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Ring Current Density Distribution and Coupling with Radiation Belts Plasma Population

Yulia Bogdanova (1), Malcolm Dunlop (1,2), Chris Perry (1), Andrew Fazakerley (3), Berndt Klecker (4), Christopher Mouikis (5), Qinghe Zhang (6), and Chao Shen (7)

(1) RAL Space, Rutherford Appleton Laboratory, Science and Technology Facilities Council, Didcot, United Kingdom (yulia.bogdanova@stfc.ac.uk), (2) Space Science Institute, School of Astronautics, Beihang University, Beijing, China, (3) Mullard Space Science Laboratory, University College London, Holmbury St.Mary, Dorking, United Kingdom, (4) Max-Planck-Institut for Extraterrestrische Physik, Garching, Germany, (5) Physics Department and Space Science Center, University of New Hampshire, Durham, NH, USA , (6) CSW, Institute of Space Sciences, Shangdong University, Weihai, China, (7) NSSC, CAS, Beijing, China.

The ring current, a toroidal current system centred at the equatorial plane at geocentric distances between ∼2Re and ∼9Re, is formed due to the gradient and curvature drifts of the energetic particles trapped in the inner magnetosphere. The radiation belts and ring current are closely related, and it has been shown previously that a subset of the radiation belt population, ions in the medium-energy range, from ∼ 10 keV to a few hundreds of keV, contribute the most towards the total ring current energy density, with the O+ ions contribution increasing strongly from 6% to 21% during active times (Daglis et al., 1993). In this work we use unique Cluster observations from the beginning of the mission (2002-2004), with the Cluster satellites often crossing the outer radiation belt and ring current region at L-shell ∼ 4 Re. At that time the Cluster tetrahedron geometry was well suited for estimations of the total ring current density and azimuthal current density from the measurements of the magnetic field, using the curlometer technique (Dunlop et al., 2002). We combine the estimations of the current density with the observations of ion and electron populations from the RAPID, CIS and PEACE instruments inside the radiation belts in order to gain additional information on the relative contributions of ions and electrons of different energies towards the ring current strength. Results for a number of cases are presented, including different MLT sectors and levels of geomagnetic activity. The changes in the particle distribution for low and high geomagnetic activity levels will be discussed.