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Memorandum

Causal linkages between variations in solar activity and climatic responses – the final proof?

WJR Alexander, Professor Emeritus,

Department of Civil and Biosystems Engineering, University of Pretoria, South Africa

alexwjr@iafrica.com

In the 1800s millions of people in India died during recurrent famines. Astronomers (no climatologists then) reported a synchronous linkage with sunspot activity. In 1889 a South African forester who served in India during the famines examined South African temperature and rainfall data recorded at the Royal Observatory in Cape Town since 1842. He found the same synchronous linkages with sunspot activity.

Only three years later in 1892, Lord Kelvin, in his address to the Royal Society in London maintained that variations in solar activity were too small to be the cause of the observed climatic variations. This remains the view expressed in the IPCC documentation. The variations in solar activity are too small, therefore solar activity does not influence global climate, therefore the observed variations are the consequence of human activity.

In 1978 I reported a synchronous linkage between river flow in a number of South African rivers and sunspot activity based on graphical analyses. I also demonstrated a predictable 20-year (later 21-year) periodicity in long rainfall and river flow records. In 1993, based on the regular and therefore predictable periodicity in the records I submitted my paper “Floods, droughts and climate change” to the South African Journal of Science in which I predicted a sudden reversal from the then current drought to flood conditions within the next two years. The editor considered that these linkages with sunspots were passé and that I would make a fool of myself if the floods did not occur. I insisted and the paper was published in August 1995.

Floods developed over a wide area of Southern Africa within three months of publication. Hundreds of lives were lost, communications were disrupted and considerable damage was caused. The solar minimum occurred five months after the commencement of the floods.

I pursued my studies with renewed vigour. Records were now long enough to detect 21-year periodicity in the data at the 95% level of statistical significance using standard serial correlation analyses. The periods commenced with sudden changes from sequences of drought years that were suddenly broken by floods that persisted in the following years. The years in which these reversals occurred were closely synchronous with the years in which the sunspot minima occurred. The years in which the reversals occurred in South Africa's major river are as follows with the corresponding sunspot minima in parentheses. They were 1932/33 (1933), 1941/42 (1944), 1953/54 (1954), 1965/66 (1964), 1972/73 (1975), 1986/87 (1986), and 1995/96 (1996).

The annual flows during the three years preceding the reversals averaged 60% of the record average annual flows and the subsequent three years averaged 156% of the average annual flows. The average sunspot numbers in the three years before and after the sunspot minima were 17 and 100 respectively. It is very clear that the sudden changes in river flow are closely linked with corresponding changes in sunspot numbers, and are not random events. This relationship exists despite the long and complex energy path starting at the sun and ending with the potential energy of the water in the river, which is a function of its elevation above sea level.

The probability that these observations are chance related is close to zero, but I needed proof. I therefore assembled a very large and comprehensive hydrometeorological database consisting of 11,000 annual observations from 198 sites and seven different processes – rainfall, river flow, flood peak maxima, open water surface evaporation, groundwater levels, the southern oscillation index, plus more than 6,000 regional, widespread rainfall events. The data were entirely from the published records of the responsible government authorities, and were not manipulated in any way before or during the analyses. I started with simple graphical presentations. A clear and unambiguous picture emerged.

The non-random grouping of sequences of dry years followed by sequences of wet years with sudden reversals from drought sequence to flood sequences was clear and unambiguous. The 21-year periodicity and its concurrence with the double sunspot cycle were present in all processes other than open water surface evaporation. But this was still not sufficient proof of a causal linkage.

It has long been known that there is a concurrent linkage between sea-surface temperatures in the Pacific Ocean (the El Niño and La Niña effects) and the climate in South Africa and elsewhere. It was tacitly assumed that there was a causal linkage between these effects and climate. In November last year we were approaching the end of a periodic sequence. Drought conditions still prevailed over the summer rainfall region of Southern Africa. I issued a flood alert stating that there was a more than 75% probability of widespread, flood-producing rainfall occurring over Southern Africa during the summer rainfall season. Climatologists disagreed and said that floods were unlikely because the La Niña conditions had not yet developed in the Pacific Ocean.

Widespread flooding commenced during the last week in December. By the end of February, rivers were flowing strongly over a wide region of Southern Africa from Namibia in the west through to Mozambique in the east. Most dams were full and the desert flora were greener than at any time in memory.

Even more importantly, La Niña conditions developed from January onwards in the Pacific Ocean, and the sunspot minimum occurred during February. My successful prediction based on the statistically significant periodicity in the hydrological and rainfall data, and its concurrence with the development of La Niña and the sunspot minimum can only lead to one conclusion. There is a strong and unequivocal causal relationship between solar activity on the one hand and the occurrence of climate reversals in Southern Africa and the change in temperature of the Pacific Ocean on the other.

Physical causes?

My calculations are simple and can be verified and replicated without difficulty using standard graphical and serial correlation analyses. The linkage with the double

sunspot cycle is solid and incontestable. This still does not identify the solar processes that are responsible for the climatic variations. I have no knowledge in this field and it remains for others to identify the causes based on my unchallengeable evidence that a hydrologically meaningful linkage exists.

The first candidate is the solar magnetic (Hale) cycle. However, the solar magnetic reversal occurs during the sunspot maxima, not the minima as I had earlier assumed. The Hale cycle begins at the maximum of the first sunspot cycle and is therefore half a cycle out of phase with the double sunspot cycle, which begins with the sunspot minima. My linkages are with the double sunspot cycle, not the double solar magnetic cycle. If my reasoning is correct, then solar activities that are synchronous with the double sunspot cycle and not the solar magnetic cycle will have to be sought.

No reasonable person could disagree, given all this evidence (and more) that an unambiguous causal linkage exists between variations in solar activity and corresponding variations in climate.

Furthermore

Another elementary scientific observation is that proof of global warming is not proof of the undesirable consequences. We are repeatedly told that global temperatures are increasing and that they have reached a higher level than at any time during the past thousand years or more. The IPCC publications predict dire consequences including the claim that global warming will result in an increase in the hydrological extremes, floods and droughts.

Why is it then, that despite a number of high-level government commissions of enquiry during the past 80 years, hydrological publications since the 1950s, climatological publications during the 1980s and my diligent studies during the past 30 years of comprehensive sets of hydrological and meteorological data with many records approaching 100 years of continuous observations, nobody has been able to detect any adverse changes in rainfall, river flow, floods and droughts that could be attributable to unnatural causes?

My studies show that there has been a sustained increase in rainfall and open water surface evaporation during the period of continuous records. One statement that I can make with complete confidence is that the signals associated with the double sunspot cycle are clear and unambiguous whereas there were no discernible signals at all of increases in the hydrological extremes – floods and droughts, or any other adverse effects associated with global warming, using the same methodology.