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SOFT X-RAY FEATURE IN ACTIVE REGIONS ASSOCIATED WITH METER WAVELENGTH SOLAR RADIO EMISSION

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Abstract

Solar radio bursts in meter wavelength are emitted associated with disturbances in the solar corona. Interferometers have been used to observe the structure of radio sources. However, it is difficult to get details of solar radio sources in meter-wave range because of its long wavelength. *Yohkoh* has observed almost the same height range of the solar corona, by the soft X-ray telescope (SXT) with high resolution, as meter-wave does. Several large meter-wave bursts have been observed in Hiraiso (N36.37 E140.63) with *Yohkoh.* An intense and long lasting metric continuum emission, observed after the M4.2/2N flare (S16W28) in NOAA7056 at 0127 UT on 1992 February 17, is reported here.

1. Introduction

Continuum emission is one of solar activities observed frequently at meter wavelengths. However, the mechanism of emission and the site of acceleration of electrons have still been uncertain. Recently, Lantos et al.(1981) found that the strong metric continuum source located near one of the transient legs and Kerdraon et al.(1993) pointed out the appearance of additional material in the corona associated with continuum radio emission from the Nancy Radioheliograph and the Solar Maximum Mission (SMM) observations. There is few observations about the coronal features associated with radio emission in detail.

The solar observation by a digital swept frequency radiospectrograph and fixed frequency solar radiometers have been made at *Hiraiso Solar Terrestrial Research Center* (N36.37 E140.63), *Communications Research Laboratory.* The Soft X-ray Telescope (SXT) aboard *Yohkoh* and our meter-wave radio equipments observe almost the same height range in the corona. The SXT can give us dynamic change of the solar corona with a high resolution. We examine solar images taken by the SXT and find several soft X-ray features in solar images associated with intense and long lasting meter-wave bursts. We report an example of them here.

2. Observations

An intense and long lasting meter-wave burst commenced after the M4.2/2N flare (S16W28) in NOAA7056 at 0127 UT on 1992 February 17 (Figure 1). A gradual rise and fall (GRF) burst at 9500 MHz was observed with weak impulsive bursts. However, impulsive meter-wave bursts (typeII and typeIII bursts) weren't observed coincident with the flare according to 100 MHz and 200 MHz radio observation in Hiraiso. After the flare, meter-wave radio intensities increased gradually and an intense part of radio emission drifted from high to low frequencies shown in Figure 2. The radio emission was weakly polarized in the initial stage. It gradually polarized and the degree of polarization reached more than 80 %. Solar radio intensities became maximum at 0257 UT at 200 MHz and at 0355 UT at 100 MHz respectively. Corresponding with this radio burst, the large X-ray loop developed in north-east side of the flare site (NOAA7056) shown in Figure 3 and the loop grew gradually after the flare. This growth of the loop may correspond with the frequency drift of the meter-wave radio emission. Time plots of the loop associated with the flare shown in Figure 4. The similarity of the light curve of the loop in north-east side of NOAA7056 and solar radio flux at 200 MHz implies that these events are physically linked. An enhancement of solar energetic particles was observed by the *GOES*. The observed shock speed by the *IMP-8* was approximately 500 km/s associated with this solar event.

3. Concluding Remarks

According to MacQueen (1980) and Klein (1983), meter-wave radio sources are associated with the large loop-system activated by flares or filament eruptions. Electrons are continuously or repetitively injected into it and they emit broadband continuum radio emission (Pick,1985). Our observational result is in agreement with their results.

We may summarize the intense and long lasting meter-wave burst as follows :

(a) An intense meter-wave burst commenced after the M4.2/2N flare without remarkable meter-wave impulsive bursts (type II and type III bursts).

(b) The similarity of the light curve of the loop in the north-east side of NOAA7056 and solar radio flux at 200 MHz implies that these events are physically linked.

(c) The growth of the loop in the north-east side of NOAA7056 may be associated with the frequency drift of the meter-wave radio emission.

