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A mesh refinement approach, AGRIF, to take into account small scale processes in the GRISLI large scale ice sheet model.

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Recent observations indicate that the dynamics of outlet glaciers may affect the evolution of the whole ice sheet. Current ice sheets models are unable to take this impact into account because their grid is too coarse compared to outlet glaciers width. Futhermore, most of these models are based on the shallow ice approximation (SIA) and cannot transmit longitudinal stress perturbations that seems to be an essential process.

GRISLI is a 3D thermomechanical ice sheet model. In addition to the usual shallow ice approximation for grounded ice flow, GRISLI incorporates ice streams that are treated as dragging ice shelves (MacAyeal, 1989). This feature allows the transmission of longitudinal stresses but the coarse grid is a major drawback to study the impact of outlets.

Several methods can be used to account for interactions between small and large scales: finite elements method with irregular grid, nesting a small scale model inside the large scale one. We present here another alternative that is a mesh refinement approach.

AGRIF is an adaptative mesh refinement software that can be used in any model provided it is discretized on a structured grid (cartesian or curvilinear). It makes possible to use an existing model on different grid levels while it manages interfaces between the grids and allows two-ways coupling. The mesh refinement is both spatial and temporal. Moreover, it also permit adaptative mesh refinement to automatically follow the physical processes. We present here the coupling method and preliminary results obtained by combining AGRIF and GRISLI.