



Ice-dammed lakes yield insights into Holocene dynamics of Marguerite Trough Ice Stream and George VI Ice Shelf, Alexander Island, Antarctic Peninsula

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We present new data regarding the past dynamics of Marguerite Trough Ice Stream, George VI Ice Shelf and valley glaciers from Ablation Point Massif on Alexander Island, Antarctic Peninsula. This ice-free oasis preserves a geological record of ice stream lateral moraines, ice-dammed lakes, ice-shelf moraines and valley glacier moraines, which we dated using cosmogenic nuclide ages. We provide one of the first detailed sediment-landform assemblage descriptions of epishelf lake shorelines. Marguerite Trough Ice Stream imprinted lateral moraines against eastern Alexander Island at 120 m at Ablation Point Massif. During deglaciation, lateral lakes formed in the Ablation and Moutonnée valleys, dammed against the ice stream in George VI Sound. Exposure ages from boulders on these shorelines yielded ages of 13.9 to 9.7 ka. Following recession of the ice stream, George VI Ice Shelf formed in George VI Sound. An epishelf lake formed at 15-20 m asl in Ablation and Moutonnée valleys, dated from 9.4 to 4.6 ka, suggesting that the lake was stable and persistent for some 5000 years. Lake-level lowering occurred after this, with the lake level at 12 m at 3.1 ± 0.4 ka and at 5 m asl today. A readvance of the valley glaciers on Alexander Island at 4.4 ± 0.7 ka is recorded by valley glacier moraines overlying epishelf lake sediments. We speculate that the glacier readvance, which occurred during a period of warmth, may have been caused by a dynamic response of the glaciers to a lowering in surface elevation of George VI Ice Shelf.