



Evidence of sublacustrine landslides in Lakelse Lake, British Columbia

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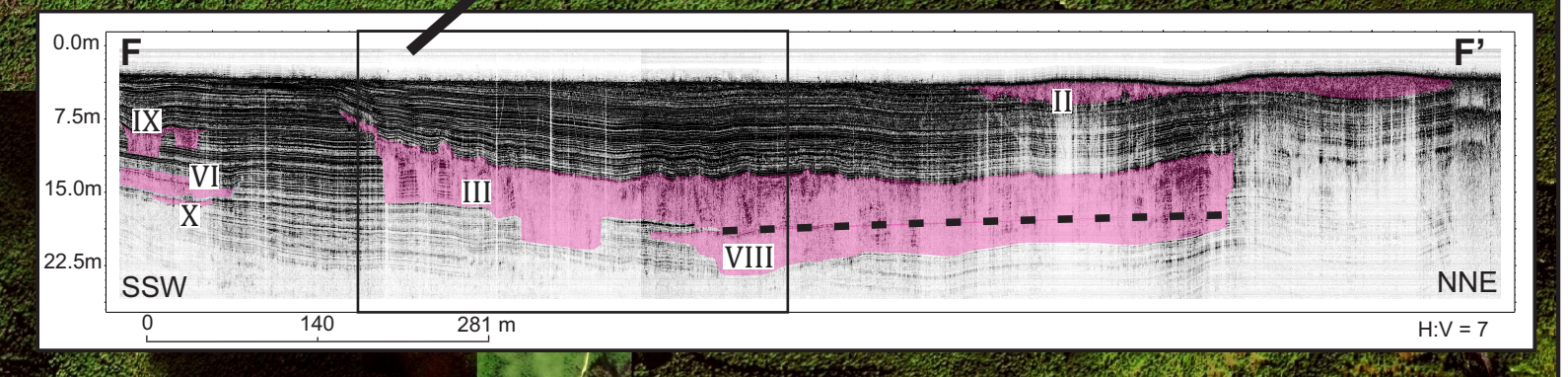
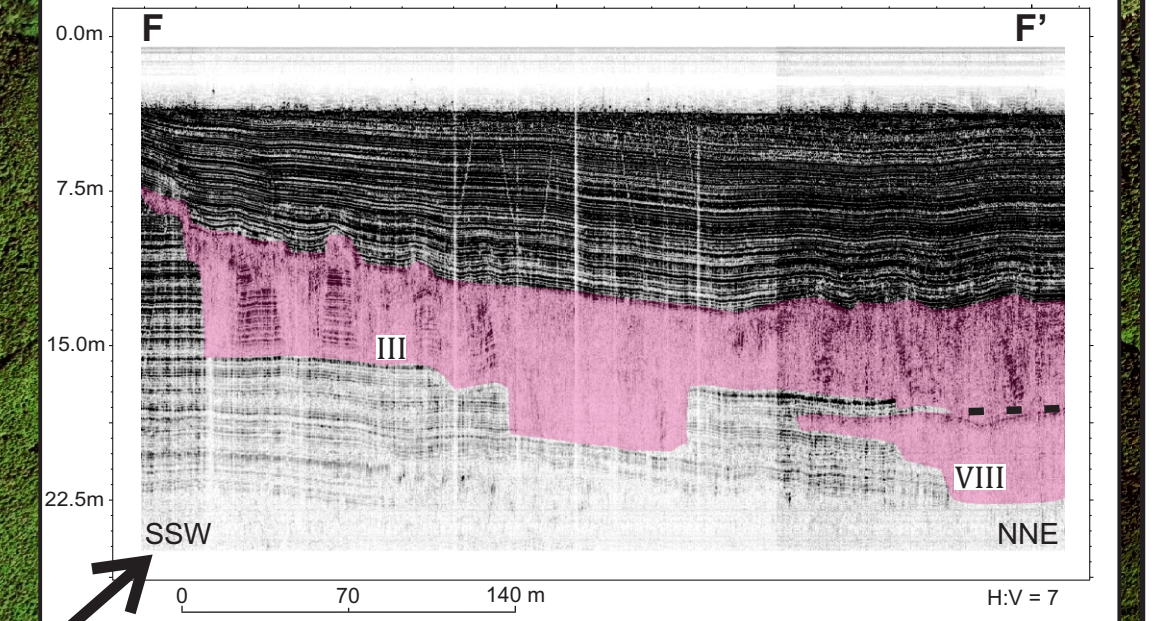
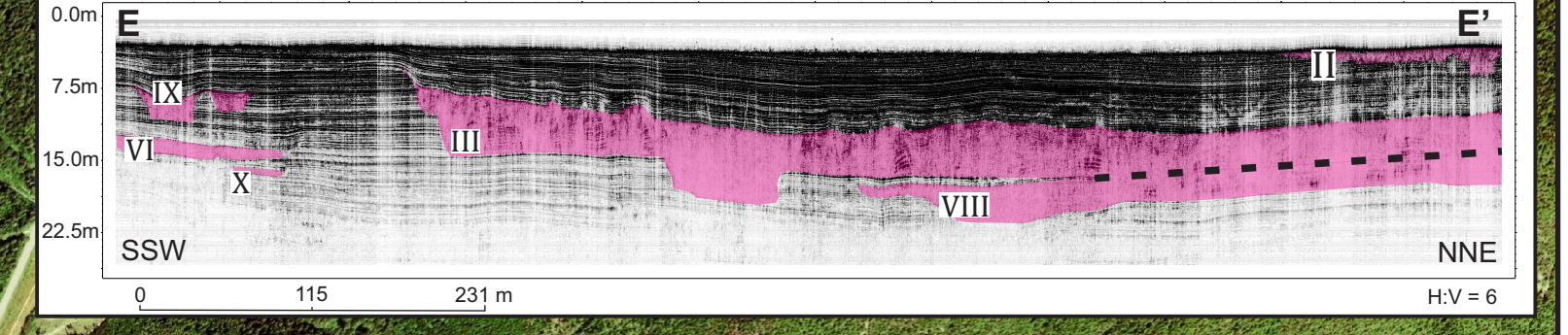
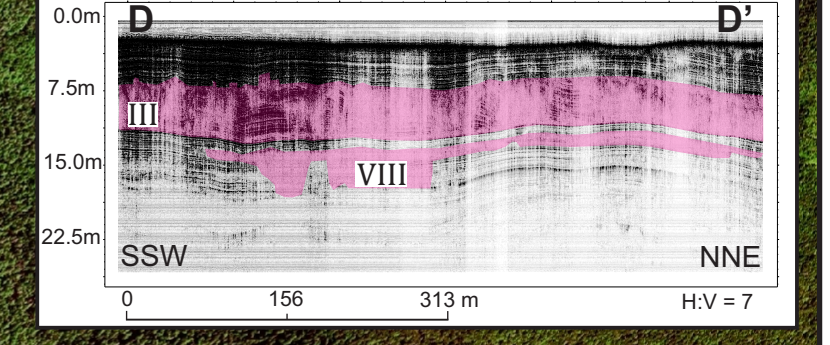
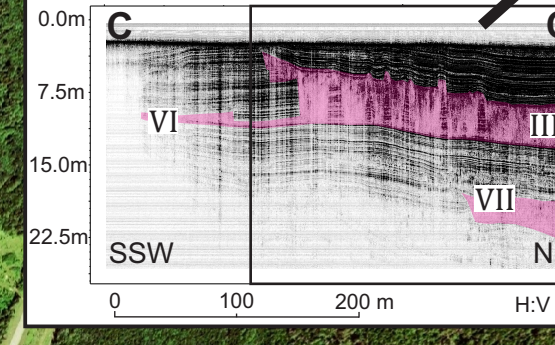
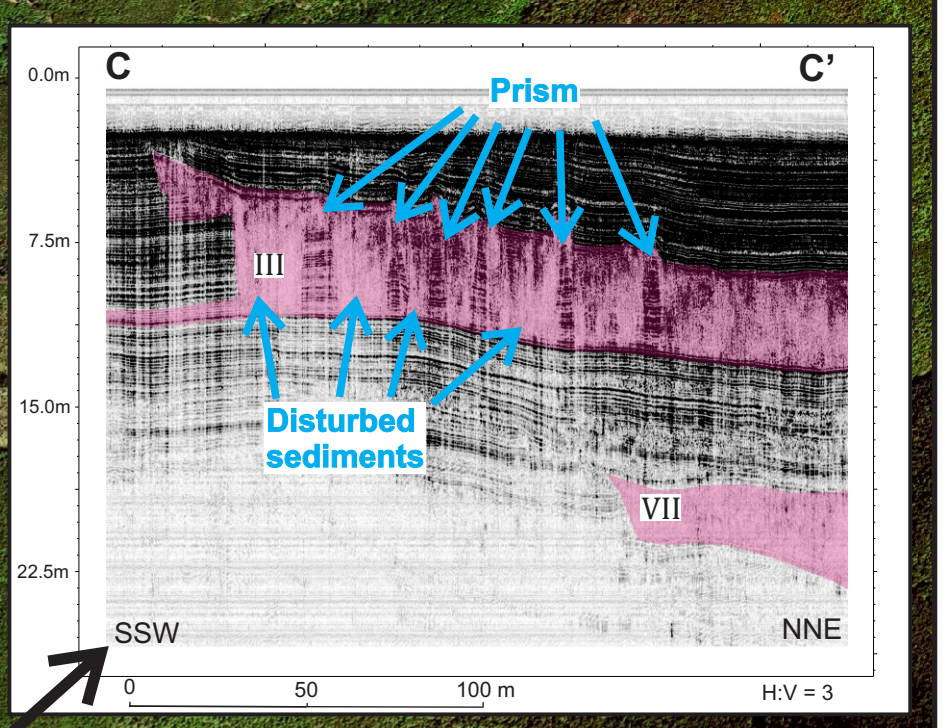
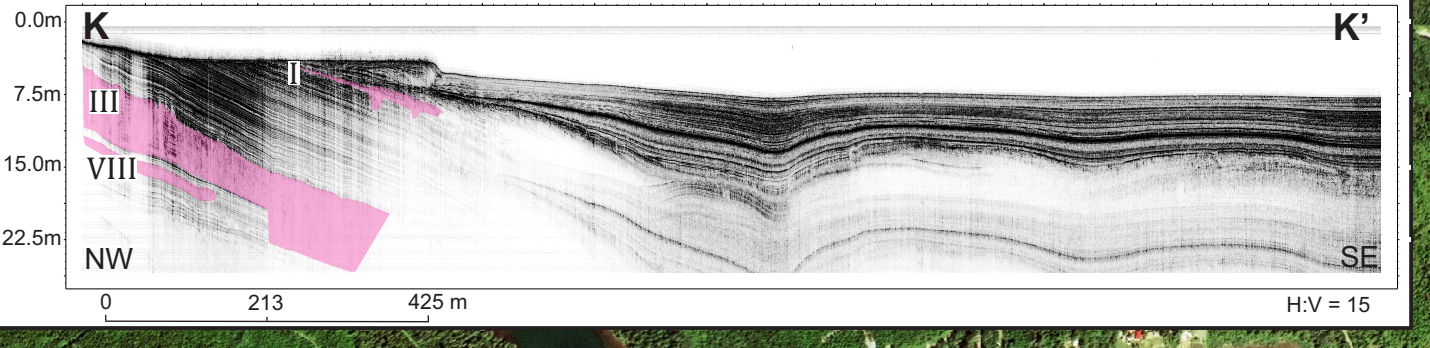
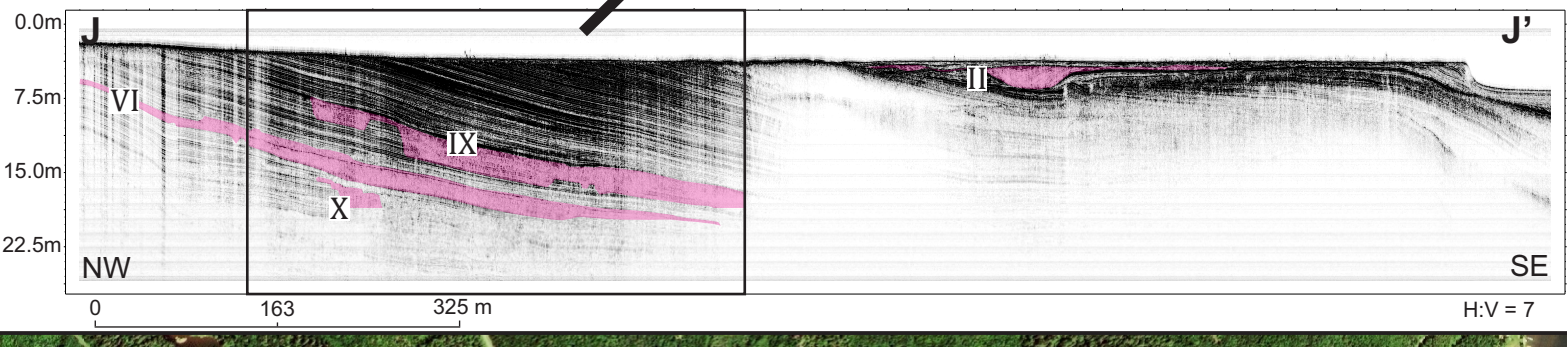
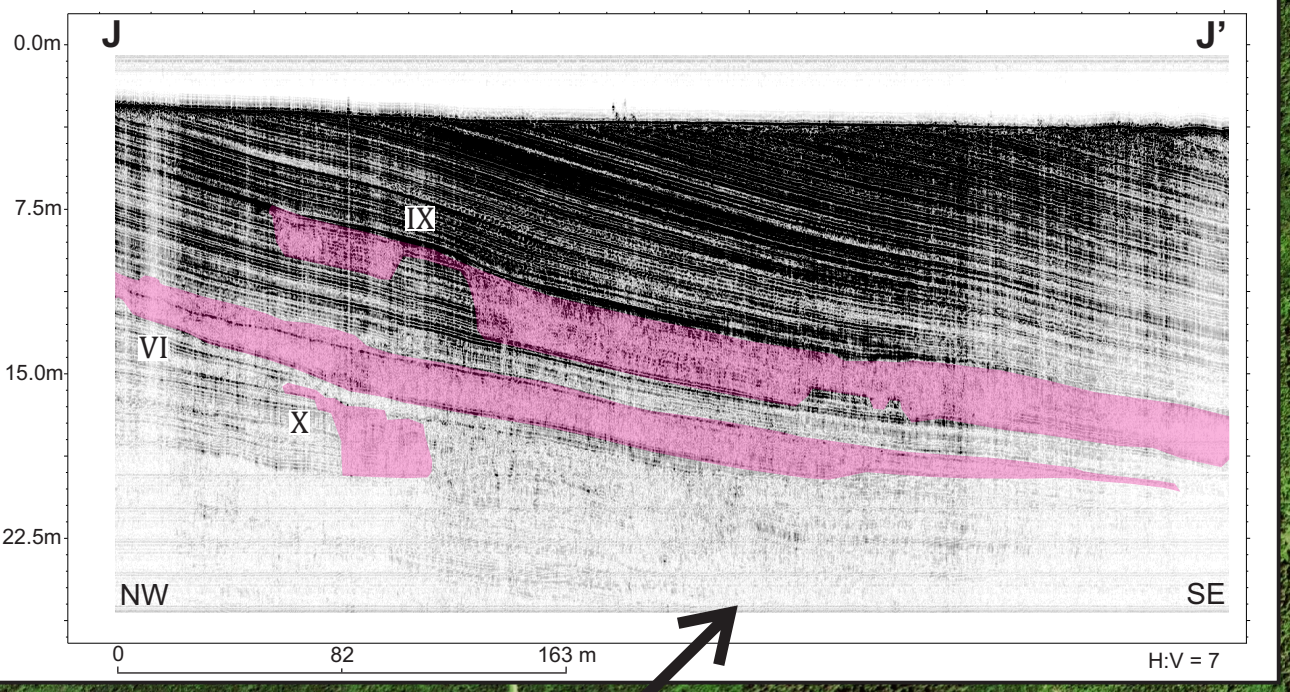
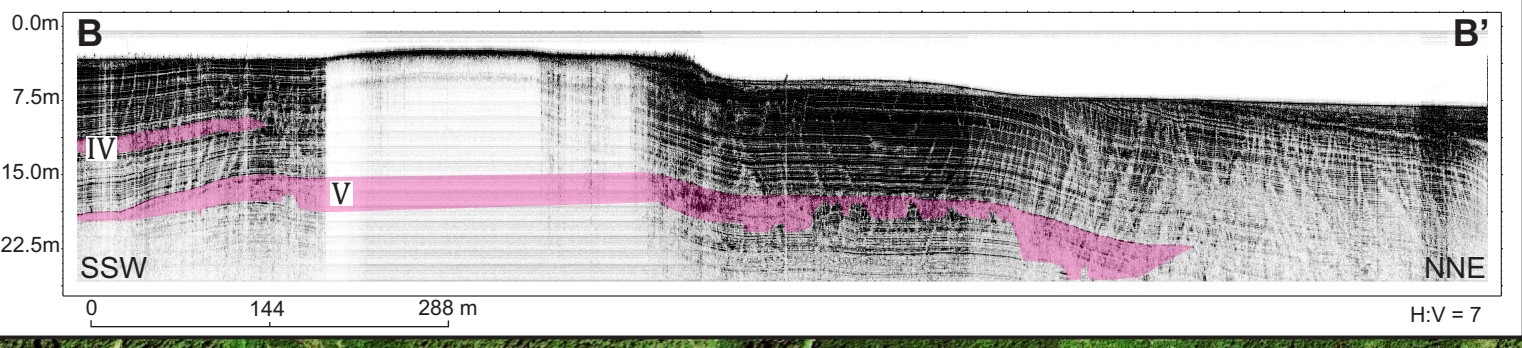
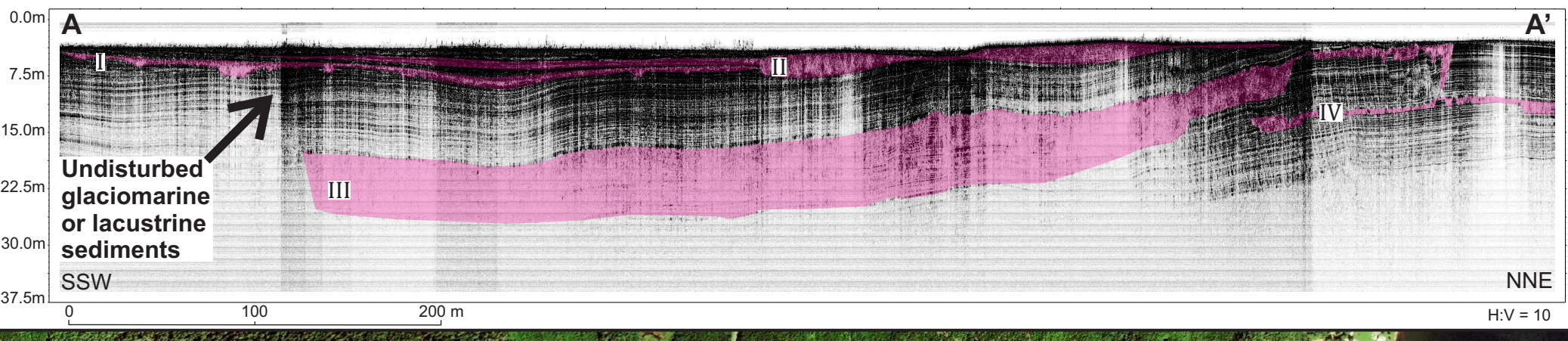
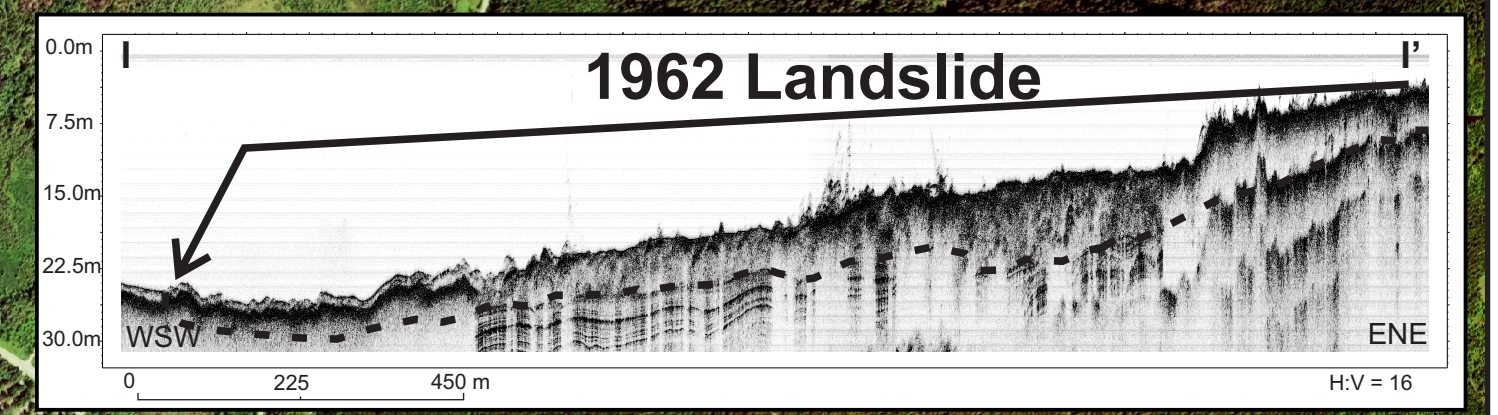
