

# matters arising

## Possible Sun-weather correlation

GERETY ET AL.<sup>1</sup> recently repeated part of my work<sup>2</sup> on the correlation between solar activity and weather for the zones 50°N–60°N and 60°N–70°N. I was not surprised by the fact that the authors have found substantial differences between my results and theirs for the simple reason that the two statistical samples on which the papers were based differ significantly. In fact, in my work I have used only those stations which provided long-term observational data, whereas Gerety *et al.* used stations with observational data even of 1 or 2 yr. Furthermore, in my paper I excluded a few annual values of  $R - R_0$  which appeared to differ significantly from the mean annual value. However, despite these remarkable differences between the two statistical samples, Gerety *et al.* have found a general similarity in the variation of the precipitation in the two northern zones. This can be clearly seen in Fig. 1 where the continuous lines represent my calculations and the dashed lines the calculations of Gerety *et al.* One could not expect to obtain a closer correlation from a comparison of two statistical samples so different in the kind and the number of stations used in the cited papers.

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1. Gerety, E. J., Olson, R. H. & Roberts, W. D. *Nature* **272**, 231–232 (1978).

2. Xanthakis, J. *Solar Activity and a Global Survey of Precipitation* (Research Center for Astronomy, Academy of Athens, 1975).

GERETY REPLIES—Although in preliminary analyses stations with only a few years data were included, the study published in *Nature* included no stations with a length of record of <15 yr. To be more specific about the statistical similarity between our separate samples: (1) In the latitude band 60°N to 70°N Xanthakis used 42 stations. Three of these stations had record lengths of less than 15 yr and two were located in another latitude band entirely. Our sample included all of those used by Xanthakis with the exception of the five just discussed and two more for which we could find no data. The total number of stations in our sample was 97. (2) In the latitude band 50°N to 60°N Xanthakis used 71 stations, one of which had a record length of less than 15 yr. Our sample included all but five of the remaining stations. The total number of stations in our sample was 159.

We agree with Xanthakis that there is a “general” similarity between his curves

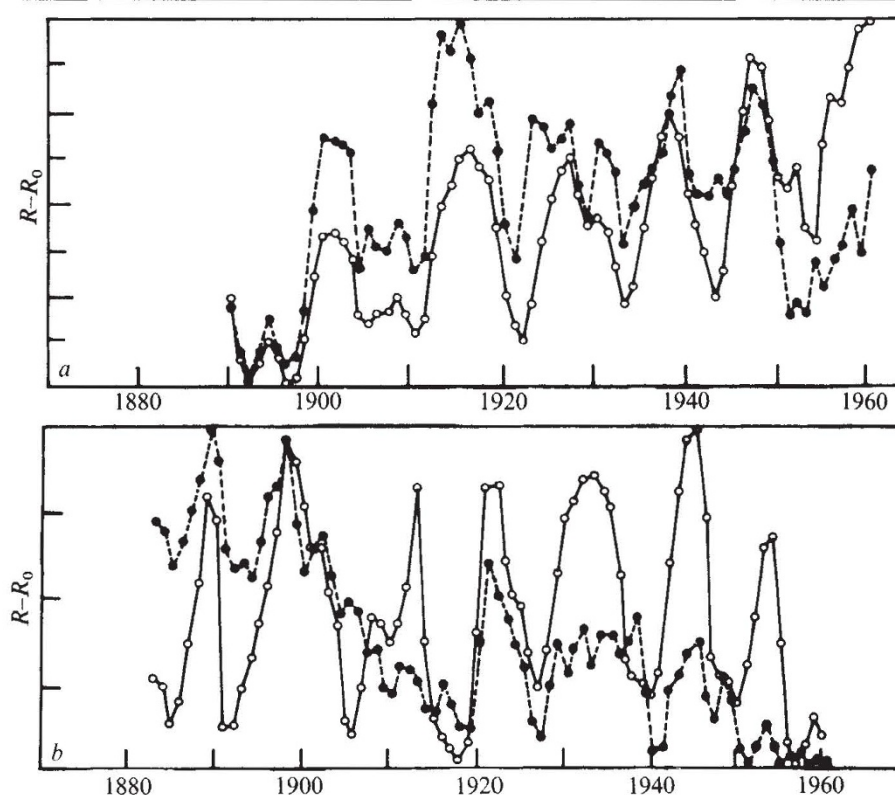


Fig. 1 Comparison of the calculations of Gerety *et al.* (dashed line) and the author (continuous line).

and ours but fail to see any hint of correlation between our curves and solar activity as measured by Xanthakis' index Ia. Finally, if there were in fact a correlation between Ia and precipitation measured in this peculiar manner, it seems to us that it ought not to depend so strongly on one's choice of stations.

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## Oxygen in the palaeoaquatic environment

The article by B. and A. Henderson-Sellers has an inappropriate title because it is not concerned with oxygen in the palaeoaquatic environment *per se* but attempts to identify, at the end of the Precambrian, the most likely region on the Earth where diversification of multicellular animals took place, by examining oceanic oxygen levels from the average

position of the density gradient or pycnocline at that time. Thus they show pycnocline depth as a function of latitude, 600 Myr ago, on the basis of a model which depends on several assumptions, the principal being that the palaeocean was density-stratified like the water of a temperate lake during the summer<sup>2</sup>, and from an assessment of the concentration of oxygen above the pycnocline (acting as a barrier to downwards diffusion of oxygen released by photosynthetic organisms) they conclude that multicellular animals originated, and diversified, in latitudinal zones between ~50 and 70° N and S. Their decision to examine the distribution of oceanic oxygen levels 600 Myr ago was evidently influenced by the very late and sudden diversification of life, that “apparently” took place at the end of the Precambrian.

Assuming that 600 Myr ago oxygen was limited to water above the pycnocline, the Henderson-Sellers have suggested only that, at that time, the surface waters of certain latitudinal zones contained a sufficiently high concentration of oxygen to be suitable for the existence of multicellular life. They have not provided evidence showing that such conditions did not exist at the same or different latitudes before 600 Myr ago and, therefore, have