



Observations of Turbulent Magnetic Reconnection within a Solar Current Sheet

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Magnetic reconnection is a fundamental physical process in various astrophysical, space, and laboratory environments. Many pieces of evidence for magnetic reconnection have been uncovered. However, its specific processes that could be fragmented and turbulent have been short of direct observational evidence. Here, we present observations of a rare super-hot current sheet that display the fragmented and turbulent nature of magnetic reconnection. As bilateral plasmas converge toward the current sheet, significant plasma heating and turbulent motions are detected therein. Two oppositely directed outflow jets are intermittently expelled out of the fragmenting current sheet, whose intensity shows a power-law distribution in wavenumber domain. The intensity and velocity of the sunward outflow jets also display a power-law distribution in frequency domain. The length-to-width ratio of the current sheet is estimated to be larger than theoretical threshold of tearing mode instability and thus ensures the formation of plasmoids. The observations therefore prove fragmented and turbulent magnetic reconnection occurring in the long stretching current sheet.

References:

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