IUCCCC
Inter-University Consortium on Cryosphere and Climate Change

Highlights of Some Significant Research Contribution

Modelling Climate Change Scenario over the Kashmir Himalayas

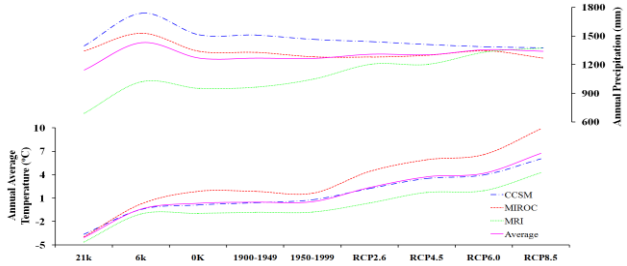


Figure showing the past climate (21k B.P) and the future climate (2100) over the Kashmir Himalayas

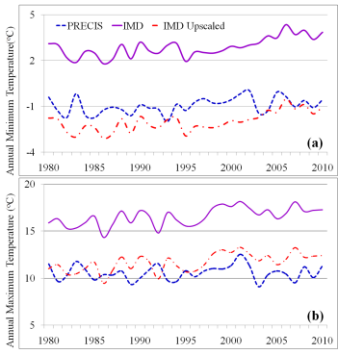


Figure showing validation of the simulated climate data over the Kashmir Himalayas

It has been found, as evident from the results of the multi-model experiments shown above (21K years B.P), that the Kashmir Himalayas have become warmer since 1950. It appears this trend could continue till the end of this cenury. However, the precipitation does not show any significant changes over the said area. The model simulations are corroborated by the observed climate data since 1980.

Contribution of snow, glacier and rainfall to theStream flow in the Kashmir Himalayas.

Snow melt	Glacier melt	Rainfall
51.93%	3.14%	44.92%

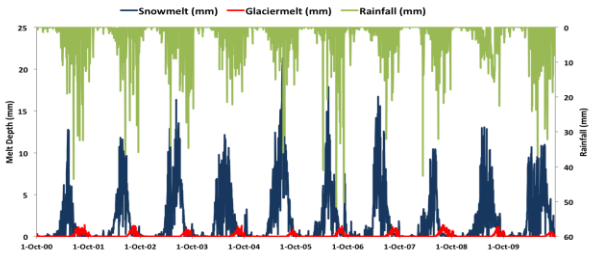


Fig showing the streamflow partitioning of Jhelum basin

The contribution of snow-melt, glacier-melt and rains have been computed in the Jhelum basin using TAC-D model supplmented by the isotope analysis. As shown above, the snow and ice contribute, on an average, almost 55% to the stream flows. The rainfall contributes 45% to the stream flows in Jhelum.

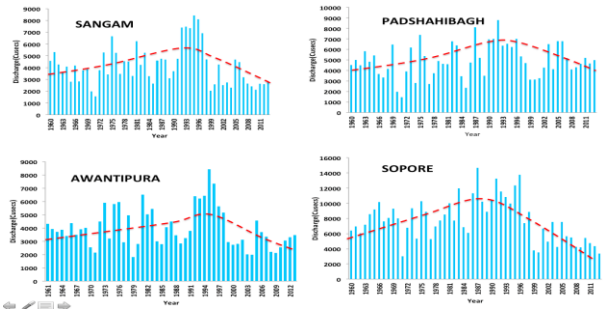


Fig. showing the impacts of depleting Himalayan cryosphere on streamflows

The climate change impacts on the Himalayan cryosphere are quite clear and evident. As shown above, the loss of glacier mass during the last 5-6 decades have resulted in significant decline in the streamflows especially since 1990s.

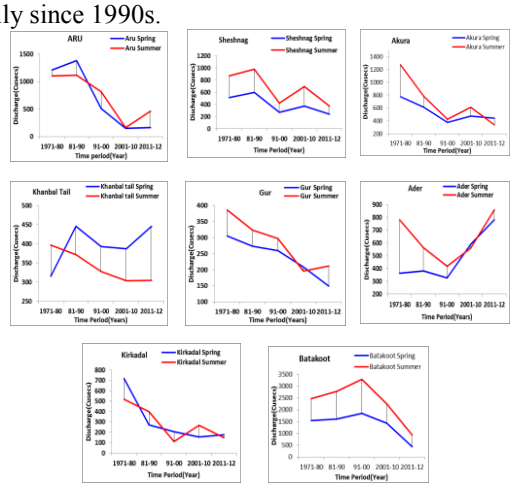


Figure showing the shifting of streamflow peak discharge (from summer to spring) in Jhelum basin

An analysis of the streamflow data in the Jhelum basin shows that there is a shifting trend in the peak discharge due to increasing temperatures observed especially during winter and spring months. As shown in the above figure, this shifting trend of peak discharge from summer to spring could have significant impacts on the agriculture production downstreams.

