Altitudinal variability of monsoon precipitation over Mountainous Region

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Abstract

The study conducted some investigations to know the relationship between topographic effects on rainfall distribution with regards to the topographic elevation over Mountainous region. Comparison of relationship between topographic effects on rainfall distribution with relation to the topographic elevation using ground based data of one hundred and ninety one rain gauge stations within domain of latitude 27.30' to 29.40' and longitude 80.00' to 84.00' of period June - August (1998- 2000) and Tropical Rainfall Measuring Mission/ Precipitation Radar (TRMM/ PR) within domain latitude 26.00' to 32.00' and longitude 75.00' to 80. 00' of the same duration are characterized relatively well. Digital elevation map (DEM) with spatial resolution 30 sec (Gtopo30) is used for spatial topographic study. Much attention was focused on "effective height for precipitation" i.e. topographic height where amount of rainfall is high. It was found through investigation that the rainfall decreases beyond 1800m using ground based data and rainfall decreases beyond 2100m using TRMM data.

Keyword: precipitation, elevation, monsoon,

1. Introduction

Spatial and temporal variation of precipitation distribution is important to know to study the detail climatic study. It's very important to know the variation of precipitation with relation to elevation in the mountainous country like Nepal to know the potential of water resources and rational utilization of water resources.

The fluctuation of rainfall distribution depends on various factors concerning atmospheric condition or topographic features, i. e. moisture source, wind speed, wind direction, topographic elevation, slope orientation, barrier characteristics, scale of mountains and other factors. Investigations have been conducted on the relation between such factors and precipitation distribution (e. g. Suzuki, 2004; Kuraji, 2001)

The study focused on the relation between topographic height and rainfall amount over Himalayan region.

2. Data Description

The research is conducted using ground-based data observed by rain gauge and using satellite data observed by Tropical Rainfall Measuring Mission (TRMM). The used ground based data is within domain of latitude 27.30' to 29.40' and longitude 80.00' to 84.00' of period June - August (1998- 2000) and satellite data is within domain latitude 26.00' to 32.00' and longitude 75.00' to 80. 00' of the same period. Both ground based data and TRMM data is averaged for one-degree X one-degree grid. The study is done for 500m to 3000m elevation height with averaging precipitation for each 100 m.

3. Results, Discussion and Conclusions

The figure 1 shows the relation between topographic height and precipitation distribution using ground-based data. The figure declears that precipitation increases gradually with increase of elevation height up to 1800m then gradually decreases with increases of elevation height.

The figure 2 shows the relation between topographic height and precipitation distribution using TRMM data. The figure declares that precipitation decreases with increase of elevation height beyond 2100m but increase of precipitation with increase of elevation height isn't clear

Though TRMM PR has sampling error due to swath width of 216m and data period is only for 3 years it shows almost same pattern in relation with topographic elevation.

A convective phenomena generated by topography appear in windward side. So further study will be done for altitudinal variation of precipitation in windward and leeward sides of mountain separately.

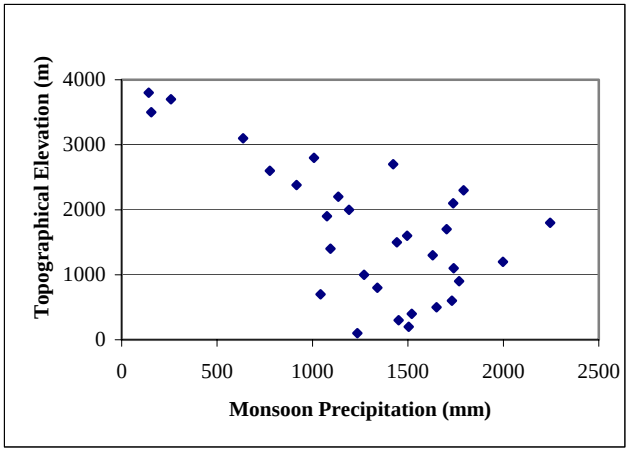

Fig. 1: altitudinal variation of precipitation using ground based data using rain gauges over latitude 27.30' to 29.40' and longitude 80.00' to 84.00' of period June - August (1998- 2000)

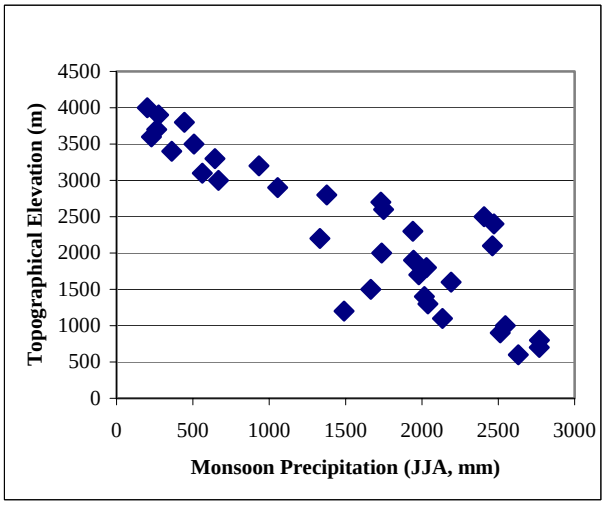

Fig. 2: altitudinal variation of precipitation using space data using TRMM data over latitude 26.00' to 32.00' and longitude 75.00' to 80. 00' of period June - August (1998- 2000)

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