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Ben Foster <foster@ucar.edu>

TIEGCM Segmentation fault

10 messages

Juho Iipponen <juho.iipponen@helsinki.fi> Wed, Jul 22, 2015 at 5:39 AM
To: Ben Foster <foster@ucar.edu>

Hi, Ben

I have discovered that a segmentation fault occurs while performing a longer run on TIEGCM revision 1189. I am attempting to run the model from summer 2009 to the beginning of the GOCE data set on December 1st 2009 using real values of the solar and geomagnetic inputs (see the attached input file). However, the model deterministically segfaults on July 15th, which seems to be a geomagnetically quiet day (see the output file).

Today, I will attempt to build the model with the debug flags and see, if I could get a clear traceback. I would also like to hear your thoughts on what could be causing the issue.

I'm using Intel ifort v13.1, Cray's built-in MPICH, netcdf v4.3 and esmf v6.3.

Thanks in Advance,
Juho

4 attachments

tiegcm_goce_spinup.inp
5K

tiegcm_goce_spinup.out
1365K

tiegcm-voima.job
1K

Make.voima
2K

Ben Foster <foster@ucar.edu> Wed, Jul 22, 2015 at 11:28 AM
To: Wenbin Wang <wbwang@ucar.edu>

Wenbin, can you take a look at this?

[Quoted text hidden]
--
Ben Foster
National Center for Atmospheric Research (NCAR)
High Altitude Observatory (HAO)
303-497-1595

4 attachments

tiegcm_goce_spinup.inp
5K

tiegcm_goce_spinup.out
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2K

Ben Foster <foster@ucar.edu> Wed, Jul 22, 2015 at 11:52 AM
To: Wenbin Wang <wbwang@ucar.edu>

Wenbin,

The version Juho Lipponen is using (timegcm r1189) does have the revised
filter kut(nlat) for 2.5-deg resolution - exactly the same as tiegcm: Here are
the old (commented) and new settings, identical in the two models (this is in cons.F,
used by sub filter in filter.F90):

```
#elif (NLAT==72 && NLON==144)             /* 2.5 deg horizontal resolution */
      integer,parameter :: kut(nlat) =
     |  (/1  ,1  ,2  ,2  ,4  ,4  ,8  ,8  ,10 ,10 ,12 ,12,
     |    15 ,15 ,18 ,18 ,22 ,22 ,26 ,26 ,30 ,30 ,32 ,32,
     |    34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34,
     |    34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34 ,34,
     |    32 ,32 ,30 ,30 ,26 ,26 ,22 ,22 ,18 ,18 ,15 ,15,
     |    12 ,12 ,10 ,10 ,8  ,8  ,4  ,4  ,2  ,2  ,1  ,1/)
!     integer,parameter :: kut(nlat) =
!    |  (/0  ,0  ,1  ,2  ,3  ,4  ,5  ,6  , 7 , 8 , 9 ,10,
!    |    15 ,15 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17,
!    |    17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17,
!    |    17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17,
!    |    17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,17 ,15 ,15,
!    |    10 , 9 , 8 , 7 ,6  ,5  ,4  ,3  ,2  ,1  ,0  ,0/)
```

HOWEVER, sub filter2 (in filter.F) is different in the two models:
TIEGCM has the following in sub filter2, whereas timegcm does not:

```
!
! Change filters so that it does not over filtering at high latitudes, it will be the
! same as filter for low wavenumer, but wrapping up smoothly for large wavenumers, not a
! sharp transition, so there is still filtering effect in the lower latitudes
!                                          Wenbin Wang  06/11/13
     n1=2*(kut2(lat)-1)+3
```

To see the code (filter.F):
tiegcm source is in /glade/u/home/foster/tiegcm/tiegcm_trunk/src

and the version Lipponen is using for timegcm is in:
/glade/u/home/foster/timegcm/timegcm_r1189/src

Thanks for looking at this.

--Ben

[Quoted text hidden]

Wenbin Wang <wbwang@ucar.edu> Wed, Jul 22, 2015 at 11:55 AM
To: Ben Foster <foster@ucar.edu>

Hi, Ben

He appears to use tiegcm, not timegcm?

Wenbin
[Quoted text hidden]

Ben Foster <foster@ucar.edu> Wed, Jul 22, 2015 at 1:51 PM
To: Wenbin Wang <wbwang@ucar.edu>

Oh sorry, you are totally correct, he is using tiegcm, and r1189 is the latest,
so he is using the tiegcm trunk code. Sorry for the confusion.
[Quoted text hidden]

Wenbin Wang <wbwang@ucar.edu> Wed, Jul 22, 2015 at 2:03 PM
To: Ben Foster <foster@ucar.edu>, juho.iipponen@helsinki.fi

Hi, Juho

Could you please make the following global plots (lat vs lon) right before the model crash (one or two time steps before the segmentation fault) and send us?

