C/NOFS Measurements of Stormtime Magnetic Perturbations in the Low-latitude Ionosphere

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The Vector Electric Field Investigation suite on the C/NOFS satellite includes a fluxgate magnetometer to monitor the Earth's magnetic fields in the low-latitude ionosphere. Measurements yield full magnetic vectors every second over the range of ±45,000 nT with a one-bit resolution of 1.37 nT (16 bit A/D) in each component. The sensor's primary responsibility is to support calculations of both $V \times B$ and $E \times B$ with greater accuracy than can be obtained using standard magnetic field models. The data also contain information about large-scale current systems, that, when analyzed in conjunction with electric field measurements, promise to significantly expand understanding of equatorial electrodynamics. We first compare in situ measurements with the POMME (POtsdam Magnetic Model of the Earth) model to establish in-flight sensor "calibrations" and to compute magnetic residuals. At low latitudes the residuals are predominately products of the stormtime ring current. Since C/NOFS provides a complete coverage of all local times every 97 minutes, magnetic field data allow studies of the temporal evolution and local-time variations of stormtime ring current. The analysis demonstrates the feasibility of using instrumented spacecraft in low-inclination orbits to extract a timely proxy for the provisional Dst index and to specify the ring current's evolution.