April 18 was probably similar to that encountered on March 16.

The vertical distribution of February 25 is reminiscent of the results from the *Explorer II* balloon flight on November 10, 1935. The almost vertical portion of the curve for February 25 on Fig. 2 suggests that a rather strong mixing process must have been operative at an altitude between 20 and 30 km. to make the ratio between ozone and air so nearly constant.

In view of the apparent existence of pronounced lateral inhomogeneities of the ozone content of the atmosphere at any given instant[4], one must consider the possibility that, due to the non-uniformity of the vertical distribution of wind, portions of the ozone layer with strongly varying ozone-content might be interposed between the balloon and the sun during the course of one balloon flight. The flights of March 16 and April 18 are probably quite free from this source of error, due to the uniform wind distribution with height which was encountered on these two days.

The balloon flights are continuing, and a fuller account will be published elsewhere at a later date. This work has been supported by the Geophysical Research Directorate, Air Force Cambridge Research Laboratories.

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Protons and the Aurora

ON September 30, 1950, spectrograms were taken simultaneously from Arnprior, Ontario, and Ithaca, New York, separated by 330 km., of an auroral arc located over Arnprior. The Arnprior spectrograph was aimed nearly along the lines of magnetic force, while the Ithaca spectrograph was aimed northward at right angles to the field. Both were aimed at the same part of the arc.

Both exposures clearly show the hydrogen line at 6563 A. On the Ithaca plate it is centred on 6562 A. but broadened to red and violet by about 10 A. The Arnprior spectrum shows the broadening to red of about 10 A., but the violet broadening extends to about 6530. This indicates a shift of the centre of the line of about 15 A. with the maximum violet shift of at least 30 A.

Thus the hydrogen is in motion toward the earth with a mean velocity of 675 km./sec. and maximum velocity of 1,350 km./sec. Since all our previous spectra[1], including those aimed low in the east, show only a broadened hydrogen line, whereas the Arnprior picture shows the violet shift, we must conclude that the hydrogen is coming in from outside in the form of protons.

The broadening on the Ithaca spectrum is due to line-of-sight motion of the scattered atoms or to spiralling around the lines of force.

These results were obtained during a moderate aurora, while a velocity of 3,200 km./sec. was obtained by Meinel[2] during the great aurora of August 18–20, 1950. This suggests a relation between size of the aurora and energy of the protons.

The hydrogen radiations during the aurora are therefore of great geophysical interest. It is suggested that fast spectrographs be aimed at the centre of the corona whenever possible; but useful results can be obtained even when they are aimed 45° away. The hydrogen line appears much stronger than the nitrogen positive bands during the rising phase of the display.

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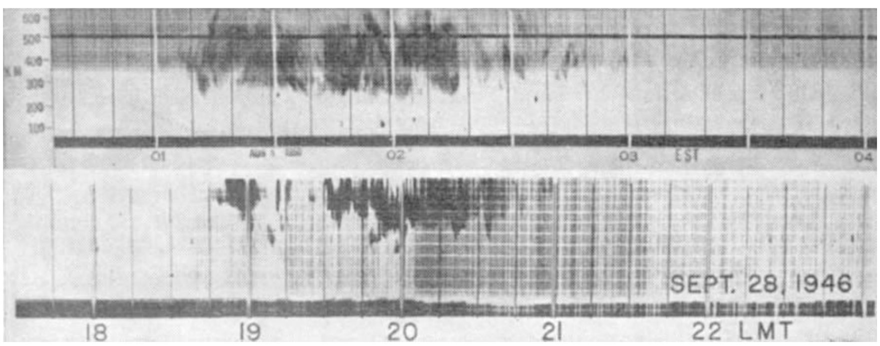
Reflexion of High Frequencies during Auroral Activity

VERTICAL incidence measurements of the ionosphere at 17·31 Mc./s. usually elicit no reflexions except when meteoric ionization is present, and then the reflexions persist for a minute or two. Recently, however, we have observed enduring reflexions at this frequency during periods of auroral activity. The returns show large slant ranges, probably indicating that the centres of reflexion are at a considerable horizontal distance rather than at great heights. The ionization



Reflexions from aurora borealis. Fig. 1. (above) on 17·31 Mc./s. on August 8, 1950. Fig. 2 (below) on 3·5 Mc./s. on September 28, 1946