

The Art of Climate Modeling

Community Atmosphere Model (CAM)

Tutorial

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Tutorial Overview

- I. Prepare new case
- II. Modify code: make ice clouds transparent to longwave radiation
- III. Plot results

I. Prepare new case

A) Create new case (like yesterday)

- 1) create_newcase
- 2) edit env_conf
- 3) configure and build
- 4) standard run settings: queue, project number, wall clock

B) **NEW** Modify input to CAM to get daily average history files

- 1) where to add CAM namelist variables
- 2) namelist variables
 - a) nhtfrq
 - b) mfil

II. Modify code

- A) Science of the project
- B) Find the source code
- C) Modify the source code
- D) Build and run

II.A: Science of the project

- Ice clouds are a strong regulator of infrared radiation
- We're going to make “ice” clouds in CAM transparent to this longwave radiation
 - Anticipated impact of this change on the atmosphere?

II.B. Find the source code

- 1) Translating science into source code
- 2) Tools for searching CAM source code
- 3) Deciding which file(s) to modify

II.C. Modify source code

- 1) Copy the file from collections to case directory
- 2) Identify where temperature is below freezing
Are these really ice clouds?
- 3) Make these clouds transparent
- 4) Add a diagnostic field to the history file to see emissivity before and after the modifications

III. Plot Results

A) Copy data to tempest

B) Latitude by longitude plots of temperature

1) New case

2) Compare to control case

C) More plots to do

1) Zonal average

2) Compare EMIS and EMISstd

How to use this tutorial

- Go to the wiki

http://atoc.colorado.edu/~dcn/ACM/wiki/index.php/Main_Page

- Download or view atm_tutorial in the format you prefer.

- Work through the tutorial at your own pace

exact commands are denoted % command

file edits are written in red

Use these if you need them.

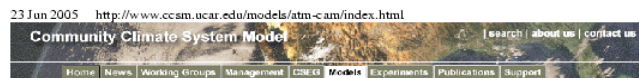
- **Ask for help or explanations of the tutorial as you need**

- **If you finish quickly, there are suggestions at the end of further exercises you can do to learn more about the model & viewing results.**

CAM Online Documentation

<http://www.cesm.ucar.edu/models/atm-cam>

CAM Home Page <http://www.cesm.ucar.edu/models/atm-cam/>



The Community Atmosphere Model (CAM)

The Community Atmosphere Model (CAM) is the latest in a series of global atmosphere models developed at NCAR for the weather and climate research communities. CAM also serves as the atmospheric component of the Community Climate System Model (CCSM).

The information on this page deals specifically with running CAM as a standalone model. Information about running CAM as the atmospheric component of the CCSM is found in the [CCSM release page](#).

What's New?

- 14 April 2005 -- Release Announcement
CAM-3.1 is mainly a software engineering release. It reproduces the CAM-3.0 climate in configurations for which [control simulations](#) have been provided. The main reason for this release is to provide parameterization developers with code that contains updated physics interfaces in the context of a model with a validated climate. However due to a severe staffing shortage, we are not able to provide updated documentation with this release. See the [release notes](#) for details.
- 27 September 2004 -- Release Announcement.
CAM-3.0.p1 is the first patched version of CAM-3.0 which includes minor bug fixes and portability enhancements. Simulations produced by this release will be bit for bit identical to simulations produced using CAM-3.0 in all configurations for which [control simulations](#) have been provided. See the [release notes](#) for details.
- [News Archive](#)

Getting Started

Downloads are available for all the scripts, source code and input datasets needed to build and run the standalone version of CAM. This includes the source code for the land model and slab ocean model that may be used in conjunction with standalone CAM. In addition, a diagnostics package using NCL scripts is available to process model output.

There is a single download page for both the

Documentation

- CAM 3.0 Users Guide ([HTML](#) [PDF](#) [PS](#))
- Scientific Description of CAM 3.0 ([HTML](#) [PDF](#) [PS](#))
- [CAM 3.0 Source Code Browser](#)
- [Single Column Solver \(SCAM\)](#)
- Detailed Design
 - Time Manager Module: Requirements and Interface Design ([HTML](#) [PDF](#) [PS](#))
 - *DRAFT* Interface to Column Physics and Chemistry Packages ([HTML](#) [PDF](#) [PS](#))
- Documentation for older releases ([CAM 2.0](#) [CCM3](#))

Control Simulations

The following links provide information on CAM control simulations, and access to related diagnostic plots and output datasets.

- [CAM 3.0 Control Simulations](#)
- Simulations using older releases ([CAM 2.0](#) [CAM 2.0.1](#) [CCM3](#))

Support

- [Bulletin Board](#)
- [Mailing list](#)

Developers

- [Home Page](#)

- Running CAM in CCSM
- User's Guide
- Scientific Description
- Control Simulations

IV: Challenge Exercises

- These are exercises you can do if you want. Or start exploring the code for your project. Or make a new case and do your own exercise.
- Modify the namelist to write out a second history file (h1) with instantaneous, hourly temperature data. Run the model.
- Plot a time series of the area-weighted globally-averaged hourly data
- Trace the source code subroutine calls to confirm that the emissivity we modified applies to longwave radiation
- Change the emissivity for actual ice clouds, instead of just clouds where the temperature is below freezing.
- Only change the emissivity for ice (or cold) clouds above 500mb