Mass balance of Vatnajökull outlet glaciers reconstructed back to 1958

L. A. Rasmussen

Department of Earth and Space Sciences, University of Washington
Seattle, Washington, 98195-1310, U.S.A.

Jökull (submitted January 2005)

ABSTRACT. A simple model using upper-air values in the U. S. National Centers for Environmental Prediction and U. S. National Center for Atmospheric Research (NCEP-NCAR) Reanalysis database that was developed for glaciers in North America and applied to glaciers in Norway and Sweden is used to model seasonal components of mass balance of five Vatnajökull outlet glaciers. Over the period of observations of mass balance between 1991 and 2001, it had percentage r^2 ranging from 41 to 93 for winter balance b_w and from 55 to 74 for summer balance b_s Sensitivity to $+1\,^{\circ}$C warming ranged from -0.82 to -1.26 meters per year water equivalent, due mainly to increased ablation and secondarily to shift of precipitation from snow to rain. Sensitivity to 10 percent increase in precipitation was about $+0.16$ The model, calibrated over the period of observations, was used to extend the mass balance series over 1958-2003. In this series, the biggest shift in net balance b_n at all five glaciers is between the means of 1958-1993 and 1994-2003. The 5-glacier average of the shift in b_n was -0.54, due to shifts of -0.06 in b_w and -0.48 in b_s.