Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09821, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09821
EGU General Assembly 2008

Rapid ablation of bare ice surfaces on debris-covered Miage glacier, Italian Alps

B. Brock, C. Williamson

Environmental Systems Research Group, School of Social Sciences, University of Dundee, UK (b.w.brock@dundee.ac.uk / Phone: +44-1382-385443)

Classical studies on rock debris-covered glaciers have established that ablation is optimized under a shallow debris cover of 2 to 3 cm thickness, when the melt rate may be twice that for bare ice. We present results from measurements at 20 ablation stakes in the debris-covered ablation zone of Miage Glacier, made in the 2007 ablation season, where bare ice surfaces were found to melt much more rapidly than debris-covered ice, for any thickness of debris. Furthermore, the bare ice melt rates were up to two times higher than those calculated by a physical energy balance model forced using meteorological data from the site. These observations are explained by: (1) differences in the definition of thin debris covers between the present study (a continuous layer) and previous studies (a discontinuous layer); and (2) additional energy from sensible heat and longwave radiation supplied to bare ice surfaces from the surrounding debris, not calculated by standard energy balance models using 2 m height meteorological observations. An energy balance melt model is developed to account for the 'missing' energy fluxes and its performance tested against observations. The implications are that bare ice areas, such as ice cliffs, may account for an even greater proportion of the total ablation of debris-covered glaciers than is currently estimated. Accurate calculation of the melt rate of bare ice surfaces in debris-covered ablation zones is important considering their distribution at relatively low elevations, with potential for extremely high melt rates.