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Modeling of supraglacial debris and glacial stagnation

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We model the role of supraglacial debris in stagnation of terminal regions of glaciers, as part of an ongoing effort to use the character of glacial deposits to learn the size and rate of the warming that caused retreat. We conduct numerical modeling experiments, using a glacier model, coupled with a dynamic layer of sediment on the ice surface. The supraglacial debris is assumed to reduce glacier melting exponentially proportional to the debris thickness.

Our experiments indicate that supraglacial debris is a key factor in the onset of glacial stagnation events. We model a variety of sources for supraglacial debris, including rock avalanche (from above the ice), melt out of englacial material, and spreading of lateral moraines on to the ice. Glacial stagnation occurs regardless of the source of debris. We conclude that the presence of supraglacial debris is very important in the onset of glacial stagnation events.