



Rainfall timing: variation, characteristics, coherence and interrelationships in Nigeria

Omon A. Obarein

Department of Geography, Kent State University

Email: oobarein@kent.edu

Aim: This study seeks to add to the body of knowledge on the characteristics, spatial variation, coherence and interdependencies of the elements of tropical rainfall timing.

Background: Tropical agriculture is more reliant on the timing of rainfall than on annual totals, and terrible losses have been incurred by farmers because of the inability to effectively determine the start of productive rains. Yet, annual rainfall amount receives more attention from tropical climatologists.

While there has been some studies on rainfall timing in Nigeria, very little is known about the interdependencies of the elements of rainfall timing. The relationship among the onset, cessation, length of the rainy season, and rainfall amount is vague in literature. It is also unclear exactly how cessation dates are influenced by an earlier or later-than-normal onset date, and it is not well-known how these components individually or collectively contribute to higher or lower annual or seasonal rainfall amounts.

METHODOLOGY: The method for estimating the date of onset and cessation of the rainy season for any individual year is the Walter (1967) formula.

Correlations between the variables was determined using Pearson's correlation coefficient.

Spatial coherence can be estimated from the interannual variance of the Standardized Anomaly Index (SAI), spatially averaged standardized anomalies (Katz and Glantz 1986).

RESULTS

The study revealed divergent characteristics between the onset and the cessation of rainfall; progressing in opposite direction, with a very high latitudinal variation in each. Rainfall onset has a relatively high interannual variability, with an average CV of 21%, compared to 3.9% for cessation. Onset also has a larger spatial range of 137 days, compared to 82 days for cessation. Additionally, rainfall cessation was found to be more spatially coherent than the onset, but both revealed a weak spatial coherence.

