

The Magnetosphere

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The physics of the magnetosphere is central to the space environment for the Earth and for most space-borne instrumentation and missions. The magnetosphere is a large cavity of low plasma density carved out of the solar wind by the Earth's magnetic field. It shields the upper atmosphere and the space out to tens of Earth radii from the immediate effects of the solar wind. However, conditions in the magnetosphere are dependent on the interaction with the solar wind and on the solar wind properties. The interaction of the magnetosphere with the solar wind determines the entry of plasma, momentum and energy into the magnetosphere, the redistribution of plasma and energy in the magnetosphere, and resulting geomagnetic effects such as radiation, strong electric fields, and energy deposition in the upper atmosphere. The lecture reviews the solar wind magnetosphere interaction, the corresponding magnetospheric dynamics such as geomagnetic substorms and storms, and aspects of the coupling to the ionosphere. Addressed will be also important basic plasma processes such as transport of information and energy in a plasma, plasma motion and acceleration, and magnetic reconnection.