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One decade hydro meteorological data assessment through statistics, Dindigul district, Tamil Nadu, South India

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ABSTRACT

The study has been made to detail an account on the environment through rainfall for the area of dindigul using meteorological data for recent decade from the collected data of the Indian Meteorological Department (IMD). All the seasons does not given significant difference in it whereas there is an important note that in 2003 winter were accounted abnormal before the tsunami year 2004 in dindigul. However there could not be a notable relation to the area, the abnormal changes on season in a particular time before a natural process has to be view focused. The graphical methods are clearly revealed the characteristics of rainfall in season wise, annual, and in month wise to brief them in it. Through the histogram curves, it have explained the distribution of the rainfall by the seasons and revealed that monsoon and winter distributed positively. Month wise classifications shown the importance of denser details could enable the broad view of understanding. The correlation implemented that there was a negative relationship with all the seasons among each other. The sudden change in a particular year and season migration has to be looking through properly by monitoring with more importance to prevent the future. Harvesting rain in the monsoon and when ever good rain, could be a moderate to the area. Depletion in climate change has to be to make aware to prevent and predict for the future.

Keywords: Rain Fall, Seasonal Variation, Dindigul Rainfall, Hydro-meteorology, Rainfall intensity.

1. Introduction

The source of ground water is always known as the rainfall precipitation. When the rain fails there will be a big natural lose in the society for living. Being India is a tropical country, it mainly depends upon the rainfall for the water resources. More than 80% of the annual rainfall occurs during the monsoon periods in Tamil Nadu. Intensity of monsoon rainfall is uneven and erratic both in space and time, resulting drought conditions in some parts of Tamil Nadu during non-monsoon periods. Thus, it is essential to analyses the occurrence of rainfall during various seasons for evolving a system to manage the water resources effectively (Vennilaet.al, 2007). The annual, monsoon and non-monsoon rainfall data, and presented the spatial and frequency distribution of rainfall intensity over the basin by preparing various diagrams (Jagannadhasarma, 2005). Analyses which have been made in the past have shown no significant trend in annual values of rainfall during the period of rainfall records in the south-western United States.

Luna in his study said that, the frequency of daily rains of various sizes is analyzed for four long-record stations in New Mexico. It is shown that the frequency of rains smaller than 0.50 inch in a day progressively increased from 1850 to about 1930. Opposite trends in different size classes tended to partially compensate one another in such a way that trends do not appear in the annual rainfall totals. Frequency of rain of various sizes comprising wet years

and dry are compared. Some effects of changes in rainfall frequency on vegetation and erosion are discussed (Luna Leopold, 1951). lysgaard in his explained that there is voluminous evidence of significant climatic variations in the past century in large areas over the world (lysgaard, 1949; ahlmann, 1948). However, it has been recognized by thornthwaite and other authors that the annual values of precipitation and temperature for the Southwest do not show significant trends (thornthwaite et.al, 1942). On the basis of the lack of progressive variation, it has been argued by them that climatic change cannot be considered an important contributing factor in the present epicycle of erosion. Identifying the distribution of daily rainfall could have a wide range of applications in hydrology, engineering design, and climate research

