
Climate Change Dynamics Versus Human Biodiversity Responses in a Rainfall Upland Area

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ABSTRACT: *The study has explored statistical and time series techniques that are used in the analysis of the data on conditional and specified activities of the atmosphere, ambient and sensible activities in Ado Ekiti, South West Nigeria. The plots of the atmospheric-ambient temperatures against sequential time series reveals an uneven pattern in temperature exponents or changes over the period covered, with behavioral trends with high relative wind speed resulting in most precipitations. It is visualized from the results that the ambient indices are with deviance of about $\pm 4^{\circ}\text{C}$ compared to atmospheric data. Observations also shown from our comparisons that with atmospheric temperatures at about $33^{\circ}\text{C} \pm 4^{\circ}\text{C}$, saturated cloud resulting in precipitations were visible. Results show that, minus the tropical average atmospheric temperature which is 18°C , maximum temperature $T_{D_{max}}$ determining features for precipitations are about 19.5°C and 17.5°C in May and June respectively, prevalent for specified days under study. Rarely on clear air days with about $33^{\circ}\text{C} \pm 0^{\circ}\text{C}$, possible precipitation were stratified or widespread when maximum temperature $T_{D_{max}}$ reaching about 15.0°C and 17.0°C justifying human biodiversity activities in the area of study.*

KEYWORDS: climate change dynamics, thermal sensitivity, humidity controlled air temperature, physiological stress, human biodiversity, wind speed, rainfall upland area

INTRODUCTION

Climate changes have been found to affect human health through trails of varying complexity, scale and directness and with different timing. Also, impacts would vary geographically as a function of environment, topography and of the vulnerability of the local population. The weather variables which include the temperature, wind speed, relative humidity and dew points have both positive and negative impacts although experts review anticipate predominantly negative. This

condition is true since climatic change would interrupt or otherwise alter a large range of natural ecological and physical systems that are integral part of earth’s life- support system.

Through climate change humans are contributing to a change in the conditions of life on earth. The more direct impacts on health include those due to changes in exposure to weather extremes, heat waves, cold spells and increases in other extreme weather events which may include floods, storms, and droughts; and increased production of certain air pollutants. Understanding and interpretation of climate variables may compensate for possible increases from high frequency of heat waves and cold spell in a particular changing climate. For vector-borne infections, the distribution and abundance of vector organisms and intermediate hosts are affected by various physical factors; temperature, precipitation, humidity, surface water and wind and biotic factors; vegetation, host species, predators, competitors, parasites and human interventions. However, the main pathways and categories of health impact of climate change are however shown in Table 1.0

Climate Changes	Modulating Influences	Health Effects
Heat waves	Transmission dynamics	Air pollution related health effect
Extreme weather	Agro- ecosystems	Extreme weather related health effects
Temperature	Socioeconomics, Demographics	Temperature related illness and death
Precipitations	Hydrology	Mental and nutritional infectious
Regional weather changes	Microbial contamination pathways	Water and food borne disease ,

Table 1.0 Pathways by which climate change affects human health as reported by Patz, J. et al (Patz, J. et al., 2000)

LITERATURE REVIEW

The atmospheric thermal factors comprise atmospheric elements which include air temperature, air humidity, wind velocity, short and long wave radiation, which have a thermo-physiological effect on man outdoors and indoors. The significance to health is associated with the close linking of thermo regulation and circulatory regulation. The causes and effects relating between the atmospheric environment and human health or human comfort can be analyzed by a human bio meteorological classification (Matzarakis and Mayer, 1996; VDI, 1998). The extent of change in the frequency, intensity and location of extreme weather events due to climate change remains uncertain in an earth region or location. In the earth regions with a high level of excess cold, the beneficial impact may outweigh the detrimental, there are still time or periodic adaptation that are required.(Langford, I.H. and Bentham, G. 1995; Rooney, C. et al, 1998).

