

To : All SOCRATES users
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Date: 1 March, 01

The following is intended to serve as a step by step guide on how to download, run, and view the results of the NCAR 2-D model, SOCRATES. This model was originally developed by Guy Brasseur, and it has been improved and enhanced by several people over many years. The version of the model that is described here has evolved over the last 2 1/2 years from the version (socrates2) that Teresa Huang last worked on, and it is called socrates3.II65 in my version control system. However, for the sake of brevity, the (unofficial) release version is called socrates3.

For a detailed description of the physics, chemistry, I/O structure of the model, references, and other pertinent information see ~~the following web site (or from ACD's home page follow the links from 'modeling')~~:

~~<http://www.acd.ucar.edu/models/SOCRATES/>~~[^](#)

Downloading and Running the Model

To get the model code, click on the link 'socrates3.tar.gz' from the above page. This is a tar file (~ 6 MB) containing all the model source code, a Makefile, all the data files, and a UNIX script to run the model. To expand (untar) the file, do the following:

```
gtar xpfz socrates3.tar.gz
```

This will create the following directories and subdirectories: data, in, out/log, out/divar, out/save, out/arch, save, and src. The sample input file for a 10-year baseline-atmosphere run is in the 'in' directory, and the script file to run this case (called 'runsoc') is in the main directory. To make (using the Makefile in ./src) and run the model, do the following

```
runsoc
```

This will create a log file of the run in the ./out/log directory, with the (results) output file (netCDF format) archived to ./out/arch.

For reference, our 10-year, baseline-atmosphere output file that was run on a DIGITAL alpha machine (ev56 cpu) using the above input file is also provided on the above web site (arch.10yr.base.nc). This is a large binary file (~ 226 MB) that contains output for every month of the 10-year simulation.

Note that the makefile provided in the 'src' directory is specific to the alpha ev56 architecture. It should therefore be modified appropriately if the model is to be run on a different platform.

NOTE

It is highly recommended that after successfully downloading and making the model on your platform, a test case of the baseline atmosphere be run and the results compared with the above (10-yr) reference output. The test case does not need to be run for 10 years; for a quick test, it can be run for 1 month (see the 'Model Description' document on the above web site for help with setting up the input file). The model output should of course be saved on the same dates as those for which the reference output file were saved. This is controlled in the input file, and can be done simply by changing the value of 'simulation end time' (see 'Model Description').

Note that some (small) numerical differences between your test baseline and the reference baseline should be expected, if the model is run on a different platform than the alpha ev56 (including different alpha processors, depending on compiler version, options, etc.).

Stability, Bugs, Portability, etc.

The model has been stabilized numerically to a large extent so that running the baseline atmosphere case and the simulations described in the manuscript mentioned below should proceed smoothly. However, it is possible that changing some parameters/constants in the model or making modifications such as changing some parts of the algorithm may cause the model to crash because of numerical instability in the overall algorithm that solves the thermodynamic equation for T. We have spent a lot of time trying to solve this problem, but it has proven to be very difficult to do so. The region of the atmosphere where this occurs is usually the mesosphere, where the numerical instability might cause the T to become negative. It may help to

make the desired changes in small increments to avoid this problem.

The person with the most expertise in this area of the model is Stacy Walters (stacy@ucar.edu).

Generally, the code is working well and no known bugs exist. However, this is not an "official" release of a software product. That is, no "formal" effort has been made to debug and/or test the code systematically according to software engineering principles. Therefore, it is requested that any bugs or errors that may be found be reported to Anne Smith (aksmith@ucar.edu) and Rashid Khosravi (rashid@ucar.edu).

Also, even though most of the code is written in FORTRAN 90, no formal effort has been made to make the code portable across all possible platforms. Therefore, any portability issues that may arise should be addressed by the user at this time, but we encourage reporting these issues to us.

Model Evaluation

The version of the model released here is in the process of being published in the manuscript titled, 'Response of the mesosphere to human-induced and solar variability calculated by a 2-D model' (R. Khosravi, et al.). Although we have not formally "validated" the model, we have evaluated it and the model fields generally compare well with the measured fields; they capture the features found in the observed atmosphere to within measurement uncertainties. Also, the model results were included in a NASA inter-comparison project, the results of which are published in the document, NASA/TM-1999-209554, titled, 'Models and Measurements Intercomparison II'.

How to View the Results

A GUI program to view the model output (archive and diurnal variation) is provided on the above web site (view2d.tar.gz). The application is called 'view2d' and it is written in IDL. To use the viewer, create a directory (e.g., view2d), copy the tar file to that directory, and in that directory untar the file by doing the following:

```
gtar xpfz view2d.tar.gz
```

Then edit the file 'preferences.pro' and change the I/O path names according to your setup. To run the program, do the following (first run IDL):

```
IDL> view2d
```

The program will then prompt you to select a directory from which to load a SOCRATES (or other 2-D ****netCDF****) output file.

The application is generally intuitive, and it's easy to learn how to use it by just playing with it. There are also guide files included in the package that may be useful, which are: README.txt, USAGE.txt, and BUGS.txt.

Good Luck!

RK