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# ***Interactive comment on “Systematics of past changes in ocean ventilation: a comparison of Cretaceous Ocean Anoxic Event 2 and Pleistocene to Holocene Oxygen Minimum Zones” by J. Schönfeld et al.***

**Anonymous Referee #2**

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The manuscript titled Systematics of past changes in ocean ventilation: a comparison of Cretaceous Ocean Anoxic Event 2 and Pleistocene to Holocene Oxygen Minimum Zones by Schönfeld et al. discusses organic carbon accumulation, trace fossils and laminated sediments as proxies for low oxygen deposition. This review compares modern OMZs, largely the Peruvian OMZ, and Cretaceous oceanic anoxic event 2 to better constrain bottom water oxygen contents. Overall, this topic is of great interest to the paleoceanography community as to understand the local and global redox state of the oceans during a major carbon burial event, especially one that has widespread sample

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recovery.

My major concern is regarding Table A3. This manuscript has taken the data directly from Kuhnt et al., 1990 but that paper (understanding at the time) uses 1.3 million years for the duration of the OAE. However, the duration of the OAE is stated to be closer to 500 thousand years but the accumulation rates don't seem to be corrected. It is unclear, to me, if the organic carbon accumulation rates that are discussed are adjusted. Also, the only region discussed in this paper is the Moroccan sections, yet the table includes many sections from the Tethys Ocean. If these sections are included I think there should be an expanded discussion and also include other sections which have been published since the Kuhnt et al., 1990 paper (Demerara rise sections). There also seems to be an absence of recent publications on the local and global redox state of the OAE2 ocean which I think could help bolster this study and why it is important to understand these OMZ regions.

I am glad to see a discussion on the importance of organic accumulation rates with a comparison of modern setting and ancient deposition. However, I think there should be more discussion on the control of sedimentation rate on OC preservation. As Canfield 1994 has shown a relationship between OC preservation and sedimentation rates with a less important role of water column oxygen contents. It seems like sedimentation rates could be very important as the sedimentation rates at the Peruvian OMZ are very high compared to the OAE2 sites. Additionally, Hartnett et al. 1998 should be referenced. It is unclear exactly how the "20 % export production" value is was obtained, except that it fits the observed modern primary production values. Is it appropriate to extrapolate this to OAE2 that likely has a different primary producer's ecology and evidence for photic zone euxinia.

There were also several blanket statements that need further clarification. "As a consequence, a whole suite of proxies have been applied to reconstruct past ocean oxygenation" this statement needs citations as to what proxies have been applied. The statement ""There are only few reliable parameters that are sufficiently explored to in-

**BGD**

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investigate paleo low-oxygen conditions in the Mesozoic and Cenozoic, which are trace fossils, laminations, and organic carbon accumulation rates" seems to be stating that the only reliable and applied redox proxies are trace fossils, laminations and organic carbon accumulation rates but there have been many geochemical proxies applied with great success.

Minor comments: More information is needed to understand why there was an adjustment to the oxygen measurements. What is the detection limit of this method?

Page 13353 Line 15 - It seems as though this sentence is putting an oxygen concentration from the modern to encompass all laminations from the late Holocene and subrecent sediments.

Figure 4 Increase in lightness scatter? The red box seems to show a decrease? Is the red box in the correct place? Please clarify.

Page 13364 Line 6: Typo where I think the word should be combined to showed

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Interactive comment on Biogeosciences Discuss., 11, 13343, 2014.

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