

The CESM Tutorial

The CESM Tutorial

■ Organizers

- Wilbert Weijer (wilbert@lanl.gov)
- Keeley Costigan (krc@lanl.gov)

■ Support

- PADSTE (Principal Associate Directorate for Science, Technology, and Engineering)
- Energy Security Center
- LANL Institutional Computing
- The New Mexico Consortium

CESM General Introduction: April 25

■ Lecture series introducing

- The NSF/DOE Community Earth System Model (CESM)
- Its model components
 - Community Atmosphere Model (CAM)
 - Community Land Model (CLM)
 - Parallel Ocean Program (POP)
 - Los Alamos Sea Ice Model (CICE)
 - Community Ice Sheet Model (CISM)

CESM General Introduction: April 25

- **Lectures by climate modeling experts from NCAR and LANL**
 - NCAR
 - Cecile Hannay
 - David Lawrence
 - LANL
 - Matthew Hecht
 - Mat Maltrud
 - Elizabeth Hunke
 - Bill Lipscomb

CESM General Introduction: April 25

■ Schedule

8:30-8:35	Welcome	McBranch (LANL)
8:35-8:50	Climate Science at LANL	Wingate (LANL)
8:50-9:00	Introduction to the Tutorial	Weijer (LANL)
9:00-10:00	Community Earth System Model, CESM	Lawrence (NCAR)
10:00-10:20	<i>Coffee Break</i>	
10:20-11:10	Community Atmosphere Model, CAM	Hannay (NCAR)
11:10-12:00	Community Land Model, CLM	Lawrence (NCAR)
12:00-13:00	<i>Lunch Break</i>	
13:00-13:50	Parallel Ocean Program, POP	Hecht (LANL)
13:50-14:20	Ocean Biogeochemistry in CESM	Maltrud (LANL)
14:20-14:40	<i>Tea Break</i>	
14:40-15:20	Community Ice Sheet Model, CISM	Lipscomb (LANL)
15:20-16:00	Los Alamos Sea Ice Model, CICE	Hunke (LANL)

CESM Lab Classes: April 26-29

- **Hands-on lab classes**

- Run CESM on LANL clusters

- **Tutorial lectures**

- NCAR
 - Cecile Hannay
 - David Lawrence
- LANL
 - Sara Rauscher
 - Matthew Hecht
 - Mat Maltrud
 - Elizabeth Hunke
 - Bill Lipscomb
 - Steve Price

CESM Lab Classes: April 26-29

	Tuesday April 26	Wednesday April 27	Thursday April 28	Friday April 29
9.00-12.00	CESM (Rauscher)	CLM (Lawrence)	POP (Hecht/ Maltrud)	Overflow/ work on own project
1.00-4.00	CAM (Hannay)	CISM (Lipscomb/ Price)	CICE (Hunke)	Overflow/ work on own project

CESM Lab Classes: April 26-29

- **Where**

- Encantado Training Room, Los Alamos Research Park, Suite 201, Room 219

- **Still possible to sign up**

- If you have access to IC clusters on the Turquoise, cryptocard

Resources: Tutorial Web Site

- <http://oceans11.lanl.gov/twiki/bin/view/Cosim/TutorialCESM>

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16 - 17 Apr 2011 - 18:41:19 - WilbertWeijer?

Overview

On April 25-29, a tutorial will be held for the Community Earth System Model (CESM). Aim is to increase the climate model literacy at LANL, and to facilitate access to an important tool in present-day climate research. The tutorial will be presented by climate model experts from LANL and the National Center for Atmospheric Research (NCAR), and is sponsored by the Principal Associate Directorate for Science, Technology, and Engineering (PADSTE), and the Energy & Climate Impacts (ECI) program development effort, a part of the Energy Security Center.

The [CESM](#) is a flexible modeling framework that couples several climate model components into a comprehensive model of the Earth's climate system. As successor to the popular Community Climate System Model (CCSM), it is managed by NCAR, with important contributions from LANL.

