with LDL (Figure $1A_{cd}$, $1B_{CD}$, $1C_{CD}$). These results unambiguously revealed that LDL-dependent activation of Receptor-C_k is responsible for the down regulation of cholesterol synthesis, DNA synthesis and apo B-specific LDL-receptor gene transcription (Figure $1A_b$, $1B_B$, $1C_B$).

Cholesterol-feedback control responsible for cholesterol homeostasis within the cell is achieved by cholesterol-dependent feedback regulation of at least two sequential enzymes in the mevalonate pathway, HMG CoA synthase and HMG CoA reductase as well as apo B-specific LDL-receptor[11]. This cholesterol-dependent feedback regulation at the transcriptional level takes place through a conserved sterol regulatory element (SRE) present in the promoter region of the genes coding for the enzymes HMG CoA reductase and HMG CoA synthase as well as apo B-specific LDL-receptor gene[12]. Using human promyelocytic leukemic cell line (HL-60) as an archetype cellular model (which is unable to express Receptor-C_k, whereas this cell line exhibits overexpression of conventional apo B-specific LDL-receptor), we have unambiguously shown that Receptor-C_k-dependent signalling regulates genes coding for HMG-CoA synthase, HMG-CoA reductase, apo B-specific LDL-receptor, Cyclin D (initiator of cell replication), Bcl-2 (suppressor of apoptosis) and mitotic inhibitor P^{27} (refs 13, 14). Further, using human platelets as a cellular model (being a nucleated cell and unable to express apo B-specific LDL-receptor but able to express Receptor-C_k), we have shown that Receptor-C_k regulates cholesterogenesis in this cell type also[15]. Consequently the results reported here are in conformity with our earlier results in other cellular models such as human lymphocytes, HL-60 cells and human platelets[4,15,16]. We have recently shown that Receptor-C_k-dependent signaling regulates a 47 kDa factor having specific affinity for SRE sequence[17,18] leading to the regulation of apo B-specific LDL-receptor gene. Further, a lot of evidence has accumulated to suggest a direct correlation between cholesterogenesis, DNA replication and cell growth[19]. The results reported here also unambiguously show that a direct correlation exists between cholesterol synthesis and DNA synthesis (Figure 1). It is interesting to note that inhibitory effect of LDL upon cellular, cholesterol synthesis, DNA synthesis as well as transcriptional expression of apo B-specific LDL-receptor gene, is abolished when cells are pre-exposed to antibody specific to Receptor-C_k, thereby indicating that this LDL-dependent inhibitory effect is mediated through Receptor-C_k and not through its conventional apo B-specific LDL-receptor. This view is strengthened by various observations reported earlier which argue strongly against the apo B-specific LDL-receptor-dependent regulation of cellular cholesterogenesis pathway[20]. In conclusion, the data reported here provides strong evidence to support the view that LDL-dependent Receptor-C_k activation is responsible for the regulation of cholesterogenesis, DNA replication as well as cell growth.

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Chhota Shigri Glacier: Its kinematic effects over the valley environment, in the northwest Himalaya

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The relation of surface lowering, net balance and flow dynamics reflects that vertical component of ice flow is downward in and around the equilibrium line while it is upward in the lower part (ablation zone) of Chhota Shigri Glacier. The submergence velocity in accumulation area is higher than the rise of surface and emergence velocity is lower than that of negative net balance. The basal sliding velocity is responsible for the movement of the glacier. The over-extension of the glacier at average snout position is one of the factors in controlling the temperature variation of the main Chandra river valley.

THE Chhota Shigri Glacier valley is a 9 km long narrow valley with about 8.75 km^2 of accumulation area which

