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Ring current analysis based on the curlometer technique: a review of Cluster results

Iannis Dandouras (1), Sandrine Rochel Grimald (2), Antoine Blanchet (1), and Malcolm Dunlop (3)

(1) IRAP, Université de Toulouse / CNRS, Toulouse, France (iannis.dandouras@irap.omp.eu, +33 561556701), (2) ONERA, Toulouse, France, (3) RAL, Chilton, Didcot, UK

The inner magnetosphere's electric currents configuration and mapping is one of the key elements for understanding current loop closure inside the entire magnetosphere. A method for directly computing current is the multi-spacecraft curlometer technique, which is based on Maxwell-Ampere's law application. This requires the use of four point magnetic field high resolution measurements. The FGM experiment on board the four Cluster spacecraft allows for the first time an instantaneous calculation of the magnetic field gradients and thus a measurement of the local current density. This technique requires however a careful analysis concerning all the factors that can affect the accuracy of the current density calculation. Earlier and more recent results, based on Cluster data acquired during passes in the ring current region at different perigee altitudes, will be reviewed in the light of recent progress on the accuracy of the method.