

Hard X-ray imaging spectroscopy of solar flares by RHESSI

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Hard X-ray observations of solar flares are expected to provide us with various information of accelerated electrons such as distribution functions, location of acceleration, and site of energy loss. Especially, it is important to use spatially resolved hard X-ray spectrum so as to understand acceleration mechanism. RHESSI (The Reuven Ramaty High Energy Solar Spectroscopic Imager), launched on 2002 February 5, has capability of higher resolution in energy than the previous instruments. In RHESSI data analysis, we can use larger number of energy bands to fit spectrum, than in Yohkoh. Therefore, we obtain hard X-ray spectrum with the high energy resolution. By taking advantage of this capability, we analyze with imaging spectroscopy on each hard X-ray sources. The analysis is carried out from intense events one by one. At the moment, we succeed at imaging spectroscopy in 2 out of 32 events (GOES class X).

A large two-ribbon flare (GOES class X1.2) occurred on 2003 May 29. Double-source structure is obtained over a wide energy range on the hard X-ray image by RHESSI. It is thought that double sources are associated with site where accelerated electrons fall down in the foot-points along a loop. We resolve spectrum on each source, and obtain photon index about 3 and 2 for the east and the west sources, respectively. Ratio of flux of the east source to the west source is about 1.3, i.e., the east source is brighter, but intensity of magnetic field is approximately equal. This result is not consistent with that of Sakao(1994), in which he found a trend that magnetic field is weaker and spectral index is harder in brighter source.

On the other hand, in a flare on 2003 May 27 (GOES class X1.3), ratio of flux of the east source to the west one is about 1.8, i.e., the east source is brighter. The ratio of intensity of magnetic field is about 0.2, i.e., the east source is weaker. Photon index is about 3 and 4 in the east and the west source, respectively. This result is consistent with that of Sakao(1994).

We will show the results of more events, then discuss about the correlation among the X-ray flux, spectral index, and intensity of magnetic field on each source.