10.7-cm Microwave Observations of AR 5395 and Related Terrestrial Effects

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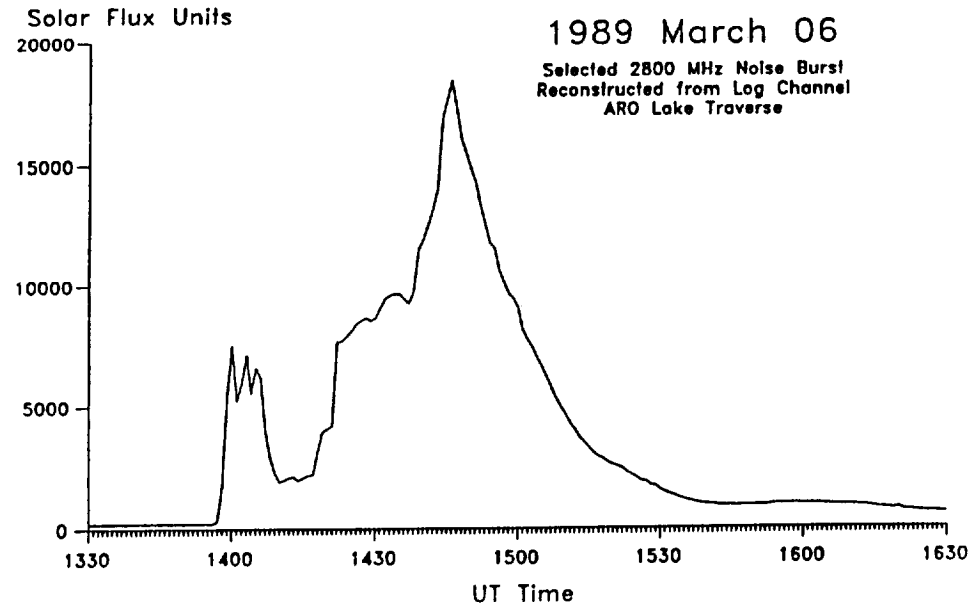
The 10.7-cm flux patrols in Canada recorded 4 Great Bursts (peaks > 500 sfu) during the disk passage of AR 5395 in March 1989 (Figures 1 and 2). The Great Bursts of 16 and 17 March were simple events of great amplitude and with half-life durations of only several minutes (Figure 2). Earlier Great Bursts, originating on 6 March towards the NE limb and on 10 March closer to the central meridian, belong to an entirely different category of event. Each started with a very strong impulsive event lasting just minutes (Figure 1). After an initial recovery, however, the emission climbed back to levels as great or greater than the initial impulsive burst. The events of 6 and 10 March stayed above the Great Burst threshold for at least 100 minutes. The second component of long duration in these two cases is associated with Type IV continuum emission and thus very likely with CME's.

Major geomagnetic disturbances did not occur as a result of the massive complex event of 6 March or the two simple but strong events of 16 and 17 March. But some 55 hours after the peak in the long-enduring burst of 10 March , a storm began which qualifies as the fourth strongest geomagnetic storm in Canada since 1932 (preceded by 18 Sept. 1941, 12 Nov. 1960, and 24 March 1940). Figure 3 depicts the vertical component of the earth's field measured during the storm by a fluxgate magnetometer at a station in Manitoba, one of several in the CANOPUS Network, Canada's contribution to the OPEN study of the magnetosphere. Within a minute of the sudden commencement of this storm, a series of breakdowns began in the transmission system of Hydro-Quebec which resulted in a total loss of power, on a bitterly cold winter's day, for at least 10 hours. Some remote parts of Quebec were without power for most of 13 March. The loss of power provoked an enormous outcry from a public frustrated by innumerable local outages during recent years. In view of that poor performance record, it proved difficult to convince the general public that there was an explanation rooted in Nature - a combination of geography and solar-terrestrial physics! Or that the results might have been much more severe had the event of 6 March occurred when AR 5395 was much closer to central meridian. On the other hand, large power utilities are now much more receptive to the need for monitoring solar as well as geomagnetic activity.



