Active Region Microflares From Hinode and RHESSI

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Abstract. We are studying microflares (A, B-C class flares) in active regions using coordinated observations from Hinode and RHESSI. Hinode/EIS has unprecedented diagnostic power for small, transient activity in the solar corona, providing temperature, density, and velocity information. For this purpose, we designed and ran an EIS observing sequence to provide high-cadence data at both transition region and coronal temperatures. A preliminary analysis of these observations is reported, with one data set given as an example.

1. Introduction

Although small-scale energy release in active regions (ARs) has been observed extensively in different forms, with different instruments such as Yohkoh/SXT, RHESSI, and TRACE, the relationship between the small-scale events observed simultaneously at different wavelengths is still unclear. We combine microflare observations from the recently launched Hinode observatory with RHESSI data to study how the observed events relate to each other. The Hinode EUV Imaging Spectrometer (EIS: Culhane et al. 2007) has diagnostic power for small, transient activity in the solar corona, providing temperature, density, and velocity information (Young et al. 2007a). RHESSI (Lin et al. 2002) provides hard X-ray diagnostics and gives quantitative measurements of the energy content in non-thermal electrons and thermal plasmas covering a wide temperature range (∼8-30 MK). When available, we use high-resolution EUV images from TRACE to provide context information.

2. A new EIS Sequence Designed to Observe Microflares

We designed an observing sequence for EIS which has been successfully run over several ARs since Apr. 2007. The study (CAM,ARTB,RHESSI) is aimed at investigating small-scale, transient energy release in ARs. A range of some of the strongest transition region (TR) and coronal lines observed with EIS has been selected in order to cover a wide temperature range. We note that, with this sequence, the relationships between coronal activity (i.e. microflares) and any TR signatures can be investigated. The hot Fe XXIV flare line at 192.03 Å is also covered. We included line pairs (Mg VII λ278.39/λ280.75, Si X
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Figure 1. Left and middle: EIS images of the 2007 May 22 microflare taken between 18:49-18:53 UT in the Fe XIII and Fe XVI lines. The overlaid contours are from RHESSI over 4-8 keV. Right: The same RHESSI 4-8 keV contours are overlaid on a softer X-ray image from XRT (note different scale than EIS).

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References

Young, P. R., Del Zanna, G., Mason, H. E. et al. 2007, PASJ, 59, S727
Young, P. R., Del Zanna, G., Mason, H. E. et al. 2007, PASJ, 59 S857