MMS-Cluster conjugate observation of disturbance in the current sheet associated with localized fast flow in the near-Earth magnetotail


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We report the evolution of the current sheet associated with a localized flow burst in the near-Earth magnetotail on Sep. 8, 2018 around 14 UT when MMS (Magnetospheric Multiscale) and Cluster at about X=17 RE, separated mainly in the dawn-dusk direction at a distance of about 4 RE, encountered at duskside and dawnside part of a dipolarization front, respectively. We analyzed the mesoscale current sheet disturbances based on multi-point data analysis between Cluster and MMS. It is shown that the current sheet thickens associated with the passage of the dipolarization front confirming results from previous statistical studies. The thickness of the current sheet, however, decreased subsequently, before recovering toward the original configuration. MMS observed enhanced field aligned currents exclusively during this thinning of the current sheet at the off-equatorial region. Multiple layers of small-scale, intense field-aligned currents accompanied by enhanced Hall-currents were detected at this region. Based on these mesoscale and microscopic multipoint observations, we infer the current structures around the localized flow and discuss the role of these mesoscale flow processes in the larger-scale magnetotail dynamics.