

An investigation into a potential long subglacial river beneath the Greenland ice sheet using SICOPOLIS simulations.

*Christopher Chambers¹, Ralf Greve¹, Bas Altena², Pierre-Marie Lefeuve²

1. Hokkaido University, 2. University of Oslo

The Greenland ice sheet appears to be hiding large geographical features at its base that have the potential to affect ice sheet simulations to an unknown degree. One feature is a broken valley extending from Petermann Fjord far into the center of Greenland revealed by the widely used BedMachine basal topographic dataset. The valley appears to be blocked by topographic rises at many points along its route, however it will be demonstrated that these blockages are entirely artificial consequences of data interpolation and that all available data indicate that the valley is not blocked. To test whether opening up this valley could affect ice sheet sliding, Simulation COde for POLythermal Ice Sheets (SICOPOLIS) simulations are used. The simulations show that opening up this valley creates an uninterrupted potential subglacial water pathway from central Greenland to Petermann Fjord (Figure 1) suggesting that water could flow along its length. The reason this is possible is because the valley tracks down a gentle ice thickness gradient as it roughly follows the ice divide. The redistribution of water towards Petermann Glacier focuses increased sliding there. There is also a small reduction of sliding in central west Greenland. Other effects of this valley on the ice-sheet hydrology and dynamics will be presented. If confirmed with further radar bed observations, this would be a great world river the runs under ice for its entire length, a distance that could be up to 1600 km.

Keywords: ice, glacier, river, Greenland, climate

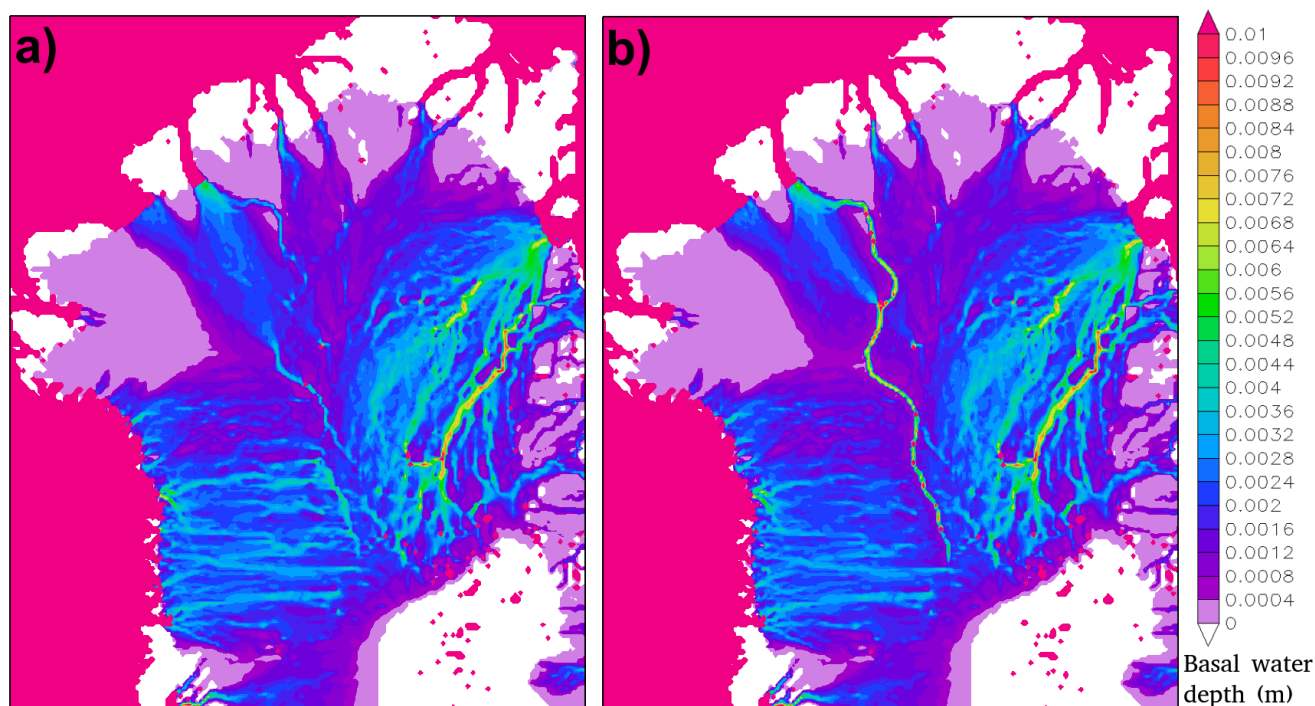


Figure 1: Basal water depth (m) for a) standard bed and b) valley inserted.