References

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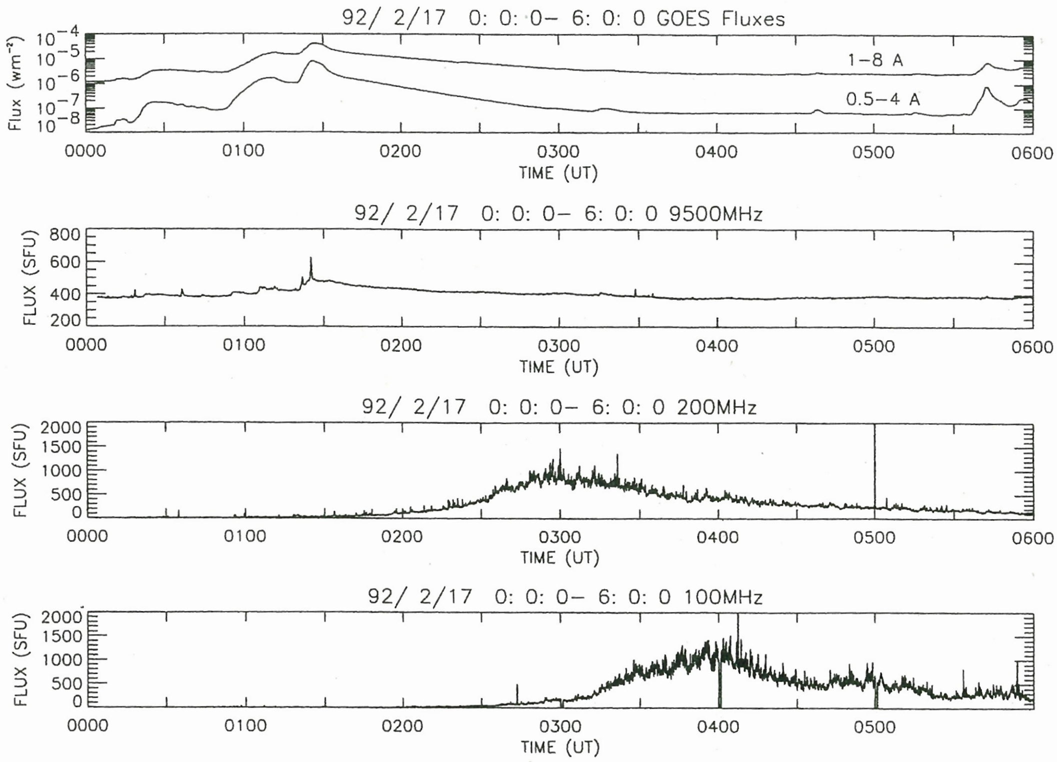

Fig. 1. Time plots of *GOES* X-ray fluxes and solar radio fluxes at 100, 200, and 9500 MHz in Hiraiso.

