Microstructural evidence of subglacial sediment deformation at the Bering Glacier, Alaska.

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Seventy thin sections from foreland sediments overridden by Bering Glacier, Alaska, surge events contain microstructures that vary from no apparent deformation to brittle and ductile features, such as faults and folds. Some samples contain both brittle and ductile structures, thus implying polyphase deformation or non-uniform pore water pressure. A decimeters-thick diamict produced during the 1993-95 surge in subglacial contact with debris free ice lacks microstructures and appears to be the product of pervasive deformation of preexisting sediment. Penetration of subglacial strain reaching several meters beneath overriding ice caused ductile and brittle deformation in finer-facies outwash. At some sites, ductile deformation confined to thrust planes follows the base of fine-grained, horizontal, organic-rich sand sheets 4.7 meters beneath till.

Our results suggest that closely spaced subglacial sediments may have been subject to heterogeneous deformation meters beneath the ice. The paucity of structures in surge till implies deforming bed conditions favored pervasive sediment deformation.