Omar in his study said that in many regions of the world, planning agricultural and water management activities is usually done based on probabilities for monthly rainfall, taking on values on specified intervals of values. These intervals of monthly rainfall amounts are commonly grouped into three categories: drought, normal rainfall, and abundant rainfall. Changes in the probabilities for occurrence of monthly rainfall amounts within these climatic rainfall categories will influence the decisions farmers and water managers will take, for example, crops to cultivate, flood preparedness, and operations of water reservoirs (Omar Abel Lucero, 1998). Gurugnanam in his study said that the groundwater quality mapping assessments needs rainfall intensity detail as the main key for the sources of water quality (Gurugnanam et.al, 2009). The anomalies were computed for 15 model grid boxes corresponding to the combined Sahelo–Sahara, Sahel and Soudan regions of Nicholson 1993. This combination of regions was necessary in order to have a reasonable number of model grid boxes in the sample, given the high spatial variability of rainfall. These grid boxes were located from 10–208N and extended from the West African coast to about 158E Nicholson 1993, Shows that the rainfall trends in these three regions have been very similar over the past 40 years. The rainfall surplus of 220–370 mm was computed in AESR 12.2 and 370–520 mm in AESR 12.3 mm. Since winter rainfall is meager and erratic this amount of rainfall may be harvested and utilized for providing supplemental irrigation to winter crops or during dry spell of rainy season crops. Study also reveals that at 80% probability level (highly assured) in first month of southwest monsoon (June) 98–156 mm rainfall occurs in AESR 12.1, 103–144 mm in AESR 12.2 and 93– 132 mm in AESR 12.3. These amounts of rainfall are sufficient to prepare land and sowing of direct seeded crops like maize, groundnut, black gram, green gram, pigeon pea, cowpea, etc(GourangaKar, Verma, 2004).

Lucero has recommended that the climate variability in annual rainfall occurs because the aggregation of daily rainfall changes. A topic open to debate is whether that change takes place because rainfall becomes more intense, or because it rains more often, or a combination of both. The answer to this question is of interest for water resources planning, hydro meteorological design, and agricultural management. Change in the number of rainy days can cause major disruptions in hydrological and ecological systems, with important economic and social effects. Furthermore, the characteristics of daily rainfall aggregation in ongoing climate variability provide a reference to evaluate the capability of GCM to simulate changes in the hydrologic cycle, Omar Lucero, Daniel Rozas, 2001).

1.1 Region of study

The study area lies between 77°15′ and 78°15′ E longitude and 10°0′ to 10°45′ N latitude, which falls under Survey of India (SOI. 1973) Toposheets No: 58J01, 58J02, 58J03, 58J04, 58J05, 58J06, 58J07,58J08, 58F06, 58F07, 58F08, 58F09, 58F10, 58F11, 58F12, 58F13,

58F14, 58F15,58F16 on 1:50000 scale and covering a total area of 6,066 km^2. The elevation varies from 158 to 2,529 m above MSL (Figure 1)

Dindigul district is bounded by Palani hill ranges of Western Ghats in the west, Sirumalai hills in the south and east. The northern part of the district covers plain terrain. This study area enjoys sub-tropical climate with the temperature (°C) ranges from 21.8 to 41.80. The study area chiefly consists of hard crystalline rocks of Archean age, which include charnockites, granite gneiss, calc gneiss and quartzite.