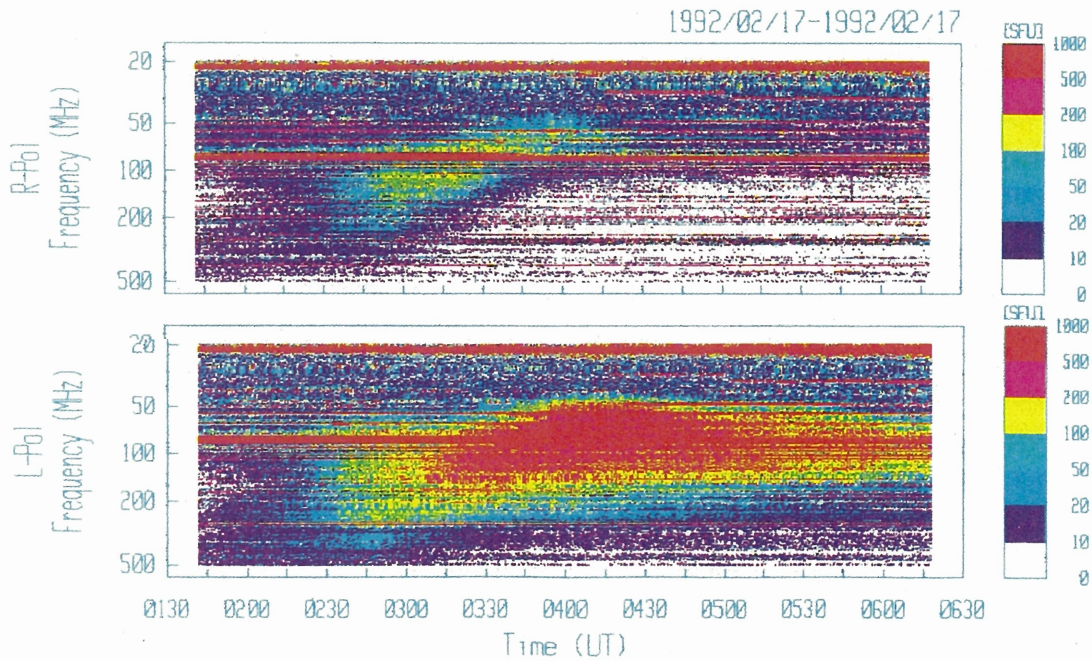

Fig. 2. Dynamic spectrum observed in Hiraiso

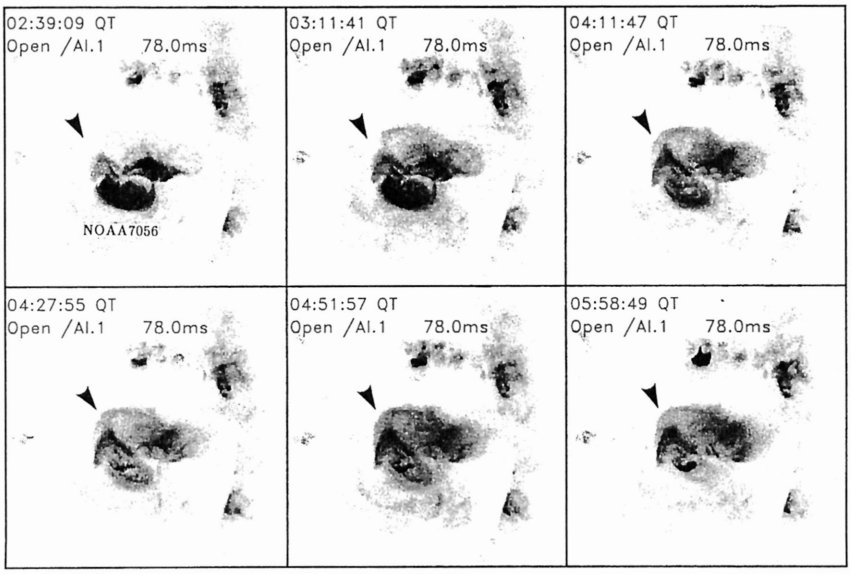

Fig. 3. Time evolution of the soft X-ray loop associated with the strong meter-wave radio burst.

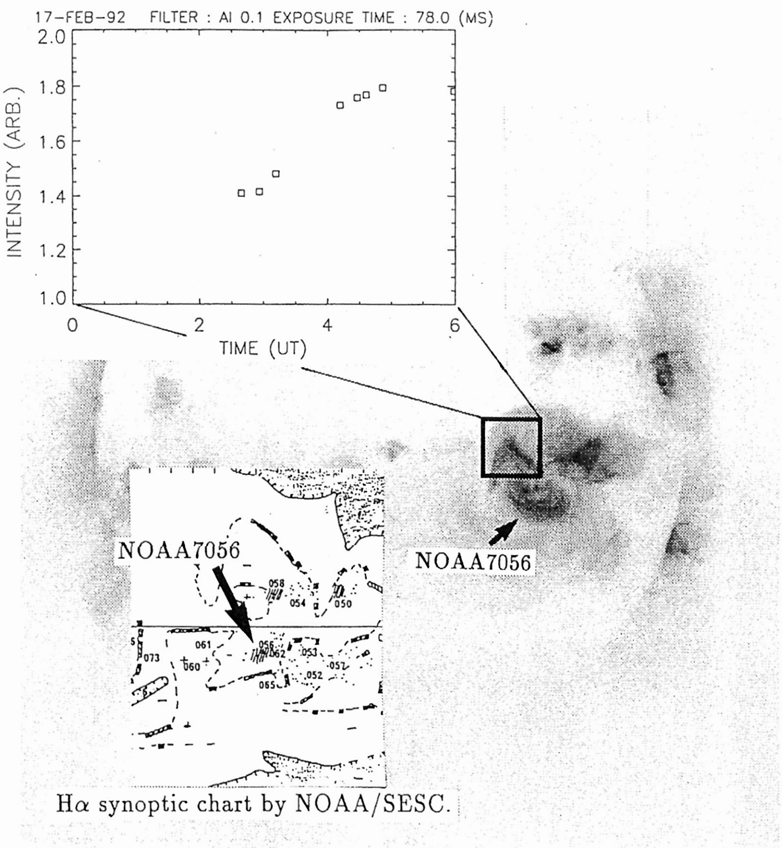

Fig. 4. The solar soft X-ray image by the SXT on February 17, a light curve of the loop associated with the 2N/M4.2 flare in NOAA7056, and Hα synoptic chart by NOAA/SESC.