VARIABILITY OF AIR TEMPERATURE LAPSE RATES: PRELIMINARY RESULTS FROM THE KARAKORAM HIMALAYA, PAKISTAN

A. T. Lowe (1), P. R. Porter (2)
Department of Geography and Environmental Sciences, University of Hertfordshire, Hatfield, Hertfordshire AL10 9AB (p.r.porter@geog.leeds.ac.uk)

In order to examine the degree of variability in air temperature lapse rates in glacierised mountain basins, a series of air temperature measurements were made during summer 1999 in the Batura and Passu basins, Karakoram Himalaya, Pakistan. To enable calculation of lapse rates and to assess their potential spatial and temporal variability, air temperature was monitored over glacier ice, and non-glacier surfaces at altitudes ranging from 2700 to 4700 m and over periods ranging from 38 to 61 days. Temperature lapse rates calculated over non-glacier surfaces were significantly higher than those established on the Batura glacier over clean ice; mean lapse rates of 0.46 and 0.57°C per 100 m were recorded over non-glacier surfaces. In contrast, a lower mean rate of 0.32°C per 100 m was calculated over clean ice surfaces on the Batura glacier. A mean lapse rate of 0.79°C per 100 m was recorded between the snow-free valley station at the snout of Passu glacier and the highest elevation station on the Batura glacier. This high rate results from the steep temperature gradient induced by low air temperatures over ice surfaces. Lapse rates measured over non-glacier surfaces are lower than those reported by other studies conducted in basins in the western Himalaya that are influenced to a greater extent by the Indian monsoon and/or have snow that is more persistent at higher elevation climate stations during the melt season. Extreme temperature gradients therefore exist due to localised cooling arising from snowfall at high elevations. Temperature data collected from the Passu and Batura basins clearly demonstrate significant spatial and temporal variability in calculated lapse rates. Even short-term variability of lapse rates over different surfaces is high, as a result of rapidly changing synoptic conditions during summer months. This effect is particularly noticeable when storm systems inundate the study basins.
and deposit snow at high elevations. This observed variability has implications for the use of lapse rate data in models that seek to forecast meltwater runoff from glacierised basins.