The tutorial will consist of two parts:

Part I: General Introduction

On Monday April 25 there will be a general introduction to the CESM, aimed at all LANL employees who are interested in the state of climate modeling in general, and the CESM in particular. It will consist of a day-long series of lectures about the CESM and its model components. Location: Otowi side rooms.

Part II: Lab Classes

On April 26-29 there will be laboratory classes aimed at LANL employees who want to learn how to run CESM and its model components on the high-performance machines at LANL. The first day (April 26) will be devoted to instruction on how to obtain, install, and run the full coupled model on LANL's HPC resources. Subsequent sessions will contain more detailed discussion of the individual model components (ocean, atmosphere, land, sea ice and land ice), and hands-on instruction on how to configure and run those. A detailed program will be announced in time. Location: Los Alamos Research Park.

Registration for the lab classes is now open. Send an e-mail to [Wilbert Weijer](#).

Organizers

[Wilbert Weijer](#)
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Resources: Tutorial Web Site

- <http://oceans11.lanl.gov/twiki/bin/view/Cosim/TutorialCESM>

General Introduction day: information and lecture material

Lab Classes: information and lecture material

Resources: Tutorial Web Site

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[Steve Price \(LANL\)](#)

[Sara Rauscher \(LANL\)](#)

Other

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List of lecturers

Resources: Tutorial Web Site

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r2 - 17 Apr 2011 - 18:38:33 - [WilbertWeijer?](#)

Useful Links

- [CESM Home Page](#)
- [Earth System Grid, gateway for CCSM/CESM data](#)
- [NCAR CESM Lecture Material \(Registration required\)](#)
- [Community Atmosphere Model \(CAM\) Documentation](#)
- [Community Land Model \(CLM\) Documentation](#)
- [Parallel Ocean Program \(POP\) Documentation](#)
- [Los Alamos Sea Ice Model \(CICE\) Documentation](#)
- [Community Ice Sheet \(CISM\) Documentation](#)
- [LANL's Institutional Computing Home Page \(cryptocard required\)](#)
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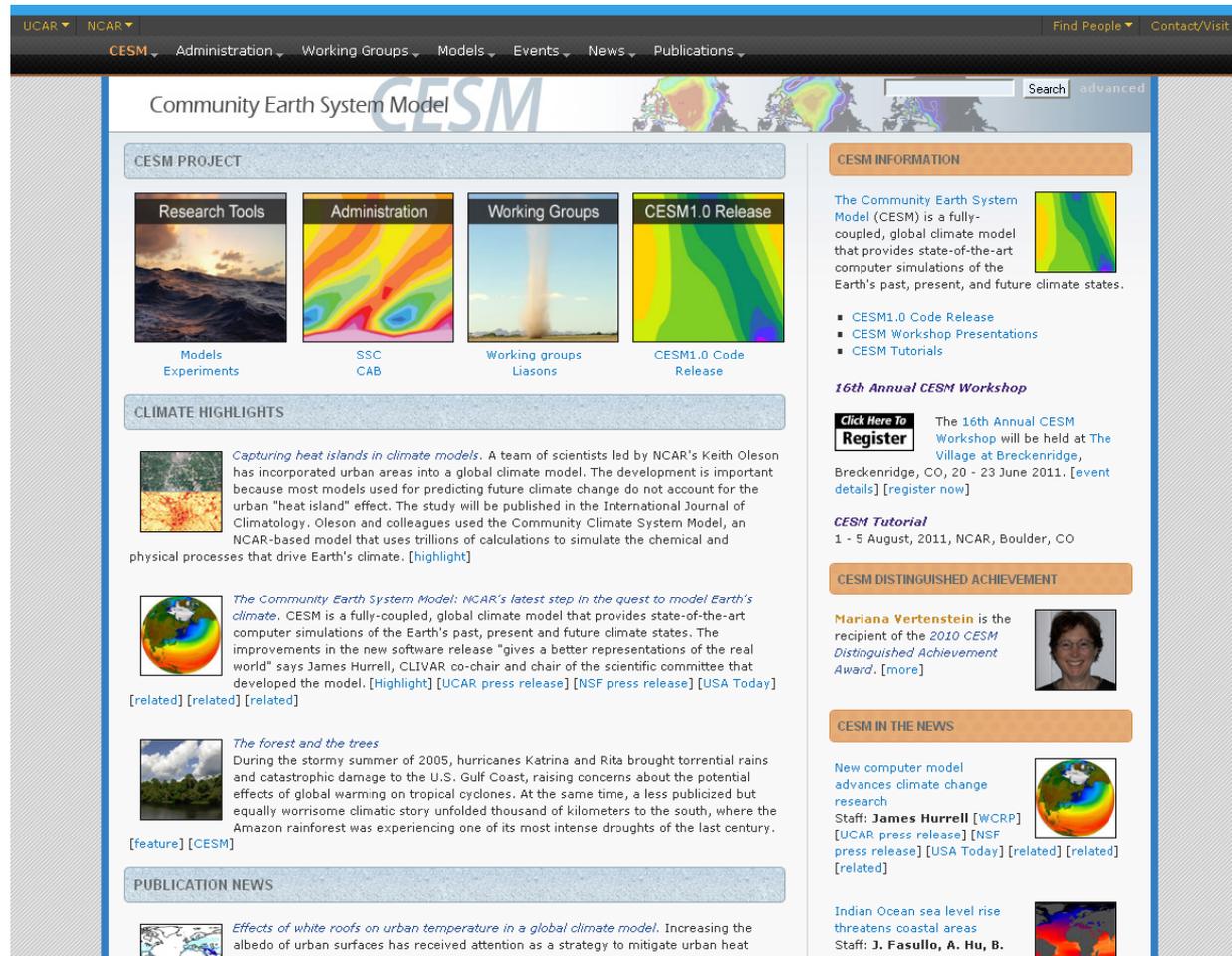
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Resources: CESM Home Page

