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ELECTRON ACCELERATION IN CONNECTION WITH RADIO NOISE STORM ONSETS OR ENHANCEMENTS

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1 Introduction

Radio noise storms are generated by suprathermal ($\simeq$ 10 keV) electrons accelerated continuously over time scales of hours or days in active region magnetic fields. They are related to emerging magnetic loops interacting with overlying loops and leading to magnetic coronal reconfiguration (e.g. Bentley et al. 2000). Noise storm onsets or enhancements have been sometimes observed in association with a flare-like sudden energy release in the active region producing a localized microwave (Raulin et al. 1991) or soft X-ray brightening (Raulin & Klein 1994). A few cases have also been reported in which 10-30 keV emission from a superhot plasma or from non-thermal electrons have been observed at the onset of noise storms (Crosby et al. 1996) confirming that a flare-like energy release in the lower corona could be a necessary condition for noise storms to start. No spatially resolved hard X-ray observations were however available in the case of the latter analysis, allowing to check that the flare-like emission and the noise storm were originating from the same active region. We present here an event for which both radio and hard X-ray (HXR) spatially resolved observations are available.

2 Observations and Results

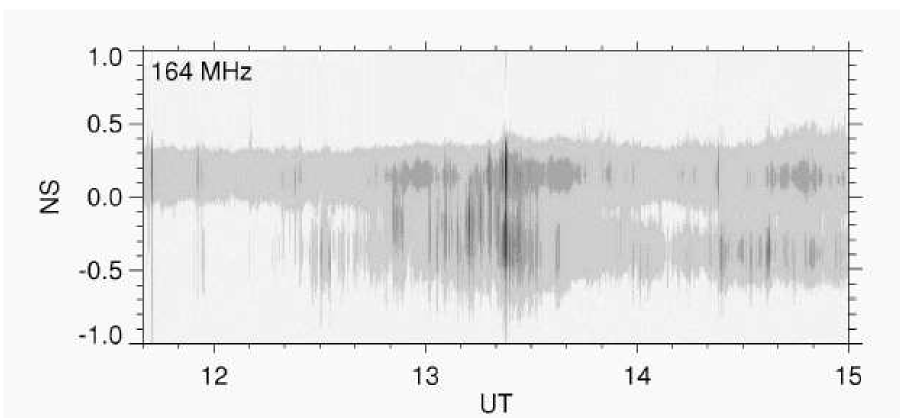

Fig. 1. Isocontours of the radio intensity at 164 MHz as a function of the north-south position on the Sun for the noise storm radio sources observed on 29 April 2005 by the Nançay Radioheliograph. Notice the appearance of a new noise storm toward the south from 12:30 UT.

Figure 1 shows the isocontours of the radio intensity at 164 MHz as a function of the north-south position observed by the Nançay Radioheliograph (NRH) on 29 April 2005. A radio noise storm is observed from 11:00 UT to 15:00 UT in the northern hemisphere at all the NRH observing frequencies. At 164 and 150 MHz, the intensity of the noise storm is observed to increase around 12:50 UT. A new radio noise storm appears in the

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southern hemisphere at these 2 frequencies (and also at 236 MHZ) after 12:30 UT. The GOES X-ray flux is observed to slowly rise after 12:00 UT. The X-ray flux observed by RHESSI in the 6-12 keV range also exhibits a rise from 12:00 ut to 13:00 UT (night time) with a succession of small peaks.

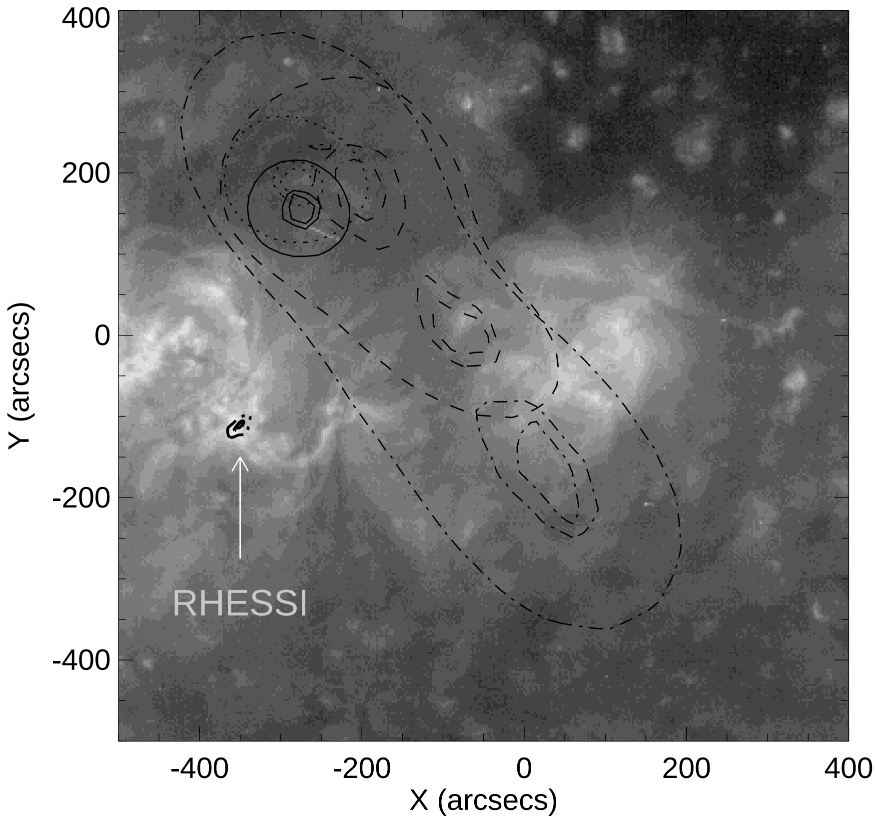

Fig. 2. Positions of the noise storm radio sources observed at 13:01 UT with the Nançay Radioheliograph: at 164 MHz (dashed-dotted contours), 236 MHz (dashed contours), 327 MHz (dotted contours) and 410 MHz(full contours) and of the X-ray emission in the 6-12 keV range observed with RHESSI between 12:47 and 12:49 UT. The radio and HXR contours are overlaid on a SOHO/EIT image taken at 13:13 UT.

Figure 2 shows the positions of the two radio noise storms observed at 13:01 UT with the NRH together with the contours of the X-ray emission observed by RHESSI in the 6-12 keV range shortly before the RHESSI night. The flare-like X-ray emissions observed by RHESSI from 12:00 UT originate from the active region which is closely linked to the radio noise storms. The PFSS extrapolation of the magnetic field in the vicinity of the active region (method from Schrijver & DeRosa (2003) available via Solar Soft) shows the magnetic connections between the location of the X-ray flare in the active region and the radio noise storm in the southern hemisphere (Vilmer and Trottet, in preparation).

References

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