

Inter-annual variability of snow water Equivalent (SWE) over Western Himalayas

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Abstract: Considering the importance of snow and glaciers in the Himalayas for understanding the water cycle and for water resource management of the rivers originating from the Himalayan, interannual variability of snow accumulation process over Himalayas and surrounding region has been studied using snow water equivalent (SWE) data. Remote sensing data from National Snow and Ice Data Centre have been used. These data have been compared against ground (in situ) observations of SWE measured at several gauge stations in the Indian part of the Satluj River basin. Accumulated SWE from remote sensing data and ground observations in the Satluj River basin have good and significant correlation. These data have also been compared against the Climate Forecast System Reanalysis and the European Centre for Medium Range Weather Forecast reanalysis-Interim (ERA-I). Upper air and surface data from the reanalyses have also been used to examine the atmospheric conditions when snowfall occurs and snow accumulates for the season. In this study, it is found that there is large interannual variation in SWE over western Himalayas and Satluj River basin (domain of interest). During excess years of snowfall, strong westerly winds are observed at 500 hPa over India. In wind anomaly, a cyclonic circulation is seen over northern parts of India with a deep trough along Pakistan, Rajasthan and Gujarat region. As a consequence of this trough, a moisture convergence zone is established in the region leading to more amount of snowfall. At the same time, during excess snow accumulation years, the air temperature from the surface to 500 hPa is colder than other years enabling the fallen snow to accumulate through the season.