[EE] Evening Poster | P (Space and Planetary Sciences) | P-EM Solar-Terrestrial Sciences, Space Electromagnetism & Space Environment

[P-EM15]Dynamics in magnetosphere and ionosphere

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Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

This session provides an opportunity to present recent results from satellite and ground-based observations and theoretical and simulation studies on the magnetosphere, ionosphere, and their coupling system. We invite contributions dealing with various phenomena related to the magnetosphere-ionosphere system: solar wind-magnetosphere interaction, magnetosphere-ionosphere convection, field-aligned current, magnetic storms/substorms, neutral-plasma interaction, ionospheric ion inflow and outflow, aurora phenomena, and so forth. Discussions on planetary and satellite ionosphere and magnetospheres, future missions and instrument developments are also welcome.

[PEM15-P17]Investigation of the magnetic neutral line region with the frame of two-fluid equations: A possibility of anomalous resistivity inferred from MMS observations

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Keywords:MMS, reconnection

Magnetic reconnection is a basic physical process by which energy of magnetic field is converted into the kinetic energy of plasmas. In recent years, MMS mission consisting of four spacecraft has been conducted aiming at elucidating the physical mechanism of merging the magnetic fields in the vicinity of the magnetic neutral line that exists in the central part of the structure. In this paper, we examine the magnetic field frozen-in relation near the magnetic neutral line as well as the causal relationship between electron and ion dynamics in the frame of two fluid equations.

It is thought that the electron dissipation region with the thickness of about the electron inertial length surrounds the magnetic neutral line, and the ion dissipation region with the thickness of about the ion inertia length further surrounds them. It is said that an anomalous resistivity exists in the dissipation region, but its existence has not been demonstrated from the observation. In the initial report of MMS, Torbert et al. [2016] evaluated the anomalous resistivity from observational data based on generalized Ohm's law, but which kind of wave effect is responsible for the anomalous resistivity was left as an open question.

In this study, we try to clarify the anomalous resistivity, applying two-fluid equations to four events which occurred around 2015-10-16 / 13: 07 UT, 2015-12-06 / 23: 38 UT, 2015-12-08 / 00: 06 UT and 2016-11-28 / 07: 37UT. In the two-fluid equation, all terms other that the collision term R can be directly evaluated from observational data, so that the value of R which can be regarded as anomalous resistivity in the collisionless magnetic reconnection. By comparing absolute value of electron collision

term with the observed wave intensity, we investigated what kind of wave is responsible for the anomalous resistivity. As a result of analysis, the absolute value of electron collision term and the intensity of the lower hybrid waves (LHW) were found to be highly correlated in the event of 2015-10-16 / 13: 07UT, indicating that the LHW was responsible for anomalous resistivity. However, in the other three events, the absolute value of electron collision term and the intensity of LHW were partially correlated but not well correlated as was found in the first event. At the present stage, we found the correlation becomes worth when the plasma density takes lower values.