White-Light Emission and Related Particle Acceleration Phenomena – Conditions that Enhance White-Light Emission in Solar Flares

Watanabe, Kyoko (1), watanabe.kyoko@isas.jaxa.jp; Toshifumi Shimizu (1); Satoshi Masuda (2); Jun Kitagawa (2); and Shinsuke Imada (2).
(1) Institute of Space and Astronautical Science (ISAS) / Japan Aerospace Exploration Agency (JAXA), Sagamihara, Kanagawa, Japan
(2) STE Laboratory, Nagoya University, Nagoya, Japan

"White-light (WL) flares" occur in association with strong solar flares like the Carrington event. It is thought that WL emission is related to strong particle acceleration, which might be connected to CMEs and SEPs as the original source. However, these relationships have not been studied well due to the small number and difficulty of obtaining WL observations. Moreover, there is still a problem concerning how the energy of non-thermal electrons (the origin of WL emission) propagates and produces WL emission.

To understand the conditions that produce enhancements of WL in solar flares, we performed a statistical analysis of the Hinode/SOT WL data. We found data for more than 30 flare events that were observed with Hinode/SOT and RHESSI among all the X- and M-class flares that have occurred since 2011. Less than the half of the events have WL emission, and more than half don't have any WL emission in the SOT FOV. We compared several parameters of these two groups, and found that the precipitation of large amounts of accelerated electrons into a compact area within a short time plays a key role in generating a WL event.

The Hinode satellite also can observe the chromospheric response seen in EUV observations. During the X1.8-class flare on 2012 October 23, Hinode/EIS was scanning over the flaring active region, and observed strong red and blue shifts over the WL kernel. Using these data we also found that density changes in the chromosphere play a key role in producing WL emission.