Resources and Tools for Deep-Time Paleoclimate*

Mathew V Rothstein, NCAR

Project Lead

Jeffrey T. Kiehl, NCAR/UC, Santa Cruz

Team members

Christine Shields, Mark A Snyder, Will Rush

* Supported by the Heising-Simons Foundation

NCAR

HEISING - SIMONS FOUNDATION

UNIVERSITY OF CALIFORNIA SANTA CRUZ

HSF Project Goals

* Produce a flexible, robust version of the Community Earth System Model (CESM) that is applicable to modeling climates of Earth's deep past and make it available to the community…

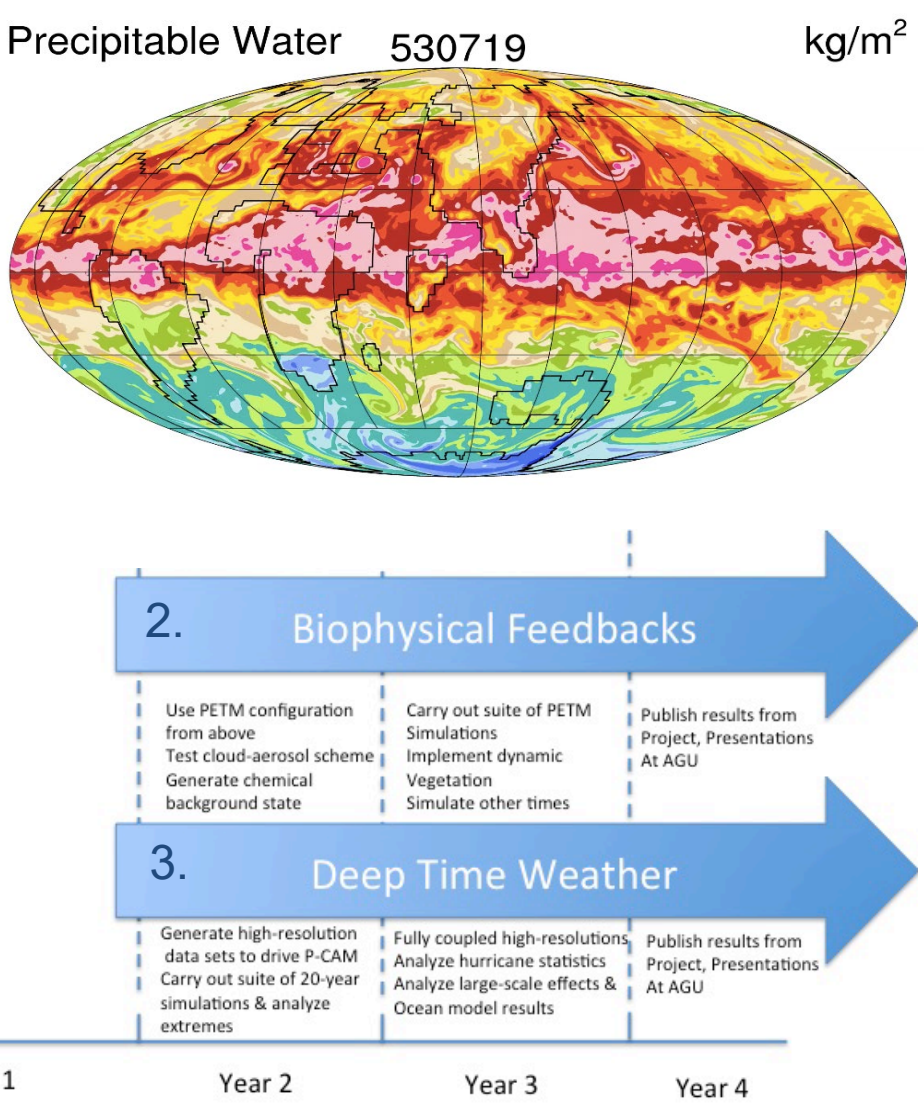
  DT-CESM

* Utilize DT-CESM to investigate scientific questions with regards to Earth's deep past

Science Objectives

GOALS

Science projects including biophysical feedbacks (w/ C. Poulsen) and developing a high-resolution version to study the hydrological cycle and deep time "weather" (w/ A. Timmerman).



