Radio counterparts to SXR transients

D. E. Gary[1]

[1] Physics Department, New Jersey Institute of Technology, Newark, NJ, USA

By now several studies have been done on small-scale brightenings seen at radio, UV, EUV, and soft X-ray wavelengths. These are to be reviewed by Kundu in these proceedings. In this talk we concentrate on the radio counterpart of a particular type of brightening—the soft X-ray transient brightenings of Shimizu. These brightenings are associated with active regions, and a first study of radio counterparts by White et al. (1995) using Nobeyama data found an excellent correspondence between the 17 GHz and SXR brightenings, both spatially and temporally. However, this study found that both the SXR and microwave emissions could be satisfactorily explained as purely thermal emission, and a search of BATSE hard X-ray data showed no nonthermal counterpart. White et al. (1995) were forced to conclude that the events may be different from flares.

A more sensitive search for nonthermal emission was needed, in particular using lower frequency microwaves where the influence of nonthermal electrons would be more easily detected. Gary, Hartl and Shimizu (1996) found 34 SXR transient brightenings over a 10-day period in May 1992, for which OVRO (1-18 GHz) total power data were available. A comparison of the data showed a number of clear nonthermal signatures. In addition, one of the events was seen in the lowest energy (6-9.3 keV) channel of the BATSE SPEC detector, suggesting a connection between the microflares discovered in hard X-rays by Lin et al. (1984). The evidence that SXR transient brightenings are microflares is reviewed in this talk. We also attempt to place other small-scale brightenings in context with regard to SXR transient brightenings and microflares.