



MMS observations of thin current sheets in solar wind

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Thin intensive current sheets play important role in solar wind dynamics. The MMS mission provides an opportunity to study the thin current sheets in the solar wind with high temporal and spatial resolution. Analyzing magnetic field data provided by the MMS mission during 3 days of November 2017, a detailed statistical analysis of current sheets is accomplished.

The current sheets were detected using PVI (Partial Variance of Increments) method. Since the distance between the MMS satellites is less than 10 km (which is less than the scales of the current layers), the multi-satellite curlometer method was used to calculate the current. The applicability of curlometer is shown by comparing with current estimated using the «timing» method. In order to find the current sheet reference frame, we apply combination of the MVA (Minimum Variance Analysis) method and the time delay method. Besides PVI, we investigated events with high-amplitude localized currents and magnetic field corresponding to 1D current sheet. We completed the full statistics of current sheets and calculated the occurrence rate of high-amplitude current sheets. About 15% of current sheets were analyzed in burst mode. Current sheets with an amplitude of up to 150 nA /m² and a thickness of up to 10 km were detected. The statistical distribution of the amplitude, current density, spatial scale and characteristic plasma parameters of the current sheets were obtained (density, temperature, plasma beta). The results and methods of the work will be especially useful in context with the new data obtained by the Parker Solar Probe mission.