

Interactive comment on “Holocene dynamics in the Bering Strait inflow to the Arctic and the Beaufort Gyre circulation based on sedimentary records from the Chukchi Sea” by Masanobu Yamamoto et al.

Anonymous Referee #2

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General comments: This paper attempts to provide an all-encompassing discussion of Holocene teleconnections and dynamics of Pacific and Atlantic atmosphere and oceans [including AMOC] in relationship to Bering Strait inflow and Arctic Ocean circulation. That is an awfully daunting task and, not surprisingly, the paper suffers from bouts of speculation and serious over-reach.

Specifically, I'd like to see the following additions or alterations. Since the atmosphere is so important in their explanations, the studies by Kaufman and other studies of terres-

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trial Holocene records should be consulted & cited. The mineral proxy topic beginning on line 143 is critical to the paleoceanographic interpretations. The argument is built on work done by Ortiz, Darby, Kobayashi, Kalineko and others. Without going into detail, the basic premise is that modern surface sediment trends in Q/F, C/I and CK/I ratios reflect hydrodynamic properties in the transport of these minerals controlled by the strength of BSI. Data from Kobayashi in press are reproduced in Figure 2, There is a lot of overlap between the two studies. One big question: are there other processes that could explain the surface sediment processes? No alternatives are discussed. Everything is based on this mineral-BSI association, and this worries me about interpreting the patterns. On the other hand, the paper does a so-so job of plotting mineral data against other more conventional proxies [dinoflagellates etc].

It is also hard to follow which samples on maps in Fig. 2 are the ones used in regressions in Fig 2D, 2E. Why plot Q/F against longitude, but C/I vs latitude? What is source of Beaufort Sea samples added to Kobayashi's data set. The basis of the proxies must be made much clearer and rigorously assessed.

Specific comments: The introduction implies that the Arctic Oscillation is critical in driving Arctic Ocean circulation and Arctic-Atlantic links, but the AO is not mentioned in the abstract. As a decadal scale mode of variability, the AO *sensu stricto* is beyond the resolution of their sediment records. So why is it considered so prominent? Conversely the AMO, which is not necessarily connected to the Arctic, is nonetheless multidecadal in the 50-90 year range and thus more appropriate.

In the detailed discussion of the BSI, I wonder if it would make sense to mention the nutrient influx with this water, even if nutrients are secondary to the authors' arguments. Nutrients, productivity, sea ice – these are the key factors in the Arctic Ocean region where the cores come from.

In sum, one cannot justify so much speculation on the basis of 2 cores with modest accumulation rates and an unproven proxy. the paper needs to stick to the Bering

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Strait and Chukchi regions, focusing on sediment transport, with added discussion of nutrients, productivity and sea ice and a more inclusive discussion of other proxy records [Kaufman's syntheses are just one place to start]. The speculative connections to AMOC, which itself is not well understood for the Holocene in the Atlantic, and Atlantic-Pacific moisture transport, should be omitted. Even if BSI is being recorded, no alternative hypotheses about causes of inflow variability are discussed- sea level variation, sediment erosion, deposition in the BS region etc. I should like to see one basic question answered: What is the nature of Holocene ocean variability in the Western Arctic in relation to sea ice and productivity. Terrestrial records are many; well-dated marine records are few. The cores are modestly well-dated but not well enough: neither is sed rate constant nor high enough to justify the spectral analyses and interpretation.

Technical corrections. Line 13 extra comma Author addresses, some inconsistent commas, no commas Line 33 chlorite/illite ratio Line 155 quartz-rich but feldspar-poor ??

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