



AUTHOR William D. Harrison

AFFILIATION University of Alaska Geophysical Institute

ADDRESS University of Alaska, Fairbanks, AK 99775-0800

TELEPHONE (907) 474-7706

TITLE: SOME EFFECTS OF GLACIER SURGES

ABSTRACT

The term "glacier surge" usually refers to periodic episodes of rapid motion at 10 to 100 times normal, but since surges vary widely in intensity and character, as does in fact the flow regime of many "normal" glaciers, a precise definition does not exist. At any rate, a "glacier surge" should not be confused with a "glacier advance." In many cases, surges do not result in advances but terminate in the stagnant ice from previous, larger surges. There are 200 or 300 surge-type glaciers in northwest North America, with a curious non-random geographic distribution. For example, they do not occur, or are very rare, in the Brooks, Kenai and Chugach mountains. Surge speeds of 100 m/d and total ice displacements of several kilometers are not uncommon. At least some surges are caused by breakdown of the glacier's internal plumbing system, but why this occurs only in certain glaciers is unknown. There is no obvious connection with climate. Surges are fairly predictable if the recurrence interval is known--typically 20 to 50 years, depending upon the glacier.

Floods are released by a glacier during a surge, but it is likely, when it occurs, that the potentially most serious hazard is ice-dammed lake formation (see abstract by Mayo). For example, the site of the present day Richardson Highway above Black Rapids has been flooded by lakes formed by past surges of that glacier. Possibly more serious is outburst flooding from such lakes. In rarer cases, structures or roads may be threatened directly by advancing ice. The destruction of a Klingit village near present day Dry Bay is a possible example, as are the Richardson Highway and Alyeska Pipeline at Black Rapids, which are built among or over deposits of past surges of that glacier.

A potentially important aspect of glacier surges is the huge amount of sediment produced; in the case of the 1982-83 surge of Variegated Glacier, the suspended sediment alone accounted for roughly 1/2 m or erosion under the glacier. If, for example, the same erosion occurred during a surge of Black Rapids Glacier, the suspended sediment in the Tanana River at Fairbanks could temporarily exceed its present estimated mean annual value by two orders of magnitude.

