

R006-04

B会場：11/26 PM2 (14:50-16:20)

15:35~15:50:00

かぐや衛星が捉えた月ミニ磁気圏における「電子のみ」磁気リコネクションの兆候

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Kaguya observations of potential electron-only magnetic reconnection signatures on the lunar mini-magnetosphere

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Magnetic reconnection is a fundamental process in space plasma that causes particle acceleration by converting electromagnetic energy into charged particle energy. Recent observations by the MMS mission first reported electron-only magnetic reconnection in a thin current sheet (thinner than the ion inertial length) in the Earth's turbulent magnetosheath region, accompanied by electron outflow jets in the absence of ion outflow jets (Phan et al., 2018). Since the lunar crustal magnetic anomalies (LMAs) also exhibit spatial scales smaller than the ion characteristic scales, recent ARTEMIS observations (Sawyer et al., 2023), numerical simulations (Stanier et al., 2024), and laboratory experiences (Rovige et al., 2024) suggested that the electron-only magnetic reconnection can also occur on LMAs. However, direct observations of electron-only magnetic reconnection on LMAs have not been reported partly because the time resolution of the instruments onboard typical lunar orbiters is not sufficient to resolve such an electron-scale phenomenon. In this study, we focus on Kaguya's low-altitude (~30 km) and high-time resolution data of charged particles and electromagnetic fields. We identified an electron-scale current sheet crossing from magnetic field data, as well as simultaneous super-ion-Alfvénic electron acceleration in the minimum variance L direction, Hall magnetic fields with polarity consistent with the electron jet direction, and a flux-rope-like signature, which suggests the occurrence of multiple X-line magnetic reconnection. Our observational results reinforce the ideas that electron-only magnetic reconnection can occur in the plasma environment near LMAs and that LMAs offer interesting plasma-physics laboratories to investigate the fundamental nature of electron-only magnetic reconnection.