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Sea ice rheology and numerical solvers for sea ice dynamics

Tuesday, 15 September 2020 15:15 (45 minutes)

Numerical solvers should be efficient, robust and scalable. Solving the sea ice momentum equation is recognized to be a difficult problem. This stems from the fact that sea ice rheology, i.e. the relation between applied stresses and the resulting deformations, is very nonlinear and leads to a stiff system of equations. From a physical point of view, this nonlinearity manifests itself by the formation of narrow features such as sea ice leads. In this talk, the viscous-plastic (VP) rheology and the recently developed elasto-brittle (EB) formulation will be presented. The various numerical methods for solving the sea ice momentum equation with a VP formulation will be discussed. A new implicit approach based on Anderson acceleration will be introduced with some preliminary results presented. We will also briefly examine numerical challenges with the EB rheology. Finally, we will discuss the potential evolution of sea ice modeling with a focus on sea ice dynamics.

Presenter: LEMIEUX, Jean-Francois (ECCC)

Session Classification: Moderator: Michail Diamantakis (ECMWF)