- <http://www.cesm.ucar.edu/>

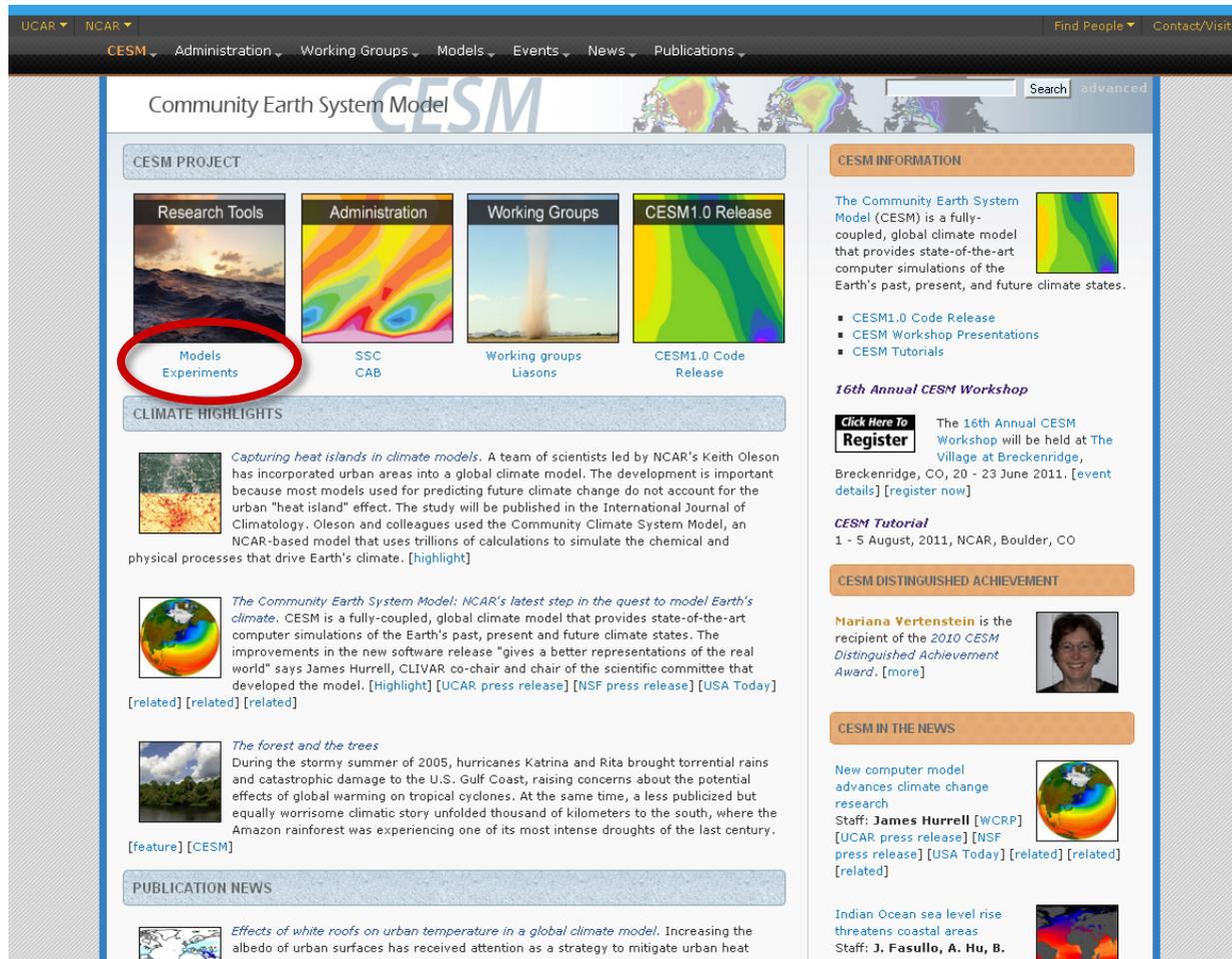


The screenshot shows the CESM Home Page with a navigation bar at the top containing links for UCAR, NCAR, Administration, Working Groups, Models, Events, News, Publications, Find People, and Contact/Visit. The main content area is divided into several sections:

- CESM PROJECT**: A row of four boxes with images and text: "Research Tools" (Models Experiments), "Administration" (SSC CAB), "Working Groups" (Working groups Liasons), and "CESM1.0 Release" (CESM1.0 Code Release).
- CLIMATE HIGHLIGHTS**: Three articles with images and text:
 - "Capturing heat islands in climate models": A team of scientists led by NCAR's Keith Oleson has incorporated urban areas into a global climate model. The development is important because most models used for predicting future climate change do not account for the urban "heat island" effect. The study will be published in the International Journal of Climatology. Oleson and colleagues used the Community Climate System Model, an NCAR-based model that uses trillions of calculations to simulate the chemical and physical processes that drive Earth's climate. [highlight]
 - "The Community Earth System Model: NCAR's latest step in the quest to model Earth's climate": CESM is a fully-coupled, global climate model that provides state-of-the-art computer simulations of the Earth's past, present and future climate states. The improvements in the new software release "gives a better representations of the real world" says James Hurrell, CLIVAR co-chair and chair of the scientific committee that developed the model. [Highlight] [UCAR press release] [NSF press release] [USA Today] [related] [related] [related]
