A sensitive microwave receiver capable of measuring small differences of radiant energy in the 3000-Mc band has been constructed after the manner of Dicke [see 1 of "References" at end of paper], and is used to measure the radio noise from the sky at Ottawa, Canada. A continuous record is obtained by means of a recording milliammeter. The receiver is calibrated by measuring the temperature of a resistance which has been substituted for the antenna; thus the equivalent temperature of the sky is used as a measure of the sky noise.

The records taken during the period April 30 to July 23, 1946, were interrupted to make improvements in the receiver, and by occasional failure of the set. During this period, an antenna with a cone of acceptance of 30° to the half-power points was used. After July 27, a continuous record was taken using an antenna with an acceptance cone of 6°. In each case the antenna was pointed toward the zenith with the electric vector in the magnetic east-west direction. The narrow-beam antenna is astronomically mounted so that solar noise observations can be taken; when this antenna points more than 15° away from the Sun, no solar noise can be received, and the background noise is measured independently.

The first strong noise fluctuations were 20°K amplitude on a background of about 75°K, and consisted of two oscillatory bursts of energy, each lasting about eight minutes. These appeared on the afternoon of May 6 at 19h 25m and 20h 06m hours GMT. Near these times, the H- and D-traces of the magnetograms from Agincourt exhibited two sharp movements in opposite senses, appearing as a distorted U in the traces, and resulting in a shift in the general levels. Later, a sudden-commencement storm appeared at 22h 25m and reached a maximum of disturbance in the night. During the violent magnetic fluctuations, the sky temperature showed only a gradual decline from early afternoon values to a constant night value. On the night of May 10, a noise storm (Fig. 1, Curve a) was accompanied by an auroral display, the noise increasing in intensity with the movement of the display from north to south. This marked the beginning of a magnetic and ionospheric storm, increasing in severity during the next four hours. The hourly ionospheric readings taken at Ottawa [2] show the presence of the abnormal E-layer and a spread F-layer at midnight, then complete absorption at the end of the four hours. During the violent magnetic fluctuations, the sky temperature again remained relatively constant. On the magnetically calm days preceding the storm-period of May 6-11, there was little variation in sky
temperature, and it was concluded there was no correlation with the quiet-day solar magnetic variation.

Other attempts to obtain instantaneous correlations with magnetic storms reveal a few more cases. A more general, though less accurate correlation, has been obtained by assigning arbitrary character-figures to the daily noise fluctuations. These noise figures, together with the American full-day magnetic character-figures [3] have been plotted in Figure 2. During this period the magnetic and noise storms both reached a maximum severity on the same days, August 14 and September 22. The storm of August 14 was followed on the next day by a similar disturbance of reduced intensity (Fig. 1, Curves b and c). For these two days, a corresponding similarity in the daily magnetic storms was also noted. The equinoctial magnetic storm of September was accompanied by evening auroral displays and associated abnormal E-layer ionization. The noise records show a corresponding evening activity, as well as the mid-day storms. Although abnormal E-layer was reported during the meteor shower of October 9, 1946, the noise records show no increase.

On May 6, the decline of the sky temperature from an afternoon value to a night value was most pronounced 20 minutes after sunset on Earth. This small drop of about 8°K has been noticed on a few other days (Fig. 1, Curves b and c). A corresponding increase of sky temperature some minutes before sunrise on Earth has also been noted. This effect,
apparently associated with sunrise and sunset in the upper atmosphere, is infrequent, and once occurred exactly at sunrise on Earth instead of before.

Although the present data point to a strong relationship between microwave sky noise and geomagnetic activity, further work will be needed before any explanation can be attempted.

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References


Electrical Engineering and Radio Branch,
National Research Council,
Ottawa, Canada, March 28, 1947

NOTES

(See also pages 355, 367, 374, and 412)

(30) Magnetic and general geophysical observatory in New Guinea—Chief Geophysicist, J. M. Rayner, of the Australian Bureau of Mineral Resources, advises that the establishment of a magnetic and general geophysical observatory in New Guinea is in contemplation. This will be a most important addition for wide coverage in the world network of magnetic observatories.

(31) Manhay Magnetic Observatory—Dr. L. Koenigsfeld, Director of the Manhay Magnetic Observatory of the Astrophysical Institute of the Liège University, advises that geomagnetic registrations were resumed from January, 1946. Absolute measurements were begun in March, 1946, using a Kew magnetometer for declination, two QHM's (standardized at Copenhagen) for horizontal intensity, and an inclinometer (loaned by the Institut de Physique du Globe of Paris) for dip.

(32) French Urṣigrams—Circulars from Director P. Lejay of the French Ionospheric Bureau of the Laboratoire National de Radioélectricité (196 rue de Paris, Bagneux, Seine, France) advise that French daily Ursigrams were resumed on May 19, 1947. Full details as to transmissions and codes, with coded examples, will be supplied upon request to the Bureau.

(33) International Association of Terrestrial Magnetism and Electricity—Effective July 1, 1947, Dr. J. W. Joyce (6641 32nd Street, Northwest, Washington 15, D. C., U.S.A.) succeeded Dr. A. H. R. Goldie as