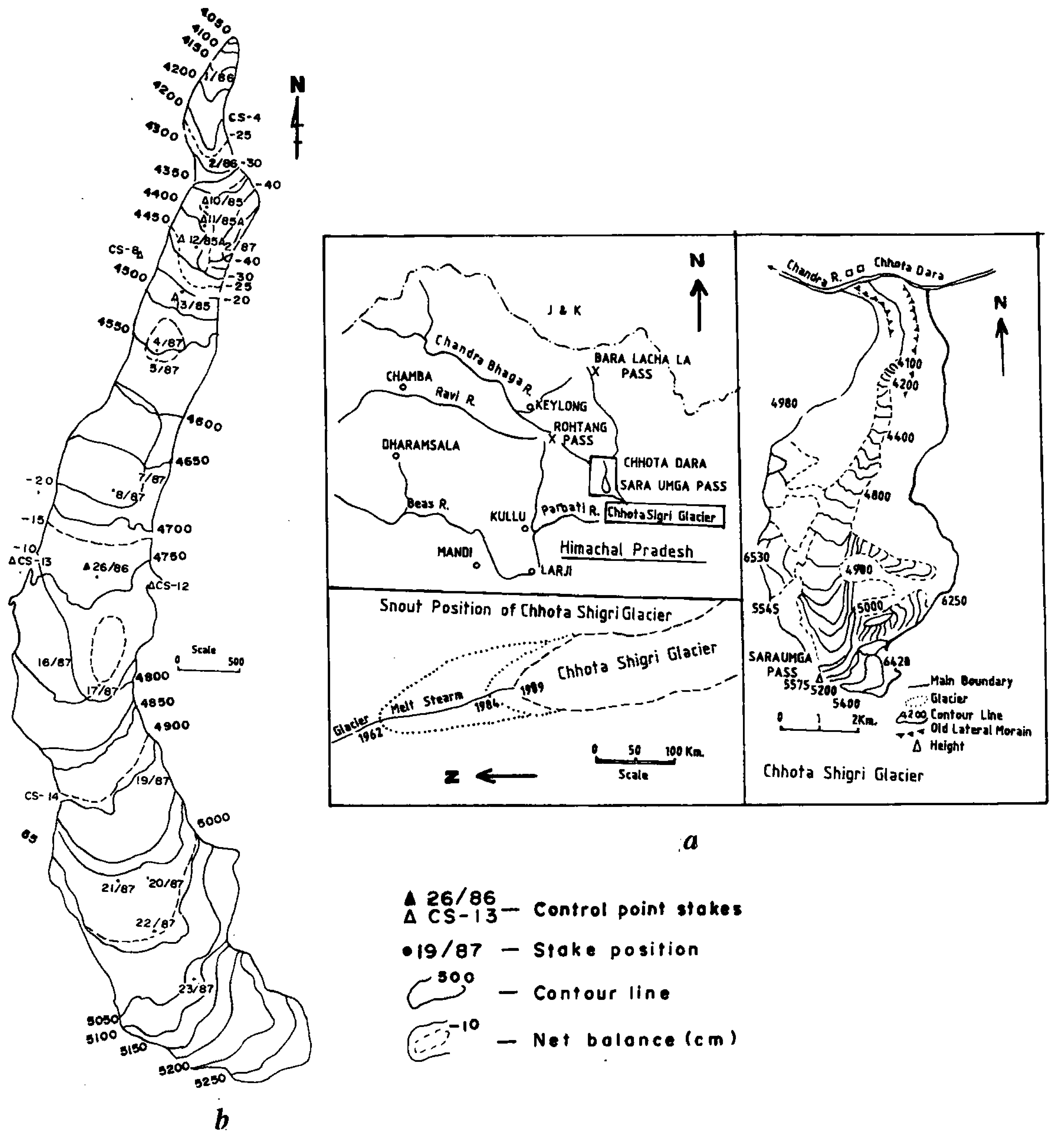

Figure 1. *a*, Geographical position of the Chhota Shigri Glacier and its snout fluctuation between 1962 and 1989; *b*, net balance during budget year September 1987 to September 1988 in cm of liquid water equivalent.

is mostly covered by thick snow and ice sheet (Figure 1 *a*). The glacier lies on the northern slopes of the main Pir Panjal range, 30 km east of Rohtang Pass. The highest peak over the range in the region reaches up to 6428 m. The total drainage area is about 45 km^2 and the glacier occupies about 22% of the total drainage area.

The study revealed a marked diurnal cycle, suggesting that the submergence velocity in accumulation area is higher than the rise of surface and emergence velocity is lower than that of negative net balance.

