

Variations in Seasonal Rainfall Under Changing Climatic Scenarios at Pantnagar Situated at Tarai Region of Uttarakhand

Ravi Kiran

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Abstract

The present investigation was carried out on the long term rainfall data from 1981 to 2015 recorded at NEBCRC, GBPUA & T, Pantnagar, situated in Udham Singh Nagar district. The data pertaining to annual rainfall shows an increasing trend of rainfall over the period only during rainy season however the number of rainy days shows a declining trend for this season. During post monsoon season and summer season a decreasing trend in rainfall anomaly was found at their rate of 0.11/year and 0.26 mm per year respectively. During all the season a decreasing trend in rainy day anomaly was found. August received average annual rainfall highest and November the minimum. Average number of rainy days found highest in July and minimum in November

Keywords: Rainfall, rainy day, anomaly, trend analysis, seasons, variability, Pantnagar, climate change.

Introduction

Trend analysis indicate whether the climate parameters like rainfall, temperature etc. are increasing or decreasing temporally. It is a key for predicting the rainfall and rainy days. Several studies of changing pattern of rainfall over India shows no clear trend of increase or decrease in average rainfall. (Mooley and Parthasarathy, 1984; Thapliyal and Kulshrestha, 1991; Lal, 2001; Kumar et al., 2010). Rainfall is one of the key components of all weather variables which influence the agricultural productivity. Agriculture in India is largely depends on rain as around 60% of the net sown area is rain fed (Venkateswarlu and Ramarao, 2010). Climate variability particularly the rainfall variability is the major factor for wide variation in production. In Indian conditions the south-west monsoon provides around 70% of the total rainfall. this shows considerable large inter annual variability which results into drought situations

Author's Affiliation: Associate Professor, Department of Agrometeorology, College of Agriculture, GBPUA & T, Pantnagar, Uttarakhand 263145, India.

Corresponding Author: Ravi Kiran, Department of Agrometeorology, College of Agriculture, GBPUA & T, Pantnagar, Uttarakhand 263145, India.

E-mail: ravikiransaxena@rediffmail.com

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in the country. In India, rainfall distribution is highly erratic temporally and spatially. Rainfall is received during south-west monsoon (about 74%), north-east monsoon (about 3%), pre monsoon (about 13%) and post monsoon (about 10%) with an average annual rainfall as 119 cm over India. High coefficient of variability over any region is found to be associated with drought like situations. The past decades have shown increased extremes in rainfall over north-west India. To optimize use of available

rainfall effectively, crop planning and management practices must follow the strategy based on amount and distribution of rainfall at a place.

Materials and Methods

The present analysis was made using the rainfall data from 1981 to 2015 recorded at NEBCRC, GBPUA & T, Pantnagar is situated in Udham Singh Nagar district (29° N Latitude 79.3 Longitude and 243.8 m MSL). This area lies in *tarai* belt located in the foothills of Himalaya with annual rainfall of about 1400 mm. the daily meteorological data was collected from the Agrometeorological Observatory situated at Normen E. Borlague Crop Research Centre at Pantnagar and verified for errors. Further the data were processed at decadal and annual

scales and various statistical analyses were made to draw any final conclusion. The magnitude of the trends of rainfall and number of number of rainydays were derived and slope of regression line using the least square method.

Results and Discussion

The seasonal trend of rainfall during different seasons are presented in Fig 1. winter season (Dec-Feb) shows a slight increasing trend however the 5 years moving average show a decreasing trend. For summer season there is a sharp increase in rainfall amount over the years. During post monsoon season slight decline has been observed. During winter season again a slight decline has been observed.

