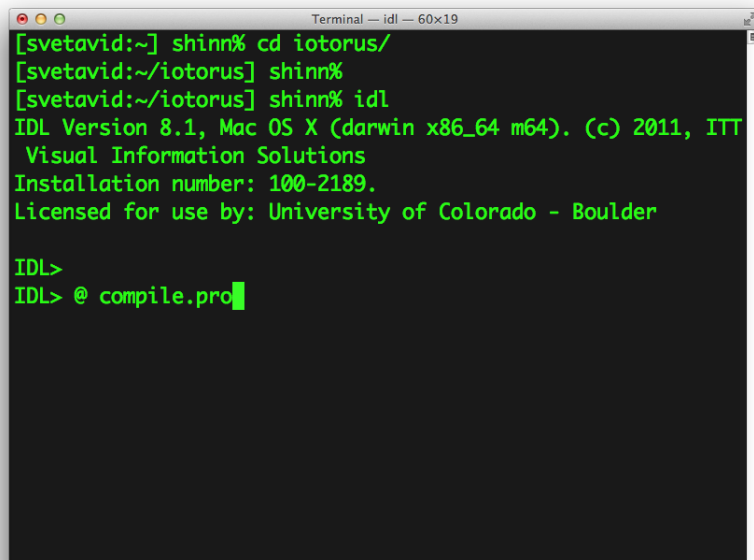


Io Torus Model: Readme

A cubic centimeter, latitudinally averaged, one-box chemistry model of the Io Plasma Torus.
Readme by Adam Shinn

Running the Model:

When using the model, run IDL within the `iotorus/` directory. The IDL script file, `compile.pro`, will add all the appropriate paths to IDL's `!path` system variable as well as compile the chemistry model. See the figure to right for an example of how to start using the model.

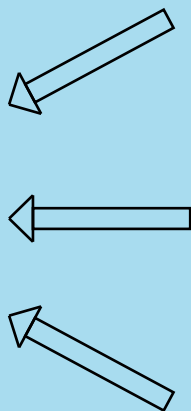


```
Terminal — idl — 60x19
[svetavid:~] shinn% cd iotorus/
[svetavid:~/iotorus] shinn%
[svetavid:~/iotorus] shinn% idl
IDL Version 8.1, Mac OS X (darwin x86_64 m64). (c) 2011, ITT
Visual Information Solutions
Installation number: 100-2189.
Licensed for use by: University of Colorado - Boulder

IDL>
IDL> @ compile.pro
```

Location of the model procedure, and its dependencies:

Main model:
cm3_latavg_onebox.pro
Main chemistry model procedure,
located within the directory:
`model/cm3_latavg_onebox/`



Dependent files and directories:

cm3_latavg_model.pro

This file contains all immediate subroutines and subfunctions used by the main model procedure, located within the directory:
`model/cm3_latavg_onebox/`

model/cm3_latavg_onebox/

This directory contains other supporting procedures as well as chemistry look-up tables used by the model.

model/astrolib/

This directory contains the IDL Astronomy User's Library. The chemistry model uses several procedures and functions from this library.

Using the model:

Also located within the `iotorus/` directory, there are two files which use the chemistry model once it has been compiled: `runmodel.pro` and `dataset_creator.pro`. The first of those files mentioned, `runmodel.pro`, runs the chemistry for one particular instance, and can be run as an IDL script file. The second file, `dataset_creator.pro`, runs the chemistry model for many iterations, populating a parameter space to be used by the Io Torus Widget. See the following section for examples of using each file.

Example, runmodel.pro:

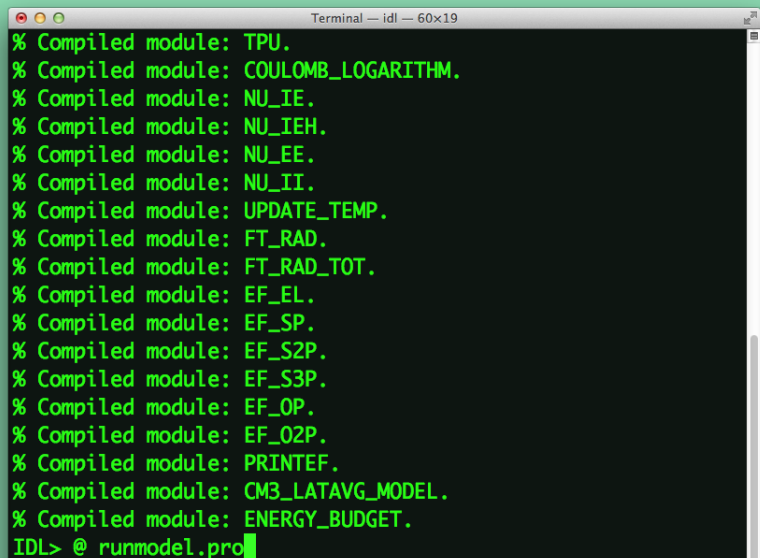
To run the model for one instance, edit the initial parameter structure within runmodel.pro, and execute runmodel.pro as an IDL script file.

