# Earth's magnetosphere and Ionosphere

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**Résumé**

The Sun emits radiations at various wavelengths and particles at different energies which then impinge on the solar system planetary environments. For example, the solar X – UV radiations contribute to ionize the neutral components of Earth's atmosphere, creating a layer of ionized particles, called ionosphere and embedded in the upper atmosphere. The solar wind, flow of protons and electrons continuously ejected from the Sun, propagates at super-sonic speeds in the interplanetary medium. Its interaction with the terrestrial magnetic field creates a gigantic bubble around the Earth, the magnetosphere, which acts as a magnetic shield deviating the solar wind flow outside of its flanks and thus preserving the Earth's environment inside the magnetospheric bubble. However, this shielding is not perfect, small-scale processes may develop at the boundary with the interplanetary medium and are responsible of important effects such as the penetration of solar wind particles into the magnetosphere. These particles contribute to form regions of ionized particles inside the magnetosphere. A planetary system of electric current circulation and particle exchange develops between the ionosphere and the magnetosphere via highly-conductive magnetic field lines. One of the best known signatures of this ionosphere-magnetosphere coupling is the manifestation of "aurorae borealis" (and australis) in the sky of high-latitude regions. Finally, the Sun is an active star with highly variable emissions of radiations and particles and this variability directly affects the ionosphere, the magnetosphere and their coupling. The biggest solar events, producing larger radiation rates and stronger currents, may have consequences on human activities: they may affect electronic devices onboard spacecraft, disturb radio communications or GPS signals between satellites or with the ground, and even induce currents in large-scale ground-based facilities as power grids, thus causing severe electric breakdowns in high-latitude regions. We will present the main physical concepts governing the ionosphere, the magnetosphere and the impact of solar emissions and events on them.

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