 - "The forest and the trees": During the stormy summer of 2005, hurricanes Katrina and Rita brought torrential rains and catastrophic damage to the U.S. Gulf Coast, raising concerns about the potential effects of global warming on tropical cyclones. At the same time, a less publicized but equally worrisome climatic story unfolded thousand of kilometers to the south, where the Amazon rainforest was experiencing one of its most intense droughts of the last century. [feature] [CESM]
- PUBLICATION NEWS**: One article with an image and text: "Effects of white roofs on urban temperature in a global climate model. Increasing the albedo of urban surfaces has received attention as a strategy to mitigate urban heat islands. Here, the effects of white roofs on urban temperature are examined using a global climate model." [related] [related] [related]
- CESM INFORMATION**: A section with a title, a paragraph of text, and a small image. The text states: "The Community Earth System Model (CESM) is a fully-coupled, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states." Below this are three bullet points: "CESM1.0 Code Release", "CESM Workshop Presentations", and "CESM Tutorials".
- 16th Annual CESM Workshop**: A section with a "Click Here To Register" button and text: "The 16th Annual CESM Workshop will be held at The Village at Breckenridge, Breckenridge, CO, 20 - 23 June 2011. [event details] [register now]"
- CESM Tutorial**: A section with text: "1 - 5 August, 2011, NCAR, Boulder, CO"
- CESM DISTINGUISHED ACHIEVEMENT**: A section with text: "Mariana Vertenstein is the recipient of the 2010 CESM Distinguished Achievement Award. [more]" and a small portrait image of Mariana Vertenstein.
- CESM IN THE NEWS**: A section with text: "New computer model advances climate change research" and "Staff: James Hurrell [WCRP] [UCAR press release] [NSF press release] [USA Today] [related] [related] [related]". It also includes a small globe image.
- Indian Ocean sea level rise threatens coastal areas**: A section with text: "Staff: J. Fasullo, A. Hu, B. L'Orange, S. Mullen, and G. ...". It includes a small image of a coastal area.

