Geophysical Research Abstracts
Vol. 12, EGU2010-11042, 2010
EGU General Assembly 2010

The surface energy balance of the Guanaco and Toro 1 glaciers in the Norte Chico region, Chile

Shelley MacDonell (1), Thomas Mölg (2), Lindsey Nicholson (2), and Christophe Kinnard (1)

(1) Centro de Estudios Avanzados en Zonas Aridas (CEAZA), Glaciology, La Serena, Chile (shelley.macdonell@gmail.com), (2) Tropical Glaciology Group, Department of Earth and Atmospheric Sciences, University of Innsbruck, Innsbruck, Austria

The ablation of the cold, arid, high-altitude glaciers of the Norte Chico region in Chile remains poorly constrained at present. The development of ablation features such as penitentes indicate that sublimation processes are prevalent, but equally the presence of ponds and cryoconite holes in the near-surface ice indicate that melt can also play a role in the ablation of these glaciers.

In this paper we used meteorological data collected from the surfaces of the Guanaco and Toro 1 glaciers between October 2008 and July 2009 to determine the conditions that control the energy balance and the resulting mass loss by surface ablation. We investigate the diurnal and seasonal energy exchanges on each glacier to evaluate whether the processes on each are equivalent, before calculating the ratio of sublimation to melt on each.

We found that melt was more important on Guanaco Glacier than on Toro 1 Glacier, and that the seasonal peak of ablation occurred on Guanaco Glacier between December and late January, whereas the ablation peak on Toro 1 Glacier between February and March. This ablation offset is probably related to differences in the terrain surrounding each climate station, such that on Guanaco Glacier, the surrounding terrain is planar, whereas on Toro 1 Glacier, whilst the immediate area around the climate station was free of penitentes for much of the modelled time, penitentes grew around the station, changing the roughness length, and hence the importance of sublimation.

This study showed that the development of penitentes during an ablation season changes the importance of energy balance terms, and hence the types of ablation experienced on a glacier. In future we hope to be able to model ablation from penitente-covered regions more accurately, and to develop a distributed energy balance model for use on glaciers where penitentes exist.