Geophysical Research Abstracts
Vol. 21, EGU2019-9726, 2019
EGU General Assembly 2019
© Author(s) 2019. CC Attribution 4.0 license.

Determination of Large Scale Plasma Properties of Solar Corona Using the X-Ray Telescope onboard Hinode: II. Correction for the Scattered Lights

Junho Shin (1), Ryouhei Kano (2), Takashi Sakurai (2), Yeon-Han Kim (3), and Yong-Jae Moon (1)

(1) Kyung Hee University, School of Space Research, Korea, Republic Of, (2) National Astronomical Observatory of Japan, Solar Science Observatory, Japan, (3) Korea Astronomy and Space Science Institute, Solar and Space Weather Research Group, Korea, Republic Of

The X-Ray Telescope (XRT) onboard Hinode, which was designed to observed a variety of coronal structures with temperature between 1 and 10 MK in the range of 34x34 arc min field of view (FOV) covering the full solar disk, has provided solar X-ray images for more than a decade and contributed to the progress in our understanding of coronal physics. In particular, long-term observation of coronal hole regions covering almost one solar cycle has an important meaning not only in the field of solar physics but also in relation to the space weather because the coronal hole is known as the source of solar winds. Detailed study on the physical conditions of solar plasma in the coronal hole and also the off-limb area will give us a clue to understand the boundary conditions and constraints on the theoretical mechanism of heating the coronal plasma.

An astronomical telescope is in general designed such that the best-focused image of an object is achieved at or very close to the optical axis, and inevitably the optical performance deteriorates away from the on-axis position. The Sun is, however, a large astronomical object and thus targets near the limb of full-disk images are placed at the outskirt of the field of view. Therefore, the optical design of a solar telescope should consider with care the uniformity of imaging quality over a wide FOV. Even after such a design effort, the off-axis performance of the solar telescopes should be characterized very carefully in order for the data away from the center to be properly interpreted.

We have evaluated the amount of scattered light inherent in the Hinode/XRT data by analyzing the in-flight images highly saturated during the solar flare events. It is revealed that, like the case of Yohkoh/SXT, the light scattered due to the roughness of mirror surface has a power-law distribution of r̂-2 and also shows clear energy dependence, which has enabled us to complete a full description of XRT PSF profile from the core to the scattering wing. A successful restoration of the scattered lights in the observed XRT images will provide us with more precise information on the physical quantities of solar coronal plasma in the off-limb regions. Many interesting results on the correction for Hinode/XRT scattered lights will be introduced and discussed thoroughly.