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# **tiegcm1.94 Documentation**

*Release 1.94*

**Ben Foster**

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# CONTENTS

<b>1</b>	<b>Release Notes for TIEGCM v1.94</b>	<b>3</b>
1.1	New validated features in the public release: . . . . .	3
1.2	New Build System (scripts/ directory): . . . . .	3
1.3	Utilities (scripts/ directory): . . . . .	3
1.4	Validation and Benchmark Runs (tests/ directory): . . . . .	3
1.5	Changes to namelist inputs: . . . . .	4
1.6	Changes in the documentation directory doc/: . . . . .	4
1.7	Bug Fixes: . . . . .	4
1.8	Other: . . . . .	4
<b>2</b>	<b>Benchmark Runs made with TIEGCM v1.94</b>	<b>5</b>
<b>3</b>	<b>Indices and tables</b>	<b>7</b>



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

Contents:



# RELEASE NOTES FOR TIEGCM V1.94

## 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.
- 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 1-6 (days 305-310), 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).

# BENCHMARK RUNS MADE WITH TIEGCM V1.94

The following benchmark runs were made with version 1.94:

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

```
mareqx: March Equinox (day 80)
junsol: June Solstice (day 172)
sepeqx: September Equinox (day 264)
decsol: December Solstice (day 355)
```

- **Solar Minimum:**

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

- **Solar Maximum:**

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

- History file output for control runs.
- “Sanity check” plots for 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*

2. **climatology**: Full-year Climatology with constant solar forcing:

- Heelis potential model with constant solar forcing:

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

- History file output for climatology run.
  - “Sanity check” plots for Climatology: TN and NE
3. **dec2006**: December, 2006 “AGU” storm case:
- Heelis potential model with GPI (Kp) data
  - Weimer potential model with IMF data (F10.7 from GPI)
  - History file output for dec2006 simulation.
  - “Sanity check” plots for dec2006:
    - *Heelis/GPI (daily)*
    - *Heelis/GPI (hourly)*
    - *Weimer/IMF (daily)*
    - *Weimer/IMF (hourly)*
4. **nov2003**: November 1-6 (days 305-310), 2003 storm case:
- Heelis potential model with GPI (Kp) data
  - Weimer potential model with IMF data (F10.7 from GPI)
  - History file output for nov2003 simulation.
  - “Sanity check” plots for nov2003:
    - *Heelis/GPI (hourly)*
    - *Weimer/IMF (hourly)*
5. **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)
  - History file output for whi2008 simulation.
  - “Sanity check” for whi2008: postscript plots of TN and NE.

# INDICES AND TABLES

- *genindex*
- *modindex*
- *search*