Observations of Auroral Breakup

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(Received October 17, 1977)

We have obtained detailed observations of the onset of auroral breakup using a variety of instruments with time resolution of some tens of seconds. Rapid sequences of all-sky photographs, and fast meridian scans by photometers, show that breakup is usually preceded by fading of the auroral brightness lasting 1 or 2 min, before the actual breakup. This optical activity is closely correlated with the development of auroral radar echoes, suggesting that variations in the ionospheric and magnetospheric electric fields are responsible for the observed auroral variations. In Fig. 1 we show an example of a fade between 2119 and 2122 UT on 6 April, 1975, as measured on an auroral bistatic radar system. There is often a simultaneous weakening of magnetic pulsation activity. Data from the IMS magnetometer network provide some indication of a correlated response by the local auroral and ionospheric currents, although this could be partly due to changes in conductivity. Riometer recordings show a slow decrease in ionospheric radio wave absorption over a period of about ten minutes prior to breakup, with the largest decrease essentially to quiet-time values in the region of auroral fading and subsequent breakup.

The subsequent increase in activity that initiates the expansion phase can take place on the same arc that shows the deepest fade, or it can occur on another arc, often a new arc, either poleward or equatorward of the fading arc. On many occasions it is clear that the aurora fades in place, while at other times there is a sug-

Fig. 1

gestion that the fade travels ahead of a surge, either eastward or westward. The geographical area where fading occurs simultaneously, or nearly so, can have dimensions of several hundred kilometers.

This research was supported by the Swedish Natural Science Research Council, and the U.S. National Science Foundation.