

Ben Foster <foster@ucar.edu>

Electron density in TIE-GCM

2 messages

Stan Solomon <stans@ucar.edu> To: s.elvidge@bham.ac.uk Cc: Ben Foster <foster@ucar.edu> Tue, Nov 17, 2015 at 10:56 AM

Sean -

We have been working on electron density validation. We do use the model for electron and ion density, but it's difficult to get it right, because in order to get the electron density profile right it's necessary to get composition, temperature, and winds right, not to mention chemistry, and transport coefficients. The postive bias in HmF2 is a problem, but it's not always positive.

The next model version will address some of these issues. For one thing, a minor error in the transport formulation will be corrected. Also, we are moving to 2.5-degree resolution as the standard, partly because we get more realistic results in the ionosphere.

There are some recent papers and also a paper in the works that discusses ionospheric results. I'll send you some reprints/preprints.

Stan

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Sean Elvidge <s.elvidge@bham.ac.uk> To: Stan Solomon <stans@ucar.edu> Cc: Ben Foster <foster@ucar.edu> Tue, Nov 17, 2015 at 11:14 AM

Many thanks for your email Stan.

Ben has kindly given me access to the tiegcm svn repo so I'm now using the latest version. I heard your talk at AT-RASC in Gran Canaria back in May and you did mention some of the improvements to electron densities with the new version.

It's interesting that it isn't always a positive bias, everything I've ever seen has come out with an overall positive bias (over long test scenarios, ~1 month). Good news that it isn't always positive, so not a systematic problem! I must point out that I haven't done any tests with the latest version from the svn. All my existing tiegcm experience has been with 1.94 or 1.95.

I've tried looking in the past for literature on model validation of tiegcm for electron densities. The "main" paper I saw was the Shim et al. papers. In these papers the test scenarios were all quite short and I was worried they weren't capturing the statistical information that well. Any recent papers you've had published would be of great interest.

I'm currently running an ionospheric test scenario with a number of groups for a whole host of models, empirical,

data assimilation and physics - based. I was planning on running tiegcm as well. I will obviously keep you updated with those results and any information we get from them.

Also, I have a PhD student who is playing around with tiegcm at the moment, constructing ensembles by varying the f10.7 and kp drivers in the model. We've found that by replacing a "true" f10.7 value with a proxy (i.e. We let the values go up to 400 or so). We think that by letting the ensemble generate proxy f10.7 values it is trying to correct for inaccuracies in the model (which are of course very difficult to model, as you pointed out). Using these though we seem to get excellent agreement with truth data. This work is very much in its infancy. But again, I'm happy to send you anything we find / work out as we go along (if you're interested that is!).

Again, many thanks for your email.

All the best, Sean.

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