Resources: CESM Home Page

- <http://www.cesm.ucar.edu/>



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- CESM PROJECT**: A row of four tiles: Research Tools, Administration, Working Groups, and CESM1.0 Release. The "Models Experiments" link under the Research Tools tile is circled in red.
- CLIMATE HIGHLIGHTS**: Three articles with images and text:
 - "Capturing heat islands in climate models" by Keith Oleson.
 - "The Community Earth System Model: NCAR's latest step in the quest to model Earth's climate" by James Hurrell.
 - "The forest and the trees" about the Amazon rainforest.
- PUBLICATION NEWS**: An article titled "Effects of white roofs on urban temperature in a global climate model".
- CESM INFORMATION**: A section on the right with a description of CESM and a list of resources:
 - CESM1.0 Code Release
 - CESM Workshop Presentations
 - CESM Tutorials
- 16th Annual CESM Workshop**: A registration link for the workshop held at Breckenridge, CO, from June 20-23, 2011.
- CESM Tutorial**: A link for a tutorial held from August 1-5, 2011, in Boulder, CO.
- CESM DISTINGUISHED ACHIEVEMENT**: A section highlighting Mariana Vertenstein as the recipient of the 2010 CESM Distinguished Achievement Award.
- CESM IN THE NEWS**: A section with a link to "New computer model advances climate change research" by James Hurrell.
- Indian Ocean sea level rise threatens coastal areas**: A link to a news item by J. Fasullo, A. Hu, and J. Mankin.

Resources: CESM Model Documentation

■ <http://www.cesm.ucar.edu/models/cesm1.0>

experiments from the CESM1 code base. In addition, the CCSM4.0 code base is frozen and all future model updates will occur from the CESM1.0 code base.

MODEL OUTPUT DATA AND DIAGNOSTICS

- Experiments & Diagnostics
- Model Output Data (ESG)
- Post Processing Utilities
- Model File Naming Conventions

MODEL DOCUMENTATION

CESM1.0

▶ [User's Guide](#)

Atmosphere Models

- ▶ [Community Atmosphere Model \(CAM5\)](#)
- ▶ [Climatological Data Model \(DATM\)](#)

Land Models

- ▶ [Community Land Model \(CLM4\)](#)
- ▶ [Climatological Data Model \(DLND\)](#)

Sea Ice Models

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- ▶ [Climatological/Slab-Ocean Data Model \(DOCN\)](#)

Land Ice Models

- ▶ [Community Ice Sheet Model \(Glimmer - CISM\)](#)

CESM Coupler

- ▶ [CESM Coupler \(CPL7\)](#)

External Library Documentation

- [Parallel I/O Library \(PIO\)](#)

Energy (DOE). Administration of the CESM is maintained by the Climate and Global Dynamics Division (CGD) at the National Center for Atmospheric Research (NCAR).

MODEL SOURCE CODE

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[Acquiring the Code](#)

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Acquisition of the code is more fully described in the [CESM1.0 User's Guide](#).

[Version Summaries and Release Notes](#)

The following table lists the available versions of code along with their test record and any known problems in the code.

