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Perscribing Antarctic landfast sea ice in a sea ice-ocean model.

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The coastal polynyas of the Southern Ocean play a crucial role in the formation of dense water and have an impact on the stability of ice shelves. Therefore, it is important to accurately simulate them in climate models. To achieve this goal, the relationship between grounded icebergs, landfast ice and polynyas appears to be central. Indeed, grounded icebergs and landfast ice are believed to be key drivers of coastal polynyas. However, ESMs do not simulate Antarctic landfast ice. Moreover, at a circumpolar scale, there are no observations of grounded icebergs available. Hence, we must seek model representations that can overcome these issues. To address these gaps, we conducted a study using an antarctic circumpolar configuration of the ocean–sea ice model NEMO4.2-SI–3 at the 1/4° resolution. We ran two simulations for the period 2001–17, with the only difference being the inclusion or exclusion of landfast ice information based on observations. All other factors, including initial conditions, resolution and atmospheric forcings, were kept the same. We then compared the results of these simulations with observations from the advanced microwave scanning radiometer to evaluate the performance of the new simulation. Our analysis allowed us to determine the extent to which prescribing the distribution of landfast ice and setting the sea ice velocity to zero on landfast ice regions influenced various aspects of the sea ice, such as polynyas, landfast ice and sea ice distribution in the model. In the future, we plan to look at the impact on the ocean and to develop a physical parameterization in order to model landfast ice and consequently polynyas on a permanent basis.