Last Cordilleran Ice Sheet retreat pattern and dynamics on the Thompson Plateau, BC, Canada.

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Introduction and Rationale

The Cordilleran Ice Sheet (CIS), which existed over British Columbia (BC) and surrounding areas until around 12 ka BP has been relatively poorly studied compared to coeval ice sheets. In particular the prevailing conceptual model of regional CIS stagnation (Fulton, 1967; 1991), is contrary to our understanding of other LGM ice sheets, which generally underwent active retreat punctuated by readvances. The basis for this CIS decay model is a lack of identified moraines throughout the former ice sheet extent which would signify active retreat, and studies undertaken on former ice-dammed lakes in the Nicola and Thompson river valleys of south-central BC, where the damming ice margins were reconstructed as stagnant lobes in the valley bottoms (Matthews, 1944; Fulton, 1969; Fulton and Walcott, 1975).

Recent studies around the Fraser Plateau have challenged this paradigm on the basis of meltwater landforms (Margold et al., 2013; Perkins and Brennand, 2015) and moraines (Perkins, 2015). These studies imply deglaciation was likely systematic, along a contiguous ice front, with minor readvances. The principle aim of this project was to reinvestigate the deglacial landforms of the Nicola and Thompson valleys in southern BC to assess the validity of the stagnation hypothesis in the area it was proposed.

Results

Five distinct glacial lake phases have been identified in the Nicola Valley, adding two to those previously known; these lake phases have allowed ice margin positions to be estimated where ice dams would be required to reconstruct lake extent; these margins imply a contiguous ice margin withdrawing to the north-northwest (Fig. 1). Large fields of recessional glaciotectonised and grounding line moraines have been identified within these lake basins on the basis of mapping, sedimentology and Electrical Resistivity Tomography, implying active retreat and readvances. Boulders on the summits of moraine ridges were sampled for cosmogenic dating, which will be undertaken in the coming months.

Glacioisostatic tilt on paleo-lake shorelines have been reconstructed rising to the north-northwest, indicating an ice surface slope in this direction and supporting active ice recession. Investigations within the outlets of these lakes have revealed indicative flood sediments including coarse boulder bars, antidunes and large diamicton intraclasts. The known extent of the glacial lake phases in the Thompson Valley (Johnsen and Brennand, 2004) have been extended northwards on the basis of lake-bottom, lacustrine fan and deltaic sediment. This refines ice margin reconstructions for glacial Lake Thompson and glacial Lake Deadman. Because a lake stage in the Nicola Valley drained into glacial Lake Thompson, temporal connections can be made between lake stages, improving regional ice margin reconstructions.

The BSG are sincerely thanked for their financial support for this project. These results have revealed the necessity to thoroughly reinvestigate the CIS in light of the rejection of the prevailing stagnation hypothesis, and will lead to several future projects across BC, for instance focussing on glacial Lake Fraser around Prince George. Further, this fieldwork has identified several sites for further research, for instance a potential subglacial meltwater corridors in Guichon and Pogo creeks draining into the Nicola area, which may aid reconstruction of CIS meltwater dynamics.

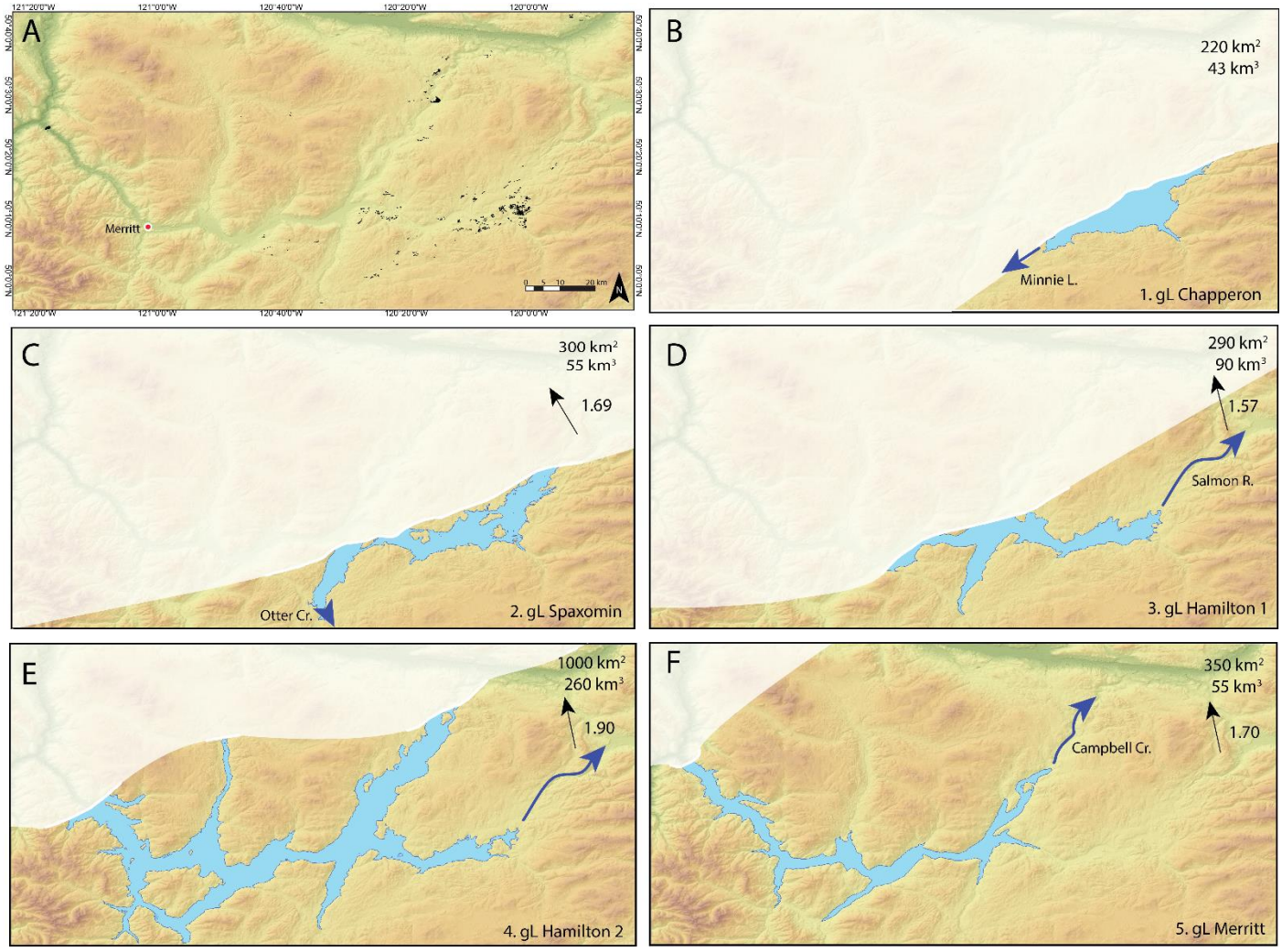

Figure 1. Reconstructed glacial lake stage (blue) and ice margin (white) history for the Nicola Valley, demonstrating a systematic retreat of a contiguous ice margin. A: Locations of moraines (black points). B – F: Glacial lake stages: Chapperon (B), Spaxomin (C), Hamilton 1 (D), Hamilton 2 (E), and Merritt (F). Blue arrows show potential outburst flood routes.