**Geoscientific
Model Development
Discussions**

Interactive comment on "Bayesian calibration of the Thermosphere-Ionosphere Electrodynamics General Circulation Model (TIE-GCM)" *by* S. Guillas et al.

Anonymous Referee #2

Received and published: 21 August 2009

General Comments:

This paper formulates a problem of tuning unknown physical parameters in geophysical computational models in a Bayesian statistical framework. It is a novel application especially to general circulation models of the upper atmosphere. It is well written with clear and straightforward language. Though it is unclear how much this study actually contributes to realistic improvement of geophysical modeling of the upper atmosphere, it is an important attempt in the light of ad-hoc parameter tuning practice prevalent in the geophysical modeling community.

Specific Comments:

The assumption that two sets of observations sampled at two separate ground stations (API, ODE) are independent (or different) does not justify the use of observational data from "only one site at a time" in the analysis. Meaningful posteriors would be the ones that are conditioned on all the observations. For example, AMP is scalar that affects the amplitude of semidiurnal tide globally, and so it does not make sense to have two estimates of AMP unless the authors consider its latitudinal dependence.

In the context of this study (magnetic local) time t in [0, 24] strictly refers to locations on a periodic domain of local time. It is confusing that there is a real passage of time when ground stations progress through local time sampling locations over the course of day. In any case, including time in model input parameter x and describing "TIEGCM is run at inputs x" sounds a bit odd. It is also baffling to find time included in the design for the same reason. There are 12 magnetic local time sampling points in the computer design D^m, and so there may be 12*n observed simulator responses eta(x) sampled from a multivariate normal distribution with (n*12)-by-(n*12) covariance?! [Page 492, Line 11].

Technical Corrections:

[Page 489, Line 1] It may be better to specify that electron density (EDN) is electron number density?

Interactive comment on Geosci. Model Dev. Discuss., 2, 485, 2009.