- [CESM1.0 Release Versions](#)

[Reporting a Problem](#)

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Resources: CESM Model Documentation

■ <http://www.cesm.ucar.edu/models/cesm1.0>

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Resources: Obtaining the CESM Code

- <http://www.cesm.ucar.edu/models/cesm1.0>

experiments from the CESM1 code base. In addition, the CCSM4.0 code base is frozen and all future model updates will occur from the CESM1.0 code base.

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How to obtain the code

Resources: CESM/CCSM4 Experiments

- <http://www.cesm.ucar.edu/models/cesm1.0>

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Experiments performed

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Reporting a Problem

If you have any problems, please first read the User's Guide including the sections on FAQs and Use Cases. Please also refer to the [CESM Bulletin Board](#), which is in place to facilitate communication within the CESM community. Finally, please also refer to the [Release Notes](#) entries that are provided with every release and release update. If questions or problems still exist, then please send an email to [cesm@ucar.edu](#).

Resources: CESM/CCSM4 Experiments

- <http://www.cesm.ucar.edu/experiments/cesm1.0>

Data Location:							
Details CESM1 (FASTCHEM) 1° Pre-Industrial Control (trk1_1deg_chm_1850_b55.01) Res: 1° atm/land, 1v6 ice/ocn Years: 70-291 Data Location: ESG (years 70-99) Details	70-99 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
Details CESM1 (WACCM) 2° Pre-Industrial Control (b40.1850.track1.2deg.wcm.007) Res: 2° atm/land, 1v6 ice/ocn Years: 96-295 Data Location: ESG (years 156-185) Details	156-185 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
Details CCSM4 1° Pre-Industrial Control (b40.1850.track1.1deg.006) Res: 1° atm/land, 1v6 ice/ocn Years: 1-1300 Data Location: ESG (years 863-892) Details	863-892 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
	863-882 - CCSM3 T85 Pre-Industrial Control	Atm	Ice	Land	Ocean		
Details CCSM4 2° Pre-Industrial Control (b40.1850.track1.2deg.003) Res: 2° atm/land, 1v6 ice/ocn Years: 1-1000 Data Location: ESG (years 501-530) Details	501-530 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
	501-520 - CCSM3 T42 Pre-Industrial Control	Atm	Ice	Land	Ocean		
Details CCSM4 T31 Pre-Industrial Control (b40.t31x3.037) Res: T31 atm/land, 3v7 ice/ocn Years: 1-506 Data Location: ESG (451-500) Details	451-500 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
	451-500 - 2° Pre-Industrial Control	Atm	Ice	Land	---		
	451-500 - CCSM3 T31 Pre-Industrial Control	Atm	Ice	Land	Ocean		
Details CCSM4 Transient 1° 1%/yr CO2 (b40.1850_ramp.track1.1deg.001) Res: 1° atm/land, 1v6 ice/ocn Years: 1850-2005 Data Location: ESG (1909-1928, 1978-1997) Details	1909-1928 (2xCO2) - Pre-Industrial Control	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
	1978-1997 (4xCO2) - Pre-Industrial Control	Atm	Ice	Land	Ocean		
Details CCSM4 Transient 2° 1%/yr CO2 (b40.1850_ramp.track1.2deg.001) Res: 2° atm/land, 1v6 ice/ocn Years: 1850-1997 Data Location: ESG (1909-1928, 1978-1997) Details	1909-1928 (2xCO2) - Pre-Industrial Control	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
	1978-1997 (4xCO2) - Pre-Industrial Control	Atm	Ice	Land	Ocean		

