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Sea ice representation in sea ice model of CICE and Icepack

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Sea ice is a critical component of the Earth system, playing an important role in high-latitude surface radiation balance and heat, moisture and momentum exchange between atmosphere and ocean. In recent years, rapid changes have been occurring in Arctic sea ice, including decline in ice extent/area, decreasing in ice thickness and volume, and shifting towards a first-year ice (FYI) dominated, rather than multi-year ice (MYI) dominated ice pack. These are one of the most well-known and striking examples of climate change. However, representing these changes in the model is still in question since most of our knowledge is based on MYI. CICE is a sea ice model developed at Los Alamos National Laboratory since 1994. It is widely used to simulate the growth, melt and movement of sea ice, and to resolve the biogeochemical processes. Its column version, Icepack, has been separated from CICE after CICE V5.1.2, which provides additional opportunity for simulating the evolution of drifting sea ice floes. How about the representation of sea ice in a column model (Icepack) and a 3d model (CICE)? In 2012, an ice mass balance buoy (IMB) and a Spectral Radiation Buoy (SRB) were deployed on FYI near the North Pole, and later drifted towards Fram Strait. These buoys collected a complete summer melt season of in-band (350-800 nm) spectral solar radiation and sea ice mass balance data. In this study, we apply the Icepack (version 1.1.1) and CICE (version 5.1.2) to investigate the seasonal evolution of sea ice in 2012 in these two models, and
assess how well the physical processes are represented in CICE and Icepack, with the focus on the surface changes.

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