Fast Plasma Flows Downstream of the Bow Shock Using MMS: Correlations and Generation Mechanisms

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Abstract

Fast plasma flows (magnetosheath jets) are localized and transient dynamic pressure enhancements found downstream of the Earth's bow shock, in the magnetosheath region. They can be attributed to density and/or density enhancements and they are an energetic manifestation of the solar wind-magnetosphere coupling. They have been associated to several phenomena such as magnetopause reconnection, direct magnetosphere plasma inflow and the energization of the outer radiation belt electrons.

In this work, we are investigating the properties of a dataset of 9196 jets found by Magnetospheric Multiscale (MMS) from 09/2015 to 09/2020. These jets are classified into different classes based on their associated bow shock configuration. From the full dataset, about 300 jets are distinguished by being in very close proximity to a bow shock transition.

This subset of jet is then carefully pre-processed and statistically analyzed, providing information regarding the likelihood of existent (bow shock ripples, SLAMS penetration) and newly proposed (magnetic reconnection, magnetic islands) generation mechanisms for these jets. The initial results of these events support the pre-existing generation mechanism while giving indications to other possible effects that may take place.