Meterwave Solar Radio Emission from NOAA7260

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Abstract

Meterwave bursts are emitted associated with disturbances in the solar corona. *Yohkoh* observes almost the same height range of the solar corona, by the Soft X-ray Telescope (SXT) with high resolution, as meterwave radio does. Several strong meterwave bursts have been observed in Hiraiso (N36.27E140.63) simultaneously with *Yohkoh*. An intense solar radio burst on 1992 August 20 and a soft X-ray arcade, associated with this event, above NOAA7260 were analyzed and it is found that activated large loops have an important role for strong and long-lasting meterwave radiation.

1. Introduction

Solar radio emission has been observed by a digital swept-frequency radiospectrograph and fixed frequency radiometers at Hiraiso Solar Terrestrial Research Center (N36.37 E140.63), Communications Research Laboratory. Meterwave bursts are emitted associated with coronal disturbances. The SXT on board *Yohkoh* can detect solar coronal phenomena with high resolution. We examined solar images taken by the SXT and found several enhancements in them associated with strong meterwave radio bursts. Here we report strong meterwave radiation observed on 1992 August 20 and a large soft X-ray arcade, associated with it, above NOAA7260.

2. Observations

A strong meterwave burst of continuum radiation occurred at around 0300UT on 1992 August 20. This burst continued for several hours and exhibited strong right-hand polarization. Solar radio flux and polarization at 100, 200, and 9500 MHz in Hiraiso are shown in Figure 1. Radio bursts

