Apparent Radio Radiation at 11-m. Wave-Length from Venus

In 1956 several preliminary communications reported the apparent reception of 11-m. radiation from the planet Venus[1]. In particular, one communication reported coherent or quasi-coherent radiation, designated Class II, which was also thought to originate from Venus. From further observations and subsequent analyses it now appears definite that these signals were not from Venus but were in all cases almost certainly interference of terrestrial origin.

Regarding the reports of the noise-type of radiation, designated Class I, a careful re-examination of the results indicates that the evidence is not sufficient to be sure that such radiation from Venus was observed. Attempts by others to detect the radiation have also been unsuccessful[2]. The validity of any deductions based on these observations, such as the rotation period of the planet, is, therefore, extremely doubtful.

Although some records, such as the one in Fig. 11 of a later article[3], show interferometer patterns which could be due to radiation from Venus, they are not conclusive. However, the fact that these records do suggest 11-m. radiation from Venus makes it difficult to rule out the possibility of such radiation completely. To determine the existence or non-existence of such radiation beyond any doubt, further observations are needed using a radio telescope of much higher resolution and better stability than was available in 1956.

J. D. Kraus

Radio Observatory,
Ohio State University,
Columbus 10, Ohio.
March 4.

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An Estimate of the Peak Sunspot Number in 1968

The smoothed peak sunspot number during the current cycle of solar activity attained a value in 1958 which has not been exceeded since accurate observations were begun more than 200 years ago. Conditions in the atmosphere of the Sun near the epoch of peak activity, and the closely related changes in the ionosphere, have already been the subject of comment[1].

It has been suggested that the uninterrupted rise in successive peak sunspot numbers since 1928, and its culmination in the unprecedented high peak of 1958, may indicate that the Sun is undergoing a long-term change and that the next peak, which will probably occur in about 1968, will be even higher than that of 1958. The opposing view is that, since the peaks of 1948 and 1958 were very high, the 1968 peak will be a very low one. These possibilities are of more than academic or scientific interest; they have a bearing on the effectiveness of the world-wide network of high-frequency radio-communication links, the successful operation of which depends on the reflexion of radio waves from the ionosphere. The operating conditions on such radio links are profoundly modified by changes in solar activity, and Hitchcock[2] has pointed out that, with the present-day overcrowding of the high-frequency radio spectrum, the occurrence of a solar cycle which attained only a low peak might lead to unforeseen difficulties.

It is of some importance, therefore, to estimate the probable limits within which the forthcoming peak sunspot number will lie. Obviously it is impossible to make a precise estimate; the present objective is merely to examine the purely statistical evidence contained in the sequence of twenty peak values which have occurred since 1750 and to decide whether there are any grounds for believing that the next peak will be either very high or very low. The cycle-matching technique described by Herrinck[3] has not been used because it cannot be safely extended beyond the end of the present cycle[4].

From a study of the lengths of sequences of uninterrupted increases and decreases in the peaks for successive cycles, it is possible to estimate the probability of occurrence of a sequence of three increases such as that which took place between the peaks of 1928 and 1958. The conclusion reached is that such an event is not an improbable one ($P \simeq 0{\cdot}12$), and it follows that its occurrence ought not to be interpreted as an indication of a long-term upward trend in solar activity. It is estimated on similar grounds that the probability of a fourth increase, leading to an even higher peak in 1968 than in 1958, is approximately 0·3.

The range of values within which the next peak will lie can be estimated from the frequency distributions of either the magnitudes of the twenty observed peaks or the differences between successive peaks. From such evidence it is found that there is a high probability that the 1968 peak will be between 110 and 160. The autocorrelation function for the twenty peaks (R) since 1750 has been evaluated, but the correlation coefficients differ significantly from zero only for R_n, R_{n+1} and R_n, R_{n+3}. The regression lines for these two cases have been used to forecast the peak in 1968; and the values obtained, with their standard errors of estimate, are 154 ± 38 and 97 ± 36 respectively. These values are consistent with the range of values (110–160) based on the frequency distributions referred to earlier.

The various independent estimates of the next peak have been combined, taking into account their respective probabilities and making an allowance for the fact that the estimates are based on a sample of only twenty values. It is concluded that there is a probability of at least 0·75 that the next smoothed peak sunspot number, which will occur about 1968, will be in the range 110–160. Thus it seems reasonable to expect that ionospheric and radio-communication conditions during the 1964–74 solar cycle will be roughly comparable with those which occurred during the 1934–44 and 1944–54 cycles.

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C. M. Minnis

Radio Research Station
(Department of Scientific and Industrial Research),
Slough, Bucks.
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