

Superflares and Their Possible Impact on on Terrestrial Environments

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Superflares are very big flares that release total energy much greater than that of the biggest solar flares with energy of $\sim 3 \times 10^{32}$ erg. If such superflares will occur on our Sun, we would have extreme space weather events, which might lead to big hazards of terrestrial environments and our civilization. Recent observations of solar type stars with Kepler satellite have revealed existence of superflares (with energy of 10^{34} - 10^{35} erg) on the Sun-like stars with similar surface temperature (5600-6000 K) and slow rotation (< 10 km/s) (Maehara et al. 2012, Nature). From the statistical analysis of these superflare observations, it is found that superflares with energy 10^{34} erg occur once in 800 years and superflares with 10^{35} erg occur once in 5000 years on the Sun-like stars. These observations suggest that we may not be able to avoid the frightening possibility that superflares with 10^{34} - 10^{35} erg would occur once in 800-5000 years on the present Sun. Finally, I will argue possible impact of such solar superflares on the terrestrial magnetosphere, atmosphere, and infra-structure of our modern civilization such as power-grids, radio communication, and artificial satellites.

Keywords: solar flares, stellar flares, space weather, geomagnetic storm, solar energetic particles