

## Geological Sciences

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### INFLUENCE OF PREDICTABLE CYCLIC VARIATIONS IN SOLAR RADIATION UPON THE CLIMATE AND CROP YIELD OF THE SOUTHWEST

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(Abstract)

By means of statistical correlation a definite casual connection between solar variations accompany the twenty-two year double cycle of sunspot numbers, Caribbean sea surface temperatures and climate and crop yield in the southwest is established. The relation between monthly relative sunspot numbers and the observed solar constant during the period 1919-1930 is expressed by a parabola with maximum solar values associated with approximately forty-five sunspots. From this parabola it appears that eighty-seven or more sunspot per month gives rise to solar constant values little or no greater than when the visible solar hemisphere is free from sunspots. During years of low solar radiation, i. e., sunspot maxima and minima, Caribbean Sea and Gulf of Mexico surface water temperatures tend to be below normal and hot draughty summers and large crop losses may be expected in the southwest. Winter temperatures on the other hand tend to be below normal. The high solar constant values at intermediate sunspot periods, on the other hand, give rise to high sea temperatures, an increase in storminess, heavy rainfall and good crop years.

The average corn yield in the southwest, including Texas, Kansas and Nebraska for the period 1891-1931 and Oklahoma for the period 1899-1931 showed a positive .53 correlation with average solar constant values computed from sunspot numbers of corresponding winter, spring and summer months. The probable error was only .07 or less than one-seventh of the correlation coefficient which indicates that the chances that there is no relationship is less than one in fifteen thousand. Other crops show a correspondingly though less striking relationship. Annual growth rings of trees in McCurtain county which extend the climatic record back more than 250 years indicate that a similar relationship has existed at least since 1750.

Abbot has recently announced that Clayton has analyzed solar variations for the period January, 1924, to September, 1932, into seven regular periodicities whose summation shows an average deviation from observed monthly values of only fifteen hundredth of one per cent.\* If, as appears from this, solar values can be accurately forecast it appears evident that long range seasonal weather and crop yield forecasts of great significance to the farmers in the southwest may, in the future, be expected.

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