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Laurentide Ice Sheet surging as modeled with PISM

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The climate during the last glacial showed a much higher variability compared to the holocene. The strongest variations were caused by Heinrich events with a reoccurence interval of 7 000 yrs. They are manifested in ice rafted debris layers in North Atlantic sediment cores. The debris stems mainly from the Laurentide Ice Sheet (LIS), which has experienced massive surges.

We use the Parallel Ice Sheet Model (PISM) to study these events; this model combines the traditional Shallow Ice Approximation (SIA) for non-sliding ice with the Shallow Shelf Approximation (SSA) for the sliding portions of the ice sheet and thus allows for a more realistic representation of the sliding areas as well as the transitions between deforming and sliding parts of the ice sheet.

We show how the surging of the LIS depends on the climate state and how it is influenced by the basal sliding parameterization. One parameterization we employ makes use of the perfectly plastic till assumption, which cannot be applied in SIA-only models.