Climate change, acting via less direct mechanisms, would affect the transmission of many infectious diseases especially water, food and vector-borne diseases and regional food productivity

especially cereal grains. In the longer term and with considerable variation between populations as a function of geography and vulnerability, these indirect impacts are likely to have greater magnitude than the more direct (McMichael, A.J. and Githeko, 2001; Epstein, P.R. 1999). The bio meteorological classification includes the relevance of air quality conditions to human health depending on the emission sources and the transmission conditions and these factors are determined by atmospheric layers grade of turbulence, wind, precipitation, relative humidity and solar radiation.

Biometry which deals with the biological effects of the weather is another important factor of the health implication of the atmospheric changes and with this, there are reactions of the human organism to the weather such as body reactions, slight and intense biotic sensitivity. However, the fact that air pollution can seriously affect human health has long been acknowledged and resulted in numerous limit, guide and threshold values of air pollutants. Its importance is not least due to the fact that air pollution occurs all year, though for different pollutants at different levels and that hardly any individual protection can be taken against it.

Physiological Temperature Indices	Thermal Sensitivity	Grade of Physiological Stress
0 ⁰ C	Very Cold	Extreme cold stress
4 ⁰ C	Cold	Strong cold stress
8 ⁰ C	Cool	Moderate cold stress
13 ⁰ C	Slightly Cool	Slight cold stress
18 ⁰ C	Comfortable	No thermal stress
23 ⁰ C	Slightly Warm	Slight heat stress
29 ⁰ C	Warm	Moderate heat stress
35 ⁰ C	Hot	Strong heat stress
41 ⁰ C	Very Hot	Extreme heat stress

Table 2.0: Threshold values of Physiological Temperature Indices for different grades of thermal sensitivity in human beings as reported by Matzarakis and Mayer. (Matzarakis and Mayer, 1996)

METHODOLOGY

Time Series Data, Trends and Seasonal Variations

The time series is the time ordered set of observations made on temperature variables and other components contributing to the surface heat fluxing periodically. This series show clearly an understanding for the exponential characteristics of temperature by observing data over a period of time. However, in this study, the time series analyses use quantized or discrete data of the temperature variables to check or validate an agreement with the relevant mathematical model and

other temperature – heat flux gradients considered in this study. The trends facilitate us to assess whether there is a rise (upward trend) a fall (downward trend) or no change (steady trend) in the time series data.

Seasonal variations used in this study are periodic in nature and occur more or less regularly within a period of one year or less due to the effect of the season. The seasonal variations are not restricted only to the effects of the dry and rainy seasons of the years but also include the favorable and unfavorable climate conditions that affect our time data. However, there are fluctuations noticeable in time series data, since our variations seasonally are not constant in all trends and thereby making our analysis of temperature factors to be a little far from conventional.

RESULTS AND DISCUSSION

Sequential Time Series Analyses

The graphs of the time series temperatures (minute and hourly time integrations) were plotted against time, based on different characteristics of results observed from the computer model of our study instruments (the paranometer and the thermo- hygrometer). These variations are to make possible realistic of the idea concepts behind our findings and to quantify the overall behavior of the measured data over the period of study to observe the analytical trend of our data of study. These plots however reveal the nature of the seasonal temperature fluctuations for the different years under study, whether in a way the property seems to be regressive or progressive with time to quantify the extreme effects of temperature on human health.

