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Ice Sheet Modelling using the Level Set Method

Predictions of future sea-level require ice sheet models that are able to robustly simulate the evolution of ice sheets and glaciers. For short-term ice dynamics prediction, an optimal fit between observations and model output is essential. Ice is an incompressible and non-Newtonian viscous fluid with extremely low Reynolds number flow. In this talk, I will present a numerical algorithm that uses the level set method to evolve the ice sheet surface position and also captures topological changes for glaciers and the evolution of the ice-air or ice-water interface. This algorithm is evaluated by comparing different benchmark simulations using the shallow ice approximation and the shallow shelf approximation. I demonstrate that the level set method is a reliable approach for tracking the ice surface interface and terminus positions for advancing and retreating ice sheets.

This is a joint work with my doctoral supervisors Dr. Sam Pimentel (Trinity Western University) and Dr. John Stockie (Simon Fraser University).