

The Study of Spatio-Temporal Variation of Precipitation over India

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Abstract:- Importance of understanding the precipitation patterns is well understood for risk assessment, understanding the effects of climate change besides having economic implications such as effects on agriculture and allied industries. Here we present a study in which we studied the precipitation patterns over India from 1901 to 2015 and its variation along with geography and the trends observed in the past century. The time series and spatial distributions were analyzed and plotted. The results show the development of drought conditions and extreme event conditions across some regions in India after 1945 and show that southern India's coastal regions have a bigger share in the occurrence of extreme events. These results can be helpful in policy formulations and inferring land use pattern and climate change effect on weather

I. INTRODUCTION

The climate of any region depends on the rainfall pattern. Rainfall occurs when water vapor condenses into tiny droplets. These tiny droplets grow bigger in size through the collision-coalescence process. It takes approximately 8 million water droplets to form a 5mm diameter drop. Due to lots of collisions, these droplets become bigger in size to be pulled down by gravity. There are 5 steps involved in the formation of rain and in every step, there are some factors which affect the rainfall

II. EVAPORATION

It's a process in which water in liquid phase gets to transform into the vapor phase. The sources of liquid water for evaporation include ocean, lakes, streams, ice, and soils. Due to heating from the sun the liquid water get enough energy for turning into water vapor (gas). The evaporation process is very less in desserts due to less availability of sources of liquid water

➤ *Upliftment and Cooling*

The upliftment of water vapor can be achieved by different mechanisms like by mountains or by the cold fronts pushing the warm front above in midlatitude area or the intensive warming of earth surface causes the upliftment in low latitude area

➤ *Condensation*

It's the opposite process of evaporation i.e., a process in which the gaseous phase converts into liquid phase. When the temperature dropped to dew point the water vapors present in atmosphere condense back on the surface of aerosol particles known as cloud condensation nuclei.

➤ *Latitude Area*

A large amount of rainfall happens as a result of the transfer of water vapors from ocean to land regions. Latitude of an area is a very significant factor in such transfer of moist air. The different types of upliftment also affect the rainfall pattern and determine the quality, quantity, and duration of rainfall

➤ *Body*

The current study has been considering Indian meteorological department (IMD) Rainfall data. Indian meteorological department was composed in 1875. It is a national Meteorological service and govt agency that work-related relating to meteorology, seismology, and allied subject. To provide meteorological statistics required for agriculture, water resource management, industries, oil, exploration, and other nation-building activities. To conduct and promote research in meteorology and allied disciplines. To detect and locate earthquake and to evaluate seismicity in different parts of the country for development project. To assess rainfall, we used the latest (10 x 10) gridded rainfall data for One hundred fifteen years (1901- 2015) (Rajeevan et al., 2006) from the Indian meteorological department (IMD). The data is in 3Dimension (3D) latitude, longitude and time (33,35,365) respectively. The data was very good and reliable. We used this data to find Variation in rainfall Annually and for different seasons Winter (January-February), Pre-monsoon (March-May), monsoon (June-September) and Post-monsoon (October December). Note that the post-monsoon seasons contains only three month and monsoon seasons contains four months. We analysis Trend analysis, Magnitude of precipitation by using a Basic statistic, such as Double exponential distribution, Linear regression, etc.

III. RAINFALL VARIATION IN MONSOON SEASON IN 30-YEAR GAP TIME SERIES

The Parameter pairs for the different time period are Presented by markers with different colors. The dots for time gap (30year), There are all five dots are arranged in a straight line. As the phase drop from upper to lower on the α - β plane, the α decrease 2.7 to 1.9 and the β value increase from 122 to 282. The round dots signifying times series of the 30-year gap. With the decreasing α values, the frequency of weak rainfall has to decrease while the intense rainfall frequency

experiences the reversed trend. The decrease (increase) of the total rainfall amount comes from weak rainfall. After 1950 (green dot) maximum decrease (increase) in rainfall trend, these might also be a turning point for the mechanism governing the decadal changes. Also, to be noted that .provide brief statistical summary of how the precipitation structure evolve. The advantage of this α - β plane-based diagram will be the more supposed composition of multimodal results or a series of a sensitive numerical experiment since it allows much information to be compacted and presented in one plot.

