

A Study Of The Daily Weather Variation Of Abuja, North Central, Nigeria: A Case Study Of The Month Of April

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Abstract— This research work investigated the daily weather variation of Abuja, Nigeria, for the month of April, using the data from Automatic weather station installed at Mathson Space International School, Abuja. Graphical method was used to analyse and represent the nature of the variations of all the parameters. It was shown from the result that there was daily variation in all the parameters but less experienced in atmospheric pressure, though has a surge at its middle before returning to initial trend. It was observed that the maximum, minimum and average daily temperatures of the study area for the month of April, 2019, are 34.920C, 30.170C and 32.490C. Also, the maximum, minimum and average daily atmospheric pressures are 975.64 hpa, 948.33 hpa and 968.32 hpa. The maximum, minimum and average daily relative humidity values are 65.58%, 47.06% and 55.51%, while the maximum, minimum and average daily wind speed values are 1.01 m/s, 0.49 m/s and 0.76 m/s. It was concluded that there were general variations in all the parameters irrespective of the nature.

Index Terms— Agriculture, Environment, Pressure, Radio signal, Satellite, Temperature.

I. INTRODUCTION

Weather is the atmospheric condition of a place over a short period of time. This could be in hours, days, months or years but not above 35 years. The variations in atmospheric parameters have effects on radio or television communication signals, environment, water, food production, and even on humans, thus studying the nature of its variation becomes imperative.

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In communications, radio wave propagation is concerned mainly with the properties and effects of the medium situated between the transmitting and receiving antennas (Amajama, 2015).

Climatic elements such as rainfall, temperature, evapotranspiration play important roles in crop (Aondoakaa, 2012) as the excess of any of these or its inadequate will also lead to unfavourable results or inadequate crop yields.

In the study of the effects of temperature and wind speed on satellite signal at KU, the result obtained showed that both temperature and wind speed have inverse relation with radio signal at this band (Ayantunji, *et al.*, 2018).

Some changes in climate are challenges to the planet, and some of these result in drought, flooding, low agricultural productivity, alteration of surface and ground water (Oruonye, 2014).

The radio or television signal transmits better if the wind propagates in a similar path as the signal to the receiver antenna, but worse in the contrary directions. Also, the speed of the wind aids signal travel to some little extent if it is coursing parallel to the signal, but becomes detrimental when the wind is tangential or anti-parallel (Amajama and Daniel, 2016).

According to Ale (2018), it was observed that the signal strength was lower during the sunny period but higher in the morning and evening when there was no or little sunshine. It was observed also that relative humidity was lower during sunny period of the day while the temperature was higher during sunny period. Also, weather is made up of multiple parameters and the environmental conditions produced by the different weather parameters have an impact on the quality of the surrounding ecosystem (Fondriest.com).

These various effects of atmospheric parameters as reported above though studied in other places outside Abuja, or done in Abuja using yearly atmospheric data calls for further studies to obtain more details as it relates to short durations variations such as daily which is the focus of this work.

II. STUDY AREA:

Abuja, the capital city of Nigeria, is located between latitude 8.25⁰ and 9.20⁰ North of the equator and longitude 6.45⁰ and 7.39⁰ East of the Greenwich meridian. It was formed in 1976 from parts of Kogi state, Nasarawa state and Niger state. It is bounded by Niger state to the West and North, Kaduna to the Northeast, Kogi to the south west and Nasarawa to the east and south. The rainy season is between April- September and dry season is between October -March.

