# Characteristics of slow-mode shocks in the dayside magnetopause observed by MMS

*Nehpreet Kaur Walia[1], Kanako Seki[1], Masahiro Hoshino[1], Takanobu Amano[1], Naritoshi Kitamura [2], Yoshifumi Saito[2], Shoichiro Yokota[3], Craig J Pollock[4,5], Barbara L Giles[5], Thomas Earle Moore[5], Roy Torbert[6], Christopher T Russell[7], James L Burch[8]

1. Department of Earth & Planetary Science, Graduate School of Science, University of Tokyo, 2. Institute for Space and Astronautical Sciences, JAXA, 3. Department of Earth and Space Science, Graduate School of Science, Osaka University, 4. Denali Scientific, 5. NASA Goddard Space Flight Center, 6. Physics Department and Space Science Center, University of New Hampshire, 7. Department of Earth Planetary and Space Sciences, University of California Los Angeles, 8. Southwest Research Institute

The existence of slow-mode shocks in the magnetic reconnection region has been proposed since 1964 [e.g., Petschek, 1964; Levy et al., 1964]. While, there have been many reports on the observation of slow-mode shocks in the magnetotail region [e.g., Feldman et al., 1987; Saito et al., 1995; Eriksson et al., 2004], there are only two event studies which have reported the presence of slow-mode shocks in the magnetopause reconnection [Walthour et al., 1994; Sonnerup et al., 2016]. Many MHD simulations of magnetopause reconnection [e.g., Hoshino and Nishida, 1983; Heyn et al., 1985; Biernat et al., 1989, Hau and Wang, 2016] have reported the presence of slow-mode shocks and their dependence on the local magnetosphere and magnetosheath parameters. The inherent turbulent nature of the magnetopause boundary and low time resolution of earlier spacecrafts before Magnetospheric Multiscale (MMS), can be the reason why there are only a few reports of slow-mode shocks in the magnetopause.

We investigated characteristics of slow-mode shocks in the dayside magnetopause based on MMS observations from September 2015 to February 2017. We analyzed 99 magnetopause crossings with reconnection jets and burst-mode (high time resolution) data, out of which 21 slow-mode shock signatures were found. 7 slow-mode shocks were observed on the magnetosphere side while 14 on the magnetosheath side. The detection probability of slow-mode shocks in the magnetopause (~20%) is greater than that reported in the magnetotail. We also found 12 rotational discontinuities in these slow-mode shock events. 9 of these rotational discontinuities were observed towards the magnetosheath side. The results also show that the observation of magnetosphere slow-mode shock is favored when the number densities of magnetosphere and magnetosheath are comparable. No clear dependence of existence of slow-mode shocks on other parameters such as, plasma beta, temperature anisotropy, jet velocity was found.

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