

Original Article

Environmental
Science

Analysis of Monthly Variation of Relative Humidity and Temperature of Sokoto, Nigeria

M Gwani ¹, GA Abubakar ¹, AT Fatigue ², SJ Adebisi ³, B Joshua ¹

ABSTRACT [ENGLISH/ANGLAIS]

Climate varied in the past on different time scale, this has generated a lot of concern among the meteorologist and climatologist given the dependence on the rainfall for agriculture production, it is against this background that this paper aimed at studying and examining the recent trend and variability in the characteristics of rainfall pattern in relation to relative humidity and maximum temperature in Sokoto State the northern part of Nigeria and their possible implication for Agricultural production in the state. Using monthly rainfall, relative humidity and maximum temperature data of seven years in Sokoto state for the period of 2005-2011. The regression /correlation analysis was used in determining the trends, the result shows that there was an increase in rainfall and relative humidity in the month of May to September and October with a positive correlation of (r^2) = 0.9193 and (r) = 0.76 for mean average rainfall and relative humidity. Further analysis of the result indicates a significant increase in rainfall in year 2010 with a value of 357.6 mm. The result also shows a very high intensity of rainfall and relative humidity in the month of July and August of all the years under study with minimum temperature observed in August of all the years considered for the study. The observed trend and variability in rainfall and relative humidity may be ascribed to a restricted northward and advance of the intercontinental discontinuity (ITD) in dry season and its considerable northward incursion in the wet season.

Keywords: Rainfall, relative humidity, temperature

RÉSUMÉ [FRANÇAIS/FRENCH]

Climat varié dans le passé sur l'échelle de temps différente, ce qui a suscité beaucoup d'inquiétude chez le météorologue et climatologue étant donné la dépendance de la pluviométrie pour la production agricole, il est dans ce contexte que le présent document vise à étudier et examiner l'évolution récente et de la variabilité dans les caractéristiques de la pluviométrie par rapport à l'humidité relative et la température maximale dans l'Etat de Sokoto au nord du Nigeria et leur implication possible de la production agricole dans l'état. Utilisation des précipitations mensuelles, l'humidité relative et les données de température maximale de sept ans dans l'Etat de Sokoto pour la période de 2005-régression octroyés en 2011 / analyse de corrélation a été utilisée pour déterminer les tendances, le résultat montre qu'il ya eu une augmentation des précipitations et l'humidité relative au mois de mai à Septembre et Octobre avec une corrélation positive (r^2) = 0.9193 et (r) = 0,76 pour la moyenne des précipitations moyennes et l'humidité relative. Une analyse plus poussée des résultats indique une augmentation significative des précipitations dans l'année 2010 avec une valeur de résultat 357.6mm. Le résultat montre également une très forte intensité des précipitations et de l'humidité relative dans le mois de Juillet et Août de toutes les années à l'étude avec température minimale observée en Août de toutes les années considérées pour l'étude. La tendance observée et la variabilité de la pluviométrie et de l'humidité relative peut être attribuée à un. limitée vers le nord et l'avance de la discontinuité intercontinental (ITD) en saison sèche et de sa considérable vers le nord incursion dans la saison des pluies

Mots-clés: Précipitations, humidité relative, température

Affiliations:

¹ Department of Physics, Kebbi State University of Science and Technology, ALIERO

² Department of Physics, Ado Ekiti State University, NIGERIA

³ Department of industrial Physics, Landmark University, Omu-Aran, Kwara State, NIGERIA

Address for Correspondence/
Adresse pour la Correspondance:
gwani25@yahoo.com

Accepted/Accepté:
March, 2013

Citation: Gwani M, Abubakar GA, Fatigue AT, Adebisi SJ, Joshua B. Analysis of monthly variation of relative humidity and temperature of Sokoto, Nigeria. World Journal of Engineering and Pure and Applied Science. 2013;3(1):12-5.

INTRODUCTION

Sokoto State is located in northern Nigeria which lies in the Rima Basin area between latitude 12° 15' 29" North of the equator and longitude 13° 58' 22" East of the Greenwich meridian. It is part of the Sudan-Sahel savannah bioclimatic zone between latitude 10°N and 14°N and longitude 4°E and 14°E, and lies immediately to

the south of Sahara desert. The climate of the Sudan-Sahel savannah bioclimatic zone is savannah type with alternating wet and dry seasons [1].

