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The Elastic-Viscous-Plastic Sea Ice Model on Different Grid Types

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The elastic-viscous-plastic (EVP) method has been introduced in the Louvain-la-Neuve sea-ice model (LIM) to improve its numerical performance. EVP is an efficient method proposed by Hunke and Dukowicz (2002) to solve the non-linear viscous-plastic model. The main idea is to reduce the time discretization error by using explicit sub-time steps without increasing the computational cost. Simultaneously the ice model has been discretized on a C-grid to make it more consistent with the numerics of the oceanic general circulation model coupled to LIM. This change also improves the quality of the solution by reducing the number of iterations needed to damp the elastic waves and by allowing ice transport through channels and straits one grid cell wide. The influence of these modifications will be illustrated by a comparison of a 1970-2006 hindcast performed with our global coupled ice-ocean model. We will outline the differences caused by the method of discretization and the grid type. Finally we will also show how to treat the land boundary condition to have a similar solution on a B-grid and a C-grid.