
Kelvin-Helmholtz instability and magnetic reconnection at the Earth's magnetopause: 3D simulation based on satellite data.

Matteo Faganello^{*1}, Manuela Sisti¹, Francesco Califano², and Benoit Lavraud³

¹PIIM – Aix-Marseille Université - AMU, CNRS : UMR7345 – France

²Physics Department, University of Pisa, Pisa, Italy – Italie

³LAB – Université de Bordeaux (Bordeaux, France), CNRS : UMR5804 – France

Résumé

A 3D two-fluid simulation using plasma parameters as measured by MMS on September 8th 2015 shows the nonlinear development of the Kelvin-Helmholtz instability at the Earth's magnetopause.

It shows an extremely rich nonlinear dynamics, including the development of a complex magnetic topology, vortex merging and secondary hydrodynamic instabilities driven by large-scale vortices distributed asymmetrically in latitude.

Vortex induced and mid-latitude magnetic reconnection coexist and produce an asymmetric distribution of magnetic reconnection events.

The results in the early nonlinear phase are in good agreement with MMS observations on the same day, in the dayside magnetopause, reporting both equatorial and off-equator reconnection, with a predominance of off-equator events in the southern hemisphere.

The late nonlinear phase shows the development of secondary hydrodynamic instabilities in the northern hemisphere and an enhancement of off-equator reconnection there. Since vortices move tailward while evolving, this suggests that a different behavior should be observed at the nightside magnetopause.

^{*}Intervenant