The Chhota Shigri Glacier valley is a very steep-walled valley. The altitude varies from 3500 m near snout to 6428 m at the top and the Sara Umga Pass at 6000 m (Figure 1 *a*) and the temperature varies between 15°C to –5°C at snout and 7°C to –15°C near the snow line. The annual 0°C temperature is at an altitude of 4000 m. The very cold condition at the accumulation zone creates an ideal condition for the development of this glacier. The opening up of creavasses on the glacier also create local temperature variations[1].

It is observed that in the main Chandra valley average wind speed ranges between 8 and 18 km/h whereas in the Chhota Shigri valley it ranges between 2 and 16 km/h. Near the snout the wind speed is reduced due

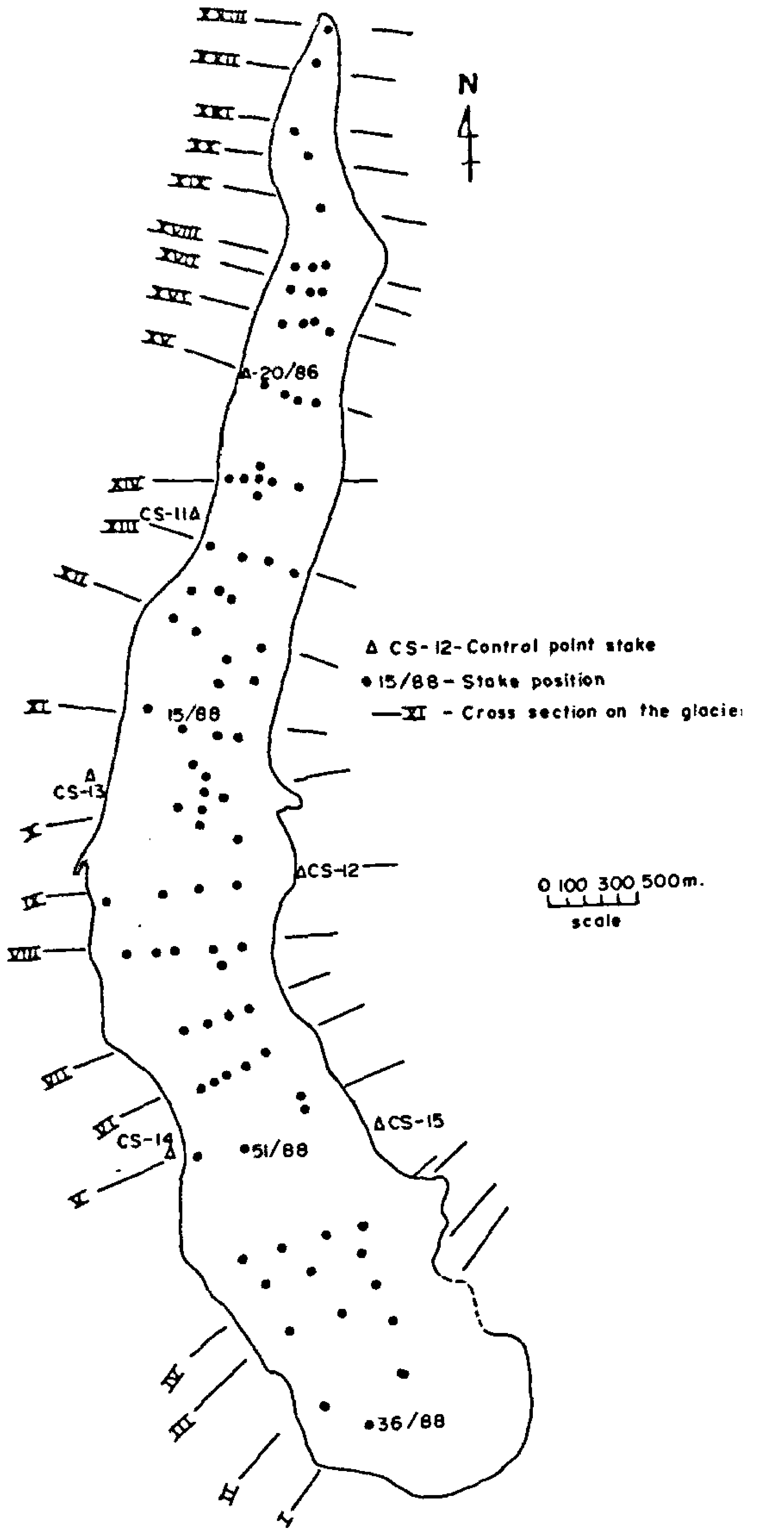

Figure 2. Chhota Shigri Glacier stable position and cross section on the glacier for velocity studies.

to the pressure from the main Chandra River Valley wind.

