



Accelerated Wastage of the Wrangell Mountain Icefields, Alaska, U.S.A., during 2000-‘07 relative to 1957-2000, from Airborne Laser Altimetry

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The high, volcanic Wrangell Mountains of Alaska are heavily covered by glacier ice in an inland climate regime and have a relatively small number of weakly surging glaciers. These glaciers and icefields are thus suitable for a study of the effects of changing climate in a heavily-glacierized region not dominated by coastal effects; that is, without glaciers subject to tidewater calving instability.

Airborne laser altimeter profiles were first acquired on the Wrangell Mountain glaciers in 2000. In 2007, these glaciers were profiled again; altimeter measurements at higher elevations were made and additional glaciers were included. The profiled glaciers include the large Nabesna system on the NNE (inland) flank of the range, and the Kennicott and Rohn-Regal-Nizina systems on the SSW (ocean) flank of the range.

The data were analyzed by first mosaicking a seamless digital elevation model (DEM) using 15 minute DEMs derived from U.S. Geological Survey topographic quadrangles derived, in turn, from 1957 aerial photographs. Two composite (separate) area-altitude distributions (AADs) were computed for all glaciers on the NNE and SSW flanks, respectively, of the Wrangell Mountains. The airborne altimetry profiles acquired on these inland and ocean sides of the range were treated as discrete samples of the corresponding two AADs. Volume-change estimates were computed separately for the two climatically-differing sides of the range, and then summed to obtain estimates of total ice-volume changes and area-average mass balances throughout the entire ca. 4730 km² area of the Wrangell Mountain glaciers during 1957-2000, 1957-2007, and 2000-2007.

The altimetry-estimated area-average mass balances of the Wrangell Mountain glaciers and icefields were -0.17 m/yr ice equivalent (i.eq.) during 1957 to 2000; -0.38 m/yr i.eq. during 1957 to 2007; and -1.7 m/yr i.eq. during 2000 to 2007. Elevation increases during 1957-2007 were measured above 2600 m on Nabesna glacier, which is the largest inland glacier outside Greenland in the Northern Hemisphere (Austin Post, pers comm. 2007), consistent with earlier observations that some Alaska glaciers are gaining mass at higher elevations. These results, including an error analysis and interpretation, will be presented.