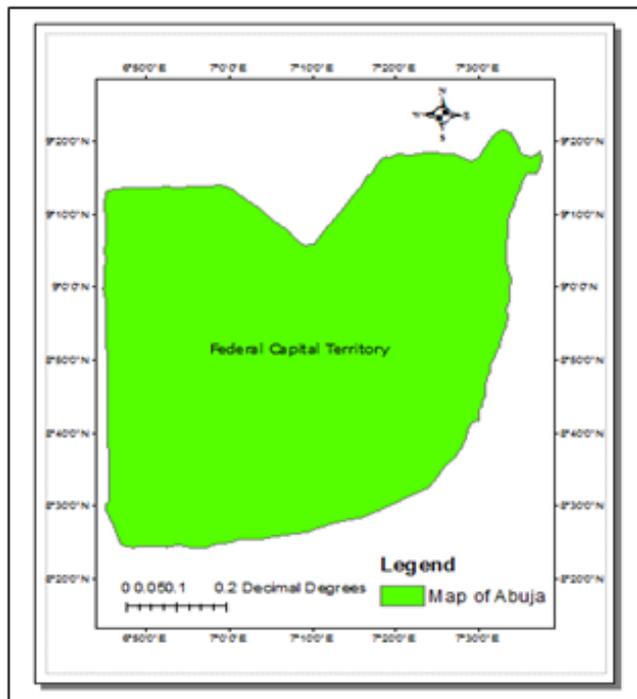


Fig. 2: Map of study area

III. METHODOLOGY

3.1 Materials

The material used for this work are data of temperature, atmospheric pressure, relative humidity and wind speed measured by a weather station in Mathson Space International School, Karshi, Abuja. The hourly parameters beginning from 5.am to 9pm for the period of 4th April to 30th April was collected and the average will be calculated to get the average daily values of each of the atmospheric parameters.

3.2 Method

This work employed graphical and tabular representation approach to analyse the nature of variations of the atmospheric parameters for the period under study. This will be carried out using Microsoft excel worksheet. The average daily parameters beginning from 5.am to 9pm for the duration of 4th April to 30th April was calculated using the excel worksheet. Graphical representations were also done for each of the parameters in order to display the clear nature of their daily variations.

IV. RESULTS AND DISCUSSIONS

Table 1.0 shows the values of the temperature, pressure, relative humidity and wind speed measured by the weather station in April. It was calculated from the average hourly values of the parameters recoded from 5.00 am to 9.00 pm. The reading was done from 4th April to 30th April. It can be observed from the result that there was daily variation in all the parameters even though significant change did not occur in some parameters like in the other.

Table 1.0: Measured atmospheric parameters for the month of April

Days	Temp (0 C)	Pressure (hpa)	RH (%)	Wind speed (m/s)
4	31.99	966.75	58.58	0.82
5	32.04	966.29	58.52	0.84
6	30.54	965.99	65.55	1.01
7	30.55	965.95	65.58	0.85
8	33.33	967.71	54.67	0.99
9	33.37	967.51	55.48	0.86
10	32.3	967.94	55.03	0.74
11	31.86	968.43	55.18	0.81
12	32.07	968.37	53.91	0.77
13	30.57	969.80	52.12	0.89
14	30.17	969.86	52.33	0.88
15	30.35	969.81	52.27	0.91
16	32.97	967.35	51.52	0.62
17	32.87	948.33	51.67	0.71
18	33.62	968.60	48.09	0.95
19	34.27	920.35	49.27	0.72
20	33.43	975.64	49.21	0.49
21	34.92	969.91	47.06	0.61
22	33.16	974.15	55.91	0.91
23	31.21	972.26	63.03	0.69
24	31.22	972.29	62.61	0.68
25	32.76	972.10	60.39	0.72
26	32.79	971.00	61.36	0.62
27	34.58	973.18	55.03	0.53
28	34.55	972.20	54.76	0.57
29	32.84	971.86	54.82	0.72
30	32.78	971.05	54.88	0.51

Unlike temperature and relative humidity, the daily variation of the atmospheric pressure in the area was not much. This situation is similar to the variation of the daily speed of the wind in the study area for the period under study. This is also shown graphically in figure 2.0

