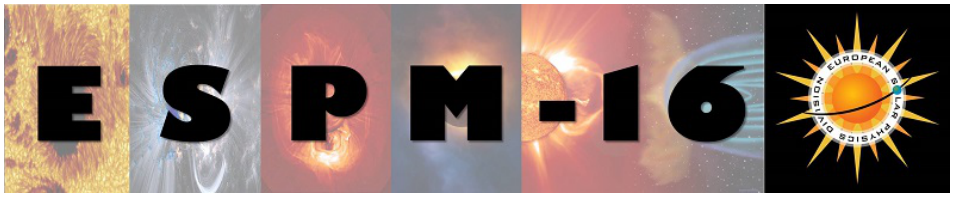

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Impacts of ionospheric ions in solar wind - magnetosphere coupling

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Ionospheric ions (mainly H+, He+ and O+) escape from the ionosphere and populate the Earth's magnetosphere. The ionospheric population is variable, and it makes significant contributions to the magnetospheric mass density in key regions where magnetic reconnection is at work. Solar wind –magnetosphere coupling occurs primarily via magnetic reconnection, a key plasma process that enables transfer of mass and energy into the near-Earth space environment. Reconnection leads to the triggering of magnetospheric storms, auroras, energetic particle precipitation and a host of other magnetospheric phenomena. Several works in the last decades have attempted to statistically quantify the amount of ionospheric plasma supplied to the magnetosphere, including the two key regions where magnetic reconnection occurs: the dayside magnetopause and the magnetotail. Recent in-situ observations by the Magnetospheric Multiscale spacecraft and associated modeling have advanced our current understanding of how ionospheric ions alter the magnetic reconnection process, including its onset and efficiency. We review the current understanding of the ionospheric plasma supply to the magnetosphere and discuss the main implications for solar wind - magnetosphere coupling. The magnetopause can be significantly mass-loaded only during disturbed magnetosphere conditions, when the ionospheric ion production is enhanced, and the efficiency of the reconnection process is reduced. In addition, the multi-component nature of the ionospheric populations modifies how magnetic reconnection proceeds at kinetic scales most of the time, although the implications of these changes for the global efficiency of the coupling are not well understood.

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