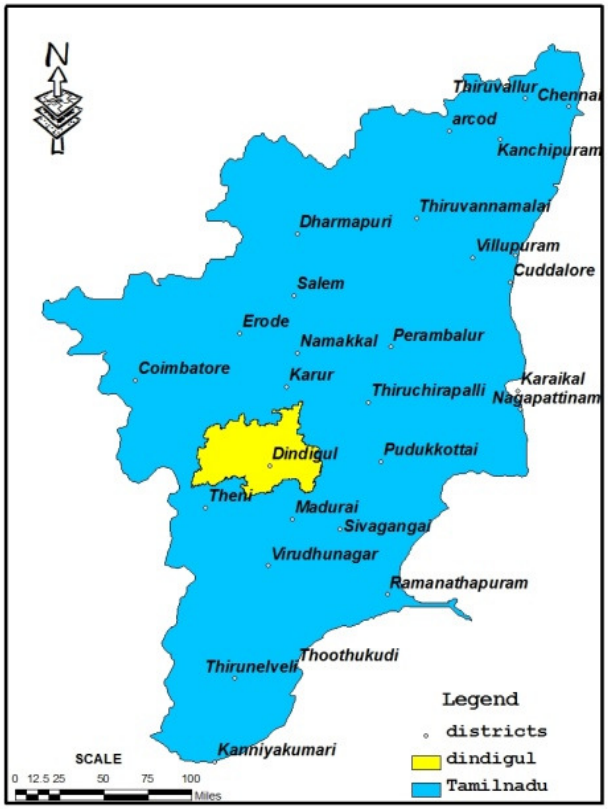

Figure 1: Key map of the study area

2. Methods of analysis

Random variables analysis are carried for total rainfall amount, in a decade years.The study has been made to detail a revised account on the environment through rainfall for the area of dindigul by using meteorological data for recent years. Base map of the study area which is falls under the toposheets no: 58J01 - 58J08 and 58F06 - 58F16 from Survey of India (SOI. 1973) on 1:50000 scales has been prepared through GIS software. The data has been split-up season wise (summer, winter and monsoon) and categorized to understand the seasonal and annual characteristics of rainfall precipitation of the area. Finally, the data productivities are used to interpret by generated charts and diagrams and also the statistical analysis (correlation, histogram, etc.,) are performed by using SPSS software.

2.1 Analysis and restructure

The seasonal rainfall is noted as random and more complex in the data. Commonly compared to the normal rainfall of the time, the rainfall has been noted much more sifted in precipitation. Sometimes over limit and sometimes not reached the limit of the normal

rainfall amount (Figure 2). This is nothing but the unpredictable nature of the nature. Even in this, somewhere in the years and seasons the bars represent actual rainfall was not given the expected normal rainfall represent by the curve orderly dark and light colours for the same season.

2.2 Summer

In the summer season after the year 2007 it was noticed that there was no significant rainfall like previous years before 2007. It is strongly notified in the summer seasons in the recent decade for the months from March to May (Figure 2) (Figure 3) and also this the season stands as the pre-monsoon. In the year 2003 pre-monsoon rain was failed totally. Where 2002 and 2004 are had good amount of rainfall, in the mid time 2003 was noted with a no value.The summer or the pre-monsoon season is represents only for the three months of March, April and May. In the last decade there was a mark placed in the behaviour in the data. The year 2003 had no rainfall in all the three months. This indicates the summer was totally differed in natural from the other years.

