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Interactive comment on "Stopping the Flood: Could We Use Targeted Geoengineering to Mitigate Sea Level Rise?" *by* Michael J. Wolovick and John C. Moore

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I will be brief in my comments, but mostly because I found this manuscript to be carefully considered and extremely well-presented. Congratulations to the authors for a very thoughtful contribution. I am disturbed that the world is coming to this - contemplation of what may seem to be fanciful, profligate civil engineering projects to try and influence something as monumental as an ice sheet. But I also agree with the authors that such interventions need to be discussed and considered. The world is arriving here, and sea-level rise on order of even 0.5 m (never mind 1 m or more) will be far more expensive and disruptive to society than what is presented here.

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It is my overall opinion that the authors have a good understanding of the glaciological and technical considerations here, and are appropriately circumspect in their discussion. The language is neutral and cautious, and the implications and limitations of their study are thoroughly considered. I also believe that this is of broad interest to readers of TC and more generally in the field of climate change science, mitigation, adaptation, and policy, so this article is likely to be highly cited. I recommend it for publication in TC with only minor clarifications.

General suggestions, for consideration:

p.4, ll.7-9, discussion of rates of sea level rise. I don't think the rates that are cited are representative of the consensus of "modern models". Rates of several m per century are only really possible from Antarctica, in association with a marine-calving collapse, i.e. the ice-cliff instability of Pollard and de Conto. From the Thwaites system, ice resistive stresses and deformational velocities generally limit the rate if deglaciation, according to most model studies to date, and this will be true for most Antarctic embayments. In the example of the last deglaciation, the sea level rise of up to 5 m/century was in a much different world, with huge mid-latitude ice sheets capable of (surface) melt rates that are not possible in the polar regions. I think these examples are still fine to mention, but don't need to be considered as the "likely" scenario for the future centuries. Especially as rates of sea level rise of an order of magnitude less than this would still be massively disruptive and would justify potential interventions.

p.4,5, Methods. It is a little worrying that the model used for this study does not appear to consider longitudinal stresses. These are important to floating ice dynamics, grounding line migration, and the timescale of marine ice sheet instabilities. This should be discussed.

p.5, Experiments. Really interesting. I worry a bit that the interventions don't address the mechanical conditions that drive MISI - subglacial topography, stress balance, and pinning points upstream of the grounding line. I appreciate that warm water (basal

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melting) strongly influences the ice thickness and then feeds back on these things, such that an ice readvance, if it can be triggered, can then bring the ice sheet back out to the manufactured sill, with possibilities to ground and stabilize. But I think there are some who would suggest that the MISI is a mechanical instability that is associated with the upstream geometry and, once triggered, it can continue without regard to ocean temperatures (i.e., with no need of enhanced melting). Again, a brief discussion of this could be helpful.

Are there oceanographic or 'storm' considerations here for effective blocking of threatening CDW by a sill? That is, are conditions so strongly stratified that a manufactured sill that does not completely block the embayment can effectively isolate the ice sheet? I don't know if tidal mixing or storm- or katabatic-driven Ekman fluxes, etc., can effectively mix the water column (especially in a future with less sea ice/a longer summer open water season), limiting the efficacy of the manufactured sills. But perhaps they just need to initially trigger ice thickening and advance, and then the mechanical grounding does the job.

And some minor comments:

abstract, l.9, "is both effective and achievable"

p.3, l.10, 1990s

p.3, l.18. displacement of 100-500 million people per year - I think this must be total, not per year. As this would not be a very sustainable rate of migration.

p.15, l.15. I am not sure that field tests could be decades away at the earliest - the authors argue that pilot tests in some Greenlandic fjords could be reasonable to contemplate. But point taken - we have time to develop more complete models and thoroughly consider oceanographic/marine biological considerations.

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