ADVANCES IN DERIVATION OF BIRKELAND CURRENTS FROM IRIDIUM: INITIAL RESULTS FROM AMPERE DEVELOPMENT

Brian J. Anderson 1, Haje Korth 1, and COLIN L. WATERS 2

1 The Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, 20723, USA, e-mail: brian.anderson@jhuapl.edu
2 School of Mathematics and Physical Sciences, University of Newcastle, University Drive, Callaghan, NSW 2308, Australia, e-mail: physpuls8@cc.newcastle.edu.au

Because Birkeland currents are the means for conveying stress between the magnetosphere and ionosphere, the measurement of their distribution and dynamics is critical to advancing magnetosphere-ionosphere (M-I) science. Although much is known about the distributions of Birkeland currents from satellite observations we still have limited understanding of their dynamics as the M-I system changes state or of their configuration and dynamics under extreme conditions. We therefore use the magnetometer data from the Iridium constellation of more than 70 satellites in low altitude, circular, polar orbits to assess the Birkeland currents. These data, acquired for scientific use since February 1999, allow determination of the two-dimensional distribution and intensity of Birkeland currents with a few degree resolution in latitude from about one hour of observations. Here we report results obtained using advances in processing and sample higher time resolution data supported under development of NSF's Active Magnetosphere and Polar Electrodynamics Response Experiment (AMPERE) project. In particular, we have advanced the processing to allow use of the full horizontal vector for the Birkeland current inversions. This allows much more robust inversions of the currents which we use to make more detailed comparisons between different instances of M-I states, compare northern and southern hemisphere distributions and contrast different storm phases. We also present initial examples of higher sampling rate data acquired under AMPERE testing development to indicate the advances in observing capability that will be afforded by AMPERE when high-time resolution Iridium data become routinely available.

Birkeland currents, geomagnetic storms, magnetosphere, ionosphere

Brian J. Anderson, The Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, 20723, USA, tel: 01-240-228-6347, fax: 01-240-228-0386, e-mail: brian.anderson@jhuapl.edu