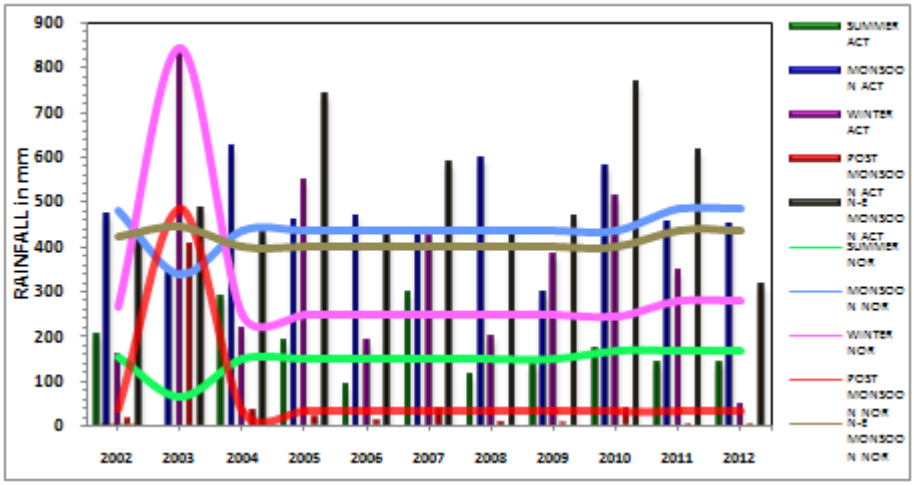

Figure 2: Seasonal rainfall variation

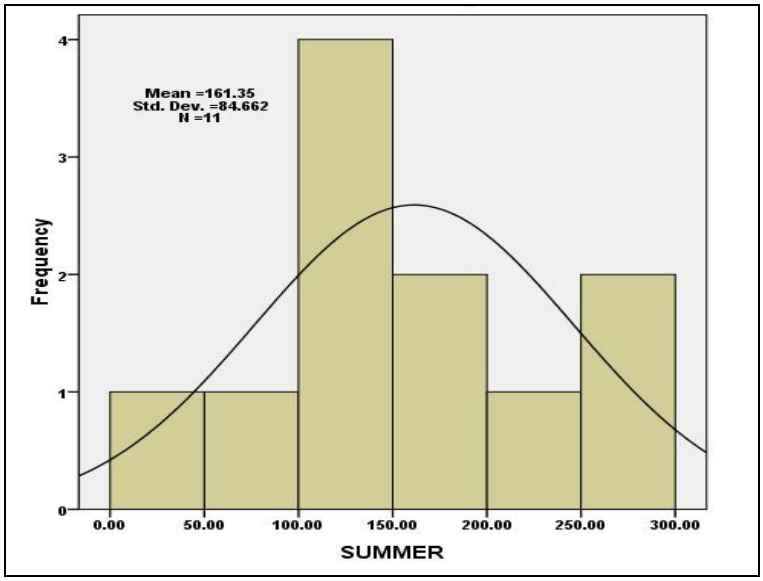

Figure 3: Distribution of rainfall in summer

2.3 Monsoon

In the monsoon season the years 2004, 2008 and 2010 are notified with good rainfall as well as with the almost reach of normal expected rainfall amount commonly. Here too in the year 2003 there was depletion noticed in the rainfall amount. In 2009 also rainfall was low compared to other years and own normal rainfall for it. Where 2002 and 2004 are had good amount of rainfall, in the mid time 2003 was noted with a low value (Figure 2) (Figure 4). The monsoon seasonal rainfall behaved good to rainfall in annual and in seasons.

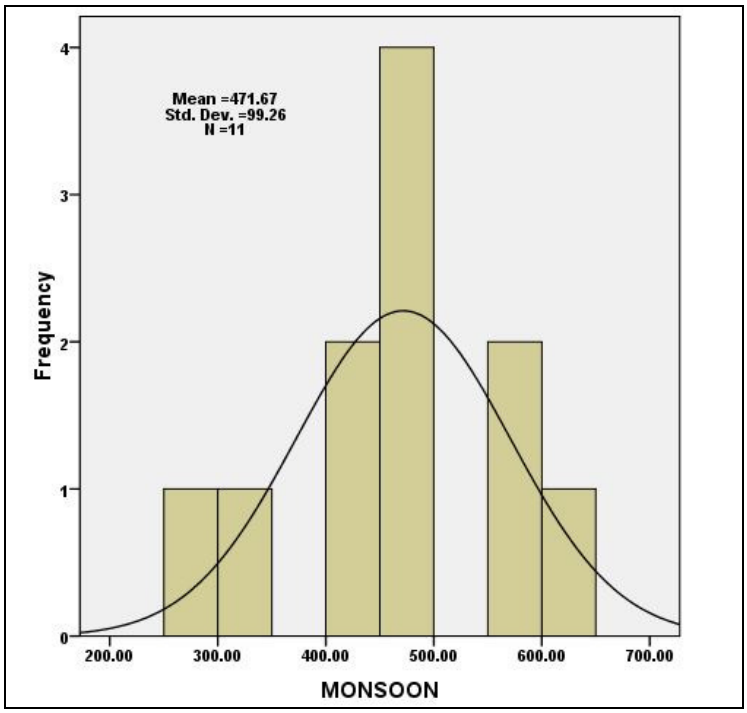

Figure 4: Distribution of rainfall in monsoon

Naturally monsoons are the prior source for the rainfall precipitation for a region. If the monsoon fails in the rainfall then there could be a big fall in the annual rainfall amount. In this too, monsoon as represents south west monsoon in widely comparison. In tamilnadu usually, north east monsoon is the prior source for the rainfall, still the area stands to the border where the south west monsoon is prior source. So, routinely this region too received good rainfall in south west and also in north east monsoons.

