Geophysical Research Abstracts, Vol. 9, 06861, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06861

Accelerating wastage of the Malaspina Glacier system in Alaska, USA, 1972 to 2006, from airborne and spaceborne InSAR DEMs and small-aircraft and ICESat laser altimetry

R. R. Muskett (1,2), C. S. Lingle (2), J. M. Sauber (3), K. A. Echelmeyer (2), A. S. Post (4), B. T. Rabus (5), W. V. Tangborn (6)

(1) International Arctic Research Center, University of Alaska Fairbanks, USA; (2) Geophysical Institute, University of Alaska Fairbanks, USA; (3) NASA Goddard Space Flight Center, Greenbelt, Maryland, USA; (4) Vashon, Washington, USA; (5) MacDonald Dettwiler and Associates, Richmond, British Columbia, Canada; (6) Hymet, Inc., Vashon, Washington, USA (clingle@gi.alaska.edu; fax +1-907-474-7290; phone +1-907-474-7679)..

Observations of three near-concurrent surges between 1999 and 2002 on (i) the main Seward lobe of Malaspina piedmont glacier; (ii) on Agassiz Glacier (a western tributary); and (iii) on Marvine Glacier (a former eastern tributary, now detached), using InSAR DEMs and laser altimetry, will be presented. The Malaspina glacier system is located in the heavily glacierized St. Elias Mountains of south-central Alaska.

During 1999 to 2002, the western half of the main Seward lobe thickened by 10 $\pm$ 1 m on average, reflecting ice input from a surge originating in the mouth of Seward Glacier during this time period. Seward Glacier is the main-trunk feeder of the Seward lobe. Simultaneously, the *eastern* half of the Seward lobe lowered by -12 $\pm$ 1 m on average. These observations, combined with observations of a surge of the *eastern* Seward lobe in 1987/1988, support a hypothesis of formation of the giant folded moraines on Malaspina piedmont glacier by a mechanism of sequential surges alternating in direction from SE to SSW. These surge-derived, folded, debris-covered and ice-cored moraines on Malaspina piedmont glacier showed area-average lowering at -1.2 $\pm$ 0.1 m/yr between 1972 and 1999, accelerating to -2.4 $\pm$ 0.3 m/yr between 1999 and 2002.

During 1972 to 1999 the eastern half of the main Seward lobe (the receiving area of the

1987/88 surge) lowered at an area-average rate of -2.0 $\pm$ 0.1 m/yr. During 1999-2002, by contrast, the eastern half of the Seward lobe lowered at an increased area-average rate of -4.1 $\pm$ 0.3 m/yr.

The western part of upper Seward Glacier, above 1200 m, lowered at an area-average rate of -0.5 $\pm$ 0.1 m/yr during 1976 to 2000. Differencing of InSAR digital elevation models (DEMs) and ICESat laser altimetry showed similar area-average surface lowering at -0.6 $\pm$ 0.7 m/yr during 2000 to 2003. At low altitudes, coastal temperatures and liquid precipitation (rainfall) have increased significantly since 1976/77 relative to the time period 1950 to 1975 (Muskett and others, 2003). This likely contributed to the high rates of surface lowering observed on the low-altitude Malaspina piedmont glacier during recent years. At high altitudes, snow accumulation recorded in the ice core retrieved from 5340 m on Mount Logan (5959 m) in the St. Elias Mountains (Moore et al., 2002) increased significantly during 1976 to 2000. At intermediate elevations, however, thinning in the accumulation area of the Malaspina Glacier system (i.e., on upper Seward Glacier) suggests a dominant role for summer ablation possibly augmented by surge dynamics.