Geophysical Research Abstracts, Vol. 8, 04777, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04777

Ring Current observations by Cluster and Double Star

C. Vallat (1), I. Dandouras (2), N. Ganushkina (3), P. Escoubet (1), M. Dunlop (4), P.C. Brandt (5), H. Reme (2), E. Lucek (6), S. McKenna-Lawlor (7)

(1)ESTEC/ESA, Noordwijk, The Netherlands;(2)CESR, Toulouse, France; (3)FMI, Helsinki, Finland; (4)RAL, Didcot, UK; (5)JHU/APL, Laurel, Maryland, USA; (6)The Blackett Laboratory, IC, London, UK; (7)National University of Ireland, Maynooth, Ireland

The highly eccentric polar orbit of the four Cluster spacecraft (perigee at 4 RE) permits them to sample the inner magnetosphere region, allowing the study of the ring current, the radiation belts and the outer plasmasphere.

The CIS experiment onboard Cluster samples ions with energy from ˜0 eV up to ˜40 keV with a 4s temporal resolution and mass per charge discrimination. This allows the detection of ions constituting the plasmasphere, the plasmasheet and the ring current. A detailed analysis of the proton structures formed on the CIS spectrograms at perigee, in association with particle trajectory simulations reveal the contribution of each ion source to the ring current and the implication of large scale electric fields in the formation of such structures.

Moreover, understanding the current circulation and closure inside the magnetosphere as a function of geomagnetic activity is still an open question. The four simultaneous points of measurements of the magnetic field (Cluster/FGM experiment) allow for the first time to estimate the instantaneous ring current density. Analysis of these data reveals the complex morphology and the large latitudinal extend of the ring current, as well as the presence of field aligned currents at higher latitudes.

The IMAGE spacecraft can also help to place the Cluster in-situ data into a global context: by applying an inversion technique to IMAGE/HENA neutral atom images, the equatorial ion distribution function can be retrieved and Cluster/CIS measurements can thus be positioned with respect to the ring current bulk. As a consequence, a 3D mapping of the ion distribution in the inner magnetosphere is obtained.

More recently, the Chinese spacecraft TC 1 (part of the Double Star mission) has been

placed on an equatorial elliptical orbit (13.4 RE apogee). Cluster and Double Star spacecraft orbits have been designed such that the spacecraft are almost in the same meridian, allowing conjugate studies of the Earth's Magnetosphere dynamics. Coordinated ion measurements are thus possible, and the latitudinal (Cluster) and radial (TC1) profiles of the plasma can be studied.