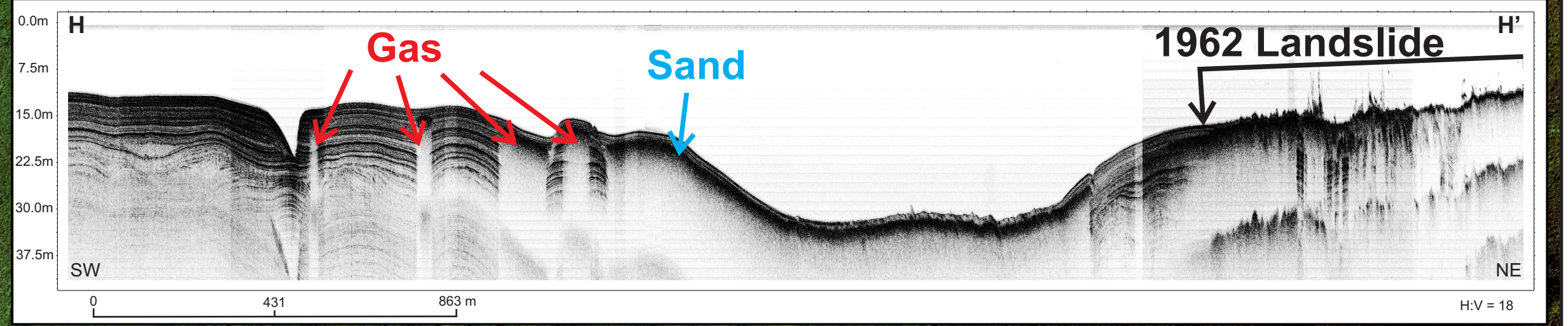
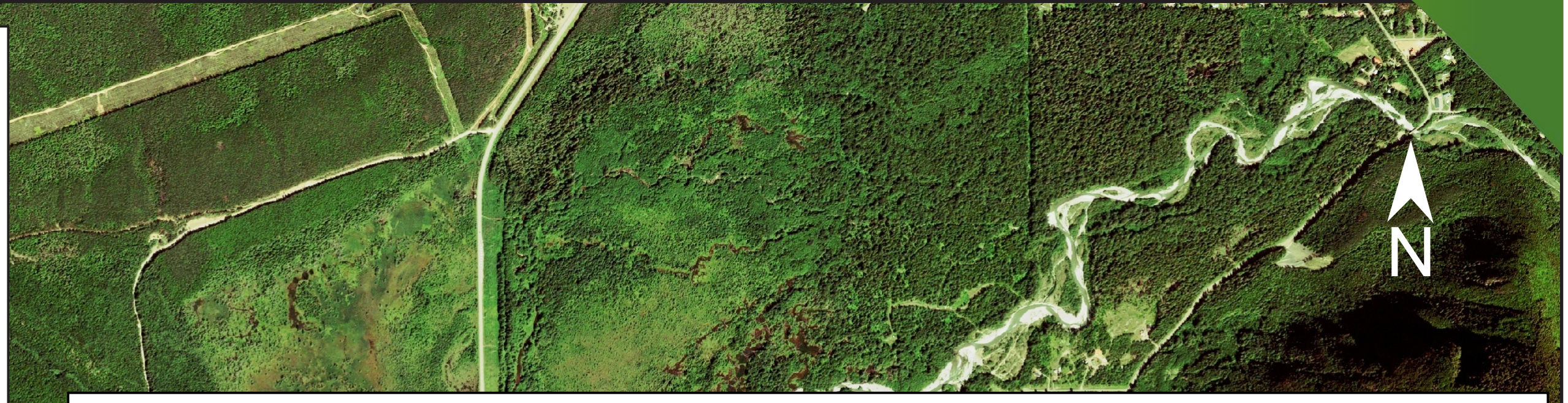
Lakelse Lake is an 8.7 km long freshwater lake located in the Skeena River watershed, about 10 km south of Terrace in northwestern British Columbia. The lake is surrounded by mountainous terrain flanked by sediments deposited during the last glacial period (Clague, 1984). Some of the sediments consist of sensitive glaciomarine sediments, making it an ideal area for destructive landslides (Geertsema and Schwab, 1997). The presence of landslide scars nearby and records of past damaging landslides in glaciomarine sediments (May and