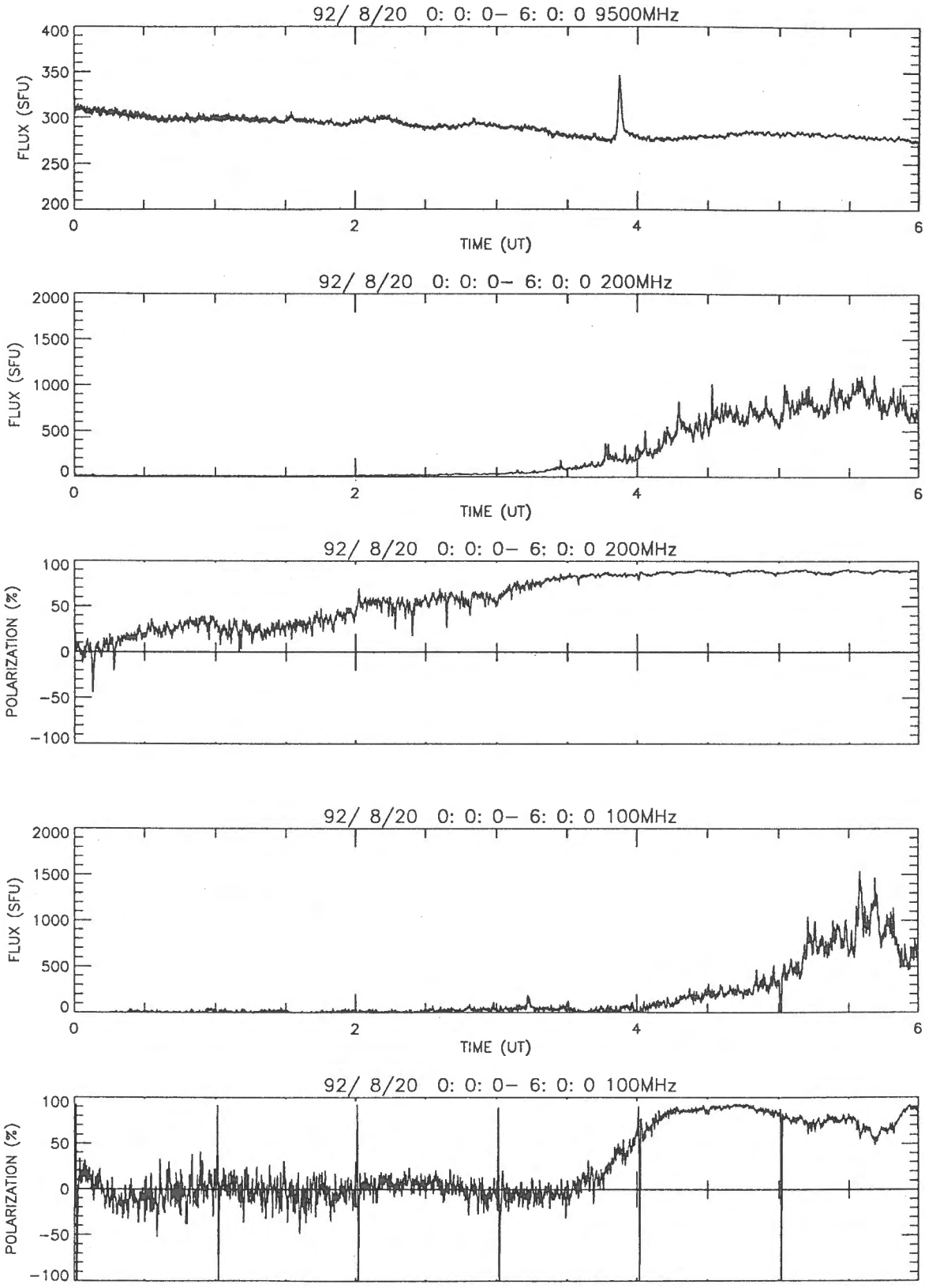


Fig. 1. Time plots of solar radio flux and polarization at 100, 200, and 9500 MHz observed