

EVOLUTION OF THE ILLECILLEWAET GLACIER, GLACIER NATIONAL PARK, B.C., USING HISTORICAL DATA, AERIAL PHOTOGRAPHY AND SATELLITE IMAGE ANALYSIS

by

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ABSTRACT

The Illecillewaet Glacier (British Columbia) has been surveyed in a variety of ways since the end of the 19th century. A summary of the different information – archive photographs, field surveys, photo-interpretation, and remote sensing – reveals that between 1887 and 1962, the glacier had retreated more than one kilometre. However, since 1972, it has advanced about 100 m. The techniques used and the results are discussed.

INTRODUCTION

The history of the Illecillewaet Glacier, located in south-east British Columbia ($51^{\circ}14.1'N$, $117^{\circ}26.5'W$), occupies a special place in the history of glaciological investigations in Canada. Although, by European standards, the quality and quantity of information is not great (cf., e.g., Swiss National Tourist Office 1981), by Canadian standards, it is one of the few glaciers for which we have a long and reasonably consistent record. The construction of the transcontinental railway line through Rogers Pass, in 1885, first gave scientists and others an opportunity to study it. The following year, the Canadian Pacific Railway Company (CPR) built an hotel for its customers in the heart of their "Canadian Pacific Rockies". Glacier House was then some 45 minutes walking distance from the glacier snout. This proximity, coupled with the hotel's facilities, attracted a number of investigators, of whom the most persistent were members of the Vaux family, of Philadelphia. In 1887, they began a series of surveys of the variation and movement of the glacier (Cavell 1983). Subsequently, other investigators joined them here and on other glaciers of the region (Asulkan, Yoho, Victoria, etc.).

PRE-WAR SURVEYS

The most popular technique, in the early years, consisted of annual photographs of the glacier from fixed points. These enabled members of the Vaux family, amongst others, to monitor the retreat of the Illecillewaet Glacier intermittently from 1887 to 1912. In addition, the rate of movement of ice in the ablation area was determined by triangulation, from fixed points, of a number of steel plaques, placed on the ice. Others were encouraged to supplement the record by photographing the glacier from the fixed points. Figure 1 shows the front of the Illecillewaet Glacier from rock "W"; (a) in 1899 by William S. Vaux (1909); (b) in 1931 by A.O. Wheeler (1932); and (c), in 1946 by C.E. Webb (unpublished report). The distance the glacier retreated between 1887 and 1946 was about 1300 m.

Observations were made more or less continuously until 1912. Afterwards, they were sporadic, due to the closing of Glacier House, the Great War, and the Depression.

WATER SURVEY OF CANADA (WSC) SURVEYS

In 1945, the Dominion Water and Power Bureau, forerunner of the WSC, decided to include the Illecillewaet Glacier in its annual snout and surface movement surveys.

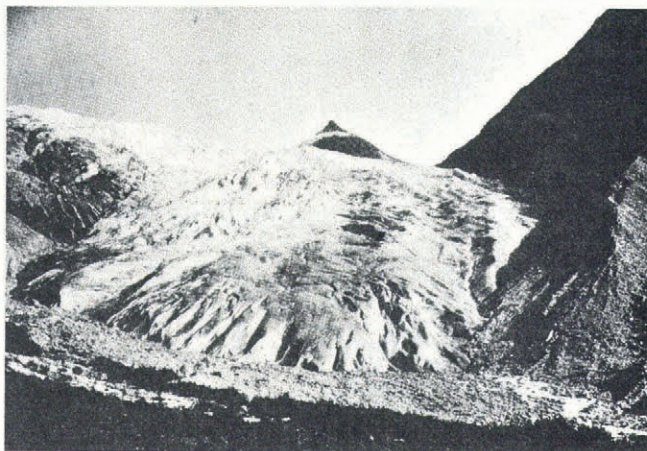


Fig.1(a) Illecillewaet Glacier 1899 (Vaux 1909).



Fig.1(b) Illecillewaet Glacier 1931 (Wheeler 1932).



Fig.1(c) Illecillewaet Glacier 1946 (C.E. Webb unpublished report).

PARKS CANADA SURVEYS

GLACIER INVENTORY SURVEY

Careful examination of enlargements of a number of recent aerial photographs has confirmed a thickening of the glacier tongue since 1972. This and the 50° tongue slope, observed in the field, imply that the advance is likely to continue for a number of years.

REMOTE SENSING

The use of LANDSAT MSS images for this study was subject to two main problems – the poor spatial resolution (59 x 79 m) and cloud cover; shadows were removed in the

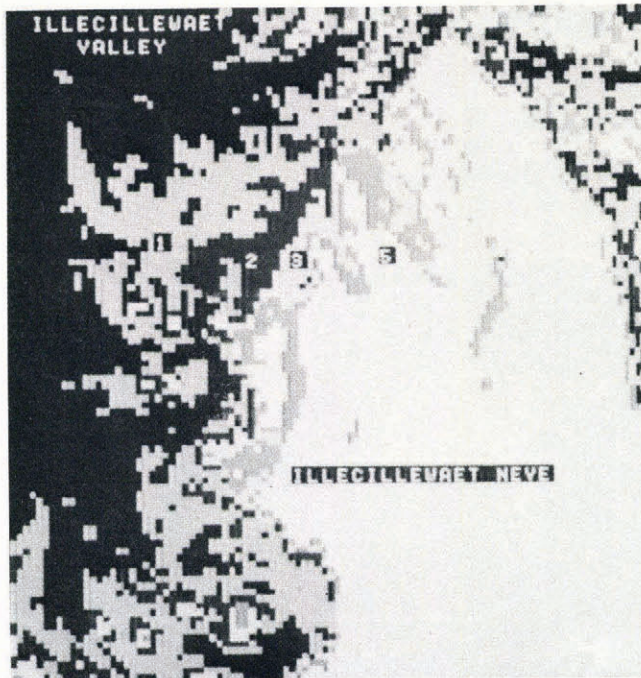


Fig.2. Unsupervised classified LANDSAT image of Illecillewaet Glacier area. Scale 1:50 000, 12 August 1981.

[illegible]

Dates	Elevations (metres above sea level)							Areas (km ²)				Depth m	Volume km ³
1978	2300	2800	2540	2248	1980	1980	2526	6.78	6.78	0.77	88	100	0.677
1951-52	2500	2800	2580	2380	2000	2000	2521	6.70	6.70	3.06	54	100	0.670
Little Ice Age	-	2800	-	-	-	1460	2451	9.27	9.27	2.78	-	100	0.927
Inventory Data	Snowline	Highest Glacier	Median Accumulation Area	Median Ablation Area	Lowest Exposed	Minimum Glacier	Median Glacier	Total Glacier	Exposed Gl. Ice	Ablation Area	Accumulation Area Ratio	Estimated Mean	Estimated Total

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