Glacier Studies in Uttarakhand

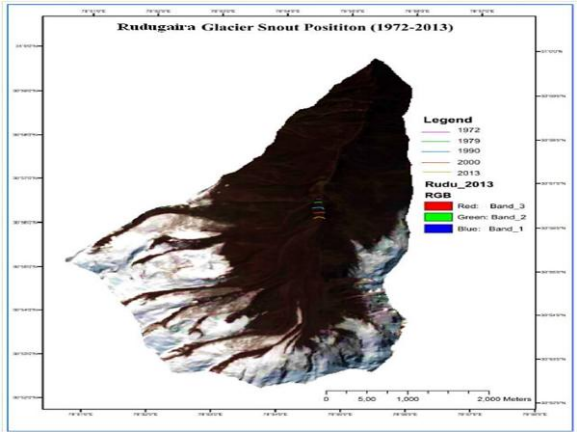


Fig. Glacial Movement of Rudugaira from 1972-2013.

The glacier is showing total retreat of 381 meters in last 39 years (1972-2013). The trend of glacier retreat is showing different magnitude, highest during the 1990-2000 and lower during the 1972-79 period

Duration	Years	Retreat in Meters	Annual Retreat (Year)	Cumulative Retreat Rate
1972 -79	7	56	8	8
1979 -90	11	105	9.55	8.78
1990 -2000	10	114	11.4	9.65
2000 -2013	13	106	8.15	9.28
Total	39	381	9.77	9.37

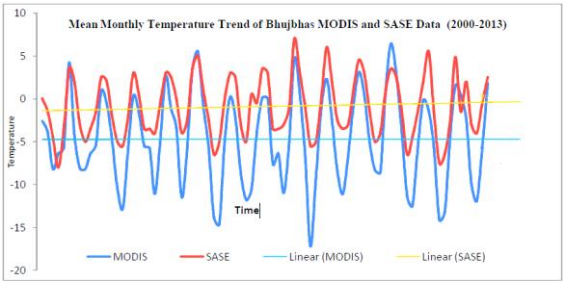


Figure: Temperature data analayis o*f* Bhujbas, using observed and MODIS data.
The data does not show any significant trend in the rising temperature.

Glacier Studies in Himachal Pradesh

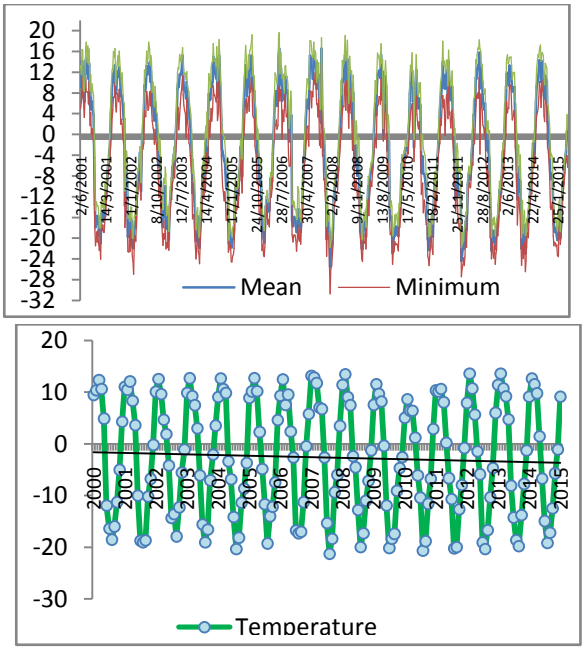


Fig. showing the daily and Mean monthly temperature trend of Miyar Glacier snout analyzed using MODIS during June 2000-2015. There is perceptible downward trend during the past one decade.

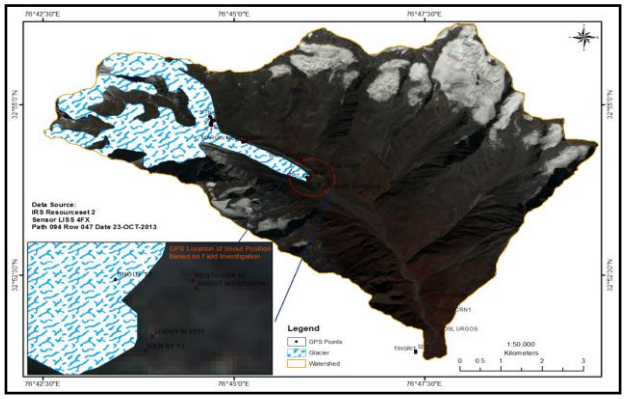
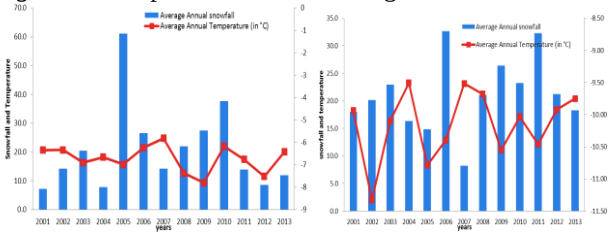


Figure: Snout position of Menthosa glacier.



(a) Menthosa (b) Gangstang

Figure: Comparative graph shows significant relationship between average annual temperature and average annual snowfall of Menthosa (a) and Gangstang (b) glaciers. The years, which recorded the temperature rise, show inverse relationship with snowfall.