2.4 Winter

In the season winter especially the year 2003 has accounted as prime and even it has given almost an exact normal rainfall amount which expected (Figure 2) (Figure 5).More multifaceted behavior played in it found through the up and down of rainfall in various years continuously. It is rare to store the normal rainfall in actual rainfall amount. November to February is the period is known as the winter season. The temperature will be less and amount water availability may high but in solidified or in dried form. It can reveal that the trend of this season pass as a wavy. More importantly compared to the previous years in the most recent it has been accounted very low. Mainly it includes post monsoon and N-E monsoon in it.

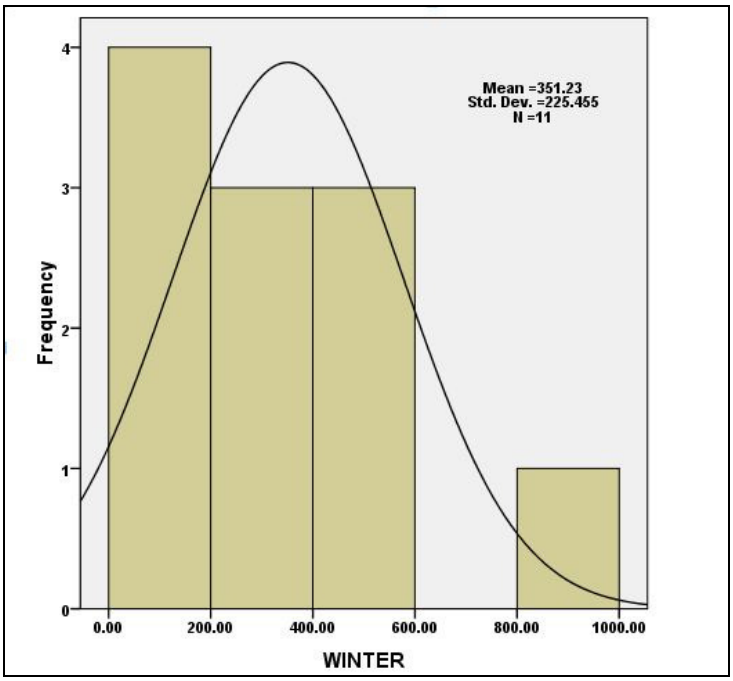

Figure 5: Distribution of rainfall in winter

4.4 Post monsoon

The second half of the winter is known as post monsoon. The post monsoon season behavior shows a prior fact to understand further the difference in rainfall accounts on forthcoming. However winter includes post and NE monsoon seasons, it is also a private period to account the rainfall. (Figure 2) (Figure 6). As usual as winter in 2003 has accounted more. An important note in 2003 was different and not shown that much in other years. Even this particular season too viewed the declined trend on it is notable.

