



Mechanisms of Multidecadal Variability in the Southern Ocean

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The physical processes which control (deep) convection in the Southern Ocean have been studied in many low-resolution global climate models. However, the timescale of variability of convection is irregular and not consistent among different models. High-resolution global climate models reveal significant differences compared to low-resolution models, for example in the background stratification and the timescale of variability of convection.

Here we present results of an analysis of model output from a long (250 years) simulation of a high-resolution (0.1° horizontally) version of the fully coupled Community Earth System Model. We find multidecadal variability in the Southern Ocean with a period of about 25 years for different quantities, such as sea-ice concentration, temperature, salinity and deep convection. The occurrence of the Weddell Polynya near Maud Rise also varies with the same 25-year period in our model. The 25-year period is related to the Southern Ocean Mode, which is an intrinsic mode of variability due to interactions of ocean eddies with the background flow. Observations and output of re-analysis indicate the same timescale of variability in the Southern Ocean. We provide a new mechanism to explain multidecadal variability in the Southern Ocean.