

EGU21-15733

<https://doi.org/10.5194/egusphere-egu21-15733>

EGU General Assembly 2021

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Monitoring the plasmopause dynamics at LEO

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In the past decades researchers have revealed links between a series of sub-auroral ionospheric phenomena and the plasmopause (PP) dynamics, such as the mid-latitude ionospheric trough (MIT) and the associated sub-auroral temperature enhancement (SETE), the light-ion trough (LIT), the sub-auroral ion drift (SAID) or the more intense sub-auroral polarisation stream (SAPS), and most recently, the inner boundary of small-scale field-aligned currents (SSFACs). Most of these phenomena can be directly observed by the Swarm constellation of ESA at LEO. Thus, Swarm presents a unique opportunity to study the relations between them and also their relation to the PP dynamics.

In a recent Swarm DISC project, PRISM (Plasmopause Related boundaries in the topside Ionosphere as derived from Swarm Measurements), three new products have been developed. Two products characterise the MIT (and the associated SETE). The MITx_LP utilises the Langmuir probe measurements of electron density and temperature, while the MITxTEC product derives the MIT properties from GPS TEC observations. The third product, PPIxFAC provides information on the location and the main characteristics of the equatorial boundary of SSFACs, and it also includes a proxy for the location of the PP at MLT midnight.

In this presentation we introduce the above Swarm L2 products, present the results of a comparative study aiming at revealing their mutual relations and also their dynamic coupling to the PP. Then we demonstrate how the observations of all these ionospheric phenomena combined can be used to develop an improved proxy for monitoring the PP dynamics at LEO as one of the goals of our new ESA-funded project PLASMA.