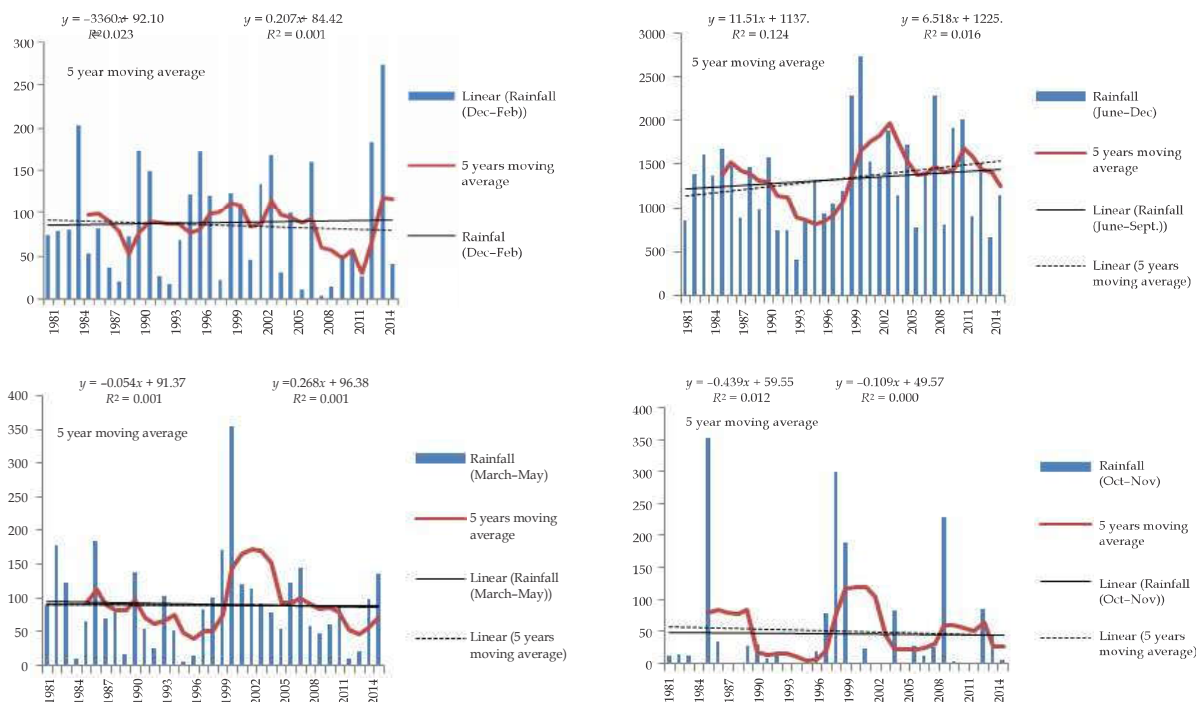
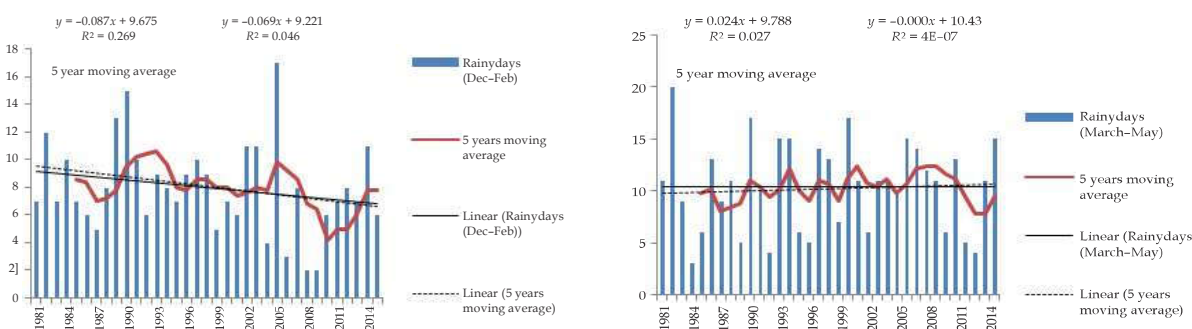


Fig. 1: Seasonal trend of rainfall (mm) from 1981 to 2015 at Pantnagar.