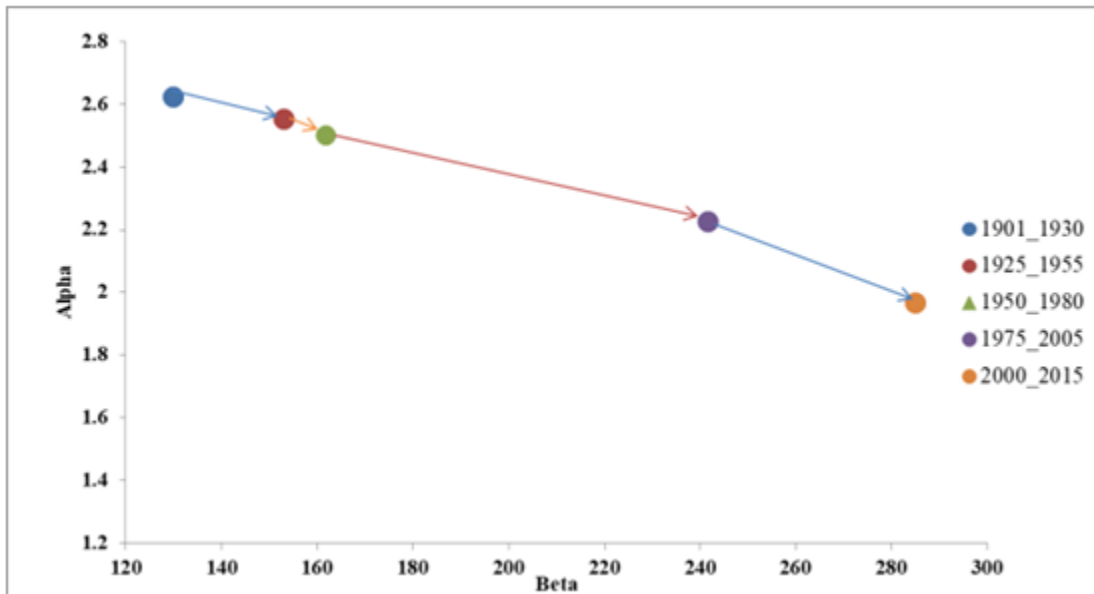


Fig 1. The parameter values (α , β) by colored dots, respectively. All parameters are calculated on a 30yrs sliding window, and different colors denote different periods.

IV. CONCLUSIONS

The result of this study shows that as the time passing there are so many variations occur in rainfall pattern. Year to year, season to season it shows increasing and decreasing trend of precipitation. In this study we Select four seasons Winter(Jan, Feb) premonsoon (March-May)Monsoon (June, July, Aug, Sept) Post monsoon (oct, nov, dec). Out of these four seasons Maximum variation and trend show in monsoon season. By using some statistical approach we find α and the β parameter they show frequency of weak and intense rainfall respectively. We also show variation in rainfall in the 30-year gap in a community.

It shows that after 1945 period continuous decrease in α values and increment in β values it proves that in some regions drought conditions are developed while in other region extreme events are developed. We find out the Number of extreme events by using Yearly and seasonally Mean and standard deviation. In Monsoon season we found the maximum number of Extreme in the southern region of coastal areas while in some regions Moderate, and low event found.

In remanding seasons like in winter, premonsoon, postmonsoon drought condition is also developed in some region where no rainfall occurs. Rainfall is a Most important parameter to determine the cropping system because India is a land of agriculture our 82% population depends on agriculture. The study about rainfall is important for the management of water resources, construction of dams and I will also help us to understand the importance of regional variability focussing mainly on the location, topography, and land use change. Today due to increase in global warming and an increase in the temperature of the earth the extreme events and drought conditions are developed so monitoring and forecasting of rainfall are so important.

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