SOLAR ACTIVITY AND CLIMATE CHANGE — A SUMMARY

by

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SOLAR ACTIVITY AND CLIMATE CHANGE—A SUMMARY

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1. INTRODUCTION

While there is abundant evidence worldwide of synchronous linkages between rainfall, river flow and sunspot activity, the causal linkage was rejected in the IPCC (2001) reports on the grounds that variations in solar radiation are too small to account for climatic variations. This response is unsatisfactory, as it does not explain the wealth of data, dating back for more than 100 years, that demonstrates that a causal linkage does indeed exist.

This is the problem that the two of us were determined to resolve. We believe that we have produced new evidence that will eventually lead to the conclusion that variations in solar activity and not the burning of fossil fuels are the direct cause of the observed multiyear variations in climatic responses.

The starting point was the incontestable, statistically significant (95%), 21-year periodicity in the South African rainfall, river flow and other hydrometeorological data.

2. PERIODICITY

Table 1 shows the presence of 21-year concurrent periodicity in South African hydrometeorological data. The degree of statistical significance is dependent on the length of the record as well as the magnitude and nature of the variability about the mean. The periodicity is almost certainly present in all hydrometeorological data series, other than open water surface evaporation, but has not yet reached a high level of statistical significance at some of the sites.

The commencements of the periods are readily identified and predictable. They are characterised by sudden reversals from sequences of years with low rainfall (droughts) to sequences of years with widespread rainfall and floods.

While the reversals are a characteristic of the start of the periods, the periodicity refers to the whole spectrum of values. For example, a significant correlation exists between all the fifth values after the commencement of the periods, all the ninth values, and so on. This relationship is stronger than the relationship between successive values in the hydrometeorological data where no statistically significant serial correlation exists.

It is very interesting to note the absence of 21-year periodicity in the evaporation data in Table 1. Another observation is that the magnitudes of the periodic changes relative to the long-term mean values, increase from evaporation (absent) to rainfall,
to river flow, to flood peak maxima. Together, these characteristics indicate that the periodicity is amplified by the processes involved in the poleward redistribution of solar energy.

Neither the lengths of the periods nor the synchronous occurrences are precise in the mathematical sense but their presence is beyond all doubt.

3. WET AND DRY SEQUENCES

Table 2 shows the alternating wet and dry sequences in South African hydrometeorological data. The following conclusions can be drawn from the independent observations by Tyson and Bredenkamp. Each author used different data and different analytical methodologies. Bredenkamp analysed lake and groundwater levels while Tyson studied areal rainfall over South Africa.

Begin with the right-hand column of the table. This shows the years in which the 21-year reversals occurred based on studies by Alexander. The fourth and fifth columns show the alternating wet and dry sequences. Note how the periods between the reversals each consist of a wet sequence followed by a dry sequence. This confirms the pattern observed in other hydrometeorological data.

There is also a good correspondence between the dates in the first column, as well as between the first and last columns considering the different data sets and methodologies used by the two authors. These are well within the range of achievable accuracy in most hydrometeorological estimates.

Note the similarity between the lengths of these sequences and the biblical prediction of seven years of plenty followed by seven years of famine. We believe that the similarity is more than coincidental.

The regular grouping of alternate sequences of wet and dry years and its linkage with the 21-year (approximately) periodicity is beyond all doubt. The best description of the periodic behaviour is that provided by Hutchins more than 100 years ago. 'The yellow line rising steeply to a maximum and then falling away gradually to a minimum is the sunspot curve - a curve which ought to be graven on the mind of every man and woman in South Africa.' There is no evidence of the sinusoidal oscillatory behaviour reported in the climatological literature.

An important characteristic is that the most extreme conditions occur at the beginning of the periods (floods) and at the end of the periods (droughts) with sudden reversals from droughts to floods that identify the beginning of the periods.
This periodicity is very important for all those who maintain that global warming will result in increased variability in the hydrological process—specifically floods, droughts and water supplies. If they are to provide convincing arguments they will have to demonstrate (not postulate) how global warming will change the alternating wet and dry sequences; the associated periodic properties; and the drought and flood severities. Simple statements that global warming will increase the variability in the hydrological processes are unacceptably naïve.

### 4. UNCERTAINTIES

A study of the literature shows that there are still large uncertainties in three related issues. These are the physical causes of the regular sunspot activity; reasons for the different climatic responses to the alternating sunspot cycles; and the mechanisms that link changes in sunspot activity with corresponding changes in climate.

We believe that we can provide answers to the first two questions. The following summary is from our joint paper *Linkages between solar activity, climate predictability and water resource development* (Alexander et al 2007) now in press.
5. CAUSE OF SUNSPOT ACTIVITY

It has long been suspected that the motions of the orbiting planets influence the earth’s climate, particularly the four major planets Jupiter, Saturn, Uranus and Neptune. Our studies confirmed this. The solar system has a centre of mass (SSCM). The orbits of the four major planets are such that at intervals of 21 years they are grouped together in space. When the movement of the centre of mass of the four planets about the SSCM is plotted in three-dimensional space, this provides information on the reciprocal movement of the sun. It was confirmed that this periodic grouping creates a wobble in the trajectory of the sun through galactic space.

As the sun wobbles about the SSCM as it moves through space there will be periods when it is ahead of the SSCM followed by periods when it lags behind the SSCM. In order to get ahead of the SSCM the sun’s galactic velocity accelerates. The velocity decelerates when it moves to a position lagging the SSCM.

We found a direct relationship between the grouping of the four major planets at 21-year intervals; the acceleration of the sun through galactic space; and the first of the two alternating sunspot cycles. This coincided with the wet periods in South Africa’s climate in Table 2. Similarly, the dry periods in Table 2 coincided with the deceleration of the sun through galactic space and the second of the two alternating sunspot cycles. Other scientists have produced evidence that describes the physical processes that link sunspot activity with global climate.

CONCLUSIONS

We believe that our studies provide solid confirmation of the view that the observed multiyear variations in global climate are directly related to variations in solar activity. Despite a diligent search we were unable to detect any adverse, multiyear changes in rainfall, river flow and other hydrometeorological processes that could be attributed to human activity. Our studies are reproducible by anybody with sufficient knowledge in this field.

We trust that our research will trigger a fresh approach to the whole climate change issue. It is necessary to state that neither of us has received any financial or other assistance from any source in connection with these studies.

REFERENCES