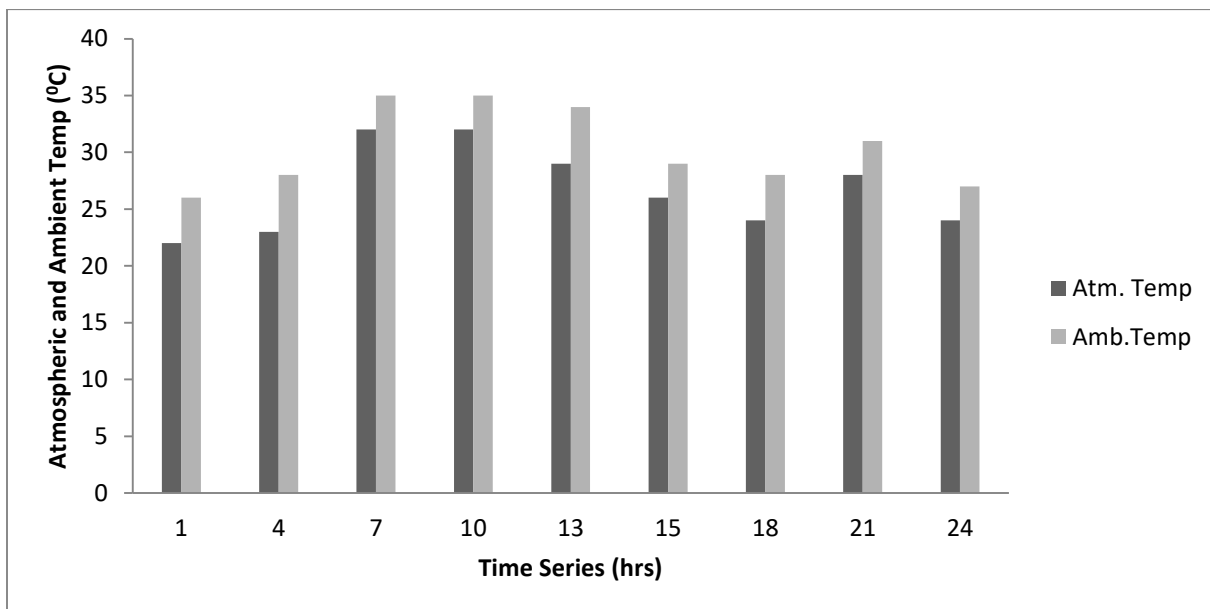


Figure 4.1 Variation of atmospheric (Atm. Temp) and ambient temperature (Amb. Temp) with time for precipitation possibilities in April 24, 2013