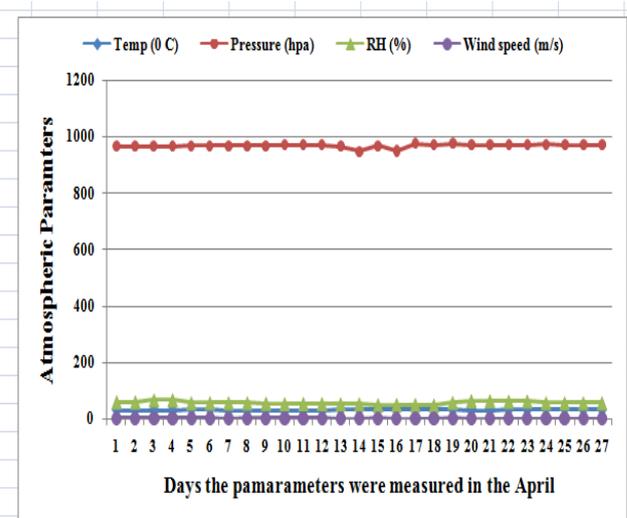


Fig. 2.0: Graph of the four atmospheric parameters

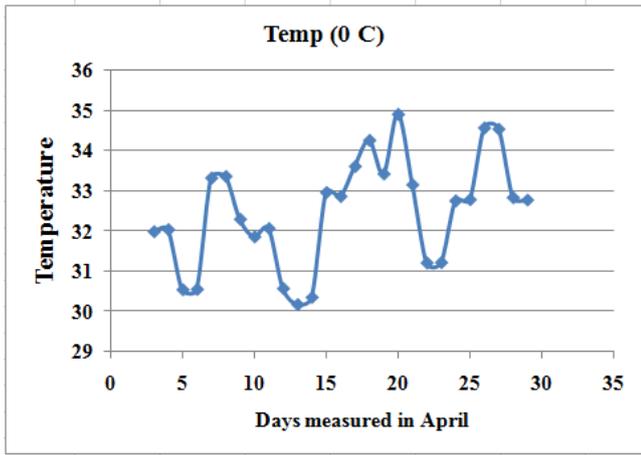


Fig. 3.0: Graph of Temperature

The variation of the daily temperature of the area is to some extent random as it appears to be in a near zigzag form. It was however observed that the temperature at the beginning of the month was lower than the temperature from the middle of the month, and the trend continues towards the end of the month (Fig. 3.0)

Although the variation of the atmospheric pressure was not much pronounced as in other quantities, there was an atmospheric pressure surge around the middle of the month in which a random oscillation of the pressure was experienced but became normal after a few days (Fig. 4.0). This strange occurrence or sudden variation might be as a result of changes in other atmospheric components, and further work which will be carried out in future to ascertain the cause or causes.

