Characteristics of Intense Current-carrying Structures in the Terrestrial Magnetosheath

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Abstract

We exploit novel "string-of-pearls" configuration of NASA's Magnetospheric Multiscale mission to investigate properties of structures within the Earth's magnetosheath that are short in duration but carry intense currents. Previous work has shown that the j.E energy conversion within current structures processes of order 10% of the total energy flux incident at the bow shock. This makes these events important contributors to the overall shock energy budget and ongoing thermalization within the magnetosheath. The present study, under very similar solar wind conditions and bow shock geometries, reveals significant qualitative differences from the previous study. Moreover, we find only modest, if any coherence, on scales <1000 km. We explore the implication of these observations in terms of both bow shock and turbulence energy transfer and dissipation.

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We exploit novel “string-of-pearls” configuration of NASA’s Magnetospheric Multiscale mission to investigate properties of structures within the Earth’s magnetosheath that are short in duration but carry intense currents. Previous work has shown that the j.E energy conversion within current structures processes of order 10% of the total energy flux incident at the bow shock. This makes these events important contributors to the overall shock energy budget and ongoing thermalization within the magnetosheath. The present study, under very similar solar wind conditions and bow shock geometries, explores the spatial scales and temporal evolution of these current structures using a colinear alignment (”string of pearls”) configuration of the 4 MMS spacecraft. We find only modest coherence on scales <1000 km. We explore the implication of these observations in terms of both bow shock and turbulence energy transfer and dissipation.