**Hydrology**

Discharge was measured in the proglacial stream from July 15 to September 6, 2009, using a LevelTroll depth sensor and a rating curve. The depth sensor was installed in a sitting well and supported by a caisson on the stream bed (Figure 2). It measured depth at 2 minute intervals throughout the season. The rating curve was constructed by measuring discharge in close proximity to the depth gauge so that the instantaneous measurements could be related. The discharge was calculated using a velocity-profile method 24 times throughout the season.

To calculate discharge, velocity and depth were measured at 10 cm intervals along a profile of the stream. At each interval a velocimeter was used to find an average velocity for the whole water column, as well as measuring the depth. The discharge is calculated by summing the discharge in each 10 cm column of water. These discharge measurements lasted from 30-60 minutes. Depth data from the LevelTroll were averaged for the period of the discharge measurement and used to construct the rating curve (Figure 3).

Discharge was measured a total of 14 times in July under a variety of flow conditions in order to best capture the variability of the stream. A separate rating curve was constructed for August and September using 10 discharge measurements, after the gauge shifted due to high flows in early August. A curve was fit to the data for each time period, resulting in R² values of 0.81 in July and 0.98 for the remainder of the season. A more rigorous statistical analysis will be undertaken to verify the models. The rating curves were then used to calculate discharge at 2 min intervals from the recorded depth data (Figure 4).

**Ice Thickness**

A pulseeKo Pro radar system employing 12.5 MHz centre frequency antennas with 1000 V transmitter, was used to image the subglacial surface of Haig Glacier. The transmitting and receiving antennas were mounted on separate skids and placed one after another maintaining 8 m spacing in between (Fig. 6). The survey was conducted along a centre line and 15 cross-profiles. The locations of these profiles are shown in Fig. 7.

A typical profile as seen on the pulseeKo’s DVL, while recording the data is shown in Fig. 8a. This data represents the longitudinal profile along the distance from the glacier head. The software was used to extract the glacier ice thickness. Software computes the thickness from the two-way travel time, assuming homogeneous ice velocity (160 m/s) and a parallel-plane geometry of ice surface and bed in the vicinity of the measurement. The longitudinal profile of the glacier, after post processing the data, is depicted in Fig. 8b. The glacier is typically 200 m deep around the middle part. Similarly the ice thickness along a few cross profiles (cross 3, 7 and 11, see Fig. 7 for their position) are plotted in Fig. 9.

**Surface Velocity**

Topcon Positioning System’s GB-1000 with a dual-frequency and GPS features was used to conduct a Stop and Go Kinematic Survey. The data was processed using Topcon Tools software to yield the positions of velocity stalks (Table 1). The displacements of stalks over summer 2009 are listed in the upper portion of the table. The lower portion contains the displacements between August 2008 and Sept 2009. The position of the stalks as they appeared on September 6, 2009 can be seen in Fig. 8.

**Introduction**

Field investigations at the Haig Glacier were undertaken in the summer of 2009 as part of an ongoing study. Weather data has been collected at the Haig since 2001 at two automatic weather stations as well as 9 temperature sensors along the centerline of the glacier and on the forefield. In addition to the continued work, three main areas were investigated in 2009: surface velocity, ice thickness and hydrology. The Haig Glacier is located in the Eastern slopes of the Canadian Rockies along the Alberta-British Columbia border (Figure 1b). The glacier is also located in areas 3 of the WC2N project (Figure 1a). The Haig covers an area of 3km², which is only slightly larger than the average glacier of the southern Rockies.

**Ice Thickness**

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