

EGU21-14350

<https://doi.org/10.5194/egusphere-egu21-14350>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Multiscale analysis of a current sheet embedded in a fast earthward flow during a substorm event detected by MMS

Olivier Le Contel¹, Alessandro Retino¹, Alexandra Alexandrova¹, Rumi Nakamura², Soboh Alqeeq¹, Thomas Chust¹, Laurent Mirioni¹, Filomena Catapano³, Christian Jacquey⁴, Sergio Toledo⁵, Julia Stawarz⁶, Katherine Goodrich⁷, Daniel J. Gershman⁸, Stephen A. Fuselier⁹, Joey Mukherjee⁹, Narges Ahmadi¹⁰, Daniel Graham¹¹, Matthew Argall¹², David Fischer², Shiyong Huang¹³, and the MMS team*

¹Laboratoire de Physique des Plasmas, CNRS/Ecole Polytechnique IP Paris/Sorbonne Université/Université Paris Saclay/Observatoire de Paris, Paris, France (olivier.lecontel@lpp.polytechnique.fr)

²Space Research Institute, Austrian Academy of Sciences, Graz, Austria

³Department of Earth Observation, European Space Agency, ESRIN, Frascati, Italy

⁴Institut de Recherche en Astrophysique et Planétologie, Toulouse, France

⁵Departamento Electromagnetismo and Electronica, Universidad de Murcia, Murcia, Spain

⁶Space and Atmospheric Physics, Department of Physics Blackett Laboratory, Imperial College, London, UK

⁷Space Science Laboratory, University of California, Berkeley, USA

⁸NASA Goddard Space Flight Center, Greenbelt, USA

⁹Southwest Research Institute, San Antonio, USA

¹⁰Laboratory of Atmospheric and Space Physics, Boulder, USA

¹¹Swedish Institute of Space Physics, Uppsala, Sweden

¹²Space Science Center and Department of Physics, University of New Hampshire, Durham, USA

¹³School of Electronic Information, Wuhan University, Wuhan, China

*A full list of authors appears at the end of the abstract

In July 2017, the MMS constellation was evolving in the magnetotail with an apogee of 25 Earth radii and an average inter-satellite distance of 10 km (i.e. at electron scales). On 23rd of July around 16:19 UT, MMS was located at the edge of the current sheet which was in a quasi-static state. Then, MMS

suddenly entered in the central plasma sheet and detected the local onset of a small substorm as indicated by the AE index (~400 nT). Fast earthward plasma flows were measured for about 1 hour starting with a period of quasi-steady flow and followed by a saw-tooth like series of plasma jets ("bursty bulk flows"). In the present study, we focus on a short sequence related to an ion scale current sheet crossing embedded in a fast earthward flow. We analyse in detail two other kinetic structures in the vicinity of this current sheet: an ion-scale flux rope and an electron vortex magnetic hole and discuss the Ohm's law and conversion energy processes.

MMS team: J. L. Burch (9), R. B. Torbert (12), B. J. Giles (8), P.-A. Lindqvist (14), R. E. Ergun (10), Y. Khotyaintsev (11) F. D. Wilder (15), D. L. Turner (16), I. J. Cohen (16), H. Wei (17), R. J. Strangeway

(17), K. R. Bromund (8), F. Plaschke (2)