

Interactive comment on “The OMZ and nutrients features as a signature of interannual and low frequency variability off the peruvian upwelling system” by M. Graco et al.

Anonymous Referee #1

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Review of the manuscript bg-2015-567: The OMZ and nutrients features as a signature of interannual and low frequency variability off the Peruvian upwelling system

by M. Graco, S. Purca, B. Dewitte, O. Moron, J. Ledesma, G. Flores, C. Castro and D. Gutierrez

General comments: The manuscript by Graco et al. is a combination of a lengthy literature review and the discussion of long time-series off Lima. The time series are great and some background information from literature is helpful, however in the present version the manuscript is difficult to read and needs to be modified. What makes the manuscript difficult to read is the bad English (I know all authors are no native English speakers, but some help should be searched to make the manuscript better readable),

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the lengthy literature review with a lot of old and 'grey literature' while the scientific results are not well enough described. IEKW are a main subject discussed in the text, however the information on IEKW is too short. E.g. in paragraph 2.4 (page 7) it is stated that sea level height at 90°W was used to derive IEKW. No information on the region used is explained, was it e.g. 90°N to 90°S, or some selected region? The figures are not called in increasing order, Figure 6a (page 8 line 22) is called before figure 3. The presentation of wrong links (see below) gives the impression that none of the co-authors read the text carefully and they decided to leave their job to the reviewers. If possible, an extension of the time series at least until the end of 2011 would improve the manuscript considerably (see below). I recommend major revisions of the manuscript.

Specific comments: As mentioned above, the time series are great. In the text it is stated, that the records are used until the end of 2009. No information is given, that the measurement program stopped. In case the measurements continued until the end of 2011 it would improve the manuscript considerably to extend the time series. The time series presented in the manuscript include a strong El Nino in 1997/1998. With regard to La Nina a moderate event existed in 2007/2008, which is visible in the temperature and salinity record but not well developed in oxygen and nutrients. From July 2010 to April 2011 a strong La Nina existed, and this would allow to compare the signal of a strong La Nina with the strong El Nino as well as with the moderate La Nina if the time series can be extended to the end of 2011.

In the manuscript relative large interannual/intraseasonal variability since 2002 is discussed. However the time period covered before 2002 is short and strongly influenced by an El Nino and a La Nina event, hence a longer time series would be needed for a clear statement. In addition, it is mentioned that in 2002 the measurements changed from Niskin bottles to CTD measurements, hence a discussion how this change in method influences the measurements is needed.

Three examples that give the impression that the co-authors did not read carefully the

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manuscript: 1) Page 8 line 19, page 10, line 28 and page 11 line 7: '(see sect. 3.5)'. There is no section 3.5 in the manuscript.

2) Page 13 line 3: '(Fig. 8f and g)'. There is no Figure 8f and g.

3) Ndef is defined different in the text (page 6 line 2) and the figure legend of figure 7. In the abstract lines 12-13 Intraseasonal should be written directly before Equatorial Kelvin Wave that the definition (IEKW) makes sense. Abstract lines 13-15. What do you mean with 'increase of the IEKW'? I can't see it in figure 8.

Normally an abbreviation is defined and then used in the following text. In this manuscript the repeated definitions of the same abbreviations are strange and make the manuscript difficult to read. E.g. IEKW is defined on page 7 two times in lines 1 and 2, on page 8 line 18, page 11 line 27 and page 17 line 1.

ESSW is defined page 3 line 8, page 7 line 25 and page 9 line 10. Similar for other abbreviations.

Figure references should make sense. Page 9 line 15: ($O_2 < 8.9$ micromol/kg, Fig.3) has nothing to do with Figure 3.

The units used in the figures and text should be the same. Oxygen in the text is presented as micromole/kg (e.g. page 9 line 8), in figure 3 as micromole/L; for nutrients in micromole/L (e.g. page 10, line 14) in Figure 5 as microM.

Statement on page 9 lines 10 to 12 is difficult to see in figure 4b and 4c and leaves only winter as deeper OMZ boundary. May be use months instead of seasons to better define the period you refer to.

Page 10 line 28 to page 11 line 2: The changes mentioned are difficult to see in Figure 5d, may be add the depths range in the text you are considering.

Page 10 lines 3 to 5. PC1 And PC2 are mentioned and shown in Figure 6b. In paragraph 2.3 (page 6) where the method is described, only PC1 is mentioned. PC2 should

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be also explained in paragraph 2.3.

The statement page 18 line 29 to page 19 line 2 either needs a reference if related to literature or a better explanation if derived here.

Technical corrections:

Page 3 line 13: Gutierrez et al 2011 is a and b in the reference list, which one?

Page 3 line 20 Pacific, not pacific

Page 7 lines 21-22 'considered' instead of 'considering'

Page 8 line 5: Better define 'Z_15' on page 7 line 21. On page 12 line 24 a 'Z_15°C' is defined, I guess this is the same as 'Z_15' hence don't introduce another abbreviation for the same thing.

Page 8 line 1: 'isopycnal' not 'isopycn'.

Page 8 line 15 or in the legend of figure 4 write like in line 12 '15°C isotherm' not only '15° isotherm'

Page 10 line 15 does not make sense. 'and' instead of 'an'?

Page 14 line 14: Criales et al., 2006, there is only a reference Criales-Hernandez et al., 2006 in the reference list.

Page 17 line 5: 'We proposed...' you do it here hence write 'We propose...'

Page 17 lines 24 to 29: A long sentence which does not make sense. It would be ok, if you remove 'evidence' and 'that' in line 25, is that what you like to say?

Page 18 line 21: Morales et al. 1996 is not in the reference list.

Page 18 line 22: Thamdrup and Dalsgaard, 2002 is not in the reference list.

Page 20 line 18: '...data out field work' remove 'out'

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Page 21 line 19: 'California Current', not 'California'

Page 24 line 28: 'Ehrhardt', not 'Ehrdardt' I only know a 1999 version of this book with Kremling as second author and Ehrhardt as third author and Anderson only listed as one of many contribution authors but not in the book author list. Please check, whether the version you listed also exists.

Figure 1: Geographical coordinates in the inset are not readable. In the figure legend it is stated 12°S, in the text 12°02'S. As the station in the figure is plotted south of 12°S better write also 12°02'S in the figure legend.

Figure 2: The numbers in the figures are not readable in the BGD version. For a final version either the figure or the numbers need to be larger.

Figure 3: Please provide the unit for oxygen in Fig. 3a either at the color bar or in the figure legend. In Figure 3b 44.6 and 22.3 are described in the figure legend but 45 and 22.5 are shown in the figure. This needs to be the same!

Figure 5: The figure is too small to read the numbers in the figure. The figure legend states that the 22.3 and 44.6 oxylines are included. I can't see them either they are not included or the figure is too small to locate them.

Figure 6: Include 'EOF' in the figure legend.

Figure 7: Remove 'Time (station date&time) [years since 0000-01-01]' from the figure and give the unit for Ndef in the figure legend (micromole/L used in the text for Ndef).

Figure 8 legend: 'On the left, different variables...' I guess it should read "On the right..." By the way the axis on the right of figure 8 are too small and unreadable.

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