



Studying the impact of proglacial lakes on ice sheet dynamics

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Proglacial lakes have an important impact on the dynamics of ice sheets by imposing a marine-like boundary condition to the ice margin. At the ice-ocean interface the ice sheet is known to have a complex dynamical behavior. These processes can include the formation of ice shelves that can buttress glaciers, increase subglacial melting, reduce basal friction and calving of icebergs. Such processes also act at the boundaries of ice-marginal lakes, which arose along the ice margins of past continental ice sheets. Some of these lakes spanned several hundreds of kilometers. We have implemented a module into the Parallel Ice Sheet Model (PISM) to study the impacts of proglacial lakes on the ice dynamics. This model dynamically updates the lake basins by filling all depressions of the domain until they overflow. This simple approach does not calculate a water budget and therefore does not rely on an advanced and computationally expensive hydrology model. The lake boundaries are treated in a similar way as a marine boundary. We test this model by reconstructing the evolution of the North American ice sheets by using a transient climate forcing for the last glacial cycle. These reconstructions are then compared to geological records, such as ice margins and paleo-lake shorelines.