

Microflares with RHESSI and *Hinode*/XRT

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Abstract. In this article we discuss the opportunities for analyzing microflares with RHESSI and *Hinode*/XRT. We present analysis of one microflare, using the RHESSI to obtain the thermal and non-thermal spectral parameters and compare the RHESSI images of the thermal (4-8 keV) and non-thermal (12-50 keV) emission with the *Hinode*/XRT images. The RHESSI non-thermal emission in this event matches spatially and temporally the initial brightest emission from XRT.

1. An Example Microflare

RHESSI (Lin et al. 2002) has observed over 25,000 microflares (small active region associated flares below GOES C class) since March 2002 (Christe et al. 2008). With RHESSI the thermal and non-thermal emission of each microflare can be imaged and the spectral parameters (temperature, emission measure, non-thermal power-law index) derived allowing an estimate of the microflare's energy (Hannah et al. 2008). As RHESSI has been continuously operating since *Hinode* (Kosugi et al. 2007) launched in late 2006, we can use both instruments to get a better understanding of the dynamics, energy composition and physical processes in these microflares.

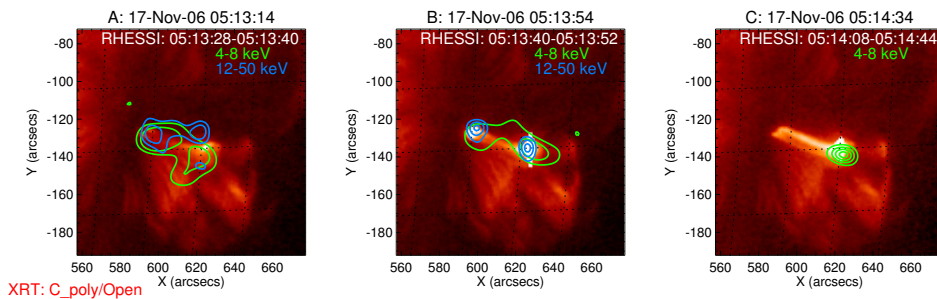


Figure 1. XRT images (using C Poly filter) during the time of peak emission from the 05:13 17-Nov-2006 microflare, with RHESSI thermal (4-8 keV) and non-thermal (12-50 keV) contours overlaid from the three time periods highlighted in Figure 2. The RHESSI images were produced using visibilities and the MEM NJIT routine (Schmahl et al. 2007). In the middle panel (B) the RHESSI non-thermal footpoints match the bright XRT emission.

An example microflare from 05:13 17-Nov-2006, observed with both RHESSI and *Hinode*/XRT (Golub et al. 2007) is shown in Figure 2 (RHESSI lightcurve

and fitted photon spectra) and Figure 1 (XRT images overlaid with RHESSI contours). This remarkably hard microflare has emission > 50 keV and the non-thermal energy input is about $W_N = 10^{28}$ ergs, assuming a thick target (Brown 1971). The RHESSI non-thermal images correspond spatially and temporally with the initial bright emission observed with *Hinode*/XRT. RHESSI and *Hinode* present a great opportunity to study microflares and the example here is merely a nice starting point.

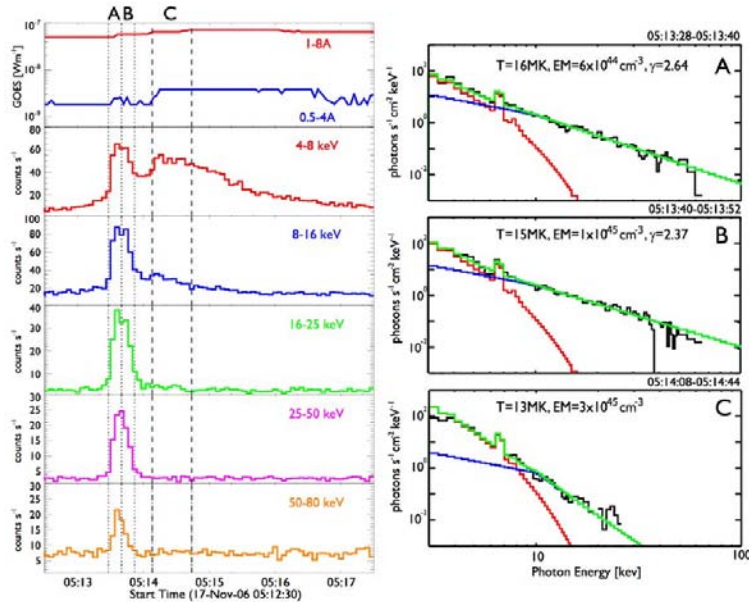


Figure 2. (Left) RHESSI light curves for various energy ranges from the 05:13 17-Nov-2006 microflare, GOES Class A8/A2 (background subtracted). The vertical lines indicate the three time periods during the microflare that have been analyzed in detail. (Right) The RHESSI photon spectra of the three highlighted time periods. The spectra have been fitted by a model containing a thermal (red: online version) and non-thermal (blue: online version) components. This small microflare has remarkably hard emission, with clear non-thermal emission from 25 to above 50 keV. The non-thermal emission was not imageable for time period C.

References

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