

MMS Fast Plasma Investigation (FPI) observations at and near the electron and ion diffusion regions as a function of guide field

*Barbara L Giles¹, James L Burch², Tai Duc Phan⁴, James Webster¹³, Levon A Avanov^{1,5}, Roy B Torbert^{2,3}, Scott A Boardsen^{1,5}, Michael O Chandler⁶, Li-Jen Chen^{1,5}, Victoria N Coffey⁶, John C Dorelli¹, Robert E Ergun⁷, Stephen Fuselier², Kevin Genestreti², Daniel Gershman^{1,5}, Benoit Lavraud⁸, David A Mackler^{1,10}, Thomas E Moore¹, William R Paterson¹, Craig J Pollock⁹, Amy C Rager^{1,10}, Christopher T Russell¹¹, Yoshifumi Saito¹², Conrad Schiff¹, Jason R Shuster^{1,5}, Susanne E Smith^{1,10}, Robert J Strangeway¹¹, Adolfo Figueroa-Viñas¹, Shan Wang⁵, Frederick Wilder⁷, Eftyhia Zesta¹

1. NASA Goddard Space Flight Center, 2. Southwest Research Institute, 3. Univ of New Hampshire, 4. Univ of California, Berkeley, 5. Univ of Maryland, College Park, 6. NASA Marshall Space Flight Center, 7. LASP, Univ of Colorado, 8. Research Inst in Astrophysics and Planetology, Toulouse, France, 9. Denali Scientific, 10. Catholic Univ of America, 11. Univ of California, Los Angeles, 12. Institute for Space Science, Sagamihara, Japan, 13. Rice Univ

Observed ion and electron distributions are compared for asymmetric reconnection events, categorized by weak-, moderate-, and strong-guide field. Several of the structures noted have been demonstrated in simulations and others have not been predicted or explained to date. We report on these observations and their persistence. In particular, we highlight counter streaming low-energy ion distributions that are seen to persist regardless of increasing guide-field. Distributions of this type were first published by *Burch and Phan* [GRL, 2016] for an 8 Dec 2015 event and by *Wang et al.* [GRL, 2016] for a 16 Oct 2015 event. *Wang et al.* showed the distributions were produced by the reflection of magnetosheath ions by the normal electric field at the magnetopause. This report presents further results on the relationship between the counter streaming ions and electron distributions and show the counter streaming ions traversing the magnetosheath, X-line, and in one case the electron stagnation point. We suggest the counterstreaming ions become the source of D-shaped distributions at points where the field line opening is indicated by the electron distributions. In addition, we suggest they become the source of ion crescent distributions that result from acceleration of ions by the reconnection electric field.

Keywords: magnetic reconnection, Magnetospheric Multiscale mission, Fast Plasma Investigation