BERING GLACIER: TECTONIC AND STRUCTURAL SETTING

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The Saint Elias orogen is created by collision of the Yakutat microplate into southern Alaska and adjacent Canada. The Bering Glacier lies along a structural boundary that is caused by accretion and indentation of the microplate into the Alaskan margin. Although the boundary is buried beneath the glacier it lies along the projected position of the Aleutian trench, marks the eastern limit of co-seismic uplift during the M9.2 Great Alaskan earthquake of 1964, and separates regions of different structural style and orientation on land. This evidence suggests that the boundary is a large thrust or oblique-slip thrust fault that dips towards the west and intersects the Aleutian megathrust at depth. The structural boundary is defined by profound changes in the geologic structure and topography of the Yakutat microplate. The east-trending fold and thrust belt developed in the central part of the microplate extends beneath the eastern edge of the Bering Glacier, but emerges farther west as a series of complexly re-folded structures. The change from structurally simple to complex and superimposed deformation is also reflected in the topography. Folding east of the glacier forms east-trending mountain ranges, but to the west the topography is dominated by isolated mountain blocks that are elongated north-northeast and dismembered by faulting. Because the structural boundary between these two regions is located beneath the ice, we must infer its location using structures exposed in mountains and nunataks, and also by measuring the directions and velocities of ice flow in the Bering and Steller glaciers, which partly reflect the geometry of sub-glacier topography and rock structure. Presumably, the topographic and structural grain imparted to this region by tectonic deformation controlled development of paleo-valleys that subsequently evolved into the intermontane trough that links the source of the Bering Glacier to its piedmont lobe. Conversely, subdued topographic relief across the structural boundary may not imply a lack of tectonic activity, but rather the nature of strain caused by microplate collision and accretion, and rapid glacial erosion that effectively removes tectonic-induced topography as it forms.