Is the Siachen glacier melting?

The correspondence by Upadhyay[1] is yet another addition to the hype that the Himalayan glaciers are melting and cause serious damage to the Himalayan eco-system. The entire interpretation[1] is based on evidences that have been collected from places that are several kilometres away from the present-day snout of the glacier.

The field evidences to emphasize the abnormal retreat of the Siachen glacier[1] are not scientifically convincing. The evidences put forth do not appear to be related directly to the trunk glacier, i.e. Siachen, as several tributary glaciers that have now retreated to their cirques, once debouched into the valley and the glacial deposits could be of these tributary glaciers rather than the trunk glacier (Figure 1). The sedimentological and geomorphological correlation of glacial deposits laid down by Siachen is required before arriving at any conclusion.

The field excursion to Siachen glacier was carried out by us in the summer of 2008, to record changes in the snout of the glacier. To our surprise, the Siachen glacier valley does not preserve evidences of glaciation older than mid-Holocene, suggesting that the glacier must have advanced and retreated simultaneously (glacier fluctuation) several times (before mid-Holocene) in the geological past, resulting in the complete obliteration and modification of the older evidences. The entire valley of the Siachen glacier is filled up with outwash terrace deposits (Figure 2) that are geologically very young (could be mid-to-late Holocene).

About 300–500 m south of the snout of the Siachen glacier, there are evidences of glaciation in the form of remnants of lateral moraine (Figure 3) and valley-wall striations. The striations on the valley wall and height of the moraine deposit suggest that the Siachen glacier could have been 15–20 m higher in the mid-Holocene than it is today and not 600 m as estimated by Upadhyay[1]. The lateral moraine remnant is OSL-dated to mid-Holocene.

Overwhelming field geomorphological evidences suggest poor response of the Siachen glacier to global warming. The snout of the Siachen glacier of 2008 has retreated by about 8–10 m since 1995 (Figure 4), making an average retreat of 0.6 m/yr.

The east (left) part of the Siachen glacier shows faster withdrawal of the snout that is essentially due to ice-calving. This phenomenon holds true for almost all major glaciers (e.g. Gangotri, Durung Drung, etc.) in the Himalayas and occurs irrespective of global warming. The west (right) part of the Siachen glacier has reduced due to the action of melt water released from the retreated tributary glacier. The Siachen glacier shows hardly any retreat in its middle part and thus defies the hype.

The Siachen glacier valley is geomorphologically young. The lateral extent of the snout of the glacier has fluctuated within a few kilometres from the present position of the snout. However, signatures of very young fluctuations during the Holocene, as recorded from elsewhere[2], are well preserved in close vicinity to the present-day snout of the Siachen glacier and not 70–80 km down the valley, as deduced on geomorphological evidences[1].

The statement that '. . . once in Holocene period entire Nubra valley. . . was filled with 600 m thick ice cover. . . .'[1], is not backed by substantial field evi-

Figure 1. Tributary glaciers that once reached the main valley of Nubra. a, Tributary glaciers withdrawn to cirques and b, Moraine deposits of tributary glaciers along the main valley walls.

Figure 2. Glacier valley in front of the Siachen glacier snout (east part) that is filled up with young outwash gravels subsequently modified to terraces.

Figure 3. Geological evidences of lateral moraine (partially eroded) on the south rock wall of the Siachen glacier valley.

Figure 4. The OP Baba shrine constructed in AD 1995 (according to the record on the foundation stone of the shrine) could only have been possible when the area was vacated by glacier.

dences. There are sufficient field and meteorological evidences from the other side of the Karakoram mountains that corroborate the fact that glaciers in this part of the world are not affected by global warming[3–7]. The field studies from other glaciers in India also corroborate the fact that inter- and intra-annual variations in weather parameters have more impact on the change in glaciers of NW Himalayas[8], rather than any impact due to global warming.

1. Upadhyay, R., *Curr. Sci.*, 2009, **96**, 646–648.
2. Mayewski, P. A. *et al*., *Quat. Res.*, 2004, **62**, 243–255.
3. Archer, D. R. and Fowler, H. J., *Hydrol. Earth Syst. Sci.*, 2004, **8**, 47–61.
4. Batura Glacier Investigation Group, Investigation Report on the Batura Glacier in the Karakoram Mountains, The Islamic Republic of Pakistan (1974–1975), Beijing, 1976.
5. Batura Glacier Investigation Group. *Sci. Sin.*, 1979, **22**, 959–974.
6. Fowler, H. J. and Archer, D. J., *Regional Hydrological Impacts of Climatic Change – Impact Assessment and Decision Making* (eds Wagener, T. *et al.*), IAHS Publications, 2005.
7. Fowler, H. J. and Archer, D. R., *J. Climate*, 2006, **19**, 4276–4293.
8. Koul, M. N. and Ganjoo, R. K., *Climatic Change* (in press).

Received 28 March 2009; revised accepted 25 June 2009

R. K. GANJOO*
M. N. KOUL

Regional Centre for Field Operations and Research on Himalayan Glaciology,
Department of Geology,
University of Jammu,
Jammu 180 006, India
**For correspondence.*
e-mail: ganjoork@rediffmail.com