Southern Ocean Bottom Water Characteristics in CMIP5 Models

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The depiction of Southern Ocean deep water properties and formation processes in climate models is an indicator of their capability to simulate future climate, heat and carbon uptake, and sea level rise. Southern Ocean potential temperature and density averaged over 1986-2005 from fifteen CMIP5 climate models are compared with an observed climatology, focusing on bottom water properties. The mean bottom properties are reasonably accurate for half of the models, but the other half may not yet have approached an equilibrium state. Eleven models create dense water on the Antarctic shelf, but it does not spill off and propagate northwards, alternatively mixing rapidly with less dense water. Instead most models create deep water by open ocean deep convection. Models with large deep convection areas are those with a strong seasonal cycle in sea ice. The most accurate bottom properties occur in models hosting deep convection in the Weddell and Ross gyres.