June 1962) provide evidence of the region's susceptibility to landslides (Geertsema et al., 2009).

Reconnaissance sub-bottom profiling was carried out in September 2015 to identify historic and pre-historic sublacustrine landslides at Lakelse Lake in order to assess the extent and potential recurrence of events. Long-term records of landslides provide baseline information to inform decisions related to infrastructure planning. Information regarding landslide characteristics such as type and behavior can be extracted by mapping the 3D extent of sublacustrine landslide deposits and used to aid the design of preventative measures.

Multiple sub-bottom acoustic profiles were collected using a Knudsen Pinger SBP™ system. The morphometric characteristics of the deposits were determined using Kingdom Suite software (v. 8.8). Locations of all transects are shown in white and the displayed profiles are shown in red. Depths indicated on the vertical axis of the profiles were calculated using an approximate value for the acoustic velocity of water (1500 m/s). Moreover, the vertical exaggeration is shown at the bottom right of each profile. The background image of Lakelse Lake is a mosaic of WorldView and GeoEye satellite imagery data obtained from 2010-2015.

In general, penetration of the acoustic signal was excellent except in areas where sediments were likely coarse (sandy or coarser; based on site observations) or there was presence of gas resulting in gaps in some of the records (e.g., H-H'). The preliminary results reveal that most deposits consist of draped fine glaciomarine or lacustrine sediments deposited in a quietest setting (e.g., A-A'). However, intercalated within these deposits are ten separate resolvable landslide deposits found at various depths. Evidence of one of the 1962 landslide events is also visible in the northeastern part of the lake (profiles I-I' and H-H'). Dimensions of the landslide deposits range from 10 m to over a 1 km in distance. Thicknesses range from a few centimetres to 10 m. Some of landslide deposits reveal that lateral spreading took place during deposition. This is indicated in unit III which is correlated across profiles C-C', D-D', E-E', F-F', K-K' where a series of intact blocks (prisms) are dispersed among disturbed sediments (see C-C'). This unit, at present, is the most extensive landslide deposit. In addition, Units III and VIII are separate in transects D-D' and K-K' (closer to the shoreline), but landslide Unit III eroded the top of Unit VIII in transects E-E' and F-F' (further downslope). The inferred contact is indicated with a black dashed line.

As most of the seismic data are focused on the central west part of the lake, certain deposits could not be resolved. Thus, more transects as well as intersections between transects are necessary to get a better understanding of the distribution and extent. Finally, chronologically dating the deposits is still required for a fully integrated analysis of the timing and recurrence of the landslide events.



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