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Experiment name & nickname

Name: Dynamics of subglacial erosion of soft marine sediments and consequences for glacier evolution

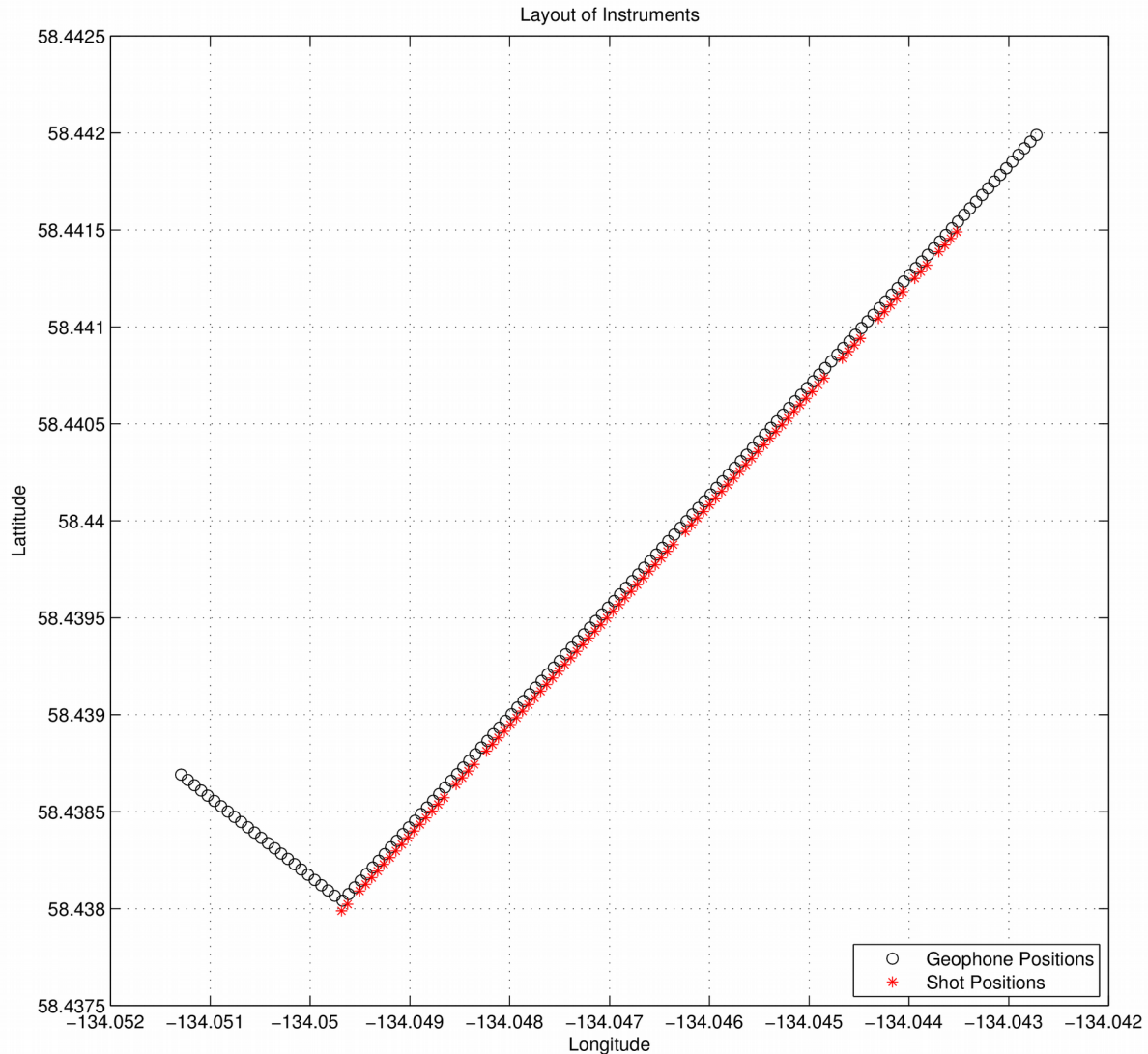
Nickname: BOOMTAKUAK

Purpose of experiment

The purpose of this experiment was to image sediment deposits beneath the Taku Glacier terminus, to determine their thickness and geometry, and to perform Amplitude Variation with Offset (AVO) analysis of seismic reflection returns from the glacier bed to learn the nature of the sediments (dilatant and soft vs. dewatered and solid). This seismic reflection survey was part of a larger glacier monitoring project aiming to characterize the relationship between subglacial sediments and the unusual dynamics of the advancing Taku Glacier terminus.

Layout of instruments

Geophones were deployed in an L-shape (see figure below) and were not moved throughout the course of the experiment, so that every shot is sensed by the same geophone array. There are 116 geophones spaced at 5-meter intervals along a line trending southwest to northeast. Additionally, there is a line of 24 geophones spaced 5 meters apart placed perpendicularly to the 116-geophone line at its southwest end. Together, the two lines form an 'L.' We set off 93 shots of Kinepak along the line, coincident with the locations of the most southwesterly 92 geophones along the 116-geophone line; the first shot is located five meters to the southeast of the first geophone, before the start of the line. Our seismic array was located at an elevation of about 250 m.a.s.l. on the surface of Taku Glacier, about 2 kilometers above the glacier terminus. The experiment took place in late March and so snow depths to ice ranged from 1.4 to 4.8 meters. Geophones were buried upright about 1 meter below the snow surface, whereas shots were detonated in boreholes typically 5 meters below the snow surface.



Seismic energy source

Our seismic energy sources were 150-gram Kinopak charges detonated 5 meters below the snow surface (or occasionally at 6 meters or fewer than five meters). See notes in the spreadsheet file `Shots_Taku` for shot depth and snow depth. Subtracting snow depth from shot depths yields distance below the ice surface. Most boreholes are listed as 'dry hole,' though we believe that most holes did contain water, as Taku is a temperate glacier. Boreholes were drilled using a Kovacs drill with a 2-inch drill bit. Blasts were triggered via radio signal and recording was initiated at that time. Charges were detonated within one day of placement in the borehole. Boreholes were generally located 5 meters apart (next to geophones); however, there are gaps in the shot line where drilling produced unsatisfactory holes or where drilling was impossible due to crevassing or the presence of slush. These gaps still contained geophones.