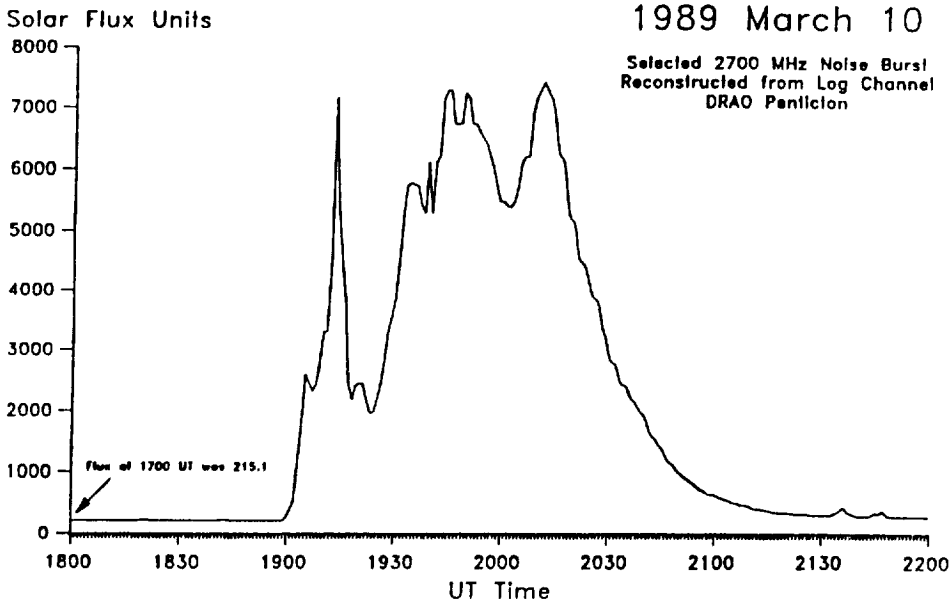
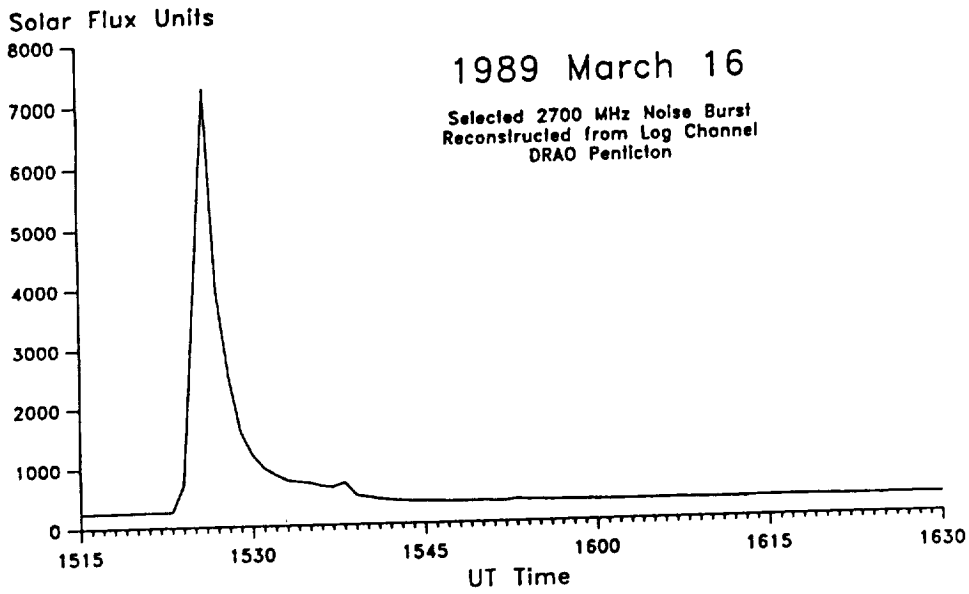


Figure 1. Great Bursts at 10.7-cm wavelength with long-enduring emission associated with Type IV bursts.



