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Skillful Prediction of Decadal Sea Ice Variability in the Antarctic Seas

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This study examines the prediction skill of decadal sea ice variability in the Antarctic Seas using a coupled general circulation model (SINTEX-F2) developed under the EU-Japan collaboration. A decadal reforecast experiment with both sea surface temperature (SST) and sea ice concentration (SIC) initializations shows higher prediction skills of the SIC in the Weddell Sea during austral autumn compared to an experiment with SST initialization only. The former experiment reproduces decadal SIC increase after the late 2000s, which is associated with anomalous sea ice advection by the strengthened Weddell Gyre. A third experiment with the SST, SIC, and subsurface ocean temperature/salinity initializations shows the highest prediction skills of the SIC in the Ross, Amundsen, and Bellingshausen (RAB) Seas during austral winter and spring. The model captures decadal SIC increase after the late 2000s when a larger number of subsurface ocean observations by Argo floats become available. The decadal SIC increase is found to be linked with anomalous cooling of subsurface ocean by the strengthened Antarctic Circumpolar Current and the associated downwelling anomalies in the RAB Seas. These results indicate that both ocean and sea ice initializations benefit skillful prediction of decadal variability in the Antarctic sea ice.