
Variability of the Earth's Magnetosphere and Ionosphere and consequences for human activities

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Résumé

The great variability of the Earth's space environment is mainly due to its coupling with the solar wind (a plasma carrying the Sun's magnetic field through the solar system). Magnetic merging is the major interaction process between the solar wind and the region of space occupied by the Earth's magnetic field (the 'magnetosphere'). In this process, the Sun's magnetic field lines connect (or 'reconnect') to those of the Earth, and drag the Earth's field lines antisunward across the polar high atmosphere (the 'ionosphere'), allowing transfer of momentum, mass and energy through the Earth's environment. In the nightside, on both sides of the magnetotail equatorial plane, the stretched opened field lines are anti-parallel and can reconnect mainly during violent episodes called substorms. The plasma stored in the tail is then released in the nightside ionosphere and the new closed field lines created by reconnection are dragged sunward by the magnetic tension. At the ionospheric footprints of these dayside and nightside reconnected field lines, auroral features are formed and fast ionospheric flows are excited, driving ionospheric currents and heating the thermosphere. These processes can considerably affect the state of the ionosphere and of the thermosphere and have important consequences on human activities. This presentation will mainly focus on the main processes affecting the electrodynamics of the magnetosphere-ionosphere system before detailing the consequences on several human activities (variation of ionosphere refractivity and perturbations of waves propagation, ground induced currents, thermosphere expansion causing satellites drag).

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