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Interactive comment on "Laminated sediments in the Bering Sea reveal atmospheric teleconnections to Greenland climate on millennial to decadal timescales during the last deglaciation" *by* H. Kuehn et al.

Anonymous Referee #1

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H. Kuehn and colleagues present a beautiful, robustly documented manuscript describing the paleoceanographic evolution of the mid-depth Bering Sea over the course of the last glacial termination. The study presents beautifully-resolved evidence for a tight coupling between the subarctic Pacific/Bering Sea and Greenland that is most adequately explained by a strong atmospheric teleconnection modulating the Aleutian Low. In addition, they provide a convincing explanation for the spatio-temporal evolution of the North Pacific OMZ, by showing that upstream oxygen consumption rather than the absolute ventilation rate on intermediate waters must be the primary control on

the basin-wide, coherent evolution of oxygenation patterns across the deglacial. Furthermore, the authors provide a detailed sedimentological description of the records a feature critically omitted in paleoceanographic studies.

In summary, I can only very enthusiastically support publication of this marvelous manuscript, provided the authors can address the relatively minor issues/questions raised below. I hope the authors will find these comments useful as they intended to be.

General comments

- export production and the subsequent remineralization of organic matter does consume oxygen. Higher productivity has no effect on oxygen consumption. This is indeed merely a semantic question, but I would urge the authors to edit the text accordingly. - One additional parameter that could be accounted for enhanced oxygen depletion at mid-depth during warm intervals has been overlooked, to my opinion. The temperature-dependent remineralization rate (e.g. Matsumoto, 07 (GRL), Kwon et al., 09 (NatGeo)) would concentrate oxygen consumption in shallow/intermediate waters during warm intervals, thereby "deoxygenating" the subsurface waters ventilating the core sites without necessarily changing ventilation rates. I would like the authors to briefly discuss this alternative positive feedback, which is certainly not inconsistent with the data presented here. - Just out of curiosity – the kasten core shows more expanded sections than the piston core (e.g. Fig. 4), which comes as a surprise to me. Do the authors have any insight as to why this may be? How does this observation influence the inferred sedimentation rates shown in Fig. 5?

Detailed comment

p. 2469, l. l.7 and throughout the text – Jaccard & Galbraith, 2012 (not 2011). p. 2470, l.17 – replace partly by episodically p. 2470, l. 24 – the acronym OMZ has been introduced previously (i.e. p. 2469, l. 9). Once introduced, please use the acronym throughout the remainder of the text. p. 2474, l. 25/p. 2479, l. 12/p. 2482, l. 11/27.

Isn't a "laminae couplet" deposited annually, technically defined as a varve? p. 2477, l. 13 – are nearly identical instead of nearly similar p. 2478, l. 16 – "rather reflecting the autumn/winter sedimentation". p. 2483, l. 15 – does this imply that the plateau-tuning method may be inadequate to establish regional-scale age models, at least for the North Pacific? p. 2483, l. 23-24. This is a very important finding. Most previous observations describing the link between export production and oxygen-depletion were based on proxies, which preservation was highly dependent on oxygen-level (or better said on the oxygen exposure time). The Si/Ti ratio and by inference opal concentrations are not primarily driven by changing sedimentary redox conditions. As such, this observation provides a robust, independent link between export production and oxygen-depletion. This being said, the observation that Si/Ti values are lower during the EAC is a bit of a stretch. I agree that the values are lower at the beginning of the EAC, but on average, I do not think that they are significantly different. p. 2490, l. 19-23. I'm surprised that the sedimentary carbonate content increases in the laminated intervals of the core. Carbonate production may well have increased during warm intervals, but would have been poorly preserved under oxygen-poor/DIC-rich conditions. What if the increased Ca/Ti and Si/Ti ratios in laminated intervals were primarily driven by decreasing detritic (i.e. Ti) supply to the core site? Do the authors have supporting evidence (i.e. %CaCO3, foram abundance) to support enhanced carbonate deposition? What are the MARs showing? In general, it would be desirable to have a few discrete measurements of CaCO3 and biogenic opal/diatom counts to support the XRF data. p. 2492, l. 14. Zheng et al., 2000 (not 2006). Fig. 6. While I fully agree that the Ca counts are primarily driven by changes in sedimentary biogenic carbonate concentrations, wouldn't the Ca/Al or Ca/Ti be more specifically related to the biogenic fraction of Ca (similar to the Si/Ti ratio to reconstruct biogenic opal) and provide an even more precise correlation tool? The authors have followed this strategy in the suppl. Figure. Why do not plot Ca/Ti instead of Ca counts in Fig. 6?

Interactive comment on Clim. Past Discuss., 10, 2467, 2014.