



Contribution ID: 34

Type: **Poster**

Sun-as-a-star Analysis of Simulated Solar Flares

Context. Stellar flares has an impact on habitable planets. To study the flares by observations with no spatial resolution, Sun-as-a-star analyses are developed. With the data of Sun-as-a-star observations, a simulation of solar flares is required to provide a systemic clue to the Sun-as-a-star study.

Aims. We aim to develop a model of solar flares and study the relationship between the Sun-as-a-star spectrum with the flare class and location.

Methods. Using 1D radiative hydrodynamics flare model and multi-thread flare assumption, we obtain the spectrum of a typical flare with an enhancement of chromospheric lines.

Results. The preflare-subtracted spectrum of $H\alpha$ shows an enhanced and shifted component, highly depending on the flare class and location. The velocity sign is well measured by the bisector method. The spectrum of a limb flare tends to be wider and shows a central reversal profile. In particular, we propose two quantities to diagnose the class and location of the stellar flares. Besides, caution must be taken when calculating the radiation energy, since the conversion coefficient from observed flux to energy is dependent on the flare location.

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Session Classification: Coffee break and poster session 2

Track Classification: Multi-scale energy release, flares and coronal mass ejections