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The single mechanism of solar and galactic cosmic rays acceleration arising during the flare process

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The modern detection of giant flares on the star dwarfs of the class G with the energy significantly exceeding the energy of the solar flares indicates the possibility of proton acceleration beyond the boundary of the solar system to energies significantly greater than the energy of solar cosmic rays. The superflare generation with the energy much larger than energy of big solar flares on a variety of class G stars are reported, some of which are rapidly rotating and some of which are of ordinary solar type [1]. 365 superflares are observed on the stars, including some superflares that are generated on the slowly rotating solar-type stars. About 83,000 stars have been investigated over 120 days using Kepler spacecraft data.

The previously considered significant difference in the energy maximums of galactic and solar cosmic rays did not contribute to the idea of the same cosmic ray acceleration mechanisms on the Sun and on stars. The recent data [2] is showed that the energy of the stellar flare can exceed 10ˆ{36} erg. It is by 3-4 orders greater than the energy of a large solar flare, and, apparently, the energy of the protons accelerated in these stellar flares can significantly exceed the energy of the particles registered from flares on the Sun. Thus, the flare can be a universal astronomical process responsible for proton acceleration on the Sun and on the stars. The flare and dynamics of the pre-flare state of the active region that caused the flare are available for direct investigation only on the Sun. Acceleration of particles of solar cosmic rays occurs during flares by the electric field in a current sheet in the corona above the active region.

1. Lin R.P., Krucker S., Hurford, G.J. et al.: 2003, Astrophys. J. 595, L69.
2. Maehara, H., Shibayama, T., Notsu, S., et al.: 2012, Nature. 485, 478.

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