TIEGCM Code Structure

Contents

- **TIEGCM** Main
- **Init** Model initialization
- **Advance** Advance model in time
- **Dynamics** Dynamics and Chemistry
- **Aurora** Aurora Parameterization
- **Oplus** O+
- **Minor** Minor Species Composition
- **DUV** Neutral Winds
- **DT** Neutral Temperature
- **Major** Major Species Composition
- **Dynamo** Electrodynamics
- **Outhist** Write to output files
- **Filter** Longitudinal filtering
TIEGCM
Main

- init
  Model initialization

- input
  Read user input

- readsoure
  Read source history

- apxparm
  Call apex module

- advance
  Advance model in time

- rdsoure

- apxmall

- apxmk

- nc_rdhist
init is called by tgcm

Model initialization

- init_cons (cons.F)
  Set constants

- rd_soldata (soldata.F)
  Read SEE flux data

- setfft (util.F)
  Initialize fft

- init_4d (fields.F)
  Allocate 4d fields

- init_3d (fields.F)
  Allocate 3d fields

- init_fsech (fields.F)
  Initialize secondary history fields

- consdyn (dynamo constants)

- allocdata
  allocate and initialize msc dynamic memory
Advance is called by tgcm

Advance (advance.F)
Advance the model in time

Contents

- sunloc (locate sun’s longitude)
- getgpi (read GPI data)
- getimf (read IMF data)
- getgswm (read GSWM data)
- aurora_cons (update auroral constants)
- init_sflux (update solar flux data)
- efield (calculate electric field)
- adddiag (calculate geopotential Z,ZG, mbar, etc.)
- hdif1, hdif2 (horizontal diffusion)
- weimer05 (Weimer potential model)
- heelis (Heelis potential model)
- dynamics (dynamics and chemistry module)
- magpres_grav (magnetic pressure and gravity)
- prep_dynamo (prepare for dynamo)
- dynamo (electrodynamics module)
- outhist (write to netCDF output files)

ssflux
lbc_gswm_adddiag
lsqdsq
aurora is called by dynamics

aurora
Aurora parameterization

- aurora_cusp
cusp

- aurora_heat
heating

- aurora_ions
ions

- aion
auroral electrons

- bion
solar protons

all in aurora.F
oplus is called by dynamics

oplus
Update O+

oplus_flux
O+ number flux

divb
divergence

rrk
Diffusion coefficients

diffus
\((d/(h*dz)*tp+m*g/r)*en\)

bdotdh
\((b(h)*del(h))*phi\)

bdzdvb
\((bz*d/(h*dz)+divb)*phi\)

trsolv
Tridiagonal solver

filter_op

filter
minor species composition routines called by dynamics.

- comp_n2d (n2d)
- comp_n4s (n4s)
- comp_no (no)

  - minor_n4s
    - minor
    - filter

  - minor_no
    - minor
    - filter
minor
Called by minor composition routines

Minor (advance minor species)

advec (horizontal advection)

trsvolv
Tridiagonal solver

filter_minor

Contents

filter
Major species composition (comp_o2o and comp are called by dynamics)

- comp_o2o (sources and sinks for O2, O)
- comp (advance O2, O)
- advecl (horizontal advection)
- smooth (Shapiro smoother)
- filter_o2o
- filter
Define history structure
nc_define Define netCDF file
nc_wrhist Write history to netCDF file
savefile Save history file to MSS
output_hist Write to primary history file
output_sechist Write to secondary history file
output Write to netCDF output files
def_fsech Define secondary history
output_hist is called by advance output
Contents
**filter**: Filter routines are called by:
- **comp** Major composition
- **dt** Neutral temperature
- **duv** Neutral winds
- **minor** Minor composition
- **oplus** O+
- **swdot** Vertical motion

**filter**
(Called by *dt*, *duv*, *swdot*, *oplus*)

**filter2**
(Called by *comp*, *minor*, *oplus*)

**fftrans** *(util.F)*

**fft999**
Fourier transform
dt is called by dynamics

- dt
  - Neutral Temperature TN

  - lbc_gswm_dt (GSWM data)
  - advec (horizontal advection)
  - advecv (vertical advection)
  - smooth (Shapiro smoother)
  - tsolv (tridiagonal solver)
  - filter_tn

  - filter