

Fault structure beneath fossil ice keel scour marks

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The orientation of conjugate fault sets beneath fossil ice keel scour marks is variable. These faults develop in response to the instantaneous vertical load of a scouring ice keel to produce a non-axisymmetric pattern of shear fractures with normal movement sense. More than one conjugate fault set may develop, although once initiated, stress is more likely to be accommodated by movement along an existing fault set than it is by creating another set.

As a scouring keel moves through the seabed or lakebed sediment any parcel of soil affected by the event will experience changes in stress regime caused by keel loading. Similarly, a scour-induced fault, once initiated, will immediately experience changes in stress orientation. Some faults will be able to continue propagating in their initial orientation as long as resolved shear stress exceeds the yield stress for friction on the fault planes. Alternatively, faults may continue propa-

gating in new orientations to enable stress relief to continue, or new faults will develop in response to the new instantaneous load. Structurally speaking, the deformation path results in a messy but explainable fault pattern.

Continuous stress change could thus result in the development of short faults which reflect initiation followed by rapid abandonment as other, more favourably-oriented faults develop. Also, longer faults should exist that have survived by continual changes in propagation orientation and in dip angle as the scouring keel moves forward. Further modification may occur as a result of bulk soil displacements that cause rotation of both locked up and active faults. Such predicted short faults and long faults that exhibit changes in dip and orientation are observed beneath ice keel scour marks.