tiegcm1.94 Documentation

Release 1.94

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CONTENTS

HAO is pleased to announce the release of version 1.94 of the Thermosphere Ionosphere Electrodynamics General Circulation Model (TIEGCM).

Contents:

CHAPTER

ONE

RELEASE NOTES

1.1 New validated features in the public release

- Weimer 2005 electric potential model, optionally with IMF data.
- Dynamic critical cross-over latitudes for transition between dynamo and empirical models at high-latitude.
- For a more detailed description of the use of the Weimer 2005 model in the TIEGCM, and the dynamic cross-over latitudes, please see *Notes on Weimer05 in TIEGCM*.
- New diagnostics module (diags.F). 22 "sanctioned" diagnostic fields are available, and can be saved on secondary histories (see diags.table in doc directory).
- HPSS archive script can be saved by the model, to be executed after a run to save history files to the NCAR HPSS with "contents" annotations.

1.2 New Build System (scripts/ directory)

- Make.machine files containing platform and machine-specific compiler and link options, library locations, etc. are available in scripts directory.
- New simplified Makefile without platform-dependent conditionals.
- Support for Intel ifort/mpif90 compiler on 64-bit HAO Linux systems (Intel-built code is significantly faster than PGI-built code on systems with Intel hardware)
- Write svnversion to history files.

1.3 Utilities (scripts/ directory)

- *tgcm_contents:* Print "contents" (annotations) of history files
- *tgcm_ncdump:* Print ncdump of history files, with data for scalars and 1d vectors
- *tgcm_put:* Archive history files on the NCAR HPSS storage system
- *mknamelist:* Make a namelist input file
- *mkjob:* Make a job script

1.4 Validation and Benchmark Runs (tests/ directory)

- Namelist input files and job scripts for benchmark runs are available in the tests/ directory.
- Seasonal steady-state source histories are provided for both equinoxes and solstices, at solar minimum and solar maximum conditions.
- The following benchmark runs were made with tiegcm v1.94:
  - **Control:** 5-day Control Runs are made, starting from the steady-state seasonal source histories.
  - **Climatology:** Full-year Climatology with constant solar forcing.
  - **Dec2006:** December, 2006 "AGU" storm case.
  - **Nov2003:** November 19-24 (days 323-328), 2003 storm case.
  - **Whi2008:** Whole Heliosphere Interval (WHI), March 21 to April 16, 2008.
- For more detailed information and access to the history files and post-processing, please see *Benchmark/test runs*.

1.5 Changes to namelist inputs

- Weimer potential model with IMF data from IMF_NCFILE, and F10.7 data from GPI_NCFILE.
- HPSS_PATH specifies destination path to the NCAR HPSS, for history file archive script. (All references to the old NCAR MSS have been removed)
- Time-dependent namelist option for F107a and F107d
- The following namelist parameters are deprecated: SAVE, SECSAVE, DISPOSE

1.6 Changes in the documentation directory doc/

- All new User's Guide (pdf, html) is now provided in the doc directory.
- Model Description (pdf) also provided in the doc directory.
- README.download: Information and instructions for downloading and executing a default run with the current version.
- Release_Notes: Release notes for the current version.

1.7 Bug Fixes

- Change nmlon to nlonp1 where defining dynpot, line 292 of magfield.F
- Change op(k,i) to nop(k,i) in calculation of ion chemistry heating (qic). Line 119 of qjion.F

1.8 Other

- Changed units of f107d, f107a, ctpoten, and hpower on the histories.
- Divide by avogadro's number instead of multiplying by 1.66e-24 in sub calczg (addiag.F).

CHAPTER

TWO

BENCHMARK RUNS

For seasonal start-up files, and control runs, the definition of “Solar Minimum” and “Solar Maximum” conditions are as follows:

- Solar Minimum Conditions:

```
POWER   = 18.
CTPOTEN = 30.
F107    = 70.
F107A   = 70.
```

- Solar Maximum Conditions:

```
POWER   = 39.
CTPOTEN = 60.
F107    = 200.
F107A   = 200.
```

2.1 Steady-State Seasonal Start-up Files

Single-history start-up files are available at the four seasons, and may be used as SOURCE files in the namelist input for initial runs (these files are about 14.5 MB each):

- Start-up files at Solar Minimum:
- March Equinox (day 80) Solar Minimum
- June Solstice (day 172) Solar Minimum
- September Equinox (day 264) Solar Minimum
- December Solstice (day 355) Solar Minimum
- Start-up files at Solar Maximum:
- March Equinox (day 80) Solar Maximum
- June Solstice (day 172) Solar Maximum
- September Equinox (day 264) Solar Maximum
- December Solstice (day 355) Solar Maximum

2.2 Seasonal Control Runs

control: 5-day control runs, started from the above steady-state histories at both equinoxes and solstices, and at solar minimum and maximum conditions.

- "Sanity check" plots for solar min control runs (global maps on last day of 5-day run):
- *December Solstice, Solar Minimum*
- *June Solstice, Solar Minimum*
- *March Equinox, Solar Minimum*
- *September Equinox, Solar Minimum*
- "Sanity check" plots for solar max control runs (global maps on last day of 5-day run):
- *December Solstice, Solar Maximum*
- *June Solstice, Solar Maximum*
- *March Equinox, Solar Maximum*
- *September Equinox, Solar Maximum*
- Full history file output for control runs will be made available on the NCAR Community Data Portal (go to "Models", then "Thermospheric General Circulation Models").

2.3 Climatology

climatology: Full-year Climatology with constant solar forcing:

- Heelis potential model with constant solar forcing:

```
POWER   = 18.
CTPOTEN = 30.
F107    = 100.
F107A   = 100.
```

- *"Sanity check" plots for Climatology*
- Full history file output for control runs will be made available on the NCAR Community Data Portal (go to "Models", then "Thermospheric General Circulation Models").

2.4 December, 2006 "AGU Storm"

dec2006: December, 2006 "AGU" storm case:

- Heelis potential model with GPI (Kp) data
- Weimer potential model with IMF data (F10.7 from GPI)
- "Sanity check" plots for dec2006:
- *Heelis/GPI (daily)*
- *Heelis/GPI (hourly)*
- *Weimer/IMF (daily)*
- *Weimer/IMF (hourly)*

- Full history file output for control runs will be made available on the NCAR Community Data Portal (go to "Models", then "Thermospheric General Circulation Models").

2.5 November, 2003 Storm Case

nov2003: November 19-24 (days 323-328), 2003 storm case:

- Heelis potential model with GPI (Kp) data
- Weimer potential model with IMF data (F10.7 from GPI)
- "Sanity check" plots for nov2003:
- *Heelis/GPI (hourly)*
- *Weimer/IMF (hourly)*
- Full history file output for control runs will be made available on the NCAR Community Data Portal (go to "Models", then "Thermospheric General Circulation Models").

2.6 Whole Heliosphere Interval (WHI)

whi2008: Whole Heliosphere interval (WHI) (March 21 to April 16, 2008)

- Heelis potential model with GPI (Kp) data
- Weimer potential model with IMF data (F10.7 from GPI)
- "Sanity check" plots for whi2008:
- *Heelis/GPI (daily)*
- *Weimer/IMF (daily)*
- Full history file output for control runs will be made available on the NCAR Community Data Portal (go to "Models", then "Thermospheric General Circulation Models").

2.7 History files on the NCAR HPSS

Seasonal start-up files and complete history files for the benchmark runs are on the NCAR HPSS in directory /home/tgcm/tiegcm1.94. Here is a `complete catalog listing`, including "contents" annotations.

- User's Guide
- Model Description
- *search*