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Fast Ice

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Landfast sea ice is defined as ice that is contiguous with the land and lacks detectable motion
for approximately 20 days, becoming fast due to coastal morphology, bathymetry, ice characteristics, and external forcings. It acts as an extension of the land over the continental shelf modifying the exchanges between the atmosphere and ocean, as well as affecting ocean dynamics, polynya location, and economic activities in the Arctic.

Current models fail to capture the production and seasonal progression of fast ice for a number of reasons. In this study, we address the failure of sea ice models to simulate ice that remains fast to the shore during offshore wind events. We show that the inclusion of pinning points within the ice pack allow ice to remain fast during stand alone sea ice simulations. Pinning points are regions of deformed pack ice that become anchored on shallow bathymetry as they drift inshore. We present results from the Los Alamos sea ice model CICE, where we create pinning points as grid points with zero ice velocity. Initial results prescribe the number and location of the pinning points but this is extended so that the model identifies where and when pinning occurs. The probability of the ridged ice becoming grounded depends upon the depth of the sea floor, depth of ridged ice and the fraction which both of these occur within each grid cell. Investigation into the critical distribution and shape of pinning points is vital in the advance of this method. Initial results suggest that this is a viable method for modelling fast ice.