The Dynamics of Himalayan Glaciers in India

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Responding to the challenge posed by the specter of global warming, the Government of India has drawn up a comprehensive National Action Plan on Climate Change. Study of the Dynamics of the Himalayan Glaciers is an important component of this national effort. Lying at the heart of glacier dynamics, the mass budget provides a direct and undelayed measure of the response of glaciers to climatic pulses. The other dimensions e.g. length, also change but in a delayed mode.

Pioneered by the Geological Survey of India during the IHD and further promoted by the Department of Science and Technology through a multi-institutional and multi-disciplinary national programme, the various facets of the Indian Himalayan glaciers have been studied for over three decades. Due to the harshness of terrain and extreme logistic difficulties, the data sample is limited in spatial and temporal coverage. The glacier snout monitoring data collected on some 100 glaciers over different time periods shows consistent but varying rates of retreat since the fifties. The rate of retreat touched 25-30m/ annum for some glaciers during mid-seventies to mid-eighties. According to some scientists, the rate of retreat has slowed down in the nineties. But there is no consensus. The annual mass balance data has been collected on some 12 glaciers using the conventional *in situ* stake and pit method. The length of time series varies from 10 to 2 years. Remote sensing- based mass balance studies cover about 1000 Square Km. Starting with near-zero or slightly positive specific mass balance in the mid seventies, the mass balance values fluctuate around -0.45 m/a w.e. up to the mid nineties. After that, around the late nineties, the mass balance shows a shift towards more negative values, ~0.75 m/a w.e. The surface temperature data indicates accelerated warming, ~0.22°C/decade since the seventies. There are indications of change in the precipitation pattern, with a reduction in the proportion of snow fall in the winters. Due to limitations of the data, the results are not conclusive. However, they are consistent with the regional and global trends. Efforts are now afoot to mount a more comprehensive and technology intensive programme of glacier research and field observations to obtain a better understanding of the health of the Himalayan glacier system.