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TIME SERIES ANALYSIS OF ANNUAL AND SEASONAL RAINFALL OVER THE MARATHWADA DIVISION

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Abstract - Rainfall is the most important atmospheric factor that has direct relevance to the very survival of life. The Marathwada division is continually suffering from a drought situation that is affecting the life and economy of this region. This meteorological division is one of the regions with the highest rainfall deficit in India and has been badly known for farmer suicides in recent years. The present study sheds light on annual and seasonal rainfall and its trend over the Marathwada division from 1901 to 2015 by using statistical tools and GIS techniques.

***Key Words*:** annual and seasonal rainfall, Average-CV rainfall, arc GIS,

1.INTRODUCTION

Rainfall is the dominant factor in every region on earth. The Marathwada division has faced drought situations from time to time. For the analysis of annual and seasonal rainfall in the Marathwada division, I have used the rainfall data for the period 1901 to 2015, which I gathered from IITM, Pune. I have calculated the mean monthly rainfall, the mean seasonal rainfall, and the mean annual rainfall to see the temporal and seasonal change. I used that data in Microsoft Excel and again joined it with the GIS environment by using the interpolation technique.

2. Methodology

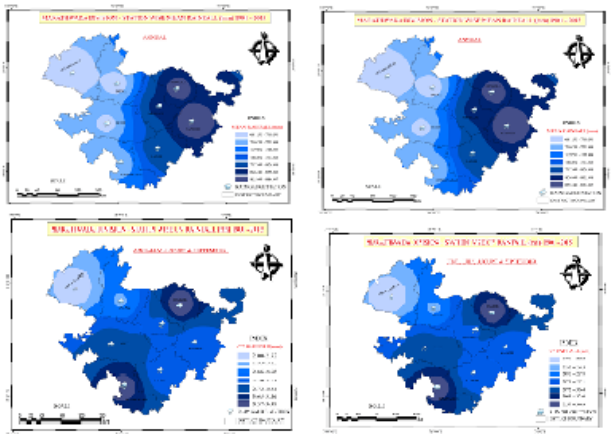
Table.1. Annual Rainfall distribution over the Marathwada division

Rain gauge station	Winter	Summer	Monsoon	Post Monsoon	Annual	SD	CV	SK	KU
AURANGABAD	4.1	23	571.5	94.9	681.5	279.5	22.3	-0.1	1.2
BEED	4.5	30.5	575.4	104	701.6	264.9	36.5	0.1	-1.5
OSMANABAD	6	37.7	575.7	112.2	720.8	289.2	32.5	0.1	-0.4
PARBHANI	8.7	29.8	712	101.3	837.6	357.5	27.9	0	-5.9
LATUR	8	40.4	671.9	109.1	819.6	352.5	25.2	-0.8	0.1
JALNA	5.2	24.7	584.2	93.4	695.6	285.2	24.9	0	-5.7
HINGOLI	9.8	26.7	750.7	93.8	869.1	404.5	41.1	-0.5	-3.1
NANDED	9.4	33.1	762.7	102.2	884.3	386.1	29	-0.2	-4.2

Table-2. Marathwada division-CV Rainfall

Rain gauge Station	June	July	Aug.	Sept.	JJAS.	ANN.
AURANGABAD	59	41.7	40.7	43.1	21	22.3
BEED	47.5	69.4	48.5	57.3	30.3	36.5
JALNA	54.7	54.1	45.8	44.7	24.6	24.9
NANDED	51.2	58.5	41.1	51.5	27	29
OSMANABAD	53.6	59.1	49.7	58.1	33.8	32.5
PARBHANI	57.2	64.1	54.3	54.3	28.4	27.9
LATUR	49.3	55.5	44.8	59.5	27.3	25.2
HINGOLI	58.5	61.8	59.5	49.4	34.1	41.1

Map.1. Mean & CV rainfall Variability(JJAS, ANNUAL) over the Marathwada division(mm)



3. CONCLUSIONS

Table.1. presents rainfall data for different rain gauge stations in the Marathwada division, categorized into four seasons: Winter, Summer, Monsoon, and Post Monsoon. It also includes the annual rainfall, standard deviation (SD), coefficient of variation (CV), skewness (SK), and kurtosis (KU) for each station.

The data reveals significant variations in rainfall across the seasons and stations. During the Monsoon season, Hingoli and Nanded receive the highest rainfall, with 750.7 and 762.7 units respectively, while Aurangabad records the lowest at 571.5 units. In terms of annual rainfall, Hingoli has the highest amount at 869.1 units, and Parbhani follows closely with 837.6 units.

The standard deviation (SD) values indicate the degree of variation in rainfall within each station, with Hingoli having the highest SD of 404.5 and Latur the lowest at 264.9. The coefficient of variation (CV) provides a measure of relative variability, with higher values indicating greater variability. Hingoli also has the highest CV at 41.1, suggesting a significant variation in rainfall patterns.

Skewness (SK) and kurtosis (KU) provide insights into the shape of the rainfall distribution. Negative skewness values indicate a distribution that is skewed to the left, while positive values indicate a skew to the right. For example, Parbhani exhibits negative skewness (-5.9), indicating a left-skewed distribution. Kurtosis measures the peakness or flatness of the distribution. Most stations have negative kurtosis values, indicating a relatively flat distribution of rainfall.

Table 2. Stations like Beed, Osmanabad, and Hingoli experience relatively higher rainfall compared to others, particularly in July and August. On the other hand, Latur and Parbhani receive comparatively lower rainfall throughout the season.

Overall the monsoon season (JJAS) tends to be the wettest period, with rainfall amounts ranging from 21 to 34.1 mm across the stations. However, variations exist in the annual rainfall as well, with Hingoli having the highest annual rainfall of 41.1 mm and Latur recording the lowest at 25.2 mm.

These findings highlight the importance of analyzing time series data to understand rainfall patterns in Marathwada division, aiding in water resource management, agricultural planning, and mitigating the impact of droughts or excess rainfall in the region.

Thematic maps prepared in ARC GIS are showing Mean & CV rainfall Variability(JJAS, ANNUAL) over the Marathwada division by using IDW Method .

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