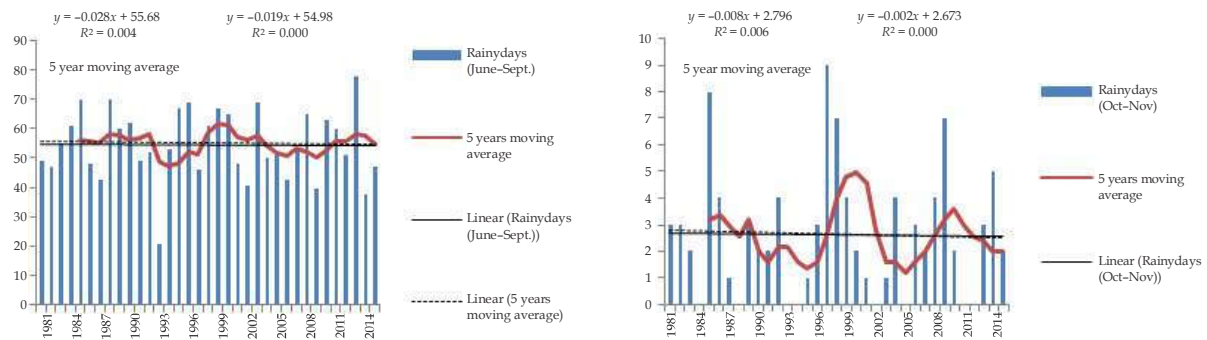


Fig. 2: Seasonal trend of number of rainydays from 1981 to 2015 at Pantnagar.

The Rainfall anomaly from 1981 to 2015 is presented in Fig. 3a,b,c,d. For the years 1981–2015 an overall increasing trend of rainfall anomalies is observed. Total annual rainfall at Pantnagar also shows an increasing trend over the period 1981–2015. Average annual rainfall is found to be highest in August and minimum in November. During post monsoon season and summer season a decreasing trend in rainfall anomaly was found at their rate of 0.11/year and 0.26 mm per year, respectively. While during winter and south west monsoon. The

trend was positive at the rate on 0.21 and 6.51 mm/year respectively.

The seasonal trend of number of rainy days during different seasons is presented in Fig 2. Winter season (Dec-Feb) shows a sharp decreasing trend. Summer season shows a decreasing trend of number of rainy days. During monsoon season a slight decline in number of rainy days has been observed. During post monsoon season a decline in number of rainydays has been observed.

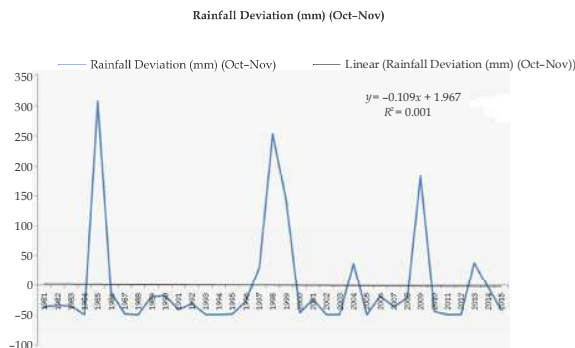


Fig. 3a:

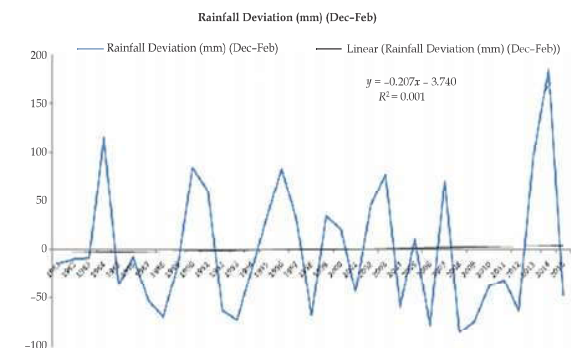


Fig. 3b:

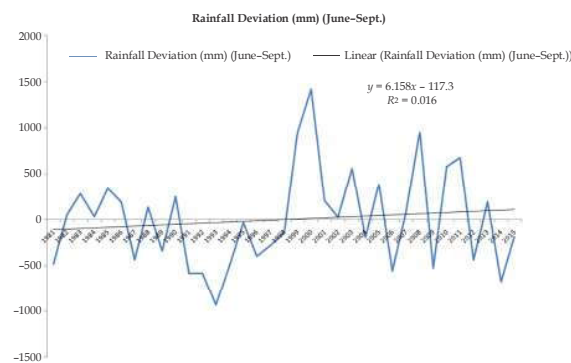


Fig. 3c:

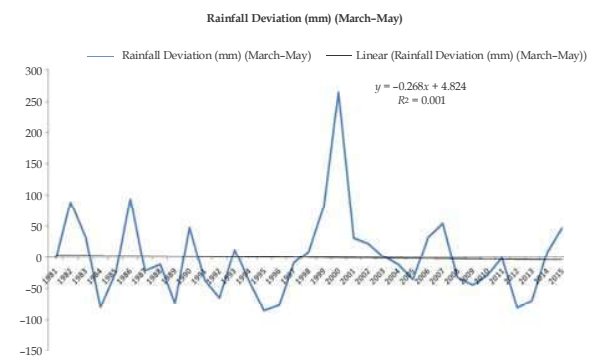


Fig. 3d:

Fig. 3: Seasonal Rainfall anomaly from 1981 to 2015 at Pantnagar (a,b,c,d)

The rainyday anomaly from 1981 to 2015 is presented in Fig. 4a,b,c,d). For the years 1981-2015 a decreasing trend of number of rainy days anomalies is observed. Average number of rainy days is found to be highest in July and minimum in November. Total annual number of rainy days at Pantnagar also shows an increasing trend over the period 1981-2015. During all the season a decreasing trend in rainy day anomaly was found. While during summer season no change was found. The long term mean annual rainfall over Pantnagar is 1569.7 ± 576.0 mm with coefficient of variation of 36.7%. July and August were rainiest month and

November and December received the least rainfall. However the season wise rainfall distribution depicts that the 85.5% rainfall was received during monsoon followed by summer, winter and Post monsoon season respectively. Premonsoon and monsoon season rainfall has been reported to show a increasing trend while post monsoon and winter season rainfall has a decreasing trend. Ramarao et al. 2013 also have reported an increase in future rain over 173 districts of India. The total annual rainfall showed an increasing trend (Yadav, R et al., 2014). Ramarao et al. 2013 also have reported an increase in future rain over 173 districts of India.

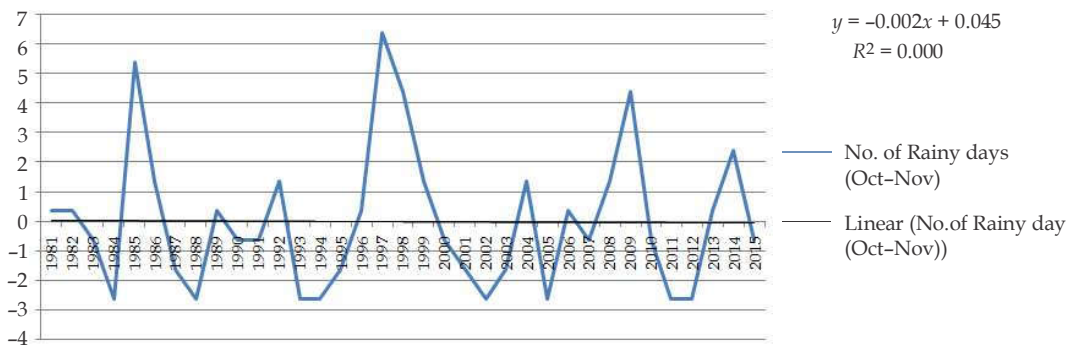


Fig. 4a:

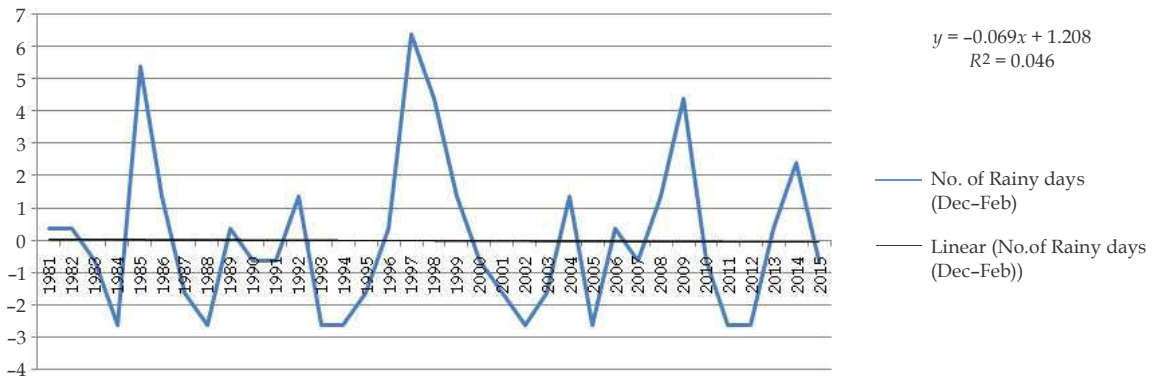


Fig. 4b:

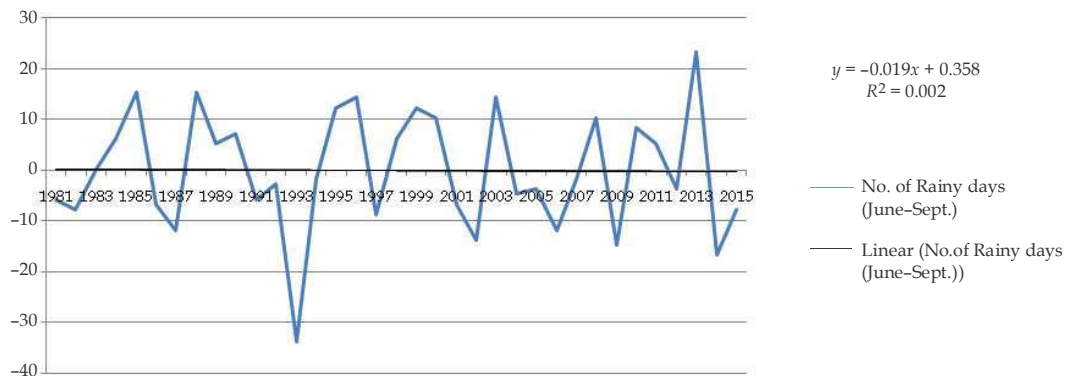


Fig. 4c:

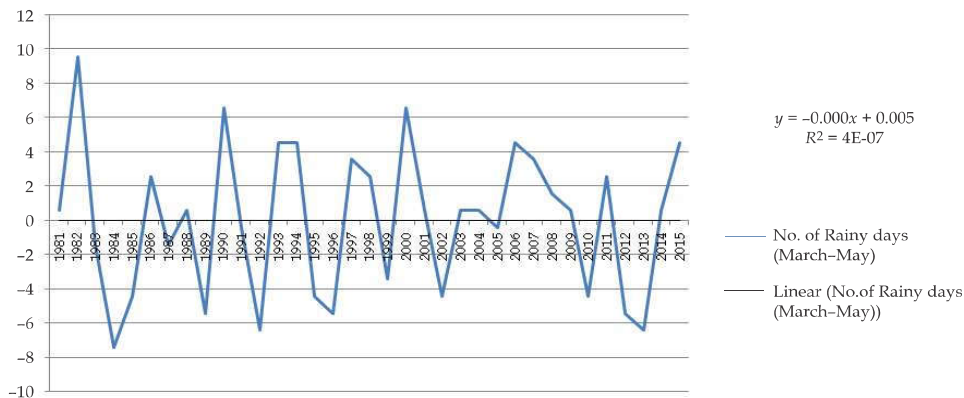


Fig. 4d:

Fig. 4: Seasonal Rainy day anomaly from 1981 to 2015 at Pantnagar (a,b,c,d)

Conclusion

The increasing trend of rainfall in monsoon suggest an increase in future monsoon rainfall over the region. However the annual rainfall having an increasing trend with decreasing number of rainydays shows more water losses through runoff than to go to soil. Increasing trend of rainfall anomalies indicate that in future wide variations in the rainfall amount is expected. This may be due to changing climatic scenario affecting the the behavior of hydrological cycle through out the globe.

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