PHYSIKALISCHES KOLLOQUIUM

AM 21. OKTOBER 2019 UM 17 UHR C.T.

IM GROßEN HÖRSAAL

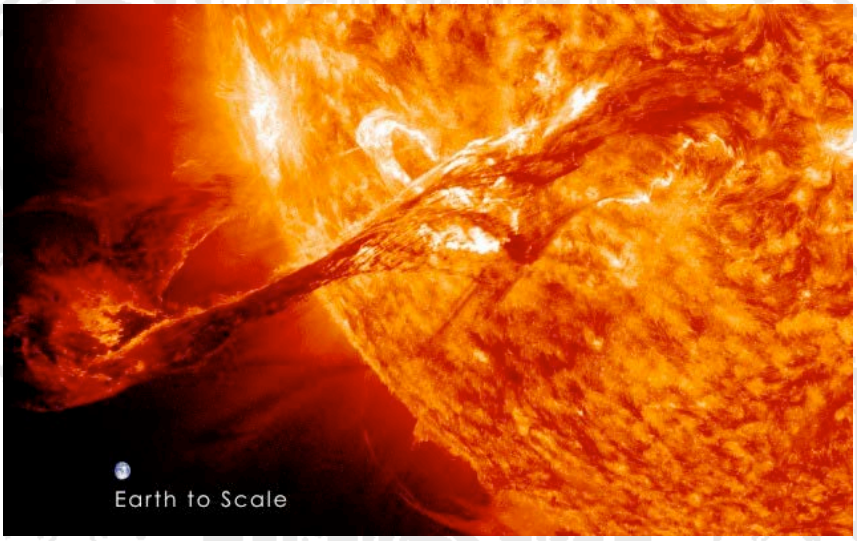

image source: https://www.nasa.gov/mission_pages/sunearth/news/gallery/earth-scale.html

EXPLOSIONS ON THE SUN

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Solar flares are extremely powerful eruptions, which can release the equivalent energy of hundreds of billions of atomic bombs in minutes. Their violent nature and influence on Earth was realized in 1859 when English astronomer R. Carrington suddenly saw an unexpected brightening on the Sun. Lasting only a few minutes on the Sun, the event was followed by intense space weather with auroras seen as far south as Hawaii, and by failures of telegraph systems, whose operators suffered from electric shocks.

Research in flare physics has determined that the energy stored in the solar magnetic field is powering the eruptions. Particles accelerated during magnetic reconnection events precipitate into interplanetary space, but also towards the solar surface where they cause many observable phenomena, such as heating, mass motions, sunquakes, and emission in the whole electromagnetic spectrum. But more than 1.5 centuries have elapsed since the first observation and we still do not understand flares well enough to build a predictive model. Flares on some Sun-like stars were found to be thousands of times more powerful than the strongest solar flares, but why such superflares occur and if this ever may happen on our Sun is still a mystery.

Recently, new space missions and ground-based observations have given more insight into the accelerated particles and the energetics of flare physics. I will present an overview of solar flares, recent discoveries and results, and provide an outlook on upcoming missions and new analysis techniques.