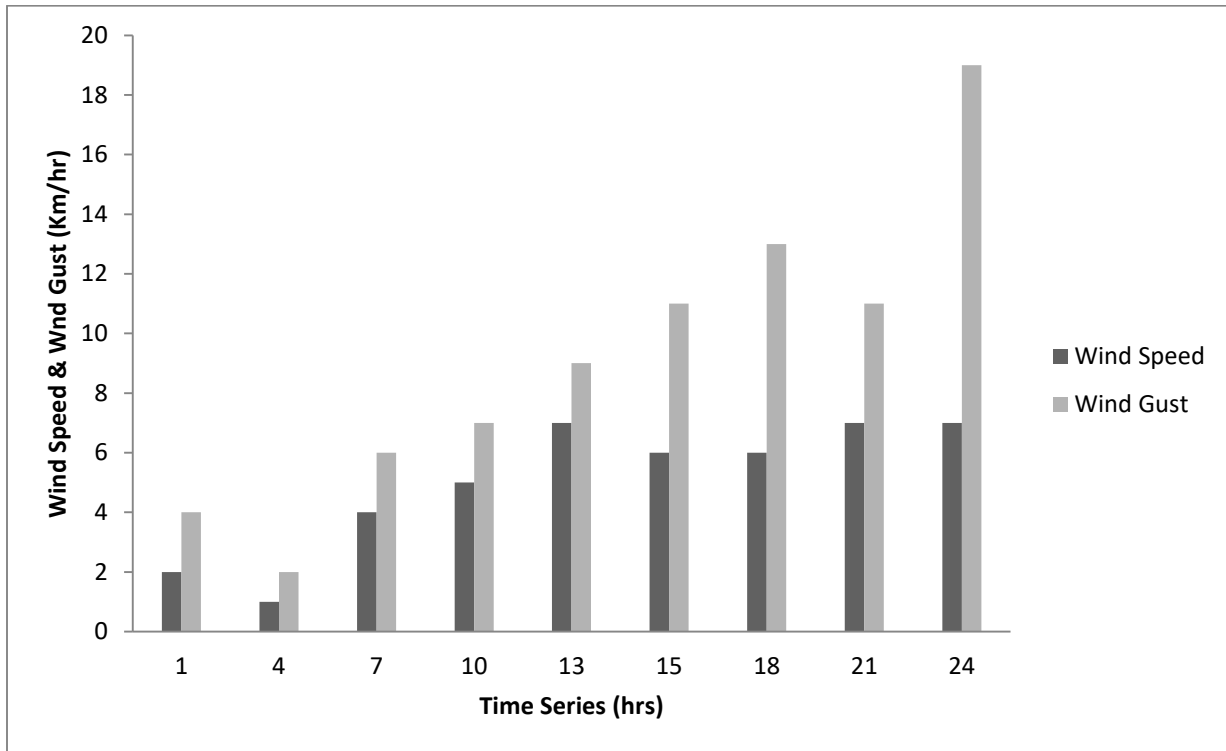


Figure 4.2 Variation of Wind Speed with time For precipitation possibilities in April 24, 2013

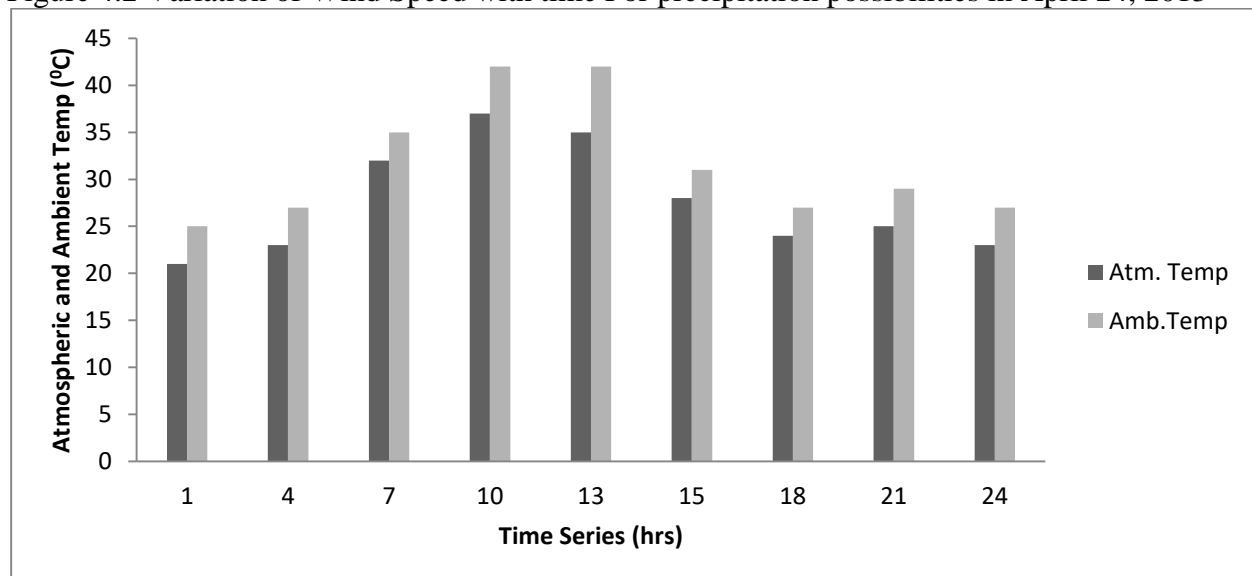


Figure 4.3 Variation of atmospheric (Atm. Temp) and ambient temperature (Amb. Temp) with time for precipitation possibilities in May 6, 2013

