Designing Regionally Refined Ocean and Sea-ice Meshes for
the E3SM v2 Cryosphere Science Campaign

Xylar Asay-Davis, Carolyn Begeman, Darin Comeau, Kristin Hoch, Matthew Hoffman,
Wuyin Lin, Mathew Maltrud, Mark Petersen, Stephen Price, Andrew Roberts,
Luke Van Roekel, Milena Veneziani, Jonathan Wolfe

The E3SM Cryosphere Science Campaign is focused on the effect of melting ice shelves and ice-sheet dynamics in Antarctica on sea-level rise. Our v2 science campaign will use an ocean and sea-ice mesh with enhanced resolution in the Southern Ocean and around the Antarctic coast. We are also exploring the use of enhanced resolution around Greenland to improve the representation of the Atlantic Meridional Overturning Circulation.

In this presentation, we present new tools, using geojson files and signed-distance functions, for quickly designing and generating regionally enhanced meshes for the Model for Prediction Across Scales (MPAS) components. E3SM uses three such components: MPAS-Ocean, MPAS-Seaice and MPAS-Albany Land Ice or MALI. We present the sequence of Southern Ocean regionally refined meshes (SORRMs) that we have explored so far in preparation for E3SM v2. We also show how the same tools have been used to design other meshes, including the Water Cycle 14-km (WC14) mesh that will be used in the Water Cycle’s v2 Science Campaign.

In a companion presentation, “Preliminary results using Regionally Refined Ocean and Sea-ice Meshes for the E3SM v2 Cryosphere Science Campaign”, we present simulations with several SORRM configurations performed in preparation for the v2 Cryosphere Campaign.