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## ***Interactive comment on “CO<sub>2</sub> maximum in the oxygen minimum zone (OMZ)” by A. Paulmier et al.***

**Anonymous Referee #1**

Received and published: 24 October 2010

The manuscript describes the vertical structure of the Carbon Maximum Zone (CMZ) which is shown to coexist with the Oxygen Minimum Zone (OMZ) in the Chilean offshore waters between 28 and 36°S latitudes. This is done by examining the simultaneous DIC and O<sub>2</sub> data sets collected during 4 cruises in 2000–2002. The analysis was further complemented by the monthly data collected at a coastal station along 36°S latitude. This work appears to be a continuation of the former studies led by the first author of the present manuscript using parts of the same data sets. The authors first described the CMZ-OMZ structures for the Chilean waters, then compared them with similar structures for other well-known OMZs and finally explain the likely mechanisms governing the Chilean CMZ structure. The manuscript concludes with a short "Conclusion" section.

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The manuscript appears to be a useful contribution to our understanding of the global OMZ dynamics. This material may also be useful for constraining of the global climate models that presently try to incorporate OMZ dynamics for assessing the fate of the future oceans. Therefore, I suggest its publication in "Biogeosciences" with some minor revisions. However, I have a main concern about the manuscript. It builds up the analysis on the basis of a composite data set by lumping four crises data together. On the other hand, looking at the annual variations at the 36oS station (Figs. 1b, 1e), one can see that (i) both DIC and O<sub>2</sub> exhibit strong summer-to-winter seasonal variations, (ii) the upper boundaries of OMZ and CMZ are close to the surface (varying in the 20-50 m range seasonally) and therefore OMZ and CMZ dynamics are strongly coupled to the euphotic zone dynamics. This implies that general description that was put forward in the manuscript based on the composite data is expected to be subject to seasonal changes and may not be a temporally uniform character. This may be one difference of this region from the other OMZs of the world oceans, which are located at much deeper levels and less affected by temporal variability of water column biogeochemistry. The issue of temporal uniformity/variability of the OMZ-CMZ deserves additional discussion in the manuscript.

Some minor comments on the manuscript are as follows: 1) I found the "Abstract" too general. It does not really reflect the spirit of the work. 2) "Introduction" section provides a two page-long description on general features of the OMZs of the world oceans. It is fine, but one or two additional paragraphs may be useful to summarize the previous works on the Chilean OMZ as a prelude to the present work. 3) It will be useful to give more information on the timing of the cruises and the background knowledge on the main general physical-biogeochemical oceanographic characteristics for each of the cruises. This may be helpful for the analysis of CMZ based on the composite data set in the subsequent sections. 4) In Fig. 2, the authors used a profile that is referred to as "mean global profile". It is presumably the mean global profile based on the all available data sets for the oxygen minimum zones. Does it also include data from oceanic sites without oxygen minimum zones?

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Interactive comment on Biogeosciences Discuss., 7, 6353, 2010.

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7, C3467–C3469, 2010

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