Edit the input parameter structure in your preferred text editor:

```
; create structure to hold all input parameters
input = create_struct( 'source', 20e-4*tot2cms, $ ; [# cm^-3 s^-1]
                      'o_to_s', 1.00 , $ ; ratio
                      'fehot_const', 0.002 , $ ; fraction of hot e
                      'transport', 25.0 , $ ; [days]
                      'tehot', 40.0 , $ ; [ev]
```

Run one instance of the model by using runmodel.pro as a script file:

(Note: when the model is running, IDL will plot the ion species mix ratios versus model time in an “x-device” window. This plot is generated from within the model itself.)



```
Terminal — idl — 60x19
% Compiled module: TPU.
% Compiled module: COULOMB_LOGARITHM.
% Compiled module: NU_IE.
% Compiled module: NU_IIEH.
% Compiled module: NU_EE.
% Compiled module: NU_II.
% Compiled module: UPDATE_TEMP.
% Compiled module: FT_RAD.
% Compiled module: FT_RAD_TOT.
% Compiled module: EF_EL.
% Compiled module: EF_SP.
% Compiled module: EF_S2P.
% Compiled module: EF_S3P.
% Compiled module: EF_OP.
% Compiled module: EF_O2P.
% Compiled module: PRINTEF.
% Compiled module: CM3_LATAVG_MODEL.
% Compiled module: ENERGY_BUDGET.
IDL> @ runmodel.pro
```

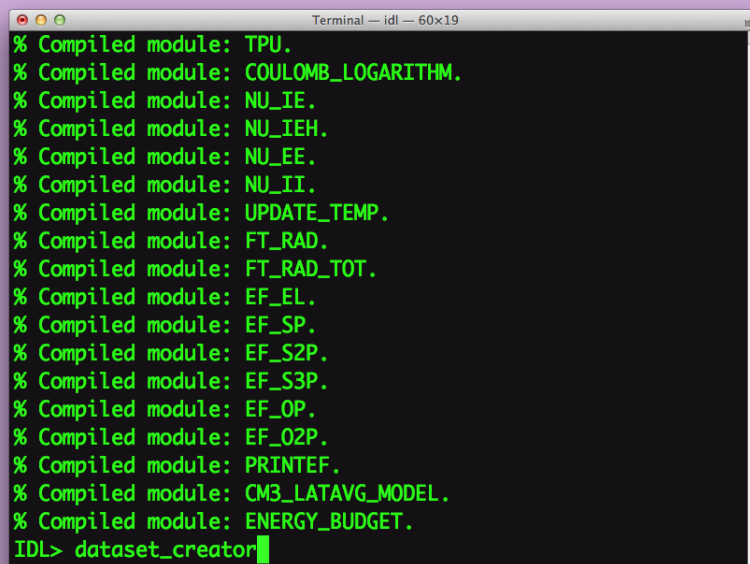
Example, dataset_creator.pro:

Much like with runmodel.pro, it is necessary to edit the parameters within dataset_creator.pro, however, each parameter is now a range instead of a single value.

For each of the four varied parameters, edit the parameter range by changing the minimum, maximum, and step size increment values:

```
; determine parameter span for neutral source rate [10^-4 cm^-3 s^-1]
incsrc = 2.0 ; step size
minsrc = 10.0 ; min value
maxsrc = 30.0 ; max value
dmsrc = (maxsrc - minsrc)/incsrc ; dimension of array
source = (maxsrc - minsrc)*findgen(dmsrc)/(dmsrc - 1.) + minsrc
source = source*tot2cms ; convert to units used by code [Sn-tot]
```

Unlike runmodel.pro, dataset_creator.pro is to be run as a procedure:
(Note: depending on your system, one model run takes about 30 seconds to 1 minute to complete. Running this procedure takes several days depending on the number of model runs to complete.)



```
Terminal — idl — 60x19
% Compiled module: TPU.
% Compiled module: COULOMB_LOGARITHM.
% Compiled module: NU_IE.
% Compiled module: NU_IH.
% Compiled module: NU_EE.
% Compiled module: NU_II.
% Compiled module: UPDATE_TEMP.
% Compiled module: FT_RAD.
% Compiled module: FT_RAD_TOT.
% Compiled module: EF_EL.
% Compiled module: EF_SP.
% Compiled module: EF_S2P.
% Compiled module: EF_S3P.
% Compiled module: EF_OP.
% Compiled module: EF_O2P.
% Compiled module: PRINTEF.
% Compiled module: CM3_LATAVG_MODEL.
% Compiled module: ENERGY_BUDGET.
IDL> dataset_creator
```