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Physical implication of two types of reconnection electron diffusion regions with and without ion-coupling current sheet

Rongsheng Wang^{1,2,3}, Quanming Lu^{1,2,3}, San Lu⁴, Christopher T. Russell⁴, J. L. Burch⁵, Daniel J. Gershman⁶, W. Gonzalez⁷, and Shui Wang^{1,2,3}

¹CAS Key Laboratory of Geospace Environment, Department of Geophysics and Planetary Science, University of Science and Technology of China, Hefei, China ²CAS Center for Excellence in Comparative Planetology, China ³Anhui Mengcheng Geophysics National Observation and Research Station, University of Science and Technology of China, Mengcheng, Anhui, China ⁴Earth Planetary and Space Sciences, University of California, Los Angeles, USA ⁵Southwest Research Institute, San Antonio, USA ⁶NASA, Goddard Space Flight Center, Greenbelt, MD, USA ⁷Instituto Nacional de Pesquisas Espaciais, São Paulo, Brazil
University
e-mail (speaker):rswan@ustc.edu.cn

By comparing an electron-only reconnection event with a traditional reconnection event observed in the magnetotail, we illustrate the differences between and similarities of the two events. The electron behaviors are very similar in both events but intensities of the electron flows and temperature in the traditional reconnection are much stronger than those in the electron-only reconnection. The Hall electric field in the traditional reconnection occurs on the ion-scale and is deflected from the normal direction by the significant magnetic field reconnected, while this field varies on the electron-scale, and points to the middle plane in the electron-only reconnection. The comparison indicates that the electrons are undergoing the same process in both events, and the electron-only reconnection was prior to the traditional reconnection. The width of the Hall

electric field and the reconnected magnetic field intensity could control the form of reconnection: producing either electron-only reconnection or traditional reconnection.

References

Wang et al., Physical implication of two types of reconnection electron diffusion regions with and without ion-coupling current sheet., *Geophys.Res.Lett.*, 2020 under review.