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Interactive comment on "Ice-shelf damming in the glacial Arctic Ocean: dynamical regimes of a basin-covering kilometre thick ice shelf" *by* Johan Nilsson et al.

Johan Nilsson et al.

nilsson@misu.su.se

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We appreciate the positive and constructive review comments provided by Dr. Thomas Cronin. The significance of extensive Arctic Ocean ice shelves for the translations of oceanic oxygen isotopic records into glacial–interglacial sea-level changes is a relevant and interesting point. We deem that it is beyond the scope of the present paper to give a detailed account on existing estimates of the sea level during the LGM and the MIS 6. As the reviewer suggests, however, it is relevant to mention the role of Arctic Ocean ice shelves in connection with glacial sea levels. For this purpose, we will in the revision add the following paragraph at the end of section 5.3:

"A significant difference in volume of the Arctic ice shelves during the LGM and the

MIS 6 has implications when inferring glacial sea levels from ocean oxygen isotope records. Broecker (1975) emphasised that floating ice shelves have essentially no impact on the sea level, but that the isotopically-light oxygen contained in ice shelves increases the mean oceanic δ^{18}O value. Thus, temperature-corrected δ^{18}O data from the deep ocean as well as from the Red Sea will overestimate glacial sea-level decreases if large ice shelves were present. The fully-developed MIS 6 Arctic Ocean ice shelf should have increased the mean oceanic δ^{18}O value by roughly 0.15 permil, equivalent to the increase caused by a sea-level decrease of around 15 meters due to continental ice accumulation (Mix and Ruddiman, 1984; Jakobsson et al., 2016). It can be noted that the deep ocean δ^{18}O values were similar during MIS 6 and LGM (Lisiecki and Raymo, 2005). By accounting for the difference in ice-shelf volume, the deep ocean δ^{18}O record indicates that the sea level should have been some 5 to 10 meters lower during LGM compared to MIS 6. However, it may be challenging to infer volumes of glacial Arctic ice shelves from comparisons of sea level estimates based on landforms and oxygen isotopes. The reason is that the oceanic δ^{18}O signature of Arctic ice shelves is comparable to uncertainties related to various steps in deriving δ^{18}O values and assumptions involved in converting them to sea level (Siddall et al., 2004). Still, it may be worthwhile to revisit the question of the relative sea levels during MIS 6 and LGM in light of the new data-based support of an extensive MIS 6 ice shelf in the Arctic Ocean."

We will also address the minor issues related to spelling and typos in the revision

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