the data, but a rewording of the results, discussion and conclusions would be needed to fully explain the observations made and hence get the most from the data being presented.

Introduction and Methods

p 1981 / line 5- What properties are transported?

P 1981/ line 7- Unsure of the meaning of the sentence: 'The western shelf is

part of the active geological features of the peninsula, so it is actually formed by intense bathymetric gradients.'

P 1981 / lines 11-15- Description of Ekman pumping is wordy and unclear. Reference a paper with a full description of the process.

P 1983/ Line 25- Reason behind using 11μm daytime SST from MODIS A only? Other satellite SST products or even a composite of MODIS A and MODIS T night-time SST would possibly give more reliable results? A reference to another paper using this 11μm product would be of use.

Fig.1 This map is generally clear and easy to read. The bathymetric lines are too small and close together. I'd suggest using a more "zoomed in" view, showing the shelf at a higher resolution. Additionally, there are 6 grey circles, possibly indicating sampling sites- this is not explained in the caption or the text.

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P 1984/ line 6-'Zeu is the euphotic zone depth in m. For this study, the euphotic zone depth wassubstituted by the mixed layer depths (MLD) obtained from results of the high resolution ocean general circulation model, HYCOM (Bleck, 2002)'.

Is there a reference for another paper on eastern boundary upwelling where actual CTD PAR sensor derived Zeu values having been compared to MLD? Using MLD only assumes that no deep chlorophyll maximum ever forms below the mixed layer. The authors comparison with MODIS derived Zeu partially satisfies this, but a reference to previous research would be useful.

Results, Discussion and Conclusions The results and discussion section, along with their respective graphs need major revision. Starting with the graphs:

p 1983/ line 10 & reference to figure 2a&b

1.The figure text is too small

2.Titles, labels and equations are unlabelled, and too small

3.Axes scales too large and should be changed to fit the data

4.Best fit line and equations are questionable, especially for 'b)' which looks bi-modal.

5.Equations are in the form y=ax, and don't detail actual parameters being represented.

Fig 3-6 Better figures, and reasonably easy to read. Issue with Fig. 4's caption- 'sea surface' typo. The mean field for the geostrophic currents on fig 6. is also particularly interesting, and might benefit from more discussion in the text, especially in the reasons behind its difference to the WSC on fig.5. Figure 5 would benefit from a colour-scale with more variability between the 0 values and the maximums.

Fig 7. This is the major figure for the paper, however it is in too small a format to comfortably view on a standard sized print out of the manuscript. The figure may need to be rotated to landscape, and have the font size of the labels, and axes increased.

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Changes to the text: In general, the results and discussion does not do a satisfactory job explaining the results expressed in the abstract. There are general descriptions of the data seen in each of the figures on p1985 to 1989, but a fairly limited attempt has been made at linking the observations seen in the different datasets (which is the key finding of the paper). This discussion, and comparisons with other published work on the region (or other similar regions) needs to be made, before the key scientific findings of the paper can be expressed. For revisions, the paper would be enhanced by a more thorough comparison of the different datasets, identifying similar features that can be seen in the different datasets, and suggesting reasons why these features can be seen. An excellent example of where this has been done on primary productivity is: On the relationship between stratification and primary productivity in the North Atlantic, Lozier, S et al. GRL, VOL. 38, L18609, doi:10.1029/2011GL049414, 2011.

Other smaller problems include: p1986 /line 11- What is being defined as the coastal zone? p1989 The Harmonic analysis section of the graph needs better explanation.

Conclusion- This is slightly too brief, and appears to focus on further work (such as correlations with ENSO), more than the actual findings of the paper. The conclusion would be improved with a more focused summation of the key findings of the paper- clearly defining the 'normal conditions' seen, and how these change under changing meridional current forcings in terms of VGPM model output, surface temperature and currents. A brief note on the correlation between VPGM output, currents and WSC would also be of use in the conclusion too.

Interactive comment on Ocean Sci. Discuss., 8, 1979, 2011.