

VARIATION OF MELT WATER DISCHARGE OF CHHOTA SHIGRI, CHANDRA BASIN, HIMACHAL PRADESH

Parmanand Sharma

Alagappan Ramanathan

Pottakkal George Jose and Anurag Linda

School of Environmental Sciences,

Jawaharlal Nehru University,

New Delhi-110067

Email : alr0400@mail.jnu.ac.in

ABSTRACT

A study has been carried out from 2003 to 2008 to understand the discharge variations during peak ablation seasons (July-August) and is continuing this year for the whole ablation season (May-October) in the Chhota Shigri glacier. Discharge measurements have been carried out at hydrological station (discharge site, 3800m amsl) i.e. 2 km downstream from snout (terminal of glacier, 4100m amsl). Maximum discharge was observed in 2009 with average $3.92 \text{ m}^3/\text{s}$ and minimum discharge $0.88 \text{ m}^3/\text{s}$ in 2005 may be due to difference in ablation rate in the glacier surface. Mean of the diurnal peak discharges of Chhota Shigri glacier melt water were $1.32 \text{ m}^3/\text{s}$, $2.11 \text{ m}^3/\text{s}$, $1.06 \text{ m}^3/\text{s}$, $1.26 \text{ m}^3/\text{s}$, $1.19 \text{ m}^3/\text{s}$, $1.31 \text{ m}^3/\text{s}$ and $3.94 \text{ m}^3/\text{s}$ in the respective years of 2003, 2004, 2005, 2006, 2007, 2008 and 2009 while the overall mean discharge were $1.12 \text{ m}^3/\text{s}$, $1.72 \text{ m}^3/\text{s}$, $0.88 \text{ m}^3/\text{s}$, $1.05 \text{ m}^3/\text{s}$, $1.05 \text{ m}^3/\text{s}$, $1.12 \text{ m}^3/\text{s}$ and $3.92 \text{ m}^3/\text{s}$ in the corresponding years. Chhota Shigri glacier reveals a highly negative mass balance over the study period with net annual balances of -1.4 m w.eq. , -1.2 m w.eq. , $+0.1 \text{ m w.eq.}$, -1.4 m w.eq. , -1.3 m w.eq. and -0.93 m w.eq. during 2002-2008. Total mass balance (volumetric) of Chhota Shigri glacier from 2003 to 2008 are -2.2 , -1.9 , $+0.2$, -2.2 , -2.0 and -1.73 million cubic meter water equivalent respectively. The rate of change in ice volume is $-0.01 \text{ km}^3 \text{ year}^{-1}$ and there is a 28% loss in ice volume in these period. The discharge was minimum during 2005 when the Chhota Shigri glacier showed a positive mass balance of $+0.1 \text{ m w.eq.}$ In 2009 and 2004, ablation on glacier surface was high giving rise to increase in discharge. In 2005 discharge was lowest during studied period due to heavy snow fall that increased albedo which in turn

resulted in reduced ablation. The melt water contribution of Chhota Shigri glacier to Chandra river was between $91,843 \text{ m}^3\text{d}^{-1}$ to $1,82,650 \text{ m}^3\text{d}^{-1}$ during the studied period. Discharge observed in the present study was very low compared to previous studies i. e $10 \text{ m}^3/\text{s}$ (1988) during July-August. It indicates that this glacier contribution of fresh water has decreased from about 0.33 % to 0.2 % since 1988 to 2008.