

#90 Received 01/20/2015

Scherliess, Ludger; Schunk, Robert; Gardner, Larry; Zhu, Lie; Eccles, Vince; Sojka, Jan
Utah State University

The USU-GAIM Data Assimilation Models for Ionospheric Specifications and Forecasts

Abstract:

Physics-based data assimilation models have been used in meteorology and oceanography for several decades and are now becoming prevalent for specifications and forecasts of the ionosphere. This increased use of ionospheric data assimilation models coincides with the increase in data suitable for assimilation.

At USU we have developed several different data assimilation models, including the Global Assimilation on Ionospheric Measurements Gauss-Markov (GAIM-GM) and Full Physics (GAIM-FP) models. Both models assimilate a variety of different data types, including ground-based GPS/TEC, occultation, bottomside electron density profiles from ionosondes, in-situ electron densities, and space-based UV radiance measurements and provide specifications and forecasts on a spatial grid that can be global, regional, or local.

The GAIM-GM model is a simpler model that uses the physics-based Ionosphere Forecast Model (IFM) as a background model but uses a statistical process in the Kalman filter. This model is currently in operational use at the Air Force Weather Agency (AFWA) in Omaha, NE.

The GAIM-FP model is a more sophisticated model that uses a physics-based ionosphere-plasmasphere model (IPM) and an Ensemble Kalman filter. The primary GAIM-FP output is in the form of 3-dimensional electron density distributions from 90 km to near geosynchronous altitude but also provides auxiliary information about the global distributions of the self-consistent ionospheric drivers (neutral winds and densities, electric fields).

The GAIM-FP model has recently been updated and extended to include the ionospheric D-region and to incorporate bubble observations obtained from the SSUSI instruments.

The current status of the models including these recent new developments will be discussed.