Geophysical Research Abstracts
Vol. 16, EGU2014-4382-1, 2014
EGU General Assembly 2014

Solar Wind Interaction Effects on Mars Crustal Field Measurements Inferred from MHD Simulations

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Analyses of MGS mapping orbit measurements of the planetary magnetic fields of Mars used best practices to minimize the contributions of induced magnetic fields and other features associated with the solar wind interaction. In particular, these concentrated on nightside sampling over long periods of time so as to average out external contributions and perturbations, and eliminated apparently disturbed times in the interplanetary medium. However solar wind interaction-related features at the mapping orbit altitude of 400km may not average out because of non-symmetrical distortions produced by reconnection and dawn-dusk differences associated with the average Parker Spiral external field. The potential issues especially affect the weaker large scale components whose influences are best measured where the solar wind effects are most influential. This includes the important axial dipole field that may be either crustal, a fossil of a previously active dynamo, or evidence of a weak presently active dynamo. We use BATS-R-US models of the Mars-solar wind interaction to investigate these effects and to demonstrate that we still may not know the low order components
of the Martian magnetic field very well.