The surface melt and the lake formation over the glacier body have direct relation with microclimatic effects created by eddies and local stress differences caused by block movements in the ice flow controlled by the bed rock topography[2].

For the mass balance of the present Chhota Shigri Glacier, surface balance melt is suitable for determining the annual balance by direct measurements. Net balance

Table 1. Budget year September 1987 to September 1988

Station no.	Height change (cm)	Density (g/cm^3)	Net balance (in cm of liquid water equivalent)
23/87 (38/88)	+34	0.57	+19.3
22/87 (41/88)	+26	0.57	+14.8
21/87 (48/88)	+19	0.57	+10.8
20/87 (47/88)	+20	0.67	+13.4
19/87	+11	0.71	+7.8
18/87	0	0.70	0.0
17/87	–20	0.75	–15.0
16/87	–8	0.80	–6.0
A-26/86	–15	0.80	–12.0
8/87	–30	0.81	–24.0
7/87	–25	0.80	–20.0
6/87	–16	0.80	–13.0
4/87	–20	0.80	–16.0
2/87	–50	0.85	–40.0
A-13/85/1	–15	0.90	–14.0
A-12/85/1	–32	0.90	–29.0
A-11/87/1	–25	0.90	–23.0
A-11/85	–40	0.90	–36.0
2/86	–29	0.90	–25.0
1/86	–23	0.90	–23.0

Table 2. Densities in pits dug on 28–29 August 1988

Pit station	Density (g/cm^3)
23/87 (38/88)	0.569
21/87 (48/88)	0.671
7/87 (64/88)	0.801

has been calculated between 1987 and 1988 (month of reaching September) (Table 1) along 20 stake positions (Figure 2) common to both the years[3]. The densities are taken at different levels in pits between these stakes (Table 2) to calculate the net balance in cm of liquid water equivalent at each stake (Figure 2)[4]. Negative mass balance of $-157934\ m^3\ a^{-1}$ has been estimated (Table 3)[5]. Mundepi *et al.*[6] on the basis of variation ratio $\delta h/\delta t$ have calculated that middle and lower portion of the glacier begin to thin while upper portion thickened. The middle zone between the cross section XII and XIII (Figure 2) shows maximum thinning due to abrupt change in slope.

Since 1985 a continuous decrease in mean surface velocity till 1989 from $73.16\ m\ a^{-1}$ to $32.60\ m\ a^{-1}$ is observed (Table 4), except from 1986–1987 to 1987–1988 for a brief advance from $26.44\ m\ a^{-1}$ to $32.60\ m\ a^{-1}$ and was followed by a retreat.

Mean surface velocity pattern along X and XX cross section (Figure 2) for 1987 and 1988 has been calculated respectively (Table 5). It was observed that velocity is maximum in the middle of ablation zone (from No. V to VII cross sections), varies from 49.80 to 52.79 and at the equilibrium line (cross section No. 13 and 14)

Table 3. Budget year September 1987 to September 1988 net balance by 50 m elevation bands as obtained from Map 1b by planimetery

m	Area (10^2 m^2)	Net balance (cm)	Vol. equivalent in m^3
5300	1290	+19	+24510
5250	1956	+19	+37164
5200	3537	+19	+67203
5150	1498	+19	+28462
5100	3240	+19	+60876
5050	4994	+19	+94886
5000	6159	+13	+80067
4950	6076	+8	+48608
4900	2996	0	0
4850	4952	0	0
4800	8198	−10	−81980
4750	4827	−12	−57924
4700	5035	−22	−110770
4650	2872	−20	−57440
4600	3329	−13	−43277
4550	1998	−16	−31968
4500	2663	−14	−37282
4450	1956	−30	−58680
4400	1165	−30	−34950
4350	624	−28	−17472
4300	916	−25	−22900
4250	999	−24	−23976
4200	499	−23	−11477
4150	293	−23	−6739
4100	42	−23	−966
4050	83	−23	−1909
4000			
Total glacier	72161	−2.2	−157934

