

Evolution of the Arctic and Antarctic sea ice over the 20th and 21st centuries as simulated by CMIP5 models

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Results from simulations conducted with the CMIP5 atmosphere-ocean general circulation models are used to study the evolution of the Arctic and Antarctic sea ice covers over the 20th and 21st centuries. We first assess the ability of the individual models and the multi-model mean to reproduce the average seasonal cycle, the interannual variability and the longer-term changes of the Arctic and Antarctic sea ice extents and volumes over the late 20th century. A performance metric based on observations is proposed and applied to all available models with the aim of selecting those that yield the most realistic behavior of both ice packs. Outputs from the selected models are then thoroughly analyzed to better understand the sharp decline of the Arctic sea ice area coverage observed during the last decades and to determine the causes of the recent increase in Antarctic sea ice extent. Second, we project with each individual model and the multi-model mean the response of the Arctic and Antarctic sea ice extents and volumes over the 21st century to the RCP2.6, RCP4.5, RCP6 and RCP8.5 forcing scenarios. Models that meet the performance criteria defined by the metric are finally used to reduce uncertainties regarding the date of disappearance of the summer Arctic sea ice.