



## Solar and Stellar Flares and Their Impacts on the Earth and Exoplanets

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### Abstract

Solar flares generate not only strong electromagnetic emissions but also nonthermal energetic particles and bulk plasma ejections called coronal mass ejections. They sometimes lead to geomagnetic storms and affect our civilization, damaging satellite, power-grids, radio communication etc. The energy source of solar flares is now established to be magnetic energy stored near sunspots. It has also been established, at least phenomenologically, that solar flares are caused by magnetic reconnection (Shibata and Magara 2011, Living Review in Solar Physics). It is well known that many stars show flares similar to solar flares, and often such stellar flares are much more energetic than solar flares ( $10^{29}$ - $10^{32}$  erg), called superflares (with energy  $> 10^{33}$  erg). We argue that these superflares on stars can also be understood in a unified way based on the reconnection mechanism. We will discuss the current status of understanding of physics of solar and stellar flares (and superflares) and their impacts on the Earth and exoplanets around stars.