AIR TEMPERATURE AT CHANCELLOR COLLEGE 1980-1993:
Has Global Warming Reached Zomba?

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ABSTRACT

Data from the Chancellor College Meteorological Station shows that average annual air temperatures from 1980-1993 have risen by around 1°C. The question must be asked "has global warming come to Zomba?" As there are no records of annual CO_2 levels for Zomba the global warming theory cannot be disapproved. However, a closer look at the Meteorological data from Chancellor College suggests a different hypothesis. The answer, therefore, may be "no".

INTRODUCTION

There are many reports warning about global warming and its potential effects on life on earth if no action is taken to curb it. The popular explanation of troposphere temperature increases is that global warming is due to greater absorption of longwave terrestrial radiation by more atmospheric carbon dioxide produced by the oxidation of carbon through combustion of organic material e.g. fossil fuels, by Man.

Given that 90% of Malawi's fuel requirements, mainly in rural areas, are satisfied by the burning of wood, and given the rise in human population and consequent increase in deforestation and wood burning during the 1980s (Moyo et al 1993), the question to be asked is "could global warming be occurring in Malawi?".

This paper attempts to answer this question by analysing meteorological data kept at Chancellor College in Zomba.

MATERIAL AND METHODS

1980 to 1993 meteorological data were obtained from the Meteorological Station Data Archives (MSDA) at Chancellor College and subjected to Spearman rank correlation analysis to obtain coefficients on several parameters (Table 1).

RESULTS AND DISCUSSION

Analysis of the data from the Chancellor College Meteorological Station showed that average annual air temperatures from 1980 - 1993 have risen by around 1°C.

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Table 1 gives Spearman's rank correlation coefficients for some selected meteorological parameters recorded from the data.

Table 1. Analysis of selected meteorological data from Chancellor College Meteorological Station from 1980 to 1993.

Parameter		Spearman's Rank Coefficient	Significance level
1.	Average Dry Season temperature/time	+0.33	not significant
2.	Average Wet Season temperature/time	+0.19	not significant
3.	Average October temperature/time	+0.65	$p < 0.01$
4.	Average September temperature/time	+0.12	not significant
5.	Average August temperature/time	+0.18	not significant
6.	Average July temperature/time	+0.48	$p < 0.05$
7.	Average June temperature/time	-0.09	not significant
8.	Average May temperature/time	+0.49	$p < 0.05$
9.	October/Dry Season temperatures	+0.60	$p < 0.05$
10.	October average maximum daily temperature/time	+0.48	$p < 0.05$
11.	October average minimum daily temperature/time	+0.25	not significant
12.	October temperature/October rainfall	-0.80	$p < 0.01$
13.	October sunshine hours/time	-0.56	$p < 0.05$
14.	October sunshine hours/October temperature	-0.56	$p < 0.05$

Using these coefficients suggest firstly that, the increase in annual temperature is probably due to an increase in the average temperature of the Dry Season (May to October) (Lines 1 and 2, Table 1). Secondly, since October temperatures, of all the Dry Season months, show the strongest, most significant, positive correlation with time and a strong, positive, significant correlation with Dry Season temperature, then the October increase probably accounts for much of the Dry Season temperature rise (Lines 3-9, Table 1). Furthermore, most of this October rise appears due to an increase in afternoon temperatures (Lines 10 & 11). Finally, October temperatures show a strong, highly significant, negative correlation with October rainfall (Line 12) which suggests the higher daytime temperatures are associated with drier conditions. This is possible since rain has a cooling effect on both surface and air temperatures. Without it, yet given tropical radiation, daily and monthly temperatures will stay high.

October atmospheric humidity is due mainly to indraughts of moist maritime air from the Mozambique Channel brought by circulation around an anticyclone centred over the eastern coast of South Africa (Pike and Rimmington 1965). Once in Malawi, the moist air with its high vapour pressure and dew point temperature is heated by intense early summer radiation, rises rapidly and experiences rapid adiabatic cooling and abundant condensation, producing Cummulonimbus clouds, thunderstorms and torrential rain. The rain then cools both air and surface until clear skies and abundant sunshine return to heat the air and initiate another cycle of ascent, condensation, rain and surface cooling. However, if the winds that bring the moist air are irregular, then air humidity, vapour pressure and dew point temperature will be low. Then despite heating and air ascent, condensation will be limited. Clouds may form, but the rain will not occur. Consequently, surface cooling may also be limited and October temperatures will remain high.

Zomba Octobers have indeed got cloudier as well as drier. The number of sunshine hours in October show strong, significant, negative correlation with time (Line 13, Table 1). Furthermore, since the October sunshine hours also show a significant correlation with October temperatures (Line 14), the increased cloudiness is associated with the temperature rise.

During the Dry Season, an anticyclone develops over central South Africa. However, with increased solar radiation and surface heating in the early summer months as the sun, on its annual apparent passage, enters the Southern Hemisphere, a low pressure system develops over the Kalahari which displaces the anticyclone to the east and brings the moist air to Malawi (Pike and Rimmington 1965). Lower solar radiation would create a less intense Kalahari low, inhibit the displacement and might account for the drier, warmer but cloudier Octobers, the warmer Dry Seasons and the higher annual temperatures.

CONCLUSION

A decrease in early summer solar radiation over Southern Africa being for the temperature increase in Zomba during the 'eighties and early' nineties is therefore presented as an alternative hypothesis to "Man-induced Global Warming".

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