

Study of reconnection layer structure with density asymmetric current sheet

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Recent Cluster spacecraft observations have obtained a detailed structure of a magnetic reconnection separatrix region (SR) on the magnetospheric (MSP) side of the magnetopause (MP). According to those results, a strong electron beam parallel to the magnetic field, a deep density cavity, a strong electric field normal to the MP, and an ion jet away from the X-line are found in the SR. In order to compare the observations and the simulation, we have investigated the two-dimensional tearing mode instability with an asymmetric plasma density. The simulation study has identified the most suitable location for the observations. At that location a sharp density dip, both the ion and the electron flows away from the X-line, a normal electric field component, and a strong electron beam parallel to the magnetic field are found. Then we have observed the structures of the current layer at different locations in the simulation domain. At the SR on the MSP side far from the X-line, both a significantly strong electron beam and a sharp density dip are seen. At the SR on the magnetosheath side near the X-line, an electron beam toward the X-line and a large Hall magnetic field are found.