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Ben Foster <foster@ucar.edu>

TIEGCM interpolation along satellite orbit

4 messages

Juho Iipponen <juho.iipponen@helsinki.fi> Mon, Jun 22, 2015 at 6:55 AM
To: Ben Foster <foster@ucar.edu>

Hi, Ben

I have now successfully simulated the April 2010 storm using TIEGCM with the Weimer 2005 potential model. Based on visual inspection of different model fields on constant pressure surfaces, the storm-time response looks good.

However, I have faced an unexpected issue regarding the analysis of the simulation results. I apologize for such a basic question, but how do you interpolate the simulation output grids (like neutral density) along a satellite orbit? Initially, I converted the GOCE and TIEGCM latitude, longitude and geometric height "ZG" coordinates into Earth-Centered, Earth-Fixed (ECEF) coordinate system. Then, I attempted to use Matlab's griddatan [1] function to fit a 4-dimensional (three spatial and one time dimension) hyper-grid to the TIEGCM mass density output, which could be sampled along the GOCE orbit.

However, the griddatan uses a Delaunay simplex method to create the hyper-surface, which seems to be taking massive amounts of memory. I have 14 days of simulation output stored on 10 min cadence, which is somewhat of a large array, so I attempted the interpolation on a machine with 256 GB of memory. Nevertheless, the griddatan managed to consume all of the available RAM and the interpolation could not finish.

I have also tried to use the interpn [2] function with the latitude and longitude grids, but discovered that it cannot be used, since the function does not allow the variation of the altitude coordinate with respect to time. I could of course use shorter sections of the simulation output (like one day at a time), but I still feel that the griddatan function is inefficient for this job. Would you please give me some tips on how to efficiently (and accurately) interpolate the simulation grids along the GOCE orbit?

Thanks in Advance,
Juho Iipponen

[1] http://se.mathworks.com/help/matlab/ref/griddatan.html
[2] http://se.mathworks.com/help/matlab/ref/interpn.html

Ben Foster <foster@ucar.edu> Mon, Jun 22, 2015 at 2:03 PM
To: Juho Iipponen <juho.iipponen@helsinki.fi>

Juho,

I don't use matlab, so I can't help you with that. We used to do something like this in an old f90 post-processor code, but its pretty old and difficult to compile and run. However, I am attaching a source file from that code that interpolated tgcm results to a satellite track, and made plots of ut vs height. This probably won't help you much, but maybe give you an idea how we did this. In the meantime, I will canvas other members of our group who are more familiar with matlab, or may have done something similar in another language.

Meanwhile, you should have received information regarding using the svn repository from Gary Studwell. I have your password, and can call you with it whenever you want. Did you say earlier that 8-10am our time would work? If so, I can call you at that time tomorrow morning (its almost 2 pm here now).

Again, its not necessary that you use the trunk version of the code, especially now that you already have a working version of the model. More recent revisions of the code use the ESMF library for regridding, and its sometimes its difficult to link this lib and build the model on certain platforms and compilers.

--Ben

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Ben Foster <foster@ucar.edu> Mon, Jun 22, 2015 at 2:05 PM
To: Astrid Maute <maute@ucar.edu>

Astrid,

I have sent Juho Lipponen a source file from tgcmproc_f90 that interpolated tgcm results to a satellite track, but he is trying to use Matlab. I seem to recall that Katrin was doing something like this? If so, do you have any of her code that might help Juho?

--Ben

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Juho Iipponen <juho.iipponen@helsinki.fi> Mon, Jun 22, 2015 at 11:35 PM
To: Ben Foster <foster@ucar.edu>

Hi

Thanks for the code, I'll look into it today.

Yes, 8-10am works for me. However, I have to leave early today (Tuesday) and tomorrow (Wednesday), so would you please call me on Thursday or Friday?

I'm using version r1061 of the model and for that I had to build the ESMF library and link it with the TIEGCM. Thus, using newer revisions of the code is not an issue, since I have the ESMF configured already.

- Juho
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