Long term measurements of the plasmasheet composition: implications on ionospheric outflow

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The plasmasheet consists of a mixture of ions originating from the solar wind and from the ionosphere. Contrary to the solar wind, ionospheric ions contain a significant amount of O^+ ions which can be used as tracers of the ionospheric material. The ionospheric ion outflow rate, its composition and the transport of ionospheric ions from the ionosphere to the plasmasheet are modulated by the solar wind conditions. This modulation of the ionospheric source impacts the plasmasheet composition, in particular the amount of O^+ ions, with some time delay related to ionospheric ion outflow and transport processes.
Using long-term O^+ and H^+ density measurements from the CODIF experiment onboard the Cluster spacecraft we investigate the spatial distribution of O^+ and H^+ ions in the Earth plasmasheet and its dependence on solar wind and geomagnetic activity. This allows the identification of the solar wind parameters that have the strongest impact on the plasmasheet O^+ density - and thus on ionospheric ion outflow and transport - as well as the associated response times. We discuss the implication of these results for our understanding of ionospheric ion sources and outflow processes.