Community Requests for HSF work

* Target specific time periods:
  P/T (~250 Ma)
  mid-cretaceous (~100 Ma)
  PETM (~55 Ma)
* Slab Ocean Model (SOM, w/ A. Winguth)
* Water Isotopes
* Dynamic Vegetation (FATES in CESM2)

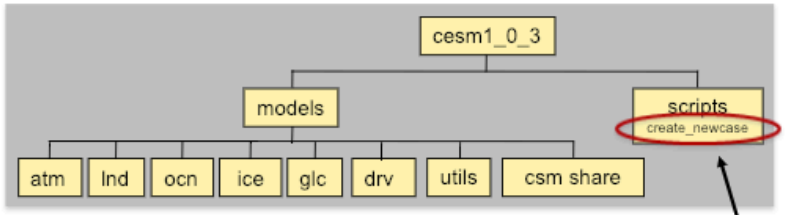
DT-CESM

* Code base branched from CESM1_2 (cam5,clm4.0,POP2,CICE,RTM)
* Important bug fixes, including the ”warm-world” fix
* Addition of certain diagnostics to code (HEAT Index, etc)
* Incorporates processes relevant to periods of deep-time
* Updated and enhanced Toolkit for preparing boundary and other forcing datasets for deep-time
* Enhancements to post-processing and diagnostics
* Period-specific compsets (analogous to others: 1850, modern-day) to enable running ”out-of-the-box”

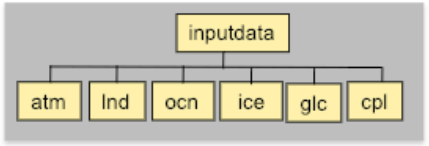
Deep-Time compsets

Step 1: create_newcase

CESM code



CESM data



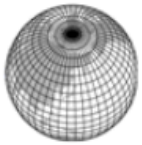
The first step to create a CESM experiment is to use **create_newcase**

create_newcase has 4 required arguments (+ more optional arguments)

