

Solar eruptions: Coronal Mass Ejections and Flares

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This lecture introduces the topic of Coronal mass ejections (CMEs) and solar flares, collectively known as solar eruptions. During solar eruptions, the released energy flows out from the Sun in the form of magnetized plasma and electromagnetic radiation. The electromagnetic radiation suddenly increases the ionization content of the ionosphere, thus impacting communication and navigation systems. Flares can be eruptive or confined. Eruptive flares accompany CMEs, while confined flares have only electromagnetic signature. CMEs can drive MHD shocks that accelerate charged particles to very high energies in the interplanetary space, which pose radiation hazard to astronauts and space systems. CMEs heading in the direction of Earth arrive in about two days and impact Earth's magnetosphere, producing geomagnetic storms. The magnetic storms result in a number of effects including induced currents that can disrupt power grids, railroads, and underground pipelines.