The gross features of rainfall patterns in this region, as in other parts of the country are usually in association with what is often called the Inter Tropical Discontinuity (ITD) [2].

The movement of the ITD northwards across the country between January and August, and its retreat from the southern fringe of the Sahara desert, after August, cause much of Nigeria including Sokoto to experience seasonal rainfall [3].

MATERIALS AND METHODS

The study was carried out at Sokoto (Northwestern part of Nigeria) which lies in the Rima Basin area between latitude $12^{\circ} 15' 29''$ North of the equator and longitude $13^{\circ} 58' 22''$ East of the Greenwich meridian which lies 15-17 km southwest of the Airport where the data was obtained Mean annual Rainfall, Mean annual relative humidity and Maximum temperature data spanning a period of seven years (2005-2011) were used for the study. The data was obtained from the Nigeria Meteorological Agency, Sultan Abubakar III International Airport Sokoto. Graphs was plotted using the Microsoft Excel sheet to study the variations of these parameters.

RESULTS AND DISCUSSION

The result of the analysis are presented in figures 1 to 8. From the figures, it can be observed that the month of May mark the beginning of rainfall in the seven years considered for the study as shown in figure 1, 2, 4, 5, 6, 7, except for 2007 where it started in April as presented in figure 3. The rainfall duration was observed to be six month as shown in figure 1,2,3,5,6,7 except for 2008 where the rainfall lasted for five months. Rainfall was observed to end in October as shown in figure 1,2,5,6,7 except for 2007 and 2008 where it ends in September as shown in figure 3 and 4 the rainfall intensity was observed to be high in the month of July and August of all the years considered for study. The peak rainfall was recorded in the month of August of all the years as presented in figure 1, 2, 3, 5, 6, 7 except for year 2008 where the peak was observed in July as shown in figure 4. The highest rainfall amount was obtained in August 2010 as presented in figure 6 with a mean value of 357.6mm this may attributed to the flooding disaster experienced by the people of Region which destroy houses and properties and displaces many people in Sokoto State in year 2010.

The relative humidity is observed to increase during the month of May to September as shown in figure 1-7 when the rainfall is considerably high, the peak relative humidity was obtained in the month of August in all the years considered for the study. it was observe in 2010 with a value of 82 and the minimum relative humidity was obtained in 2008 with a value of 75.

Figure 1: This figure shows mean monthly rainfall, mean relative humidity and maximum temperature year 2005

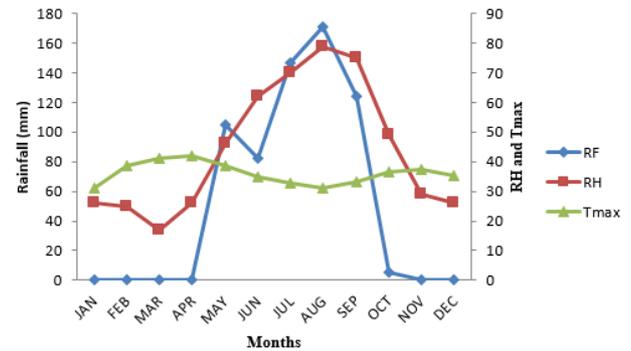


Figure 2: This figure shows mean monthly rainfall, mean relative humidity and maximum temperature year 2006

