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Comment

Interactive comment on “Ocean acidification: setting the record straight” by A. J. Andersson and F. T. Mackenzie

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We are encouraged that referee #2 thinks this article on ocean acidification has the potential to be a useful summary of the problems and concerns that are discussed. We certainly will take the specific comments into careful consideration in making revisions to our manuscript. Here we provide brief responses to the specific comments made by referee #2 in the order they were raised:

1. The objective of the introduction was not to give a full historical account of ocean acidification relevant research as this has been done more completely in several other publications, including that of Gattuso and Hansson (2011, Chapter 1 in the book *Ocean Acidification* published by Oxford University Press). However, we will acknowledge in the revision a number of the pioneers of OA relevant research that we currently

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only refer to “as well as others.”

2. As we state, misconceptions concerning OA have arisen in a number of different forums including the scientific literature and popular media, at scientific meetings and workshops, in manuscript and proposal reviews, as well as in informal discussions. Our intent with this article was to mainly raise the awareness of a general problem, and not to criticize specifically individual studies or scientists. We realize this leads to the article being somewhat under supported by the science behind our discussion. Whether the opinionated parts of this article are appropriate for a final publication in Biogeosciences remains to be seen, but there are few alternatives to BGD that facilitate the publication of opinionated pieces and discussions.

3. The effects of upwelling on biological and chemical processes are certainly an important aspect to consider in the context of ocean acidification, but the resulting effect and the resulting anthropogenic acidification rate of waters affected by upwelling depends on numerous factors beyond the scope of this article. Nevertheless, we agree that this issue requires attention and needs to be addressed. Several previous publications have addressed or discussed the issues associated with upwelling, onwelling or ventilation in coastal regions including for example, Hales et al. (2003), Andersson and Mackenzie (2004), Feely et al. (2008; 2010), Hauri et al. (2009), Cao et al. (2011), Mucci et al. (2011) as well as others.

4. If it is not clear why dissolution of shallow water carbonates will not significantly buffer shallow water environments on timescales of decades to hundreds of years, we are seriously failing to get this message across. As this is our main point of section 5, we will have to consider carefully the revisions of this section to make it absolutely clear why and how. We will also need to place our arguments in the context of the work of Cao and Dai (2011) on the South China Sea from which they concluded that carbonate dissolution in marginal seas could contribute significant total alkalinity accumulations to the upper layer of the open ocean to enhance the buffer capacity of the ocean to rising atmospheric CO₂. For a preliminary discussion regarding ‘significant buffer effect’ see

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our response to the comment by Hauck et al.

5. For this comment please see our response to Hauck et al.

6. Pages 6173-6174 are essentially where we outline why CaCO_3 dissolution will not produce a significant buffer effect for coastal carbonate ecosystems, including coral reefs, on the decadal to centurial timescale. As the details of these results have been shown in many other publications (e.g., Andersson et al., 2003, 2005, 2006, 2007; Morse et al., 2006), we would like to refer the interested reader to these publications. However, conceptually, it boils down to a mass balance problem where the rate of dissolution needs to be fast enough in order for total alkalinity to accumulate in order to balance the rate of increase in DIC owing to anthropogenic uptake of CO_2 and the rate of physical mixing.

7. We agree that the use of different units can be confusing and will correct this accordingly.

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