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Modelling the impact of ice streams and ice shelves dynamics on the evolution of northern hemisphere ice sheets

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Numerical modelling is a valuable tool to investigate the ice-sheets evolution. In this work we focus on the role of dynamical processes in the evolution of last quaternary ice sheets, Laurentide, Fennoscandie and Greenland. For instance the way an ice sheet can extend on the continental shelf depends on the dynamics of its floating part (ice-shelves). Up to now most ice sheets models use a parameterization to simulate this process. We followed another approach using a 3D thermo-mechanical ice-sheet model that includes a description of ice streams and ice shelves (GRISLI model). This model was validated from simulations of Antarctica (Ritz et al. JGR 2001), and we now apply it to the northern ice sheets. To better simulate ice streams, we have implemented a simple hydrological model for subglacial water. Our objective is to take advantage of the model features to study the impact of ice shelves on the ice sheet extent and the role of fast flow (ice streams) in the ice sheets drainage, especially during fast climatic events. Preliminary results are encouraging and ice streams localisation is noticeably improved