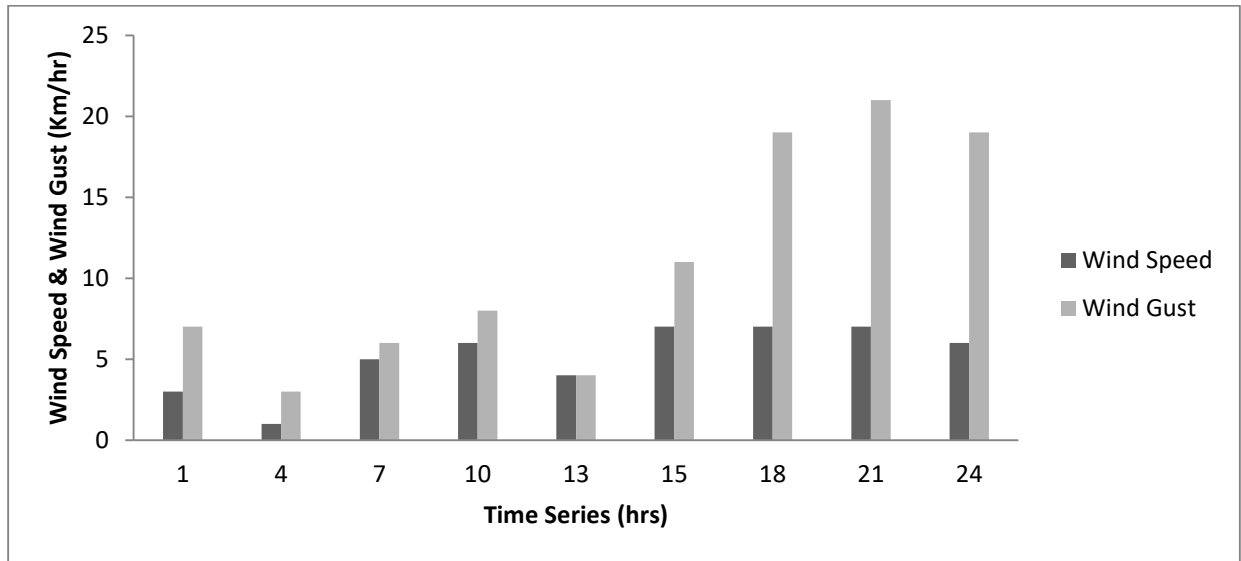


Figure 4.4 Variation of Wind Speed with time for precipitation possibilities in May 6, 2013

The plots of the atmospheric-ambient temperatures against sequential time series reveals an uneven pattern in temperature exponents or changes over the period covered, with aurora behavioral trends with the relative wind speed resulting in most precipitation events, it can be visualized from Figure 4.1 to figure 4.4, that there is a lead in most histogram for the ambient indices with deviance of about $\pm 4^{\circ}C$ even when the wind speed are normal, however precipitation event or cold clouds are visible to wind gust ranging from 6km/hr to 18km/hr as can be observed for the precedence of the terrestrial radiation by the solar radiation just after the solar noon, precipitations were convective. These agree with the fact that the weather system have well defined cycles and structural features that are governed by the law of heat and motion (D. Heristchi and Z. Mouradian, 2000).

It can also be deduced from the graph that the series maintain a trend that are responsive to instantaneous seasonal components such as large bodies of water and wind cloud that are common phenomenon with rainfall upland climate. These become a factor contributing to rain fall indices in April 2013 and are validated by the fact that sun emits its energy at almost a constant rate but a region receives more heat when sun is higher in the sky and when there are more hours of sunlight in the day (C.J Henney and J.W Harvey, 1998). The patterns on the graphs (see figure 4.1 to figure 4.4) have a similar trend but different seasonal variability, this attests a realistic fact that solar radiation exceeds terrestrial radiation during the day and the surface becomes warmer. This also confirms that the amount of solar energy received by any region varies with time of the day, with season, with latitude.

Descriptive Analyses

As can be observed from figures 4.5 to figure 4.8, the amplitude patterns of the time series temperature differences are regular only that, maximum temperature differences are reached at particular relative humidity for either the possibilities of zero precipitation or precipitation events, nonetheless, the relative humidity for days under study are $\geq 50\%$ but characteristically become not only elements for the formation of clouds (cold , warm, mixed phased clouds, or clear air). It becomes evidently clear that the temperature differential gradients would not be the same for our time series data (See figure 4.5 – figure 4.8) on specified days from April to June, 2013, these were cold cloud days.