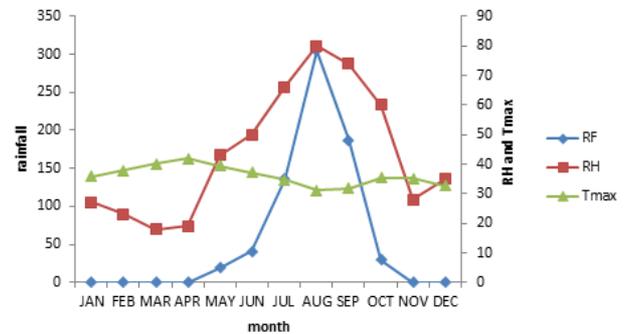
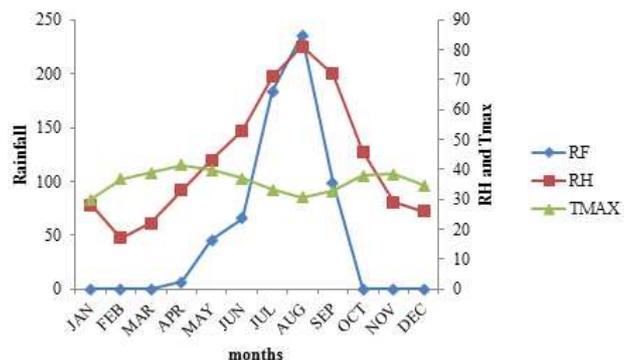


Figure 3: This figure shows mean monthly rainfall, mean relative humidity and maximum temperature year 2007



The temperature on the other hand shows a similar pattern in figure 1- 7 in all the years under study. the temperature was observed to have increase in the month of January to April and dropped in the month of May just when the rainfall began ,it decreases to its minimal in the month of August when the rainfall and relative humidity was observe to be very high. The temperature eventually increases in the month of November and

December where there is no rainfall at all. the peak value of the temperature was observed in April of 2005 with a value of 42°C and the minimum temperature was obtained in 2007 with a value of 30.7.

Figure 4: This figure shows mean monthly rainfall, mean relative humidity and maximum temperature year 2008

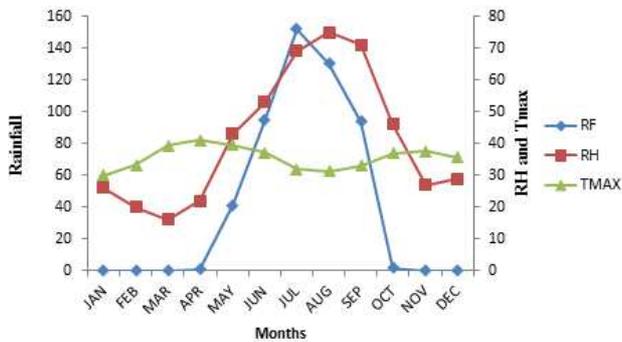


Figure 5: This figure shows mean monthly rainfall, mean relative humidity and maximum temperature year 2009

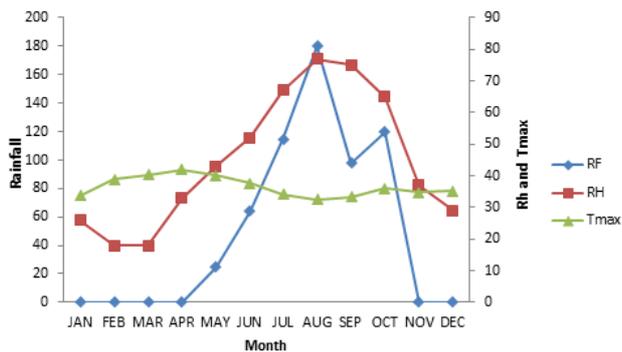
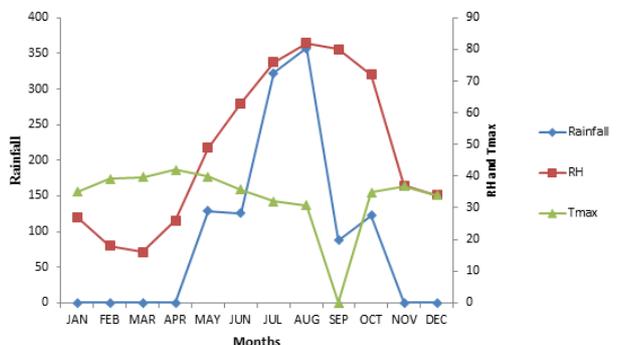


Figure 6: This figure shows mean monthly rainfall, mean relative humidity and maximum temperature year 2010



Generally speaking year 2008 was observed to show a peculiar trend, the rainfall lasted for five month, the

minimum relative humidity was obtained in 2008, the rainfall end in September and the peak rainfall was observed in the month of July contrary to other years where it was observed in August.

