
Study of a dayside magnetopause reconnection event detected by MMS and related to a large-scale solar wind perturbation

Mohammed Baraka^{*1}, Olivier Le Contel¹, Patrick Canu¹, Soboh Alqeeq¹, Mojtaba Akhavan-Tafti², Alessandro Retinò¹, Thomas Chust¹, Alexandra Alexandrova¹, Dominique Fontaine¹, and Emanuele Cazzola³

¹Laboratoire de Physique des Plasmas – Observatoire de Paris, Université Paris sciences et lettres, Ecole Polytechnique, Sorbonne Université, Université Paris-Saclay, Centre National de la Recherche Scientifique : UMR7648 – France

²Climate and Space Sciences and Engineering, Ann Arbor – États-Unis

³Laboratoire de Physique des Plasmas – Observatoire de Paris, Université Paris sciences et lettres, Ecole Polytechnique, Sorbonne Université, Université Paris-Saclay, Centre National de la Recherche Scientifique : UMR7648 – France

Résumé

Magnetic reconnection is a fundamental process that is ubiquitous in the universe and allows the conversion of the magnetic field energy into heating and acceleration of plasma. It's also very important as it is responsible for the dominant transport of plasma, momentum, and energy across the magnetopause from the solar wind into the Earth magnetosphere. Coronal Mass Ejections (CMEs) and Corotating Interaction Regions (CIRs) are the primary large-scale propagating structures and important drivers of unusual space weather disturbances causing magnetospheric activity. The present study reports on a magnetic reconnection event detected by the Magnetospheric Multiscale mission (MMS) on 21 October 2015 around 04:40 UT and related to a large-scale solar wind (SW) perturbation impacting the Earth's magnetopause. Based on OMNI data, the event impacting the Earth's magnetosphere is ahead of weak CIR (SW beta ≈ 7 and Alfvénic Mach number ≈ 15) where the density of solar wind is about $\approx 20 \text{ cm}^{-3}$ (compared with average SW density $\approx 3\text{-}10 \text{ cm}^{-3}$). Furthermore, the magnetosheath (MSH) density measured by MMS just after the crossing of the magnetopause is about $\approx 95 \text{ cm}^{-3}$ (compared with average MSH density $\approx 20 \text{ cm}^{-3}$). Due to the large density gradient, we have started to investigate the possible role of the associated diamagnetic currents. Reconnection signatures such as ion and electron jets, Hall field, and energy conversion are compared with a "classical" reconnection event observed during quiet solar wind conditions.

^{*}Intervenant