in Hiraiso Solar Terrestrial Research Center.

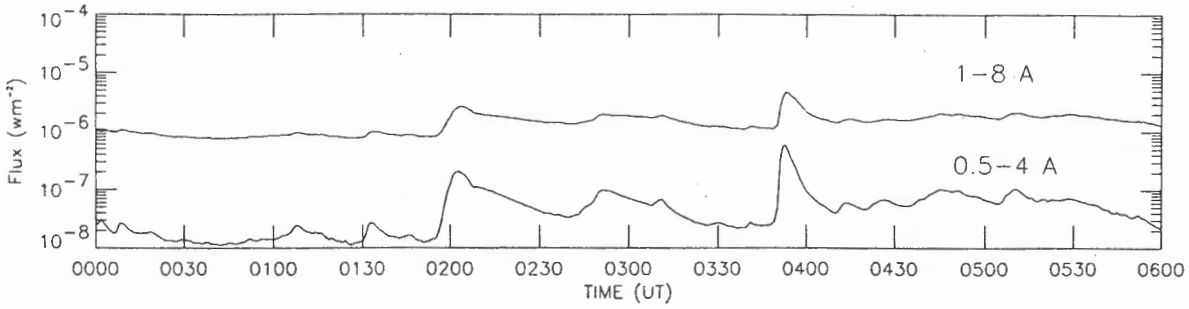
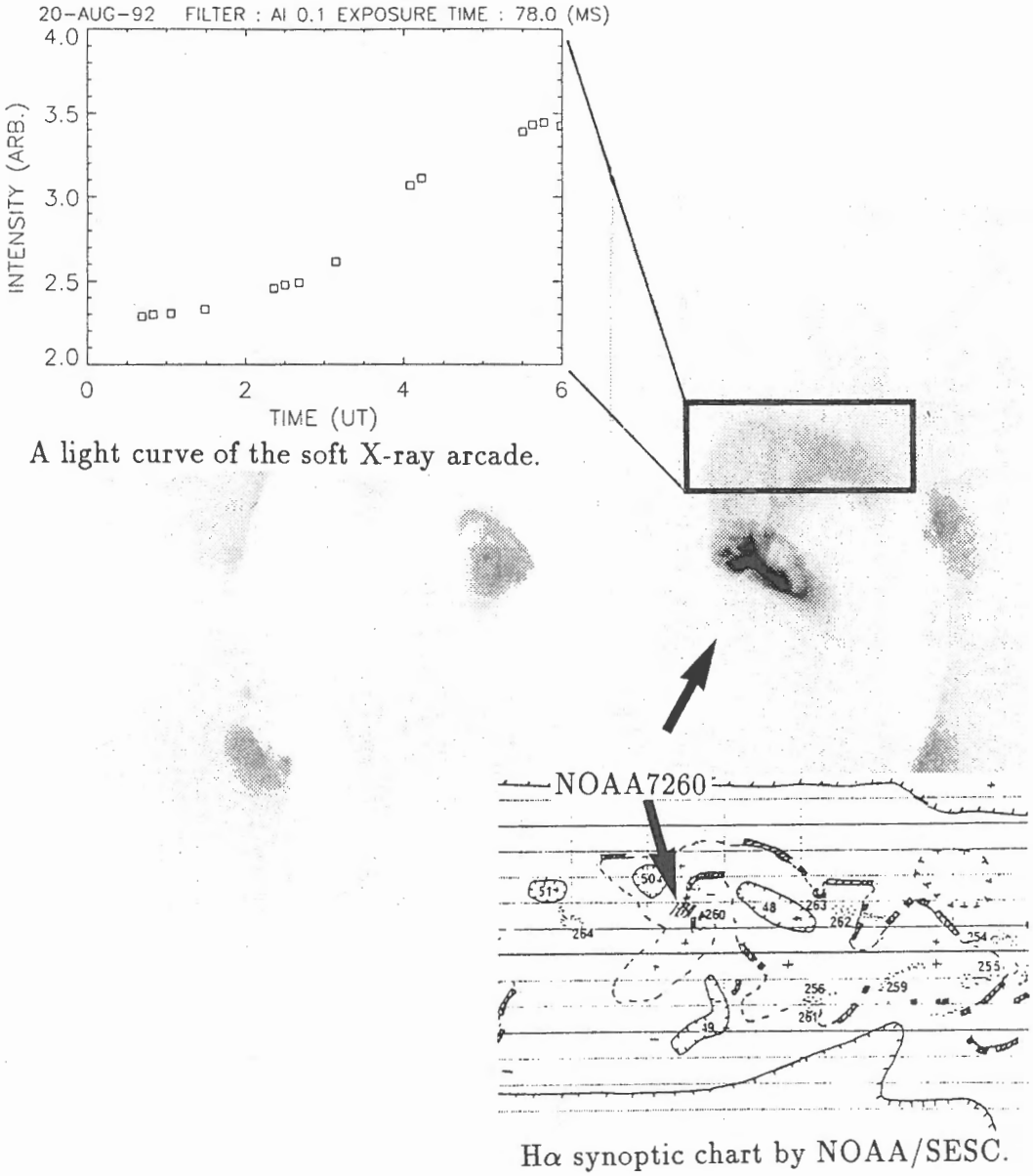


