ABSTRACT submitted to SEASONS Conference, APL 2008

Space Weather Prediction With The JPL/USC Global Assimilative Ionosphere Model

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Environmental conditions in the Earth's ionosphere have a significant impact on U.S. government activities. Users benefit from accurate forecasting of space weather events that degrade communications, navigation and radar systems. Accurate "nowcasts" of ionospheric conditions are also very useful during relatively benign conditions, because of a high reliance on signals that propagate through the distorting lens of the ionosphere. The JPL/USC Global Assimilative Ionosphere Model (GAIM) is becoming an increasing useful tool for predicting the global structure of the Earth's ionosphere, permitting users to assess and mitigate impacts to higher standards of quantitative accuracy. In this presentation, we discuss how GAIM is meeting the "nowcasting" challenge: creating accurate three dimensional maps of the global electron density distribution, updated every few minutes using globally distributed measurements acquired on the ground and from space.

The JPL/USC GAIM is being used in a variety of space weather applications that we will describe. As with any assimilative model, the quantity, type and quality of data being assimilated are critical factors affecting performance. JPL/USC GAIM was designed from the beginning to be a useful operational asset with existing and planned data types. We will describe model performance using objective validation tests, and discuss model improvement strategies being worked on at JPL that continue to refine the algorithms and increase performance. Requirements for data collection strategies will be described that are well suited to producing accurate nowcasts over the full solar cycle.