Hard-Xray Imaging Spectroscopy of Flare by RHESSI

Natsuko Mitani[1]; Takaaki Yokoyama[2]; Jun Sato[3]

[1] Earth and Planetary Sci., Univ. of Tokyo; [2] School of Science, Univ.Tokyo; [3] Graduate School of Environmentan Studies, Nagoya Univ

It is widely accepted that the magnetic reconnection model explains the release of magnetic energy in solar flares. But the mechanism which accelerates high energy particles that emit nonthermal radiations is still unknown. 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 hard X-ray sources.

The analysis is carried out four spikes on one event. A 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. Double sources are associated with site where accelerated electrons fall down in the foot-points along a loop. We resolve spectrum on sources in detail, and obtain the spatial structure of photon index. At the outside of a source (the farther side from the magnetic neutral line), the spectrum tends to be harder than that in the inner side. We also analyzed the centroid positions of the double sources and separation of the footpoints in different energy. The separation as a function of photon energy is consistent with the tendency of the spatial structure of photon index. We discuss what kind of model can support this tendency.