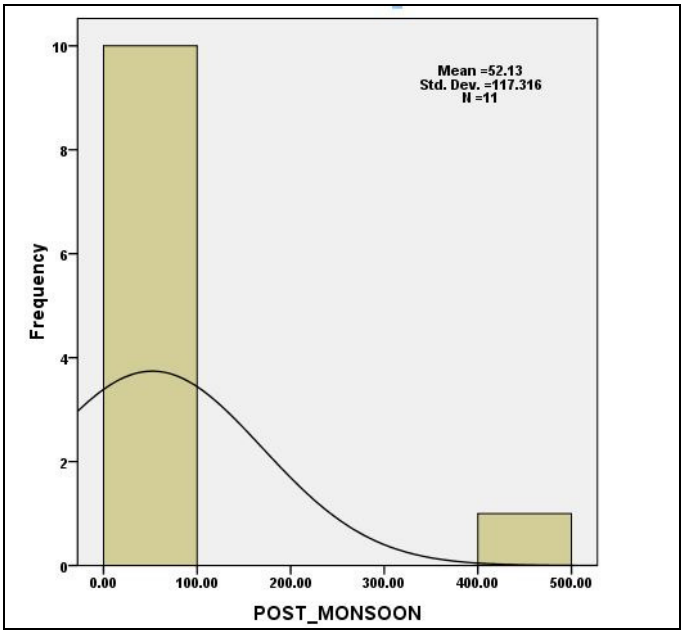

Figure 6: Distribution of rainfall in post monsoon

4.5 NE Monsoon

The North East monsoon period is the most probable and vital source season to the region. Forth coming recent years have to be monitored properly to make prevent the behavior changes on the climate. (Figure 2) (Figure 7).Even a single drop can change pot full water's nature, so the change in season or migrate in season could not be an ignorable.

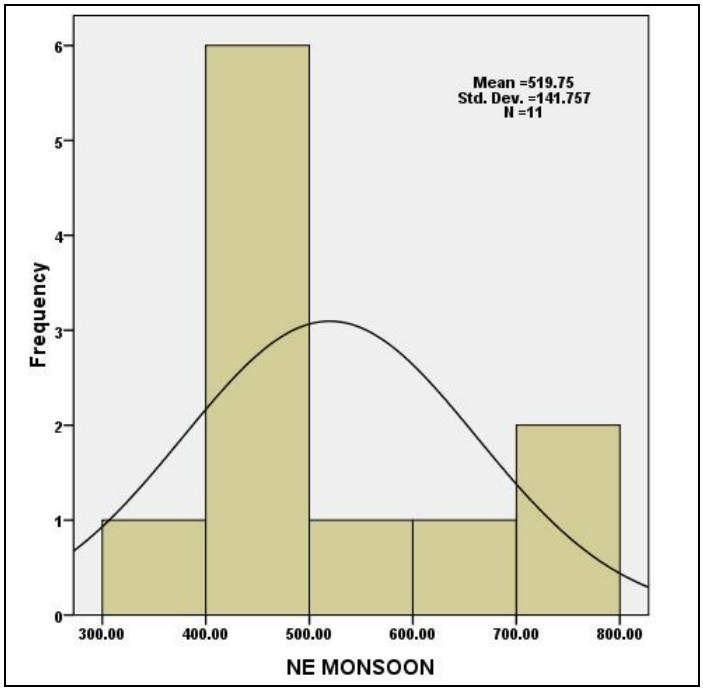

Figure 7: Distribution of rainfall in NE monsoon

Descriptive Statistics

	n	minimum	maximum	mean	std. deviation	variance	skewness		kurtosis	
	statistic	statistic	statistic	statistic	statistic	statistic	statistic	std. error	statistic	std. error
summer	11	.00	298.50	1.6134	84.66244	7.168	-.010	.661	.497	1.279
monsoon	11	299.00	623.30	4.7167	99.25969	9.852	-.055	.661	-.264	1.279
winter	11	47.50	841.20	3.5123	225.45461	5.083	.900	.661	.892	1.279
post monsoon	11	3.00	403.40	52.1273	117.31598	1.376	3.234	.661	10.597	1.279
NE	11	317.00	768.40	5.1975	141.75677	2.009	.699	.661	-.407	1.279

Figure 8: Descriptive statistics

3. Statistical studies

Through the statistical histogram it is noted properly that the monsoon as well as NE has been distributed better in the source. However the post monsoon not played well to the source in the climate summer distributed well with the lower precipitations (Figure 8). Winter acted well in source of the distribution to the area.

Correlations					
	SUMMER	MONSOON	WINTER	POST MONSOON	NE
SUMMER	1				
MONSOON	.413	1			
WINTER	-.329	-.392	1		
POST_MONSOON	-.556	-.371	.753**	1	
NE	.192	.102	.587	-.023	1
**. Correlation is significant at the 0.01 level (2-tailed).					