Resources: CESM/CCSM4 Experiments

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Details CCSM4 1° Pre-Industrial Control (b40.1850.track1.1deg.006) Res: 1° atm/land, 1v6 ice/ocn Years: 1-1300 Data Location: ESG (years 863-892) Details	863-892 w/observations	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
	863-882 - CCSM3 T85 Pre-Industrial Control	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
Details CCSM4 2° Pre-Industrial Control (b40.1850.track1.2deg.007) Res: 2° atm/land, 1v6 ice/ocn Years: 1-1000 Data Location: ESG (years 501-530) Details	501-530 w/observations	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
	501-520 - CCSM3 T42 Pre-Industrial Control	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
Details CCSM4 T31 Pre-Industrial Control (b40.t31x3.037) Res: T31 atm/land, 3v7 ice/ocn Years: 1-506 Data Location: ESG (451-500) Details	451-500 w/observations	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
	451-500 - 2° Pre-Industrial Control	Atm.	Ice	Land	---	CCR	Ocean Timeseries	
	451-500 - CCSM3 T31 Pre-Industrial Control	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
Details CCSM4 Transient 1° 1%/yr CO2 (b40.1850_ramp.track1.1deg.001) Res: 1° atm/land, 1v6 ice/ocn Years: 1850-2005 Data Location: ESG (1909-1928, 1978-1997) Details	1909-1928 (2xCO2) - Pre-Industrial Control	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
	1978-1997 (4xCO2) - Pre-Industrial Control	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	
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	1978-1997 (4xCO2) - Pre-Industrial Control	Atm.	Ice	Land	Ocean	CCR	Ocean Timeseries	

Pre-industrial control (1300 year run with fixed forcing)



Resources: CESM/CCSM4 Experiments

- <http://www.cesm.ucar.edu/experiments/cesm1.0>

70-99 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
156-185 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
863-892 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
863-882 CSM3 T85 Pre-Industrial Control	Atm	Ice	Land	Ocean		
501-530 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
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451-500 w/observations	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
1-500 - 2° Pre-Industrial Control	Atm	Ice	Land	---		
1-500 - CCSM3 T31 Pre-Industrial Control	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
09-1928 (2xCO2) - Pre-Industrial Control	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
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CCSM4 Transient 2° 1%/yr CO2 (b40.1850_ramp.track1.2deg.001) Res: 2° atm/land, 1v6 ice/ocn Years: 1850-1997 Data Location: ESG (1909-1928, 1978-1997)	Atm	Ice	Land	Ocean	CCR	Ocean Timeseries
1978-1997 (4xCO2) - Pre-Industrial Control	Atm	Ice	Land	Ocean		

Resources: CESM/CCSM4 Data

- <http://www.cesm.ucar.edu/models/cesm1.0>

experiments from the CESM1 code base. In addition, the CCSM4.0 code base is frozen and all future model updates will occur from the CESM1.0 code base.

MODEL OUTPUT DATA AND DIAGNOSTICS

- Experiments & Diagnostics
- Model Output Data (ESG)
- Post-Processing Utilities
- Model File Naming Conventions

Model Output

MODEL DOCUMENTATION

CESM1.0

▶ User's Guide

Atmosphere Models

- ▶ Community Atmosphere Model (CAM5)
- ▶ Climatological Data Model (DATM)

Land Models

- ▶ Community Land Model (CLM4)
- ▶ Climatological Data Model (DLND)

Sea Ice Models

- ▶ Community Ice CodE (CICE4)
- ▶ Climatological Ice Model (DICE)

Ocean Models

- ▶ Parallel Ocean Program (POP2)
- ▶ Climatological/Slab-Ocean Data Model (DOCN)

Land Ice Models

- ▶ Community Ice Sheet Model (Glimmer - CISM)

CESM Coupler

- ▶ CESM Coupler (CPL7)

External Library Documentation

- ▶ Parallel I/O Library (PIO)

Energy (DOE). Administration of the CESM is maintained by the Climate and Global Dynamics Division (CGD) at the National Center for Atmospheric Research (NCAR).

MODEL SOURCE CODE

Copyright and Terms of Use

All CESM source code is subject to the following [Copyright Notice and Disclaimer](#).

Acquiring the Code

CESM source code is distributed through a public Subversion code repository. This code can be checked out using Subversion client software, such as the command tool svn, or simply [view the latest version with a web browser](#).

A short [registration](#) is required to access the repository. After registering, you will receive an email containing a user name and password that is necessary to gain access to the repository.

Acquisition of the code is more fully described in the [CESM1.0 User's Guide](#).

Version Summaries and Release Notes

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Resources: Earth System Grid

- <http://earthsystemgrid.org>



ESG Gateway at the National Center for Atmospheric Research

Search: for:

To conduct a search, select a category from the pull down menu and/or enter free text into the the text box.

