

Analysis of 30 years rainfall variability in Imo State of southeastern Nigeria

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Many variations in rainfall have occurred for different climatic regions and individual locations in Nigeria with associated disasters. Every rainy season in Nigeria, wind gusts arising from tropical storms claim lives and properties worth millions of naira across the country. Flash floods from torrential rains wash away thousands of hectares of farmland. Dam bursts are common following such floods. Rainfall is one of the atmospheric driving forces responsible for climate variation and its effects in Imo state of Nigeria as in other parts of the world. A study in 2009 indicated that about 16% of the erosion in Owerri Municipality of Imo State is caused by rainfall (Maduka, 2009). Other current research shows that 91% of malaria cases in Orlu, Imo State, are attributed to rainfall variability (Okorie *et al.* 2014), which means that rainfall promotes mosquito breeding. The aim of this research is to analyse variability in rainfall in Imo State of Nigeria over 30 years. Ground truth precipitation data for 1980–2009 acquired from Nigeria Meteorological Department were used. The results show many variations in rainfall within the period under study, which have caused some environ-hydrological problems including coastal erosion, flooding and flood-related disasters (such as pollution, increased disease vectors, communicable diseases and epidemics). Such hydrological problems are the effects of climate variation induced by rainfall anomalies.

Imo State is located between latitude 4°45'N and 7°15'N and longitude 6°50'E and 7°25'E, with an area of about 5100 km². It lies within the humid tropics and is generally characterized by a high surface air temperature regime year-round. Mean minimum temperature is 23.5°C and mean maximum temperature is 32.1°C. Two seasons, wet and dry, are observed in the year. The rainy seasons begin in April and lasts till October. The State experiences climate variations following rainfall variability. It is on this premise therefore, that this study focused on determination of the shifts in rainfall and the associated disasters as the evidence of climate variation in Imo State.

METHODOLOGY

Mean monthly rainfall data from Owerri synoptic station between 1980 and 2009 converted to annual mean were collected from the Nigerian Meteorological Department, Lagos (Table 1). Rainfall data is used in this study as an indication of rainfall being a key climatic variable. The research covers one climatic period of 30 years that provides a better platform to investigate the variability and changes in the climate systems in the study area. The mean annual rainfall data were used to construct a rainfall chart of the state for the climatic period (Fig. 1) and with the chart, the analysis of the pattern and trends of rainfall in the area was carried out.

RESULTS AND DISCUSSION

This study established that there is variability in the weather and climate system of Imo State due to the observed shifts in rainfall within the 30-year climatic period. For example, the average mean rainfall in Table 1 from 1980 to 1982 was the same 3.4%, but in 1983, there was sharp decline in rainfall with the mean 2.2%, and in 1984 it increased to 3.0%, 1985, 3.4% and 1986, 3.5%. In 1987 it dropped to 2.9% and rose to 3.6% in 1988/89, then in 1990 it rained heavily with 4.2% and dropped to 3.5% in 1991, and remained high for 7 years till 1998 when it declined to 2.3%. In 1999 it shifted to 3.5% and remained high above 3.0% throughout, except in 2002 with 2.9%, 2004 with 2.5% and in 2009 with 2.9%.

This research ascertained that the shifts and variability in rainfall over the state within the period under study show some evidence of climate variations and change in the climate of the area.

Table 1 Rainfall data for Imo State, 1980–2009 (Owerri synoptic station).

Year	Total RF (mm)	Monthly mean (mm)	Mean/30-year total (%)	Year	Total RF (mm)	Monthly mean (mm)	Mean/30-year total (%)
1980	2398.2	199.9	3.4	1995	2622.3	219	3.7
1981	2432.7	202.7	3.4	1996	2705.5	225	3.8
1982	2404.3	200.4	3.4	1997	2891.4	241	4.1
1983	1557.9	129.8	2.2	1998	1640.1	136.7	2.3
1984	2153.2	179	3.0	1999	2515.4	209.6	3.5
1985	2396.1	199.7	3.4	2000	2337.2	195	3.3
1986	2482.9	206.9	3.5	2001	2304.3	192	3.2
1987	2075.5	173	2.9	2002	2053.7	171	2.9
1988	2563.7	213.6	3.6	2003	2327.8	194	3.3
1989	2581.5	215	3.6	2004	1762.3	147	2.5
1990	2961.3	246.8	4.2	2005	2236.6	186.4	3.1
1991	2567.4	210.6	3.5	2006	3209.1	267	4.5
1992	2424.1	202	3.4	2007	2361.6	197	3.3
1993	2182.8	181.9	3.1	2008	2470.2	205.9	3.5
1994	2626	219	3.7	2009	2092.8	174.4	2.9
Total 1980 to 2009					6110.5		

Source: Field Survey 2011; NIMET 2011, Lagos, Nigeria

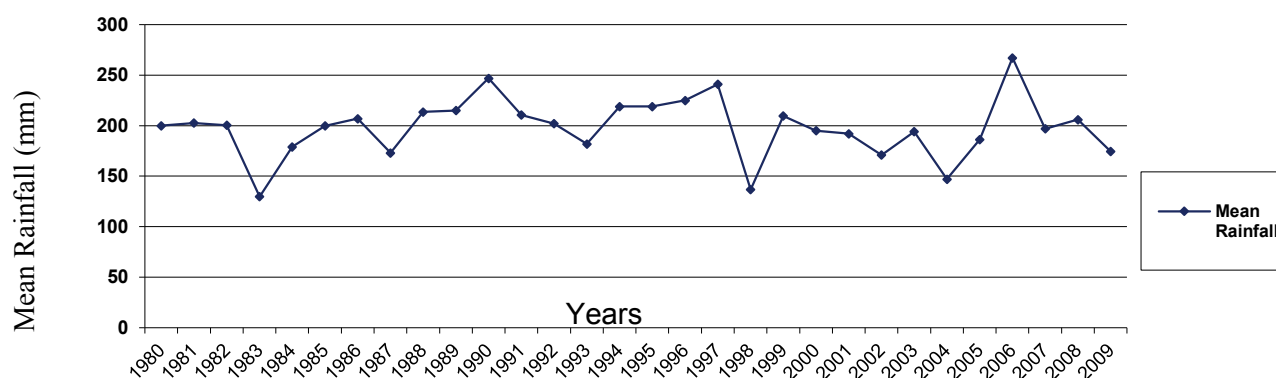


Fig. 1 30 years (1980–2009) rainfall variability curve in Imo State.

CONCLUSION

The Earth has experienced cycles of temperature and precipitation changes on a geological scale. The overlying mechanism for the various changes in weather and climate system is related to restless atmospheric processes, which are always in a delicate state of equilibrium. Nnaji (1998) reported that variations in rainfall intensified for the different climatic regions and individual locations in Nigeria in the last three decades of the last century. However, this study indicates that there is variation in the climate of Imo State following rainfall variability and a lot of negative impacts have been created by this climatic phenomenon in the area.

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