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Data assimilation of ionospheric magnetic field perturbations into a global magnetospheric model.

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KONDRASHOV, Dmitri[1*] ; MERKIN, Slava[2]
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[1]University of California, Los Angeles, [2]John Hopkins University, USA
[1]University of California, Los Angeles, [2]John Hopkins University, USA

Ionosphere is tightly coupled with the magnetosphere and is the only region of geospace where in situ observations approaching global scale are possible. This capability is owing to the emergence of new datasets of key ionospheric measurements with global spatial and high-frequency temporal coverage, such as AMPERE (Active Magnetosphere and Planetary Electrodynamics Response Experiment) magnetic field data measured onboard Iridium satellites. We are reporting first results for assimilation of low-altitude ionospheric measurements of magnetic field perturbations into a Lyon-Fedder-Mobarry (LFM) global magnetospheric model coupled with Rice-Convection Model (RCM).

We adopt optimal interpolation approach and rely on quasi-steady, linear approximation between equatorial magnetospheric pressure and field-aligned currents in the ionosphere. This approximation is estimated numerically by perturbing the LFM-RCM model and by considering only large-scale modes from Fourier decomposition of the ionospheric magnetic field and equatorial magnetospheric pressure.

The developed methodology was validated by using so called ”fraternal-twins” model-based assimilation tests. The numerical LFM-RCM model with one set of parameters is used to generate synthetic observations, while model with differing set of parameters is used for assimilation and to calculate magnetospheric pressure corrections to be applied in order to reproduce synthetic observations.

キーワード: data assimilation, ionosphere, MHD, magnetosphere
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