# GLACIER ABLATION UNDER DEBRIS COVER, FIELD OBSERVATION ON LIRUNG GLACIER, NEPAL HIMALAYA

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## INTRODUCTION

One of the most common characteristics of glaciers in the Nepal Himalaya is the presence of a debris-covered surface in the ablation area. This tremendously influences the ablation process of the glacier itself. Evaluation of ice-melt under debris-cover is important for runoff modeling of glacierised drainage basins. In order to evaluate this melt, field observations were made, between 18th to 21st June 1995, near the active terminus of Lirung Glacier.

## OBSERVATION SITE AND DATA COLLECTION

Lirung Glacier is located in Langtang Valley, 60km north of Kathmandu, Nepal. Langtang Valley has been under constant hydrometeorological and glaciological observation from 1981. Heat budget observations, including temperature, relative humidity, wind speed and ground heat flux, were recorded at 5-minute intervals on three different debris sites of Lirung Glacier from 17th to 21st June. Ablation was measured twice a day on 30 points having different debris thickness from clean ice to 13cm thick ice. The site

was artificially prepared after clearing away the big boulders from the plots. A string to the surface was measured twice a day and the difference was taken as the ablation under debris.

## METEOROLOGICAL CONDITIONS

The mean air temperature during the ablation experiment period was 6.1° C; relative humidity, 97%; incoming short wave radiation, 121W/m$^2$; wind speed, 1.1m/s; and total precipitation, 11.5mm.

## RESULT AND DISCUSSION

Figure 1 shows the observed ablation rate with the debris thickness for day-time and night time. It was found that the maximum ablation, 10cm/day, occurred under a debris thickness of 2.5cm. At lower thicknesses, the reflectivity of the surface is high, and thus less energy can be used for ice melting. The critical thickness is approximately 8cm. At higher thicknesses, the energy is stored and used for increasing the surface temperature and later released during night time, rather than conducting heat to lower surfaces for melting. Although, the order of the ablation is similar to observations made in the Punjab Himalaya (Mattson et al. 1993). The maximum ablation occured at higher thicknesses. Figure 2 shows the comparision of the calculated ablation rate to the observed ablation rate using the energy balance equations (Nakowa and Young 1981). It can be seen that, during daytime, the calculated ablation rate, using the energy balance equation, overestimates nearly twice the observed ablation and during night time underestimates by half. This may be because the plots were in a lower valley than the energy budget observation site, and thus, less incoming energy is actually available for melting than is used.

Fig. 1. Relation between debris thickness and daily mean observed ablation, Urung Glacier

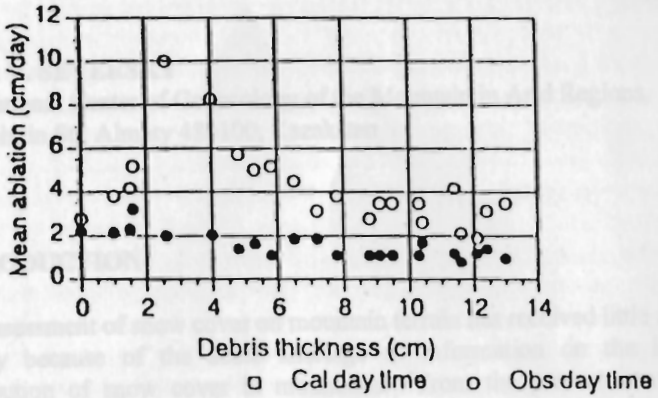


Fig.2. Comparison of daily mean calculated to observed ablation during day time and night time