O+, Te, Ti, and Tn on pressure level 6.75 or one level just below the top boundary

You can also make some lev vs lat plots of these parameters at certain local times, such as 12 noon, 1600 and midnight

Thanks

Wenbin

On Wed, Jul 22, 2015 at 11:28 AM, Ben Foster <foster@ucar.edu> wrote:
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Wenbin Wang <wbwang@ucar.edu> Fri, Jul 24, 2015 at 10:45 AM
To: Juho Iipponen <juho.iipponen@helsinki.fi>, Ben Foster <foster@ucar.edu>

Hi, Juho

I do not see outstanding issues with the outputs at this time step. So the seg fault is a little puzzling to me.

One thing you can try is to reduce the time step by half for a day or two around the date the fault occurred.
When you do that, remember to go to cons.F and change the Shapiro parameter from
3.e-2 to 3e-3. In fact you should change this parameter for all your runs.

Wenbin

On Fri, Jul 24, 2015 at 4:05 AM, Juho Iipponen <juho.iipponen@helsinki.fi> wrote:

> Hi, Wenbin
>
> I have attached the plots of TN, TI, TE and OP on level 6.75 and on four local times. Neutral temperature looks okay, but there are many unrealistically steep gradients visible in the other fields.
>
> Running the simulation in a debug mode takes a lot of time, over an hour for simulated day, but if you would like me to provide you with the debug output, I'll make the debug run.
>
> -- Juho
> [Quoted text hidden]

Wenbin Wang <wbwang@ucar.edu> Fri, Jul 31, 2015 at 7:40 AM
To: Juho Iipponen <juho.iipponen@helsinki.fi>, Ben Foster <foster@ucar.edu>

The discontinuity of Te at middle/high latitudes is a concern. Are you using your own plotting software? Could you please double check it and plot out Te, as well as Ne, on other pressure levels?

Wenbin

On Fri, Jul 31, 2015 at 1:31 AM, Juho Iipponen <juho.iipponen@helsinki.fi> wrote:

> Hi
>
> I tried your suggestion of reducing the Shapiro parameter from 3E-2 to 3E-3, thank you for that. Initially that was the only change I made, because the model passed the point where it had previously segfaulted. However, it only postponed the segmentation fault, which now occurs on model time 206, 10, 6 (I have again attached the plots you requested, and the output file). I'm pretty sure that reducing the time step for a limited period around the time of the segmentation fault will help, so I'll try that next.
>
> I'm sure we get this issue resolved.
> [Quoted text hidden]

Juho Iipponen <juho.iipponen@helsinki.fi> Fri, Jul 31, 2015 at 11:09 AM
To: Wenbin Wang <wbwang@ucar.edu>
Cc: foster@ucar.edu

Hi, Wenbin

I have confirmed that my Matlab plotting script works as intended. For example, the TE plot I sent you in my last message can be found in Matlab by indexing the 4-D TE field as in TE_plot = TE(:,:,end-1,end). Near the western boundary, TE(1,62,end-1,end) = 2866 K, but at the next point to the North TE(1,63,end-1,end) = 3222 K. The same manual lookup could be conducted at any longitude, but it will always show a similar discontinuity exactly where it has been plotted in the figure, hence the discontinuity is real. I also think that the discontinuities are visible in the local time maps of the electron temperature.

I have made similar plots on other pressure surfaces as well. They are available at:
https://drive.google.com/folderview?id=0B4sen2e1bh9Sfk91eHVqRHlYLU0tdk9QeTZCUUZEbVJKMnBoY1hOUkRYU3U5WUl0Q2lTV3M&usp=sharing

There you shall also find the script I've used for plotting.

I unfortunately did not save the electron densities for this run, but I'll rerun the model first thing on the Monday morning and I'll send the plots to you. Hope this information will help you in the mean time.

Have a nice weekend,
[Quoted text hidden]

Wenbin Wang <wbwang@ucar.edu> Fri, Jul 31, 2015 at 11:43 AM
To: Juho Iipponen <juho.iipponen@helsinki.fi>
Cc: Ben Foster <foster@ucar.edu>

Hi, Juho and Ben

Yes, there is a problem with Te in the TIEGCM. I also looked at model outputs from my model runs.
Ben, we need to take a look at why this happened, what's wrong, May be next week

Regards

Wenbin
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