create_newcase -case myFirstCase -mach ekman -compset B1850 -res 0.9x1.25_gx1v6

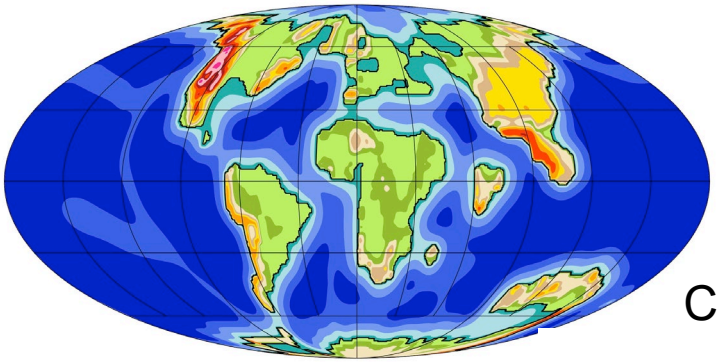
casename

it is the experiment identifier

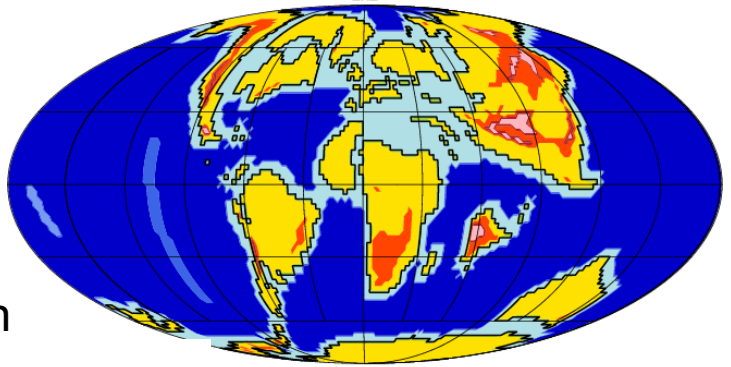


