



Why is the electron diffusion region quiet?

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Observations by the Magnetospheric Multiscale mission show a surprising match of observed electron gyroscale features with predictions by translationally invariant models. The fact that gyroscale features are commonly seen by MMS indicates that fluctuations in the central electron diffusion region cannot be of sufficient amplitude or frequency to disrupt the electron bounce motion in the central electron diffusion region. This absence may explain the match of observation with results from these models, which exclude fluctuations with k vectors in the current direction by design. In addition, observations indicate a clear spatial separation between the X line proper, where electric and magnetic fluctuations are small, and the often seen strong bipolar electric field fluctuations, which involve significant fluctuations of the energy conversion rate $E \cdot j$. The reason for this separation and the apparent comparatively quiet nature of the immediate vicinity of the X point is unclear. We here propose an explanation for the absence of significant fluctuations in the inner electron diffusion region based on the limited residence time of electrons in this region.