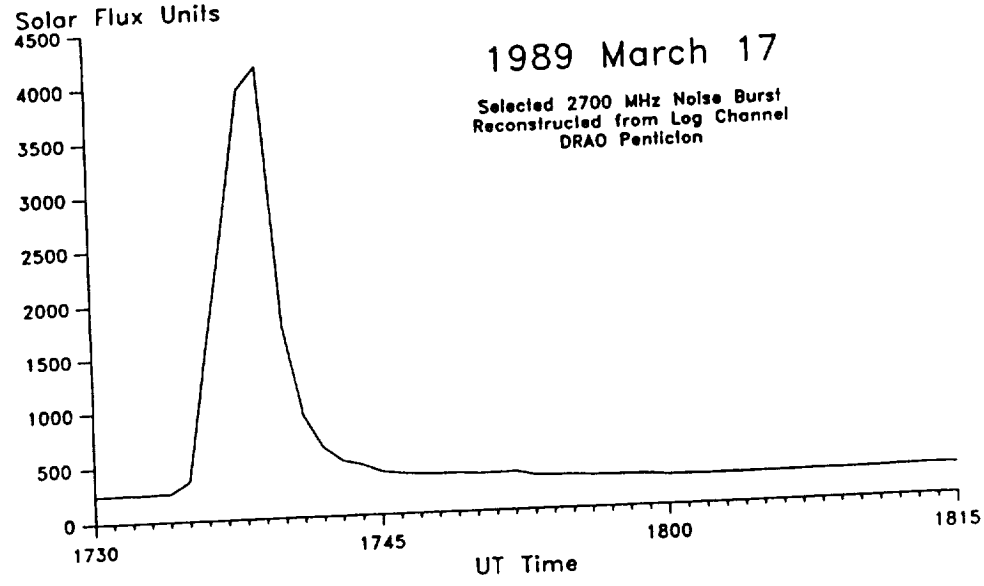


Figure 2. Great Bursts of short duration at 10.7-cm wavelength.

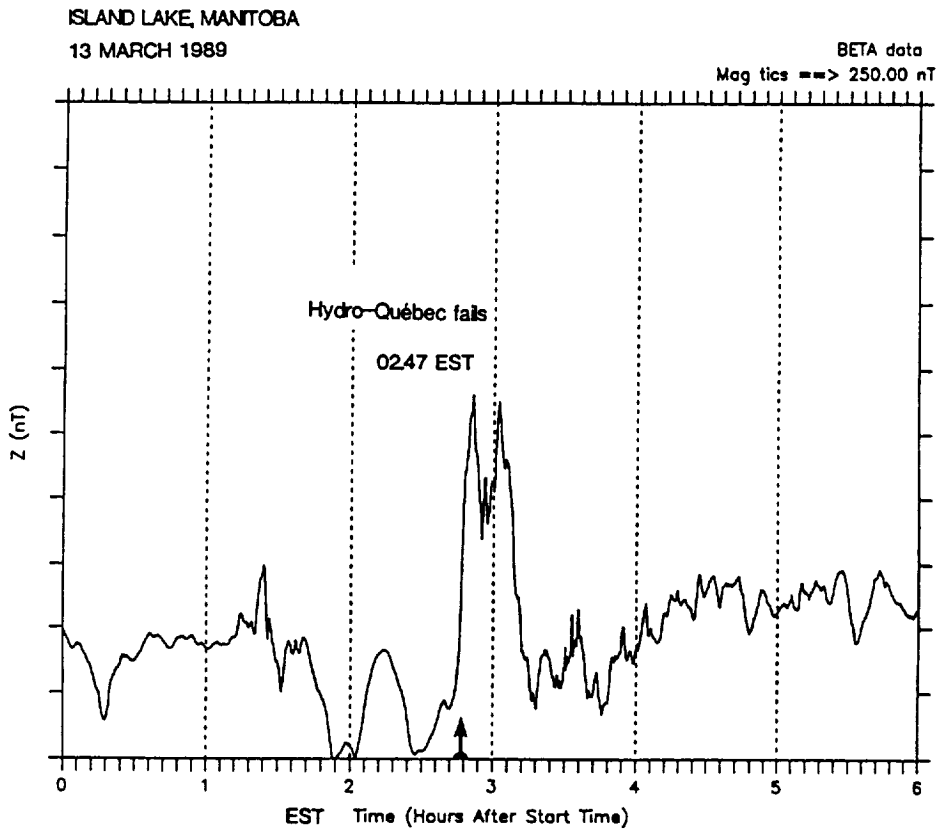


Figure 3. Vertical component of the Earth's magnetic field in Northern Manitoba.