Comparison of Solar and Stellar White-light Flares

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Flares are sudden brightenings on stellar surfaces. Especially, flares observed in visible continuum are called “**white-light flares**”. Recently, many superflares on solar-type stars which have 10-10,000 times larger energies than the largest solar flares are discovered as white-light flares with Kepler space telescope (Maehara et al. 2012; Shibayama et al. 2013). According to the statistical study of superflares, there is a correlation between the energies (E) and durations (t): $t \propto E^{0.39}$ (Maehara et al. 2015). This power-law relation is similar to that of the solar hard/soft X-ray: $t \propto E^{0.2\text{-}0.33}$ (Christ et al. 2008; Veronig et al. 2002). These common relations suggest the universal mechanism of energy release on solar and stellar flares (magnetic reconnection).

We present here a comparison of solar and stellar “white-light” flares on the relation between the flare energies and durations. The comparison of the same wavelength emission (visible continuum) can directly approach that of the energy release mechanism of solar and stellar flares.

The result shows that **the durations of solar white-light flares are one order of magnitude longer than that expected by the t-E relation of stellar superflares**. The discrepancy may imply the different physical properties of solar and stellar flares such as (1) flare emission / cooling mechanism or (2) magnetic field strength.

We consider that this difference between solar and stellar flare can become a clue not only to the environment of stellar superflares but also to the possibility of superflares on our Sun.

Keywords: solar flares, superflares, magnetic reconnection