SNOW MELT RUNOFF AND CLIMATE CHANGE STUDIES IN MANALI SUB-BASIN OF BEAS RIVER, INDIA

Praveen K. Thakur*
Yulia Radchenko
Faculty at Indian Institute of Remote Sensing (IIRS) - Dehradun
*Email : praveen@iirs.gov.in

S. P. Aggarwal
Student at Centre for Space Science and Technology Education in Asia And PacificCSSTEAP) Dehradun

ABSTRACT

Snow melt runoff remains the largest source of fresh water for the majority of rivers originating from the Himalayas, which have their upper catchments in the snow covered areas. The solid precipitation results in temporary storage and the melt water reach the river in the melt season. The snow accumulation in Himalayas is generally from November to March while snowmelt is from April to June. There are 22 major river systems in the Himalayas, the rivers originate from the snow and glacier covered areas. These basins cover about 106 km2 mountainous catchment's area and have significant contribution from snow and ice melt runoff. The study area of this work is Manali watershed, which situated in Himachal Pradesh within geographical co-ordinates 32°13'06" to 32°24'51" North latitude and 77°01'35" to 77°17'01" East longitude. The total area of the study area is about 350 km^2. The altitude ranges from 1800 m to 5932 m above sea level. Snowmelt runoff was estimated from WINSRM model was used (Martinec 1975). This model is designed to simulate and forecast daily stream flow in mountain basins where snowmelt is a major runoff factor and also generate climate change scenarios. For simulation of snowmelt the study area was divided into 10 elevation zones. Maximum area is 21.74 % and belong to range 4000-4500 m. Minimum of study area is lied in range 5250-5870 m (0.56 %). Snowmelt simulation for period 2004-2008 was done successfully. Also during this period, snow cover area was estimated in Manali sub-basin. Accumulation of snow takes place during period from October to March and then with increasing of temperature begin the snowmelt. The ratio of snow cover area to the total area is vary from 0.01 (August, 2004) to the 0.97 (March, 2007). the coefficient of determination for snowmelt season of 2004 is 0.97 and for snowmelt season of 2005 is 0.93. The coefficient of determination for full 2004 year is 0.75 and for

full 2005 year is 0.76. Relative error for full 2004 year is 1 %, for snowmelt season is 32 %. Climate change scenarios were generated for +1, +2 and +4 deg. C increase in temperature and modified snow depletion curve were generated. Using this the snowmelt scenario for climate change with increased temperature was done successfully.