Evidence from the seven years considered, shows that there is a significant increase in annual rainfall amount mostly in the month of July and August with the highest amount of rainfall observed in the month of August except in 2008 where the maximum rainfall was recorded in July. This can be attributed to the increase in the relative humidity observed within this period, this indicates a positive correlation between relative humidity and rainfall. with (r²) value of 0.9193 and (r) value of 0.76. The plot also reveals that the maximum temperature decreases to its minimum when the amount of rainfall and relative humidity are both at their maximum, this indicates that the amount of rainfall is dependent on relative humidity but it is independent of maximum temperature.

Figure 7: This figure shows mean monthly rainfall, mean relative humidity and maximum temperature year 2011

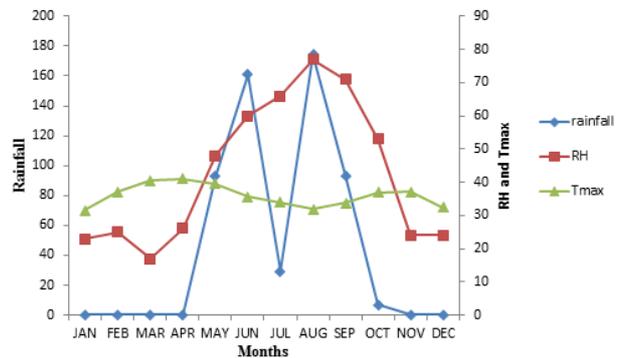
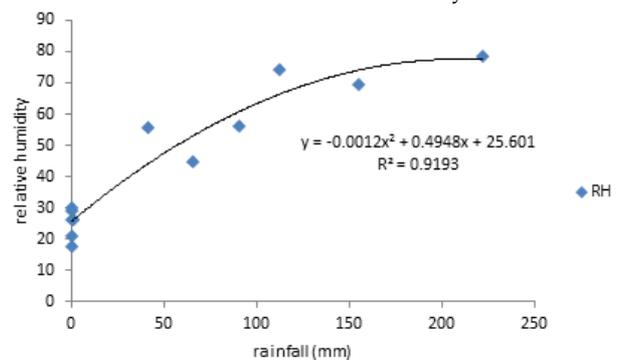


Figure 8: This figure shows average mean annual rainfall and annual mean relative humidity



The seven years considered shows that there is an increase in annual rainfall. It means, therefore, that we

are experiencing wetter conditions in the sudano-sahelian zone of Nigeria. This is at variance with earlier conclusions drawn on the rainfall trends in the zone [1].

CONCLUSION

The following conclusion may be drawn from the study. The maximum duration of rainfall in the study area is six month while the minimum duration of rainfall is five month, the peak rainfall was observed in August with a highest rainfall rate in 2010. The rainfall is directly proportional to relative humidity and inversely proportional to the temperature

REFERENCES

- [1] Ati OF, Iguisi EO, Afolayan JO. Are we experiencing drier conditions in the Sudano-

Sahelian Zone of Nigeria. J. of Appl. Sci. Res 2007;3(12):1746-51.

- [2] Olaniran OJ, Sumner GN. A study of climate variability in Nigeria based on the onset, retreat and length of the rainy season. Int. Journal of Climatol.1989.9:253-69.
- [3] Pollock NC. Africa. University of London P London. 1968.

ACKNOWLEDGEMENT / SOURCE OF SUPPORT

Nil.

CONFLICT OF INTEREST

No conflict of interests was declared by authors.

How to Submit Manuscripts

Manuscript must be submitted online. The URL for manuscript submission is <http://rrpjournals.org/submit>

Manuscript submissions are often acknowledged within five to 10 minutes of submission by emailing manuscript ID to the corresponding author.

Review process normally starts within six to 24 hours of manuscript submission. Manuscripts are hardly rejected without first sending them for review, except in the cases where the manuscripts are poorly formatted and the author(s) have not followed the guidelines for manuscript preparation, <http://rrpjournals.org/guidelines>

Research | Reviews | Publications and its journals (<http://rrpjournals.org/journals>) have many unique features such as rapid and quality publication of excellent articles, bilingual publication, and so on.