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Interactive comment on "Last Glacial Maximum and Deglacial Abyssal Seawater Oxygen Isotopic Ratios" *by* Carl Wunsch

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In this manuscript, the author extends his salinity-only analysis (Wunsch, 2015) to the pore-water measurements of the oxygen isotope ratio 18Ow. Using "standard control theory", he arrives at the same conclusion as Müller et al. (2015) – who use a Markov Chain-Monte Carlo (MCMC) approach – and as in his previous work: A very cold, highly saline abyssal ocean during the Last Glacial Maximum (LGM) is possible, but not required by the existing data. This conclusion is important as it gives lesser weight to a constraint that has been imposed on many attempts to reconstruct the deep-ocean circulation during the LGM.

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2 Major comments

I recommend to (1) add some more detail to the description of the method such that – although short – it can stand it by itself and (2) rephrase or shorten paragraphs that sound (pardon me) a bit like a text book (see below).

P. 5: What is the relevance of the subsections "Identification“ and "State Estimation and

Control“ for the current manuscript? They sound a bit "text book-like“. With respect to the identification problem, which assumption is made in the end and what is the concrete solution that is proposed?

P. 6: Is the "fuller discussion of contollability and observability“ essential, or is the present discussion sufficient? This is another "text book-like“ statement that may confuse

the reader.

The puzzle facing any writer of a paper such as this one is to figure out who the audience is likely to be—and whether the mathematical bits will put off the geochemists/geologists, and (or) vice-versa? One runs the risk of falling between two stools. I've now tried to explain in the text e.g., why "Identification" and "State Estimation and Control" are mentioned—they are general pieces of machinery that can be used to evaluate a system in advance of the data, among other possibilities.

Are really all Figures 7 to 16 needed, or could one select one or two prominent examples. *The other reviewer called for more examples! Given the very large number of possibilities, I've decided to drop one of the figures, and condense some of the remaining discussion.*

3 Minor comments

Throughout.the manuscript, the same symbol 18Ow should indicate the oxygen isotope *Ok*

ratio of pore water (or seawater). Furthermore, a true percent sign should be used. *Will leave to publisher.*

P. 3, lines 11-13: [...] and represent the values that any estimate of the core values

through time, c(z; t); $0 < t < tf$, must converge to within error bars [: : :]*Ok*

P. 3, line 18: should refer to Table 2 (p. 16) *Ok*

P. 4, line 7: introduce abbreviation "RTS“ here *Ok*

P. 16: The caption of Table 2 needs to be checked for the use of LaTeX and punctuation. *Yes*

In the present version of the manuscript, the figures are generally too small and consequently

the text is barely readable, especially the annotation of the axes. *Fixed subject to display size.*

Figure 1 (also in Figures 7 to 16): The horizontal axis should be clearly marked as

"Time/(ka BP)“ or "Time [ka BP]“, and it should start at -100 ka BP (kilo-years before

present) to make it easier to the reader to recognize the last glacial cycle and the LGM. *Done*

Figure 11: It should probably read 18Ow instead of 18Osw. *Ok*

Figure 13: not clear which figure one should compare to (Figure 7?) *Ok*

Figure 14: It should probably read 18Ow instead of 13Cw. *Ok*

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