Developed Deep Time CESM Configurations

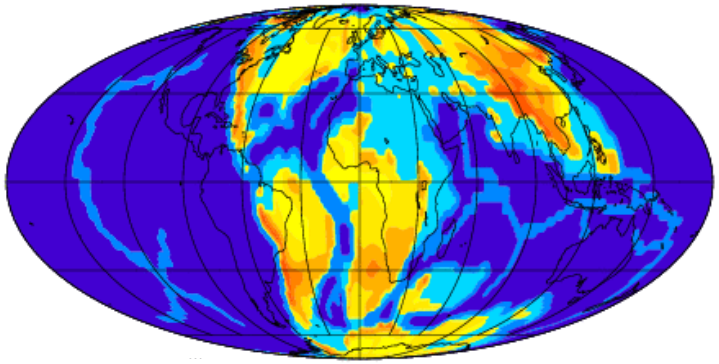
PETM



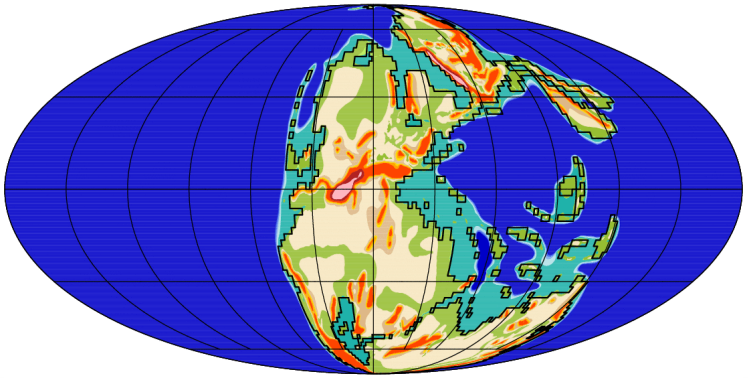
K/T



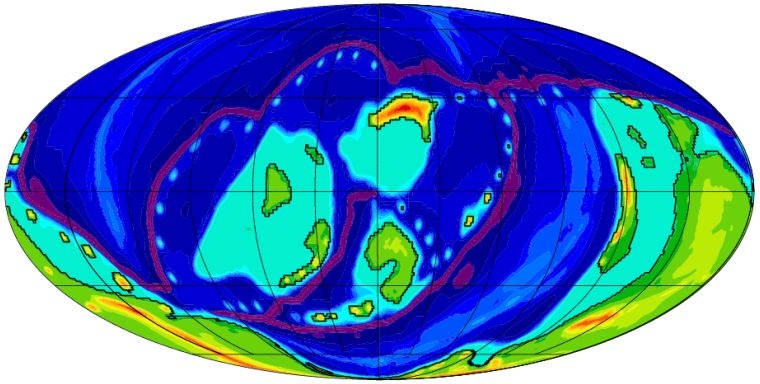
Cretaceous/Albion



Permian/Triassic

