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Glacier-dammed lakes of Alaska: changes and basin characteristics 1971-2000

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Alaskan ice-marginal glacier-dammed lakes (GDLs) inventoried in 1971 were reviewed via ASTER satellite imagery. All glacier margins between the Aleutian/Coastal and Brooks Ranges were reviewed for new GDLs as well. Nearly 700 GDL basins were digitized, located, and assigned unique identifiers. Lake persistence, elevation, surface-area change, proximity to glacier terminus and ELA, and ice dam aspect were analyzed. Over 260 (49.8%) 1971 GDLs no longer form. The probability of lake loss is disproportionate across the study area: 30% south of 61^o disappeared vs. 60% north of 62^o30'. The highest proportion of the 135 new lakes detected were between 61^o30' and 62^o30'. Lake formation surpasses lake-loss in part of this zone by $>$2:1. 1971 lake perimeters were digitized and compared to contemporary boundaries of persistent and new lakes digitized from satellite imagery. GDL surface-area decreased $>$75% 1971-2000. Differences between persisting and absent lakes indicate the aspect of the ice dam plays a role in lake longevity (and possibly frequency of release). Ice-dam aspects are not uniformly distributed, and mean aspect varies by lake classification: mean of new-lake ice dam aspects differed $>12^o$ from the mean aspect of the absent lakes. Ice dams facing s and w are generally $>$5km from the glacier terminus, whereas those facing n and e tend to be $<$4km of the glacier terminus. Overall, 60% of the GDLs evaluated formed or disappeared since 1971. Documented GDL distribution changes will contribute to new outburst flood hazards as new lakes begin their release cycles. Results of our GDL characteristics analyses may be useful in predicting trends in the dynamic phenomenon of episodically-releasing, ice-marginal GDLs across the cryosphere.