Geophysical Research Abstracts, Vol. 8, 06702, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06702


# Observations of magnetic reconnection on the Earth's magnetopause at different temporal and spatial scales: Cluster results.

**A. Retinò** (1), A. Vaivads (1), M. André (1), M.B. Bavasssano Cattaneo (2), M.F. Marcucci (2), Y. Khotyaintsev (1), S.C. Buchert (1), J.S. Pickett (3), C.J. Owen (4), N. Cornilleau-Wehrlin (5)

(1) Swedish Institute of Space Physics,Uppsala, Sweden, (2) IFSI - INAF, Roma, Italy, (3) University of Iowa, Iowa City, Iowa, USA, (4) MSSL, University College London, United Kingdom, (5) CETP - CNRS/IPSL, Vélizy, France.

The transport of mass, momentum and energy across boundaries in space plasmas is a fundamental problem of plasma astrophysics. The Earth's magnetopause is a boundary where such transport can be studied in detail using in-situ spacecraft measurements. Among several mechanisms invoked to explain this transport, magnetic reconnection is considered to be the most efficient and much evidence of reconnection has been found. Nevertheless some fundamental questions still remain open e.g. where reconnection occurs on the magnetopause, how it proceeds in time once initiated and how far away from the X-line microphysical consequences such as separatrix regions can extend. To answer these questions it is fundamental to study magnetic reconnection at very different spatial and temporal scales since reconnection is a cross-scale process fast initiated in small regions but affecting large volumes for long time. We investigate the cross-scale aspect of magnetic reconnection using Cluster spacecraft observations at the dayside magnetopause. At large spatial ($\sim R_E$) and temporal ($\sim$ hours) scales we find that magnetic reconnection best agrees with the component merging model and it can be continuous in time for several hours. At smaller scales we study in detail the microphysics of reconnection and find that separatrix regions can extend far away ($\sim$ 100 ion inertial lengths) from the X-line and still be very structured and dynamic while reconnection is ongoing. We discuss the coupling between the different scales involved in reconnection and suggest how future missions could improve the cross-scale understanding of the magnetic reconnection mechanism.