Figure 9: Correlation table

Relationship among the seasonal data with each other seasons shown negative relationship as common (Figure 9). Finally, among the seasons summer, monsoon, and winter are major three seasons taken place and resulting the responsibilities for the seasonal changes. Sudden change in the year 2003 on the seasons before the tsunami year 2004 has to be noted an important fact on migration on climate. Winter and monsoon periods are changed their natural characteristic.

4. Conclusion

The study has reconstructed the data to view the relationship and executed well through with statistical tools. The area enjoys both the SW and NE monsoon but not in good amount. The graphical method is strongly shown the characteristics of season wise, annual, and in month wise to brief them in it. Histogram curves have explained the distribution of the rainfall by the seasons and revealed that monsoon and winter distributed positively. Month wise classifications shown the importance of denser details could enable the broad view of understanding. Even though, the correlation implemented some significant relationships that there was a negative relationship with all the seasons among each other. The sudden change in a particular year, by season migration has to be looking through properly by monitoring with more importance to prevent the future.

There cannot be an appropriate impact to non coastal region by the tsunami, but still rises anomalies that in 2003 season migration and abnormal change. Winter season totally abnormal in 2003, whereas summer too given ignorable a non value rainfall.

Water is the important resource for all. When rain fails then all the sources will go down to the living aspects. Harvesting rain in the monsoon and when ever good rain, could be a moderate to the area. Depletion in climate change has to be to make aware to prevent and predict for the future.

Acknowledgments

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5. References

1 GourangaKar, Verma .H.N., (2004), Climatic water balance, probable rainfall, rice crop Water requirements and cold periods in AER 12.0 in india. Water Technology Centre for Eastern Region, P.O.: S.E. Railway Project Complex,Chandrasekharpur, Bhubaneswar, Orissa, India.

2 Gurugnanam .B, Suresh. M , Vinoth. M . and Kumaravel. S., (2010), High/Low Rainfall Domain Demarcation Mapping Using Gis At Salem District, Central Tamil Nadu. (ISSN 0974 - 6846), Indian Journal of Science and Technology, 3(5), pp 542-545.

3 Jagannadhasarma (2005), The Rainfall Patterns In The Coastal Zone Of Krishna - Godavary River Basin, Andhra Pradesh, India.

4 Luna B. Leopold., (1951), Rainfall Frequency: An aspect of Climatic Variation Transactions, American Geophysical Union, 32(3), pp 347-357.

5 Magesh N. S. , Krishnakumar .S , Chandrasekar.N,.& John Prince Soundranayagam (2012), Groundwater Quality Assessment Using WQI And GIS Techniques, Dindigul District, Tamil Nadu, India, Arab Journal of Geosciences. DOI: 10.1007/s12517-012-0673-8.

6 Nicholson, S.E., (1993), An overview of African Rainfall Fluctuations of the last decade. Journal of Climatology, 6, pp 1463–1466.

7 Omar A. Lucero , Daniel Rozas (2001) Characteristics of aggregation of daily rainfall in a middle-latitudes region during a climate variability in annual rainfall amount Centro de la Regio´nSemia´rida (INA), Inst. Nacional del Agua, Universidad Nacional de Co´rdoba, Alt Arganaraz al (2000), PasajeCurupaity 2460, 5009 Barrio Villa Cabrera, Co´rdoba, Argentina.

8 Omar Abel Lucero., (1998), Effects of The Southern Oscillation on The Probability for Climatic Categories of Monthly Rainfall, in a Semi- Arid Region in The Southern Mid-Latitudes, Centro de la RegionSemiarid (INA) and UniversidadNational de Cordoba, Cordoba, ArgentinaAtmospheric Research 49 _1998, pp 337–348.

9 Vennil., Subramani. T. and Elango.L., (2007), Rainfall variation analysis of vattamalaikarai sub-basin, Tamilnadu, India, Journal of applied hydrology, Xx(3), pp 50-59.