

Superflares on solar-type stars

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We will present our recent research on superflares on solar-type stars (G-type main sequence stars).

Superflares are eruptive events mainly seen in rapidly-rotating stars like young stars and close binary stars, and have a total energy of 10^{33} - 10^{38} ergs, 10 - 10^6 times larger than that of the largest solar-flares observed so far.

We searched for superflares from the data of 90,000 solar-type stars observed by the Kepler space telescope between 2009 April and 2010 August. We found more than 1,500 superflares on 279 solar-type stars, including 60 superflares on 25 Sun-like stars (solar-type stars with a rotation period longer than 10 days and with the surface temperature of 5600-6000 K). Most of these stars show quasi-periodic light variations with the amplitude of 0.1-10% which suggest the existence of large starspots on rotating stars.

The energy-frequency distribution of superflares are similar to that of solar-flares and can be fitted by a power-law function with the index of -1.6 - -2.0 in the energy range between 10^{34} and 10^{36} erg.

Although the flare occurrence frequency decreases as the rotation period increases, the maximum energy of superflares does not depend on the rotation period of stars. These results suggest that superflares can occur on the slowly rotating stars like our Sun.

The average occurrence frequency of superflares which release 10^{35} erg of energy (1,000 times larger than that of the largest solar-flares) on Sun-like stars is estimated to be once in a few thousand years.

Keywords: solar flares, superflares, extreme space weather events