ENERGY AND MASS BALANCE AT GRAN CAMPO NEVADO, PATAGONIA, CHILE

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The Gran Campo Nevado (GCN) Ice Cap on Peninsula Muñoz Gamero, Chile, is located in the southernmost part of the Patagonian Andes at 53°S. It comprises an ice cap and numerous outlet glaciers which mostly end in proglacial lakes at sea level. The total ice covered area sums up to approximately 250 km2. GCN forms the only major ice body between the Southern Patagonian Icefield and the Street of Magallan. Its almost unique location in the zone of the all-year westerlies makes it a region of key interest in terms of glacier and climate change studies of the westwind zone of the Southern Hemisphere. Mean annual temperature of approximately +5°C at sea level and high precipitation of about 8,000 mm per year lead to an extreme turn-over of ice mass from the accumulation area of the GCN Ice Cap to the ablation areas of the outlet glaciers. Since October 1999 an automated weather station (AWS) is run continuously in the area at Bahia Bahamondes for monitoring climate parameters. From February to April 2000 an additional AWS was operated on Glaciar Lengua a small outlet glacier of GCN to the north-west. Ablation has been measured at stakes during the same period. The aim of this study, was to obtain point energy and mass balance on Glaciar Lengua. The work was conducted as part of the international and interdisciplinary working group §Gran Campo Nevado¶ and supported by the German Research Foundation (DFG). Energy balance was calculated using the bulk approach formulas and calibrated to the measured ablation. It turns out, that sensible heat transfer is the major contribution to the energy balance. Since high cloud cover rates prevail, air temperature is the key factor for the energy balance of the glacier. Despite high rain fall rates, energy input from rain fall is of only minor importance to the overall energy balance. From the energy balance computed, it was possible to derive summer-time degree-day factors for Glaciar Lengua. With data from the nearby AWS at Bahia Bahamondes we computed summer ablation for the summer seasons of 1999/2000 and 2000/2001. Ablation at 450 m a.s.l. sums up to about 7 m in 1999/2000 and to 5.5 m in 2000/2001. This is in excellent accordance (+/-2%) with measurements at ablation stakes that have been drilled into the glacier on its ablation area. Surface velocity measured from the displacement of the ablation stakes is estimated to 62 m per year. A RADAR survey with ice penetrating RADAR conducted on the ablation area of Glaciar Lengua during the austral summer 2000/2001 reveals glacier depths between 120 m and 200 m ap-
proximately. The data sampled will allow to set up a model for mass flow and ablation at a cross-section of Glacial Lengua at 450 m a.s.l. Glacial Lengua has no accumulation area itself but obtains all of its ice mass through icefall from the heights of the GCN Ice Cap. Therefore, this model will be of fundamental importance to understand the glacial regime of the entire ice cap.