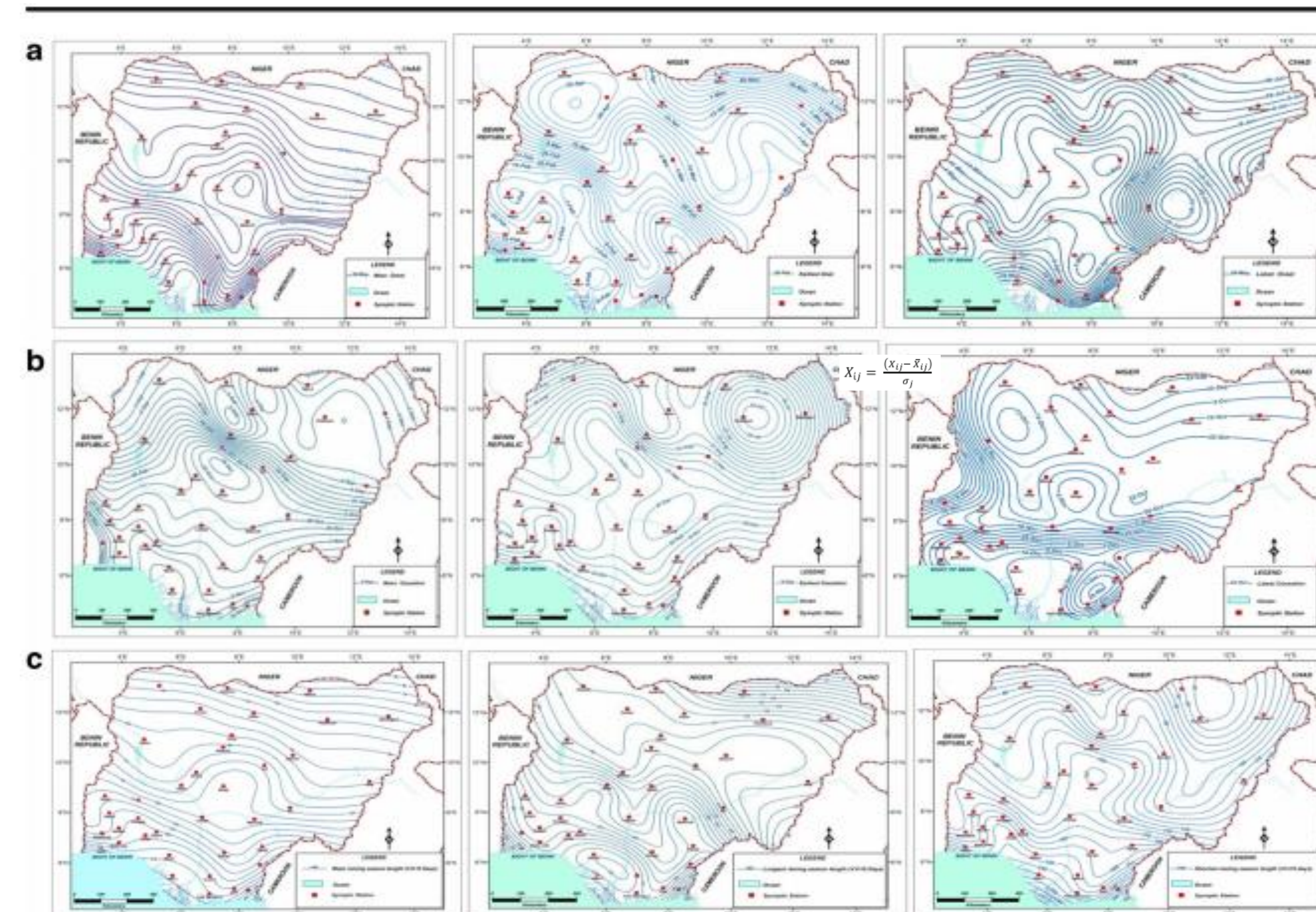


Figure 1: Spatial variation of the a mean, earliest, and latest onset of the rains; b mean, earliest, and latest cessation of the rains; and c mean, longest, and shortest rainy season length

Table 1: North/south contrasts in rainfall timing

Rainfall characteristics	Average for Southern stations	Average for Northern stations
Mean rainfall amount	2015 mm	763 mm
Mean rainfall onset	Mar 1 (60)	May 29 (149)
Mean rainfall cessation	Nov 8 (312)	Sep 21 (264)
Mean length of the rainy season	8.5 months	4 months
Onset CV (%)	32	10.4
Rainy season length CV (%)	4.2	16.7

Discussion

Rainfall cessation is indecisive and weak in setting the length of the rainy season because of its low and uniform interannual variability. The onset, in contrast, is more predictive of the rainy season length.

The onset, cessation, and rainy season length appear closely associated with the amount of rainfall when the onset occurs late, cessation is early, and rainy season length is relatively short—conditions that are satisfied by the rainfall characteristics in Northern Nigeria, and contrasted with conditions in the rainy Southern latitudes. It is likely that Southern stations show little association with rainfall amount because the onset is usually quite early, thus allowing for a longer rainy season, and ample time for rainfall amount and rainfall onset to vary in more ways.

Table 2: Interannual variance of the SAI

Region	N	Var (SAI) (%)	
		Onset	Cessation
Nigeria	38	13.05	17.07
Sahel	4	46.46	58.68
Humid tropical	15	28.60	34.46
Dry tropical	11	20.84	34.39
Sub-equatorial	7	49.52	49.40

CONCLUSION

The implications of rainfall timing extend to other domains of tropical climatology. Assessing trends and fluctuations in the timing of rainfall may serve as a useful tropical climate change signal. It would be interesting to note just how different a climate change signal the timing of rainfall is from other rainfall attributes, especially rainfall amount? And how reliable is it?

References

- Bello NJ (1996) An investigation of the characteristics of the onset and cessation of the rains in Nigeria. *Theor Appl Climatol* 54:161–173
- Moron V, Robertson AW, Ward MN (2006) Seasonal predictability and spatial coherence of rainfall characteristics in the tropical setting of Senegal. *Mon Weather Rev* 134:3248–3262
- Recha CW, Makokha GL, Traore PS, Shinsanya C, Lodoun T, Sako A (2011) Determination of the seasonal rainfall variability, onset and cessation in semi-arid Tharaka district, Kenya. *Theor Appl Climatol* 108:479–494