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Effects of internal wave drag in the CICE model on sea ice state

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Internal waves generated by a moving boundary over a stratified fluid are a subject long studied. In nature, this problem is the perfect theoretical representation of sea ice
moving across a stratified ocean.
Ridging makes the bottom of the ice not smooth: surface roughness and keels can generate internal waves that propagate momentum and act to increase the drag coefficient at the ice—ocean interface. This source of drag is additional to form drag arising from the pressure jump across obstacles such as keels.

The magnitude of the internal wave contribution to drag depends upon the mixed layer depth, buoyancy jump at the mixed layer bottom, stratification of the ocean beneath the mixed layer, and the geometry of the surface roughness.

In this work, we take a model of internal wave drag developed by McPhee [1989] and include it into a state-of-the-art sea ice model (CICE) forced with NEMO ocean simulation results.

We study the effect of the internal wave drag on emergent Arctic sea ice characteristics, motion, and deformation.