

Estimating South Cascade Glacier (Washington, U.S.A.) mass balance from a distant radiosonde and comparison with Blue Glacier

L. A. RASMUSSEN, H. CONWAY

Geophysics Program, University of Washington, Seattle, Washington 98195, U.S.A.

Journal of Glaciology (2001) vol. 47, no. 159, p. 579-588

ABSTRACT A simple flux model using twice-daily measurements of wind, humidity, and temperature from standard upper-air levels in a distant radiosonde estimated winter balance of South Cascade Glacier over 1959-98 with error 0.24 m w.e. Correlation between net and winter balance is strong; the model estimates net balance with error 0.53 m w.e. Over the past 40 years, average net balance of South Cascade Glacier has been strongly negative (-0.46 m w.e.), and it has been shrinking steadily. In comparison, 200 km WSW at Blue Glacier, the average balance has been less negative (-0.13 m w.e.); that glacier has undergone little change over the 40 years. Balance histories of the two glaciers are positively correlated ($r = +0.54$), and South Cascade has been more out of balance than Blue, presumably because it is still adjusting to climate change since the Little Ice Age. Recent warming and drying has made the net balance of both glaciers strongly negative since 1976 (-0.84 m w.e. at South Cascade, -0.56 m w.e. at Blue). If South Cascade Glacier were in balance with the 1986-1998 climate, it would be about 1/4 of its present area. If conditions persist, retreat of both glaciers is inevitable.