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Earth System Dynamics
Discussions

Interactive comment on "Semi-equilibrated global sea-level change projections for the next 10 000 years" *by* Jonas Van Breedam et al.

Anonymous Referee #1

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The authors used LOVECLIM to explore global sea-level change due to melting of land ice combined with steric sea effects during the next 10,000 years. They adopted the scenarios following the Extended Concentration Pathways with no carbon dioxide emissions after 2300. They found that the change in global mean sea level ranges from 9.2 m to more than 37 m after 10,000 years. The Greenland ice sheet nearly disappear for all forcing scenarios while the Antarctic ice sheet contributes about 1.6 m and up to 27 m to sea level for the lowest and higher forcing scenario, respectively.

This study investigates multi-millennial semi-equilibrated sea-level rise, which potentially contributes to our understanding of future sea level change beyond centurial timescales. Thereby, I would like to support publication after minor revisions.

First, the authors may want to show the global maps of surface air temperature, surface

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Discussion paper

winds and precipitation changes, especially over the Greenland and Antarctic ice sheet regions. Given the three-layer atmosphere model in LOVECLIM, how does LOVECLIM tackle surface air temperature and surface winds changes considering boundary layer processes? Also, how do precipitation changes affect mass balance of ice sheet and hence modulate the melting of ice sheet? How do surface wind changes drive the drifts of the Arctic and Antarctic sea ice and also drive the ocean circulation, like the Deacon Cell in the Southern Ocean?

Besides, I am confused by the AMOC change in the simulations. Why does AMOC recover after a temporary almost shutdown, and even overshoot in the higher forcing scenarios? Is AMOC mono-stable in LOVECLIM?

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