Event study of vortex-induced reconnection at the magnetopause using MMS observations and fully kinetic simulations

*Takuma Nakamura[1], Hiroshi Hasegawa[2], Stefan Eriksson[3], William Daughton[4], Wenya Li[5], Rumi Nakamura[1]

1. Space Research Institute, Austrian Academy of Sciences, 2. Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 3. Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, 4. Los Alamos National Laboratory, 5. Swedish Institute of Space Physics

A large-scale three-dimensional fully kinetic simulation is performed for a Kelvin-Helmholtz (KH) vortex event recently observed by the Magnetospheric Multiscale Mission (MMS) at the duskside magnetopause. In this event, kinetic-scale reconnection signatures are observed within the flow patterns of the MHD-scale KH vortices. The simulation was performed with realistic density and magnetic field structures for this event and with a sufficiently large system size to separate the scales between the reconnection region and the vortex. The results show the clear development of the ion and electron reconnection jets within the large-scale vortex flows for the first time, which are in quantitative agreement with the observed reconnection signatures. The simulation also demonstrates an efficient, large-scale plasma transport across the magnetopause resulting from the vortex-induced reconnection. In this presentation, we will show the detailed comparisons between the simulation and the MMS observation, and discuss how largely the KH vortex and the resulting vortex-induced reconnection process contribute to the solar wind entry into the magnetosphere.

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