Magnetic reconnection triggered by Kelvin-Helmholtz instability at the magnetopause

Hiroshi Hasegawa[1]; A. Vaivads[2]; Yuri Khotyaintsev[3]; M. Andre[2]; Takuma Nakamura[4]; Yoshitaka Seki[1]; Taku Takada[1]; Masaki Fujimoto[5]; Henri Reme[6]
[1] ISAS/JAXA; [2] IRF Uppsala; [3] Swedish Inst. Space Phys.; [4] ISAS,JAXA; [5] ISAS, JAXA; [6] CESR

We present observations on 20 November 2001 by the Cluster spacecraft at the dusk-flank magnetopause which show evidence of magnetic reconnection triggered by nonlinear growth of Kelvin-Helmholtz instability (KHI). Identified reconnection signatures consist of outflow jet inside a bifurcated current sheet whose full width is a few times ion inertia length, magnetic field component normal to the current sheet, and field-aligned electron beam with polarity consistent with acceleration by reconnection electric field. Those are found at the hyperbolic point in a rolled-up vortex where the current sheet is highly pinched by vortex flow. The magnetic shear at the magnetopause (˜60 deg.) should have resulted from the three-dimensional (3D) KHI development that can deform initially non-sheared field lines into a sheared configuration. The results suggest that KHI-driven reconnection is responsible for plasma transport across the magnetopause under the condition when standard high field-shear reconnection cannot occur.