Table 4. Mean surface velocity from 1985 to 1988

Year	Mean surface velocity (ma^{-1})
1985–1986	73.16
1986–1987	26.44
1987–1988	32.60

it varies from 42.34 to 49.15 m a^{-1} whereas at the accumulation zone, the mean surface velocity is 34.11 m a^{-1} and at snout, 27.52 m a^{-1}. The velocity variations have also been effected by the valley widening (Table 6) (Figure 2) and shearing of margin from the valley wall in the same way as that of surging at the bend at cross section 9 and 10 (Figure 2).

Surface velocity pattern at the central flow line for short period August–September 1988 and long period 1987–1988 has been shown by direction and amount in Figure 3 along the longitudinal axis. All the vectors are diverging towards its central flow line. Surface velocity is decreasing between height 4750 and 4800 m where the glacier is thickest and the valley is also widened (Figure 1 *b*). The flow patterns of short period (Figure 3 *a*) and long period (Figure 3 *b*) do not vary much.

Table 5. Mean surface velocity through the cross sections over the Chhota Shigri Glacier

Cross section no. (on Figure 2)	Mean surface velocity (ma^{-1}) August–September 1988 (Short term)	1987–1988 (Long term)
I	27.52	24.15
II	30.27	22.34
III	31.97	25.14
IV	31.70	29.98
V	49.80	40.30
VI	51.41	40.49
VII	52.79	32.84
VIII	44.03	41.12
IX	41.92	40.68
X	44.03	37.42
XI	31.68	–
XII	38.22	–
XIII	42.34	–
XIV	49.34	–
XV	37.98	–
XVI	31.19	–
XVII	29.04	–
XVIII	25.86	–
XIX	19.28	–
XX	34.11	–

Table 6. Maximum and minimum horizontal surface velocity, vertical component and mass flux during 1987–1988 and 1988

Description height	Aug.–Sept. 1988 ma^{-1}	Height above MSL (m)	1987–1988 ma^{-1}	above MSL (m)
Maximum surface velocity	60.24	4617	42.43	4721
Minimum surface velocity (ablation)	28.20	4361	25.70	4387
Minimum surface velocity	30.47	4981	32.84	4746
Near accumulation				
Maximum vertical component of velocity	11.70	4982	2.26	4781
Minimum vertical component of velocity	0.50	4695	0.10	4468
Maximum mass flux	+20.20	4387	+0.16	4543
Minimum mass flux	−04.20	4982	−0.32	4360

From Tables 5 and 6 it is clear that the glacier near the velocity measurement cross sections X to V, i.e. near the equilibrium line and XIII to XVI, i.e. near snout gets raised by 2.26 m a^{-1} but remains lower than the negative net balance. Such fluctuations near the snout indicate that the year when maximum vertical velocity component is more, i.e. if the emergence velocity is more near the snout, the main Chandra valley temperature will be less and there will be a lower discharge

