Observation of the tailward electron flows commonly detected at the flow boundary of the earthward ion Bursty Bulk Flows in the magnetotail

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By measurements of the Magnetospheric Multiscale (MMS) mission in the magnetotail from -24 to -15 $R_E$, we identified 40 ion Bursty Bulk Flow events (BBFs) and investigated the electron behaviors during these BBFs. The ion flows peaked near the center of the plasma sheet and had a sharp flow boundary. The electron flow profile is distinct from the ion flows of BBFs. Inside the BBFs, the strongest earthward electron flows are observed in the ion flow boundary, away from the current sheet center. Further away from the peak of the earthward electron flows, the tailward electron flows are observed in the edges of the ion flows, are mainly field-aligned with low energy, and are stronger than the earthward flows. It seems that the tailward low-energy electrons are energized at some places tailward of the spacecraft and then ejected towards Earth, consistent with the magnetic reconnection scenario in the magnetotail. The implication to the understanding of the astrophysical jets is suggested.