MEASUREMENTS OF THERMOSPHERIC RESPONSE TO AURORAL ACTIVITIES

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The Joule heating produced by auroral electrojets and its thermospheric response can be studied by monitoring the thermospheric temperatures by optical methods; simultaneously, the concurrent auroral electrojet activities can be investigated by using geomagnetic records obtained from stations along a meridian close to the observation site of optical measurements.

We report, in this paper, the measurements of thermospheric response to auroral activities which were made at Albany (42.68°N, 73.82°W), New York on September 2, 1978 (UT) when an isolated substorm occurred. The thermospheric temperatures were measured by using a high-resolution Fabry-Perot interferometer that determines the line profiles of the [OI] 6300Å line emission. The intensities and latitudinal positions of auroral electrojets were obtained by the analysis of magnetograms from the IMS Fort Churchill meridian chain stations.

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Figure 1. Locations of magnetic stations and Albany, New York in geomagnetic coordinates.
Figure 2a. The plots of the one-minute averages of $X_m$ (magnetic north) components observed at stations in the Fort Churchill chain on September 2, 1978 (UT).
Figure 2b. The plots of the one-minute averages of Z (downward) components observed at stations in the Fort Churchill chain on September 2, 1978 (UT).
Figure 3. $\Delta X_m$ and $\Delta Z$ values at 0720 UT on September 2, 1978 from each station were plotted and the best-fitted curves were drawn through $\Delta X_m$ and $\Delta Z$ data, respectively, in order to determine the position and intensity of the westward electrojet.
Figure 4. The position of electrojet and \((\Delta X_m^{\text{max}})^2\) value that were obtained by the analysis of magnetograms from the IMS Fort Churchill meridian chain stations and thermospheric temperature measured from Albany, New York are plotted as a function of universal time from top to bottom, respectively.