The 8th European Congress on Computational Methods in Applied Sciences and Engineering
ECCOMAS Congress 2022
5-9 June 2022, Oslo, Norway

Comparative study on finite element methods for modeling sea ice dynamics.

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Keywords: *Sea Ice Dynamics, Galerkin FEM, Mixed Least-Squares FEM*

The viscous-plastic sea ice model, based on [1], describes the motion of sea ice on large scales. The numerical model for simulating sea ice circulation takes into account velocities and stresses and is coupled with the field quantities ice thickness and ice concentration, which are modeled by transient advection equations. Here, viscosity in the sense of a non-Newtonian fluid depends on velocities, but also on ice concentration and ice thickness. This leads to a strong nonlinearity of the constitutive relation in which viscosity enters.

Previous studies on the implementation of sea ice models have shown that the least-squares finite element method is a promising approach to solve the numerically difficult problem, see [2] and [3]. In this talk, we will discuss a comparative study of solving the sea ice dynamics problem on large scales using least-squares FEM and standard Galerkin FEM. An emphasis will be placed on space and time discretization schemes.

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