Observations show from our comparisons, that during the solar noon in all the days under study, when the atmospheric temperature are about $33^{\circ}C \pm 4^{\circ}C$, saturated cloud for precipitations are visible, under these view, the maximum temperature $T_{D_{max}}$ determining features for precipitations about $19.5^{\circ}C$ and $17.5^{\circ}C$ in May and June respectively . (Figure 4.6 and Figure 4.8 shown the pattern) . Clear air days with about $33^{\circ}C \pm 0^{\circ}C$, possible precipitation were stratified or widespread when maximum temperature $T_{D_{max}}$ reached after the noon are about $15.0^{\circ}C$ and $17.0^{\circ}C$ in April and May 2013 (Figure 4.5 and Figure 4.8 shown the pattern). It is however fair to justify from our study that solar variation becomes the major determinant for precipitation possibilities irrespective of other weather elements such as wind, pressure, cloudiness and relative humidity.

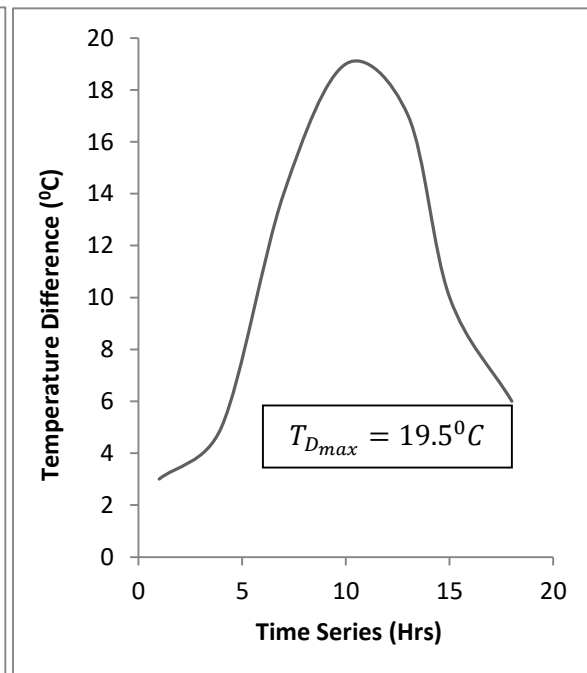
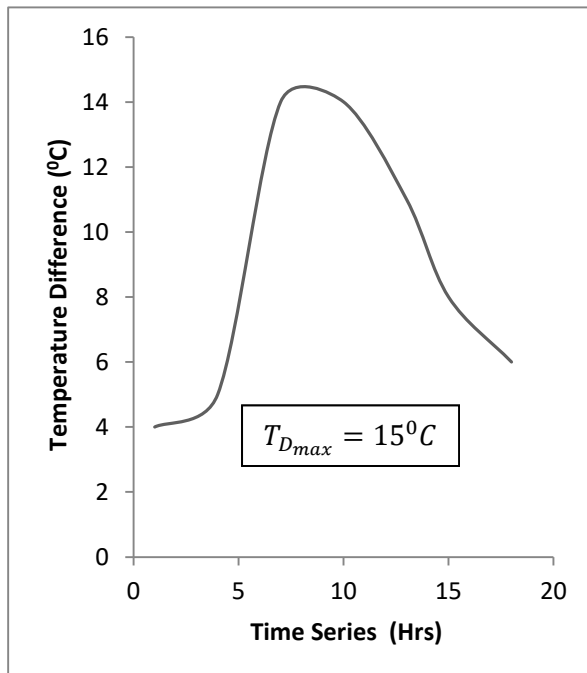


