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A new full-Stokes model as a tool for basal inversions.

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High resolution models of ice sheet dynamics are required to make accurate predictions of the future mass balance of ice sheets. These require knowledge of flow conditions at the bed of the ice, however, the inaccessibility of the bed means there exist few observational constraints. Inverse methods are therefore commonly used to obtain information about the nature of basal control using given surface observations.

We present a new 3D Stokes solver written using FEniCS with the potential to carry out second-order inversions for basal slipperiness. We will be applying the model to Pine Island Glacier, Antarctica. Pine Island Glacier is one of the fastest flowing and most rapidly changing ice streams in Antarctica, and is currently contributing to sea-level rise at an increasing rate. Recent field seasons as part of the iSTAR project have acquired high-resolution in-situ geophysical measurements; results from our model will be compared with these to try and increase understanding about the conditions at the bed of Pine Island Glacier.