Search Categories

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 - > [CMIP5](#)
 - > [CMIP5/IPCC AR5](#)
 - > [NARCCAP](#)
 - > [PCM](#)
- + Institute
- + Model
- + Experiment
- + Frequency
- + Product
- + Realm
- + Variable

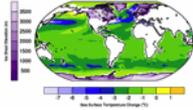
Global Climate Models

- Community Earth System Model
- [Community Earth System Model \(CESM\)](#)
 - [CCSM 4.0 Model Output](#)
 - [CCSM 3.0 Model Output](#)
 - [Parallel Climate Model \(PCM\)](#)

Regional Climate Models

-  [NARCCAP: North American Regional Climate Assessment Program](#)

Analysis & Visualization Software

-  [NCL: NCAR Command Language](#)
- [PyNGL: Python Interface to the NCL Graphic Libraries](#)
 - [PyNIO: Python Interface for Multi-format Geoscientific Data I/O](#)

Quick Links

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ESG Data Gateways

- [BADC Gateway](#)
- [DKRZ Gateway](#)
- [NASA JPL Gateway](#)
- [NCI Gateway](#)
- [NERSC Gateway](#)
- [ORNL Gateway](#)
- [PCMDI Gateway](#)

Other Gateways

- [CADIS \(Arctic\)](#)

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Registration



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Global Climate Models

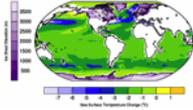
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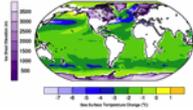
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 - [NCI Gateway](#)
 - [NERSC Gateway](#)
 - [ORNL Gateway](#)
 - [PCMDI Gateway](#)

- Other Gateways**
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CCSM output

Resources: Earth System Grid



Collection

CCSM 4 Model Output

Summary Administration

Description: Data generated by the Community Climate System Model version 4
Identifier: ucar.cgd.cesm4.output

Related Activities

Project - [CCSM](#)

Related Collections

- [CCSM run b40.1850.track1.1deg.006 data \(subset\)](#)
CCSM 4.0 Monthly Mean History Tapes years 863-892 (1 degree PI control)
- [CCSM run b40.1850.track1.2deg.005 data \(subset\)](#)
CCSM 4.0 Monthly Mean History Tapes years 501-530 (2 degree PI control)
- [CCSM run b40.1850_ramp.track1.1deg.001 data \(subset\)](#)
CCSM 4.0 Monthly Mean History Tapes years 1909-1928 and 1978-1997 (1 degree 1%/yr CO2)
- [CCSM run b40.1850_ramp.track1.2deg.001 data \(subset\)](#)
CCSM 4.0 Monthly Mean History Tapes years 1909-1928 and 1978-1997 (2 degree 1%/yr CO2)
- [CCSM c40.t62x1.verif.01 data](#)
CCSM c40.t62x1.verif.01 ocean verification data
- [CCSM run c.b27.01 data](#)
CCSM 4.0 Ocean-only CCSM4 core2 hindcast 1948-2007
- [CCSM run g.b29.01 data](#)
CCSM 4.0 Ocean/ice CCSM4 core2 hindcast 1948-2007
- [CESM1 run trk1_1deg_chm_1850_b55.01](#)
CESM1 (FASTCHEM) pre-industrial control
- [CESM1 run b40.1850.track1.2deg.wcm.007](#)
CESM1 (WACCM) pre-industrial control
- [CESM1 \(BGC\) Prognostic CO2 Pre-Industrial Control](#)
- [CESM1 \(BGC\) Prescribed CO2 Pre-Industrial](#)
- [CCSM run b40.20th.track1.2deg.001 data](#)
Historical: 20th century run from current 1850 control Resolution: 1.9x2.5_gx1v6

Experiment



Resources

- **Data is in **netcdf** format**

- <http://www.unidata.ucar.edu/software/netcdf/>
- Can be processed by many display and analysis tools
 - Matlab
 - GrADS
 - Ferret,
 - NCL
 - ...

Finally...

- Enjoy!