Solar wind as a Source of Magnetospheric Plasma

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Understanding the sources and subsequent evolution of plasma within a planetary magnetosphere holds intrinsic importance for magnetospheric dynamics. For example, the balance of endogenic and solar wind plasma can be used to study the relative importance of different solar wind-magnetosphere interactions (e.g., magnetic reconnection versus Kelvin-Helmholtz instabilities) as a source of magnetospheric plasma, which can provide insight into the properties and evolution of certain planetary magnetospheres. Recent observational studies have utilized ion charge state composition to determine when and where solar wind ion populations can access a magnetosphere. These populations have subsequently been observed within injection events, bringing these solar wind-originating particles to within geosychronous orbit. Additionally, recent global modeling of the Earth system has explored the various possible pathways of solar wind entry through the use of test particle simulations. Together these studies have found that solar wind-originating plasma enters the magnetosphere through both magnetic reconnection and Kelvin-Helmholtz instabilities, as well as through cusp dynamics, and can subsequently reach the inner magnetospheric region. This presentation will focus on observational and modelling results investigating these pathways of solar wind access to the magnetosphere, and the resulting effect on magnetospheric ion composition in the inner magnetosphere.

Keywords: Plasma, Composition, Magnetosphere

