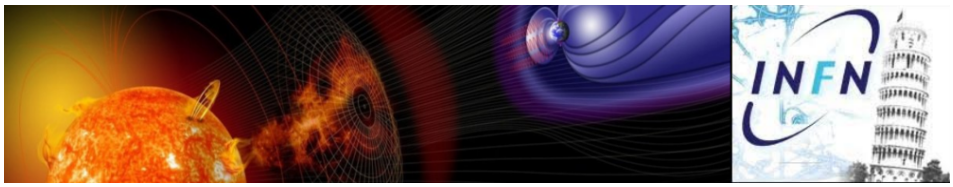

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Time Evolution of Thermal and Non-thermal Emission from M7.6 Class Flare Observed with MinXSS and RHESSI

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We conduct the wide-band X-ray spectral analysis in the energy range of 1.5 keV-100 keV and study the time evolution of the thermal and non-thermal emission in the July 23, 2016 M7.6 Class solar flare observed with the Miniature X-ray Solar Spectrometer (MinXSS) CubeSat and the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI). As a result, the time evolution of multi-thermal and non-thermal emissions is clearly resolved with a resolution of 10 seconds cadence, which corresponds to the Alfven time scale in the solar corona and it makes possible to track the detailed spectral phases as the flare progresses. A maximum of three temperature components: a "cool" plasma (T~3 MK), a "hot" plasma (T~15 MK), and a "super-hot" plasma (T~30 MK) are detected and the emission measure of cool and hot plasma emissions are drastically increased more than hundreds of times as the non-thermal emission becomes harder. In addition, we also quantify the time variation in Fe, Ca and Si abundances with the help of high energy resolution of MinXSS. This detailed time evolution information is a key to estimate each emission mechanism even though MinXSS has no spatial information. By comparing the 17 GHz radiowave flux observed by the Nobeyama Radio Polarimeters (NoRP) and the spatial information obtained by the Atmospheric Imaging Assembly (AIA) onboard the Solar Dynamics Observatory (SDO), we find that a cool and a hot plasma thermal emission are related to chromospheric evaporation and a super-hot thermal emission may come from the thermalization of the non-thermal electrons trapped in the flaring loop.

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