Geophysical Research Abstracts
Vol. 21, EGU2019-373, 2019
EGU General Assembly 2019

Investigation of Quasi-parallel & Quasi-perpendicular Magnetosheath Jets Using Magnetospheric Multiscale (MMS)

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Magnetosheath jets are flows that manifest as localized, large amplitude and transient increases of dynamic pressure. They are a vital component in the coupled system consisting of Earth's magnetosphere and the solar wind. Jets can contribute to various phenomena when they interact with the magnetopause. Surface waves, radiation belt and ionospheric flow enhancements, magnetic field fluctuations, and even auroral features are a few of the phenomena linked to magnetosheath jets.

In this work, we investigate a subset of magnetosheath jets that occur in clearly identified quasi-parallel and quasi-perpendicular bow shock configuration. Magnetosheath jets can occur in either quasi-parallel or quasi-perpendicular magnetosheath or at the boundary between these regions. We here attempt to separate, analyze and quantify the differences of these jet subsets.

We show the first statistical results on the separation of magnetosheath jets in four distinct subsets through analyzing the in-situ observations of the Magnetospheric Multiscale Mission (MMS) from 2015 to 2018. We will investigate the properties of the different jets to search for similarities and difference between each group. A better quantification of these properties will ideally provide a clearer picture regarding the formation mechanism of each jet subset and how this is connected to their properties.

Finally, this analysis aims to contribute in answering several open questions regarding magnetosheath jets, such as their exact origin mechanism. We discuss how suggested generation mechanisms such as bow shock ripples" and "solar wind discontinuities" may or may not be consistent with the different types of jets.