# Electron Heating by Parallel Electric Fields in Magnetotail Reconnection

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**Abstract**

Large-scale magnetic field-aligned (parallel) electric fields are a key feature of magnetic reconnection and are believed to contribute significantly to electron heating. Yet, their exact role and importance remain uncertain. We use high-resolution measurements from the Magnetospheric Multiscale (MMS) mission to investigate electron heating by parallel electric fields during reconnection in Earth's magnetotail. We show that these fields scale with the inflow Alfvén and thermal speeds, maintaining macroscopic quasi-neutrality. Furthermore, the work done by parallel electric fields on electrons can exceed ten times their initial thermal energy. These results demonstrate that parallel electric fields play a major role in electron heating and the ion-to-electron energy partition during magnetic reconnection.

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