Geophysical Research Abstracts
Vol. 16, EGU2014-10000, 2014
EGU General Assembly 2014


# Simulations of Antarctic ice shelves and the Southern Ocean in the POP2x ocean model coupled with the BISICLES ice-sheet model

Xylar Asay-Davis (1), Daniel Martin (2), Stephen Price (3), and Mathew Maltrud (3)

(1) Potsdam Institute for Climate Impact Research, Potsdam, Germany (xylar.asay-davis@pik-potsdam.de), (2) Lawrence Berkeley National Laboratory, Berkeley, CA, United States, (3) Los Alamos National Laboratory, Los Alamos, NM, United States

We present initial results from Antarctic, ice-ocean coupled simulations using large-scale ocean circulation and ice-sheet evolution models. This presentation focuses on the ocean model, POP2x, which is a modified version of POP, a fully eddying, global-scale ocean model (Smith and Gent, 2002). POP2x allows for circulation beneath ice shelf cavities using the method of partial top cells (Losch, 2008). Boundary layer physics, which control fresh water and salt exchange at the ice-ocean interface, are implemented following Holland and Jenkins (1999), Jenkins (2001), and Jenkins et al. (2010). Standalone POP2x output compares well with standard ice-ocean test cases (e.g., ISOMIP; Losch, 2008) and other continental-scale simulations and melt-rate observations (Kimura et al., 2013; Rignot et al., 2013) and with results from other idealized ice-ocean coupling test cases (e.g., Goldberg et al., 2012). A companion presentation, "Fully resolved whole-continent Antarctica simulations using the BISICLES AMR ice sheet model coupled with the POP2x Ocean Model", concentrates more on the ice-sheet model, BISICLES (Cornford et al., 2012), which includes a 1st-order accurate momentum balance (L1L2) and uses block structured, adaptive-mesh refinement to more accurately model regions of dynamic complexity, such as ice streams, outlet glaciers, and grounding lines. For idealized test cases focused on marine-ice sheet dynamics, BISICLES output compares very favorably relative to simulations based on the full, nonlinear Stokes momentum balance (MISMIP-3d; Pattyn et al., 2013). Here, we present large-scale (Southern Ocean) simulations using POP2x at 0.1 degree resolution with fixed ice shelf geometries, which are used to obtain and validate modeled submarine melt rates against observations. These melt rates are, in turn, used to force evolution of the BISICLES model. An offline-coupling scheme, which we compare with the ice-ocean coupling work of Goldberg et al. (2012), is then used to sequentially update the sub-shelf cavity geometry seen by POP2x.