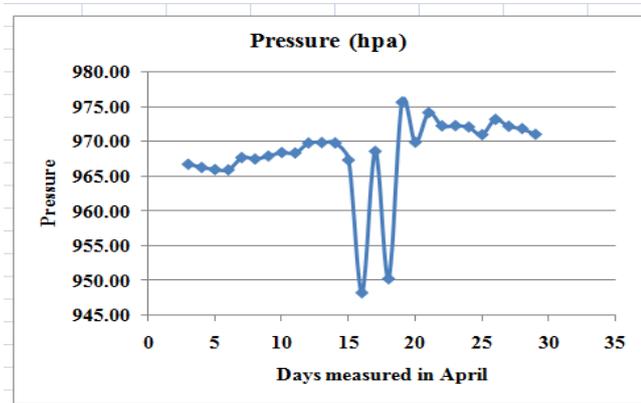


Fig. 4.0: Graph of Atmospheric Pressure

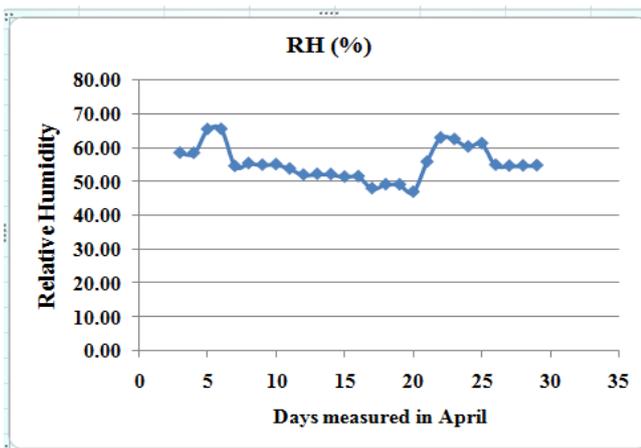


Fig. 5.0: Graph of Relative Humidity

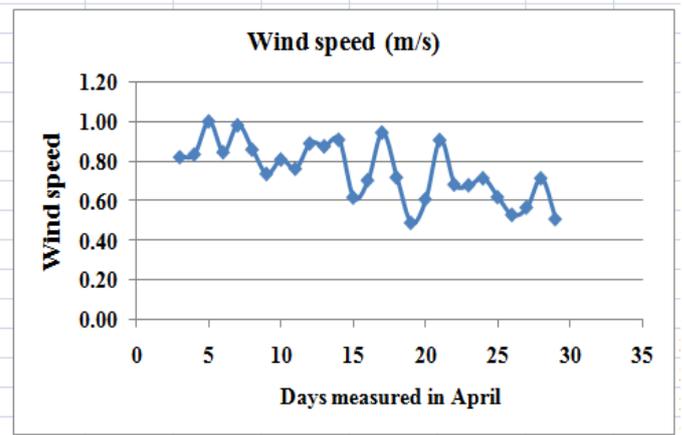


Fig. 6.0: Graph of Wind Speed

The relative humidity of the study area in the month of April was higher at the beginning and the end of the month, though became low a few days to the end of the month. The lower relative humidity of Abuja was recorded from around after the first week of the month till some days after the middle of the month before it began to rise again. This might be likely connected to the temperature variation, even though the variation of the graph of the temperature did not follow the same or reverse trend as that of relative humidity (Fig. 5.0). As for the wind speed, the nature of its variation can be described as irregular because it did not follow any particular pattern. It can be however said that the wind speed was less towards the end of the month, as it can be seen sloping downward from left to right though still maintain its irregular or random nature (Fig. 6.0).

On the whole, the maximum, minimum and average daily temperatures of the study area for the month of April are 34.92°C, 30.17°C and 32.49°C. Also, the maximum, minimum and average daily atmospheric pressures are 975.64 hpa, 948.33 hpa and 968.32 hpa. The maximum, minimum and average daily relative humidity values are 65.58%, 47.06% and 55.51%, while the maximum, minimum and average daily wind speed values are 1.01m/s, 0.49m/s and 0.76m/s

Table 2.0: Maximum, minimum and average values of the atmospheric parameters

Level /Parameters	Temp (°C)	Pressure (hpa)	RH (%)	Wind Speed (m/s)
Max	34.92	975.64	65.58	1.01
Min	30.17	948.33	47.06	0.49
Average	32.49	968.32	55.51	0.76

V. CONCLUSION

The data from an automatic weather station has been used to assess the daily weather variation of Abuja, Nigeria, for the month of April. It can be concluded from the results that there were daily variations in all the four atmospheric parameters (temperature, pressure, relative humidity and wind speed) but the variation in atmospheric pressure was little compared to that of other quantities except the point of sudden large variation at the middle. From the average temperature being

32.49 while the maximum daily temperature was 34.92⁰C and the minimum being 30.12 ⁰C, it can be concluded that the range of the variation in temperature for the month of April was very little.

This information will be important to geographers, environmental specialists, communications experts, agriculturalists as well as solar power systems personnel in Abuja as well other North central states with similar atmospheric conditions.

VI. RECOMMENDATION

The research work was carried out in this area when it has not started raining or when the rainfall was just very little in the area, it is recommended that this work be carried out in the month of rainfall in the area. Also, the sudden surge in the atmospheric pressure in this month might be caused by one or more of the atmospheric components; it is also recommended that the relationship between atmospheric pressure and other remaining three quantities be investigated for clarification.

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