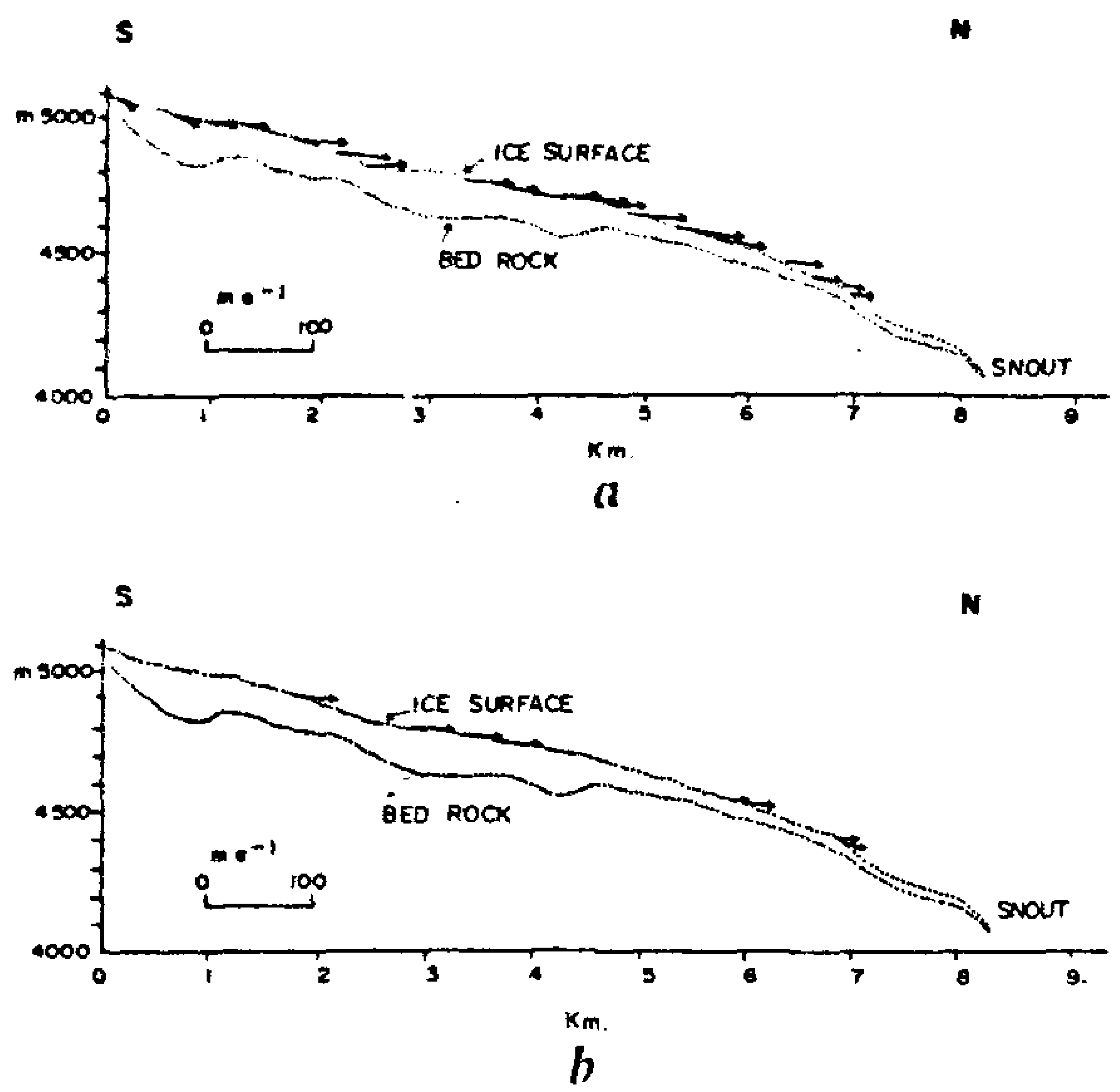

Figure 3. ***a***, Surface flow velocity in longitudinal vertical planes. Profiles of surface and bedrock topography are with vertical exaggeration. Velocity vectors in ma^{-1} are plotted at 10 times the space scale in m (i.e. 10 ma^{-1} would represent as a 100 m arrow). Stable stakes were observed between 8 August 1988 and 5 September 1988. ***b***, Surface flow velocity in longitudinal vertical planes. Profiles of surface and bedrock topography are with vertical exaggeration. Velocity vectors in ma^{-1} are plotted at 10 times the space scale in m (i.e. 10 ma^{-1} would represent as a 100 m arrow). Stable stakes were observed between 14 August 1987 and 18 August 1988.

in the Chhota Shigri stream. This shows that the vertical rise due to vertical velocity in the glacier near the snout has got direct effect on the valley temperature as the Chandra valley temperatures are more than the Chhota Shigri valley. Hence to maintain the latent temperature effect on the valley temperature, the extra glacier rise melt near the snout compensates the lower temperatures that year. This lower temperature has got direct effect on the meteorological variations which control the seasons either in lengthening of rainy season or earlier snow in the upper reaches.

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