

## Characterisation and association of topographic controls with the sub regimes in the climate of Uttarakhand Himalayas

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The state of Uttarakhand is divided into two glaciohydrological zones on the basis of divisions created by precipitation conditions under Indian Summer Monsoon (ISM) and temperature conditions during its peak period i.e. ISM deficit zone and ISM dominant zone. These zones branch the geographical region of Uttarakhand Himalayas over an area of about 54,000 sq. km with the different climate forcings at play. A topographical control is identified as an orogenic structure acting as the geographical divide between the two zones. In addition, an 'odd' high temperature-high elevation belt is identified with an average temperature much higher than the low elevation regions. It has a considerable subset of peak temperature values conspicuously higher than the peak values belonging to the lower plains. Samples of positive lapse rates and sections of very high negative lapse rates are identified over one of the glaciohydrological zones - ISM deficit zone. Further, this zone does not show a biased recession rate towards south-facing glaciers, has majority of coldest points, shows similar temperature at much higher elevation values (than ISM dominant region), has a higher average temperature in discrete elevation bands, is affected most by Tibetan heat, and yet has a higher glacier count compared to the ISM dominant region. Average glacial responses in ISM dominant and ISM deficit zone for the period 1994 - 2016/2017 have distinct regimes, as such the extreme areal change values in latter are relatively much higher.