

## LETTERS TO THE EDITORS

### GEO- and RADIO-PHYSICS

#### A Day-time Maximum of Oblique Auroral Reflexions observed in the Auroral Zone

ALMOST all investigations of high-frequency and very high-frequency reflexions from aurora made in or near the auroral zone have given diurnal variation curves with one main maximum near local midnight<sup>1-3</sup>. An exception is the recent observations by Presnell *et al.*<sup>4</sup> at 216 Mc./s., made at College, which—for diffuse echoes only—has given two maxima, one in the morning and one in the afternoon with the peak between 1700 and 1900 L.T. Observers at lower latitudes have usually found two maxima in the night<sup>5-8</sup>.

From four months records (March–June 1959) of aurorally propagated very high-frequency signals taken in the auroral zone at Kiruna Geophysical Observatory (geographic co-ordinates 67.8° N., 20.4° E., geomagnetic co-ordinates 65.3° N., 115.5° E.) and transmitted by the Finnish broadcasting station at Kemi (geographic co-ordinates 65.8° N., 24.8° E., geomagnetic co-ordinates 62.5° N., 117.6° E.) a diurnal variation curve with two maxima has been found (cf. Fig. 1). One of these maxima is in day-time between 1200 and 1600 M.E.T. The experimental points include all observed reflexions. This is in remarkable contrast to the diurnal variation mentioned above, which was observed by radar methods at Kiruna (in 1951–52) and at other places in auroral zone latitudes.

The transmissions studied at Kiruna have a frequency of 92.8 Mc./s. The broadcasting station, 310 km. distant, has sent out continuous waves in the periods between programme transmissions. The radiated power is 8.9 kW, and the polarization horizontal. A 'Servo' model R 5200-A2 receiver and a five-element Yagi antenna are used. The sensitivity is better than 1 μV. for 50 mW. output for a bandwidth of 25 kc./s.

There is no doubt that this auroral echo day-time maximum is real. The day-time echoes have the same signal characteristics observable<sup>2</sup> as night echoes<sup>1</sup> on the Esterline Angus records. The direction distributions for day- and night-maxima are approximately the same; this has been determined by means of rotary antennae. The day-time maximum has been found also in monitoring another transmitter (Östersund in central Sweden, 87.9 Mc./s.).

The local time for the afternoon echo maximum of Fig. 1 is much earlier than that found by any other observers, so far as we are aware. If the geomagnetic time for the maximum is investigated, the

difference from the time of maximum found on the western hemisphere (especially in Alaska) is reduced by several hours, but also the geomagnetic time for the afternoon maximum found at Kiruna is earlier than reported by anybody else. Recent work at a frequency of 216 Mc./s. (ref. 4) has given an afternoon maximum, but only for a special type of echo, the so-called diffuse echoes. The difference between the geomagnetic time for the afternoon maximum reported by Presnell *et al.*<sup>4</sup> and that shown in Fig. 1 is about 1 hr.

The investigation at Kiruna will be extended over a longer period of time, and it is hoped that the recorded material will show if the diurnal variation

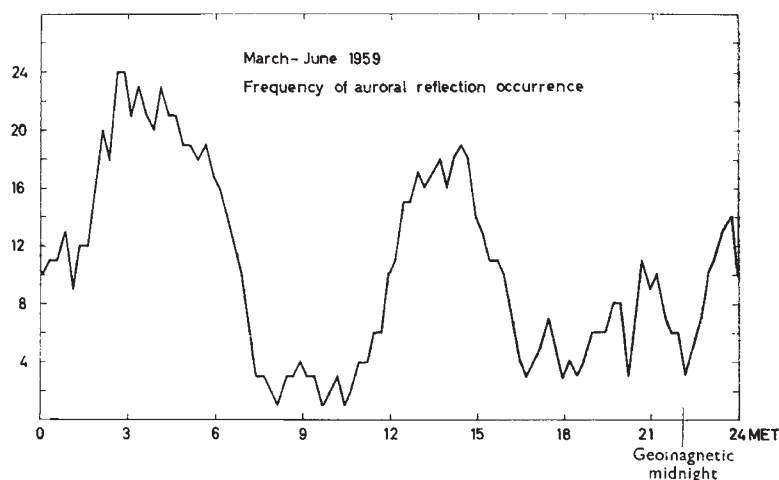


Fig. 1

curve described above is characteristic of observations of oblique auroral very high-frequency reflexions at Kiruna for longer periods, or only for the four months analysed.

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ALV EGELAND  
BENGT HULTQVIST  
JOHANNES ORTNER

Kiruna Geophysical Observatory,  
Kiruna C., Sweden.  
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