Fig 4.5: Variations for April 24, 2013 Fig 4.6: Variations For May 6, 2013

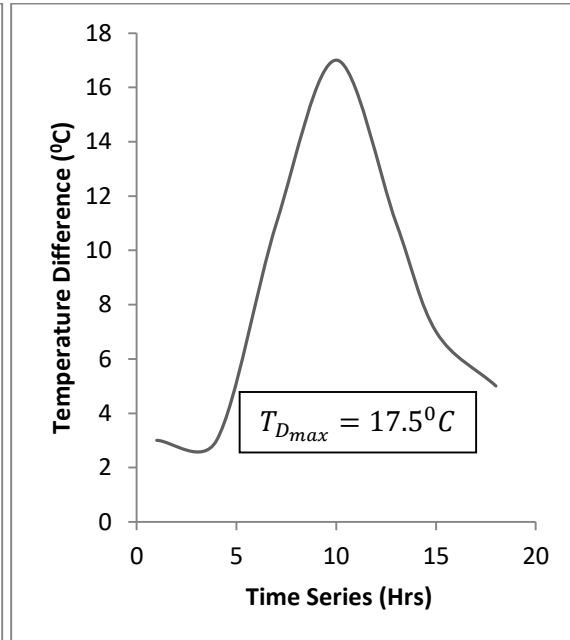
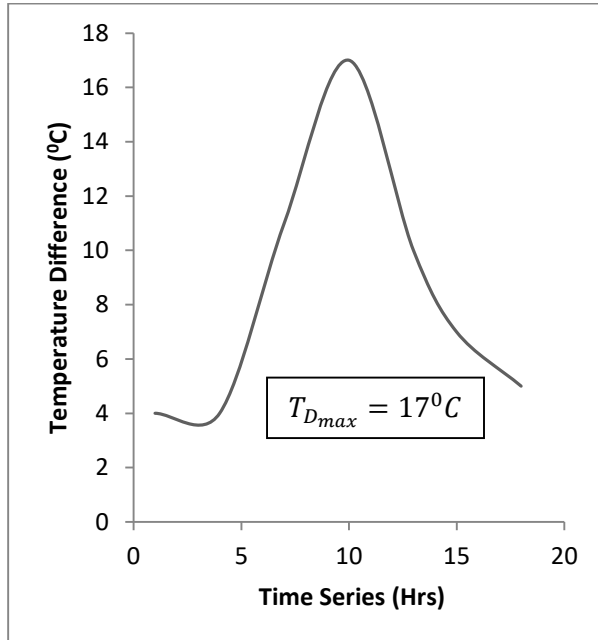


Fig 4.7: Variations for May 30, 2013

Fig 4.8: Variations for June 10, 2013

Figure 4.5 – Figure 4.8: Fitted Amplitude Pattern Time – sequenced Tropical Temperature Differentials on High Relative Humidity Days from April – June, 2013

CONCLUSION

This study has conversely observed how climate change dynamics has influenced human biodiversity activities and responses to changing variables of the weather prevalent to the rainfall upland area of this latest study. Inferences of this study conclude that the tropical climate averages 18°C where large water bodies, wind speed, and relative humidity are favorable to air temperature. This informs that the temporal characteristics of the rainfall upland area under study Ado Ekiti, South West, Nigeria are a favorable belt for health factors and with improved climate for environmental exotic activities.

This paper however gives the data presentations and interpretations of the descriptive autistics of the climate change dynamics continually interfaced by human biodiversity activities. The results and analyses concerning different variables include sample days' events and transect fitted graphs. This work estimated that ambient and atmospheric temperatures variations are significant to growing climate where precipitations as cloud cover are primary for reduction of the effect of biotic factors resulting in many infections.

Our observatory study also confirms that conduction and heat exchange results in warm air and that equilibrium is usually reached when the solar radiation exceeds the terrestrial radiation for which fluctuating temperature exponents are regular in rainfall upland area characteristics. This

latest paper shows that long-term good health of human beings depends on the continued stability and functioning between the weather system, the biosphere's ecological system and physical systems. The potential health consequences of climate change have provided human biodiversity with the basic information to understand seasonal adjustment, climate, climate variability and climate change.

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