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# Design and validation of a lagrangian, finite element, adaptive sea-ice model

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We present a lagrangian, finite element, adaptive sea-ice model. Our model has representations of both dynamic and thermodynamic sea-ice processes and includes viscous-plastic rheology along with a complete parametrization of the atmospheric fluxes. Unstructured meshes, with their natural ability to fit boundaries and increase locally the mesh resolution, propose an alternative framework to capture the complex oceanic areas formed by coasts and islands. In this lagrangian version of the model, the computational grid moves with the ice drift. In order to maintain a good quality of the mesh, the mesh has to be adapted during the simulation, involving particular mesh adaptation techniques. Different test cases are first shown to evaluate the mesh adaptation procedure. An idealized sea-ice box circulation is presented to validate the lagrangian sea-ice model. Finally, we analyze a simulation carried out on the Arctic Basin. This feature of the model has several interesting applications, such as the dynamical mesh refinement along any region of interest (e.g., the ice edge) or buoys tracking.