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The Community Earth System Model: Evaluation and CMIP5 simulations. Activities of the Polar Climate Working Group

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The Community Earth System Model (CESM) Polar Climate Working Group (PCWG) is a consortium of scientists who are interested in modeling and understanding the climate in the Arctic and the Antarctic, and how polar climate processes interact with and influence climate at lower latitudes. This includes studies on variability and change across the sea ice, atmospheric, terrestrial and oceanic domains. The recently released CESM has polar climate related improvements across all of the component models. Here we discuss some of these improvement and provide an analysis of the polar climate simulated in CESM preindustrial, 20th century and 21st century integrations. Of note, the sea ice model has an improved albedo treatment, including a melt pond parameterization and aerosol deposition and cycling. The Arctic sea ice extent annual cycle and spatial pattern of ice thickness compare very well to observations and the late 20th century summer sea ice loss in the ensemble members bracket the observed change. In the Antarctic, sea ice is considerably too extensive year-round but interannual variability in the sea ice exhibits a dipole pattern that compares well to observations.