[EE] Evening Poster | P (Space and Planetary Sciences) | P-EM Solar-Terrestrial Sciences, Space Electromagnetism & Space Environment

[P-EM12]Space Weather, Space Climate, and VarSITI

convener:Ryuho Kataoka(National Institute of Polar Research), Antti A Pulkkinen (NASA Goddard Space Flight Center), Kanya Kusano(名古屋大学宇宙地球環境研究所, 共同), Kazuo Shiokawa(Institute for Space-Earth Environmental Research, Nagoya University)
Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
Past, Present, and Future of Solar-Terrestrial Environment is the keynote of this session. We share the latest scientific papers to understand how the solar-terrestrial environment changes in various time scales, and discuss the necessary international collaboration projects associated with VarSITI. More specifically, welcomed papers include space climate studies using tree rings and ice cores; cutting-edge observational and modeling studies of geospace, heliosphere and the sun; simulation and statistical studies to predict the future space weather and space climate.

[PEM12-P02]Statistical study of active-region microflares observed with Hinode/XRT

*Satoshi Masuda[1], Ryoya Uemura[1], Ryouhei Kano[2] (1.Institute for Space-Earth Environmental Research, Nagoya University, 2.National Astronomical Observatory of Japan)
Keywords:solar flare, coronal heating, X-ray

The solar corona, the most outer atmosphere of the sun, is very hot (~ 1 MK) compared with the solar surface (~6,000 K) in spite that the energy source is nuclear fusion taking place in the deep layer inside the sun. This is one of the unsolved major problems of solar physics, and is also closely related with the problem of the solar wind acceleration. Small solar flare such as ‘microflare’ and ‘nanoflare’ is one of the candidates of the heating mechanism of the solar corona. Since 1980s, many observational studies of microflares have been done in various wavelengths such as hard X-rays, soft X-rays, and EUVs. Soft X-ray observation is the most important among them because it can detect emissions from a high temperature (a few MK) plasma might be created by microflares. The first statistical study of soft X-ray microflares was done as a result of observations with Soft X-ray Telescope (SXT) onboard Yohkoh (Shimizu 1995, hereafter S95). The results showed that the frequency distribution of flare energy was represented by a single power-law (dN/dE = A x $E^{-\α}$; N: number of events, E: energy of events, A and α: constants) in the energy range of 10^{27} - 10^{29} with α of 1.5-1.6. It was concluded that the total energy supplied by microflares is not enough to maintain the temperature of the active-region corona even if this distribution can be extended to the lower energy range.
In order to investigate the frequency distribution in the energy range below 10^{27} erg, we analyzed high-cadence (3-6 sec) and high-resolution (1.03 arcsec/pixel) soft X-ray images taken with the X-Ray Telescope (XRT) onboard Hinode. The same active region was observed with four different filters repeatedly and the total observing time is 45 – 90 minutes for one filter. More than 10,000 events in total were automatically detected in the light curves of 4 x 4-pixel-binned XRT images. The frequency distribution was represented by a power-law in the energy range of about $10^{25.5}$ - $10^{27.5}$ erg. The shape of the distribution is similar to S95. However, the power-law index is different. Our result is about 2.2-2.6, larger than 2 though that of S95 is smaller than 2. This is a new finding for active-region microflares. Next, we compared the total energy loss rate and the total energy input rate by microflares detected in this analysis. It was found that the total energy input rate is much smaller than the total energy loss rate. However, there is a possibility if this distribution with the same power-law index

extends to the smaller energy range because the power-law index α is larger than 2 in our study. Actually if the same distribution extends of ~ 10^{22} erg, then such smaller events can have enough energy to explain the active-region coronal heating.