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Uncertainty quantification of transient ice flow dynamics on 79 North, Greenland.

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Constraining transient ice flow models for continental ice sheets such as Antarctica and Greenland can be difficult, because a lot of the model inputs inferred from satellite and in-situ observations carry measurement errors that propagate forward in transient analyses. Here, we aim at comprehensively assessing error margins on model diagnostics such as mass outflux at the grounding line, maximum surface velocity, overall ice-sheet volume, applied to the 79 North Ice Stream (NEGIS) in Greenland. Our analysis relies on uncertainty quantification (UQ) methods implemented in the Ice Sheet System Model (ISSM), developed at the Jet Propulsion Laboratory in collaboration with the University of California at Irvine. We focus in particular on sensitivy analysis, to understand the local influence of specific inputs on the model results, and sampling analysis, to quantify error margins on model diagnostics due to propagation of errors in the model inputs. Our results demonstrate the expected influence of errors on surface altimetry, bedrock position and basal friction. They however also show the non-negligible influence of model inputs such as surface mass balance, which can contribute significant error margins on projections of ice sheet mass balance.

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