

## **Paleoclimate earth system modelling of cryosphere-ocean interactions in the Southern Hemisphere**

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### **Abstract**

We present paleoclimate model experiments designed to explore ocean-ice interactions in the Southern Hemisphere. Using the UVic intermediate-complexity earth system model, we examine the changes in ocean circulation and biochemistry associated with a minimal and maximal West Antarctic Ice Sheet (WAIS) using steady-state simulations of the Pliocene and the Miocene interglacials and glacials, and the relative sensitivity of the ocean to orbital forcing and atmospheric CO<sub>2</sub> under these boundary conditions. In particular, we explore obliquity-driven responses in the Southern Ocean, such as biological productivity, deep-water formation and circulation, and the link to the carbon cycle. Is obliquity-driven warming amplified in the ocean (relative to the atmosphere), thereby contributing to the increased sensitivity of the marine-based WAIS during periods of maximal extent?

**Keywords:** Earth system modelling, Southern Hemisphere, paleoclimate, orbital forcing