

The Sun and Earth

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Thus the Sun forms the basis for life on Earth via the black body radiation it emits. The Sun also emits mass in the form of the solar wind and the coronal mass ejections (CMEs). Mass emission also occurs in the form of solar energetic particles (SEPs), which happens during CMEs and solar flares. Both the mass and electromagnetic energy output of the Sun vary over a wide range of time scales, thus introducing disturbances on the space environment that extends from the Sun through the entire heliosphere including the magnetospheres and ionospheres of planets and moons of the solar system. Although our habitat is located in the neutral atmosphere of Earth, we are intimately connected to the non-neutral space environment starting from the ionosphere to the magnetosphere and to the vast interplanetary space. The variability of the solar mass emissions results in the interaction between the solar wind plasma and the magnetospheric plasma leading to huge disturbances in the geospace. The Sun ionizes our atmosphere and creates the ionosphere. The ionosphere can be severely disturbed by the transient energy input from solar flares and the solar wind during geomagnetic storms. The complex interplay between Earth's magnetic field and the solar magnetic field carried by the solar wind presents varying conditions that are both beneficial and hazardous to life on earth. This seminar presents some of the key aspects of this Sun-Earth connection that we have learned since the birth of space science as a scientific discipline some half a century ago.