Fig. 2. Time plots of *GOES* X-ray flux on 1992 August 20.



A light curve of the soft X-ray arcade.

Hα synoptic chart by NOAA/SESC.

Fig. 3. Soft X-ray arcade above NOAA7260 associated with the strong metric burst, a light curve of the soft X-ray arcade, and Hα synoptic chart by NOAA/SESC.

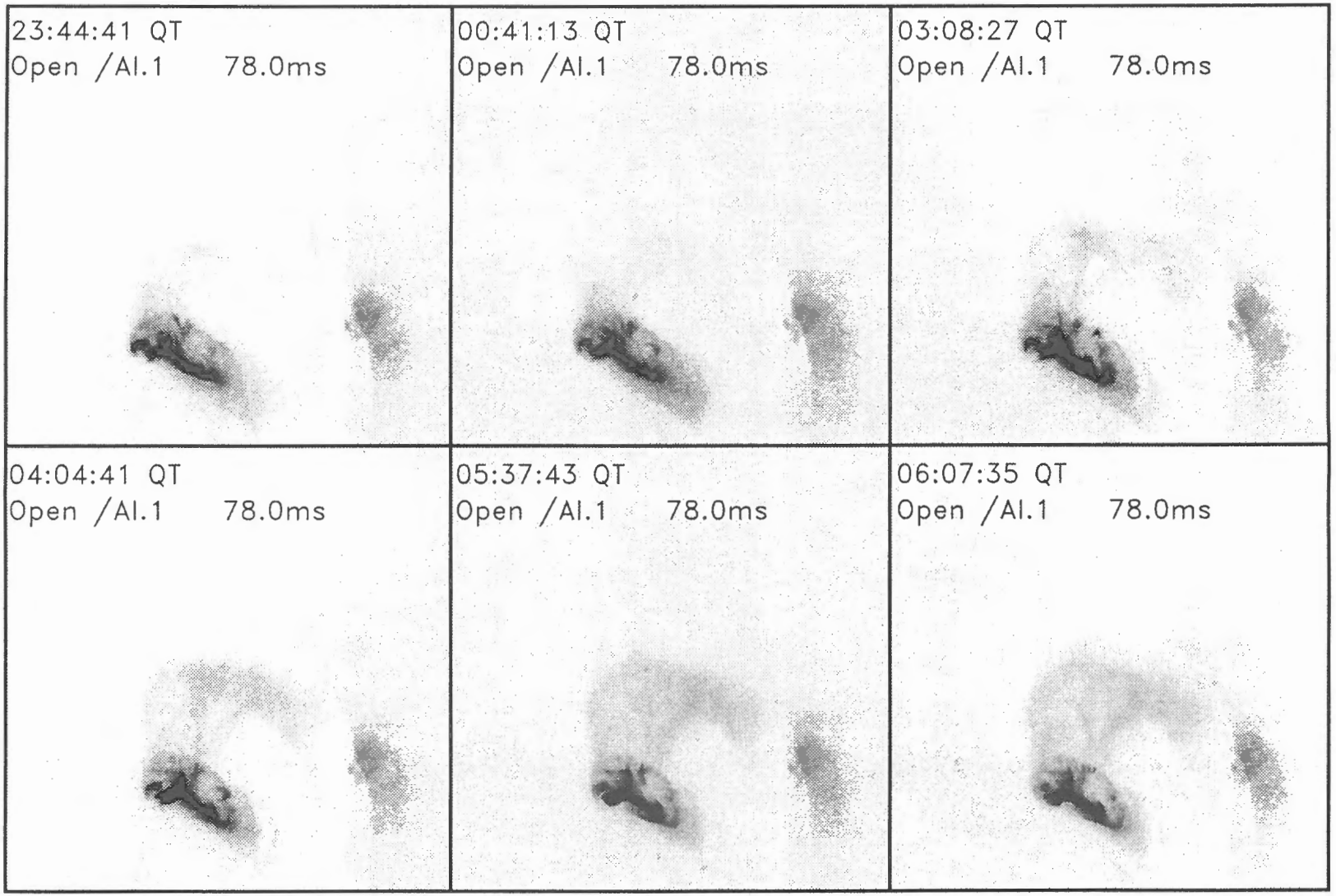


Fig. 4. Time evolution of soft X-ray arcade associated with the strong metric radio burst on 1992 August 20.

at 200 MHz and 100 MHz commenced at around 0300UT and 0330UT respectively. A weak microwave burst at 9500 MHz was observed at about 0450UT during meterwave continuum radiation. No remarkable impulsive burst was observed in both meter- and micro-wave range at the beginning of this event shown in Figure 1. Several C-class flares were observed by the American meteorological satellite, *GOES* (Figure 2). However, they weren't coincident with the beginning of this meterwave continuum radiation.

The soft X-ray bright arcade with large extension in the north side of the active region, NOAA7260(N16W28), was observed by the SXT on *Yohkoh* at the same time as this meterwave burst and continued for several hours shown in Figure 3. This arcade crossed over an inversion line and expanded along this, according to Hα synoptic chart (Figure 3) by NOAA/SESC. A light curve of the soft X-ray arcade above NOAA7260 (Figure 3) is similar to the time plot of the radio flux at 200 MHz shown in Figure 1. The similarity of these two time-profiles implies a close physical connection between the two phenomena. And height of the arcade is correspond with height responsible for plasma emission at around 200 MHz, according to Newkirk model. This suggests that meterwave emission occurred in the large arcade apart from the active region.

Time evolution of the arcade, formed above NOAA7260, is shown in Figure 4. At the beginning of this event, several large loops in the north side of NOAA7260 became brighter. They connected between small loops in NOAA7260 and area above it. There was a small filament along the top of the large loops. And then bright parts expanded both sides along the inversion line.

3. Discussion

As described above, frequent interactions between small and large loops may activate large loops along the inversion line and generate a intense metric continuum radiation, through continuous electron-acceleration, without remarkable impulsive bursts.

There are many loop-interactions in active regions according to *Yohkoh* observation. However, the observed number of intense metric events is not so many comparing with the number of observed loop-interactions. This implies that a large arcade may have an important role for intense and intense metric continuum radiation.

Gergely et al. (1979) pointed out that a long-lasting meterwave continuum emission on 1973 August 21 is associated with large white-light loops in

the High Altitude Observatory's coronagraph. Lantos et al. (1981) analyzed the relationship between a soft X-ray long duration event and an intense metric noise storm and concluded that electrons of about 10 keV generate the radio emission inside a large expanding loop transient apart from an active region. Our observational result is in agreement with Gergely (1979) and Lantos (1981) and emphasizes that large loops activated by small loops in an active region have an important role for intense metric continuum emission.

4. Concluding Remarks

We may summarize the intense metric continuum event as follows :

(a) An intense metric continuum emission commenced at about 0300 UT without remarkable impulsive bursts (type II and type III bursts). This may suggest that impulsive bursts aren't necessary for this kind of continuum radiation. No flare was coincident with the beginning of this metric burst.

(b) The similarity of light curves of the soft X-ray arcade above NOAA7260 and 200 MHz radio flux implies that these events were physically linked.

(c) Small loops in an active region (NOAA7260) frequently interacted with a filament, which lay along an inversion line, through several large loops. As a result, a large bright arcade was developed. This activity seems to have generated the strong metric radiation. Large soft X-ray arcade or loops may have an important role for the strong metric continuum radiation.

References

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Lantos, P., Kerdraon, A., Rapley, G.G., and Bentley, R.D., 1981, Astron.Astrophys., **101**, 33.