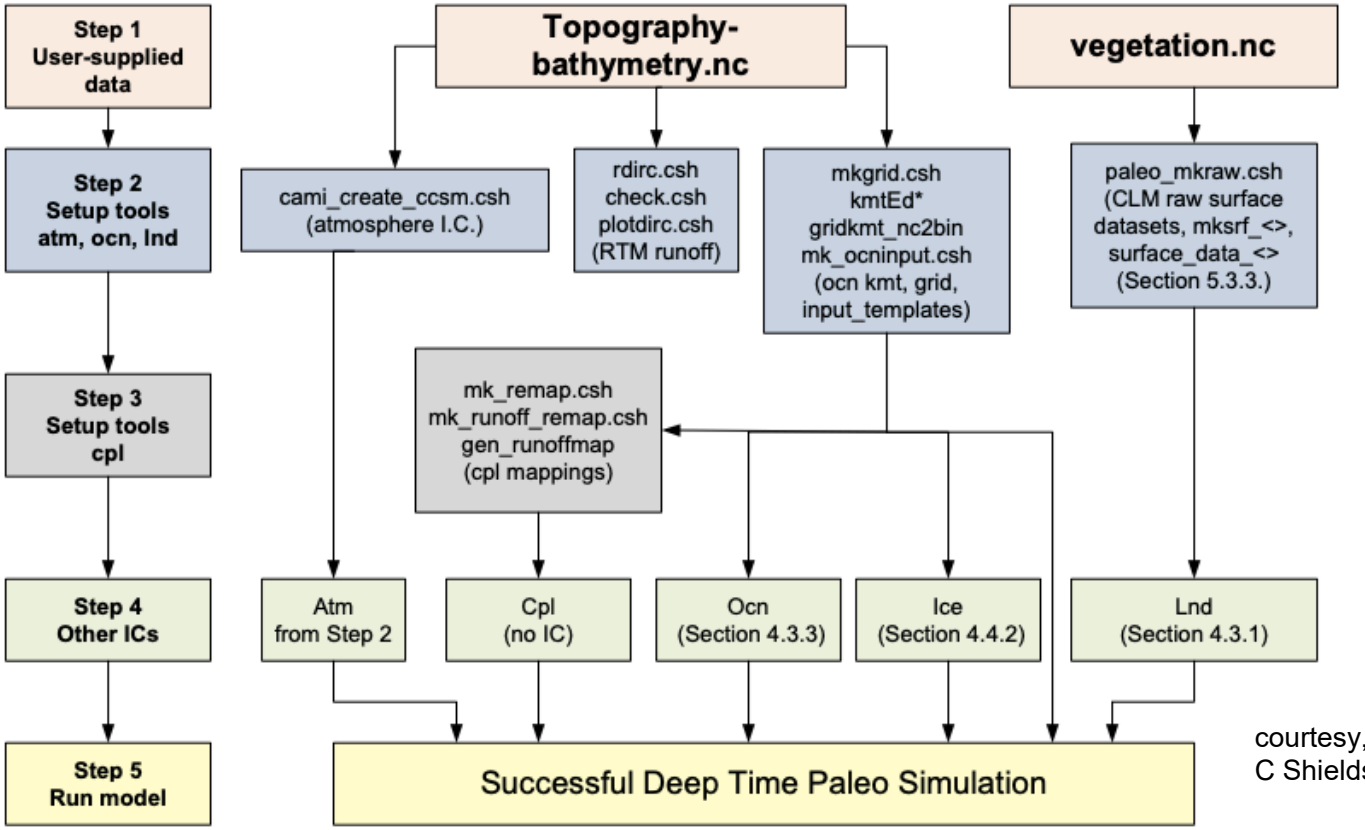


Ordovician



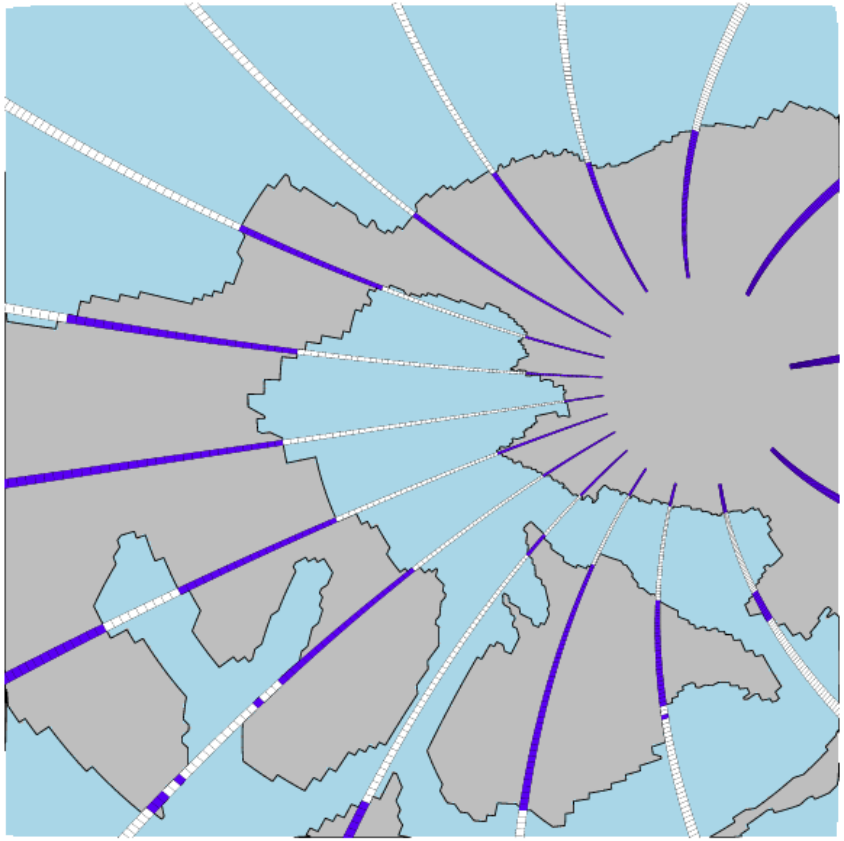
courtesy, C Shields

Current Workflow



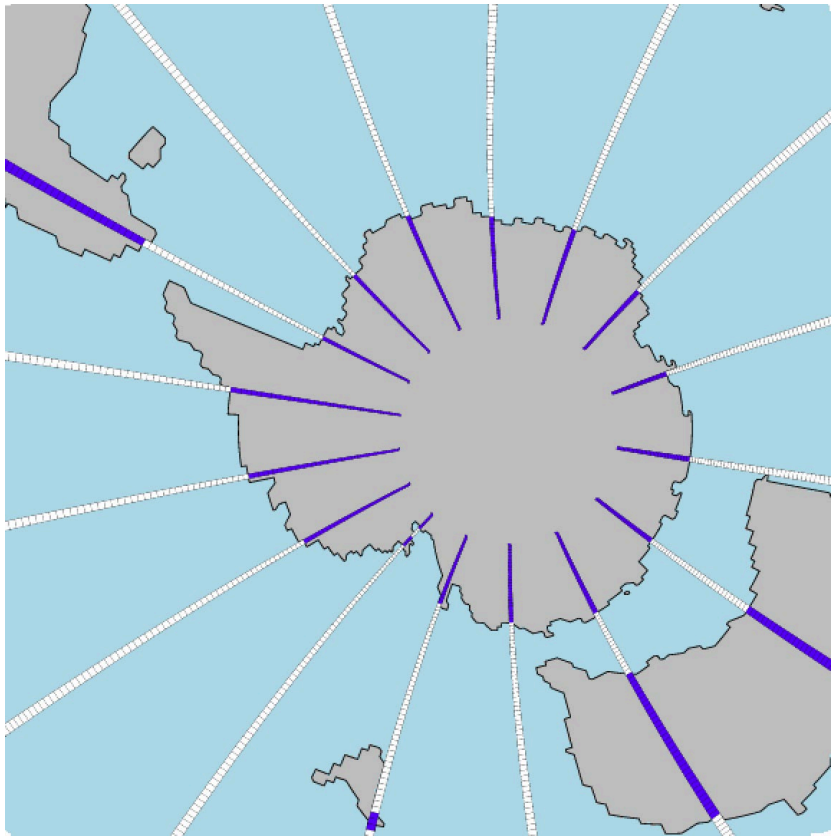
courtesy, N Rosenbloom, C Shields

Pole Locations

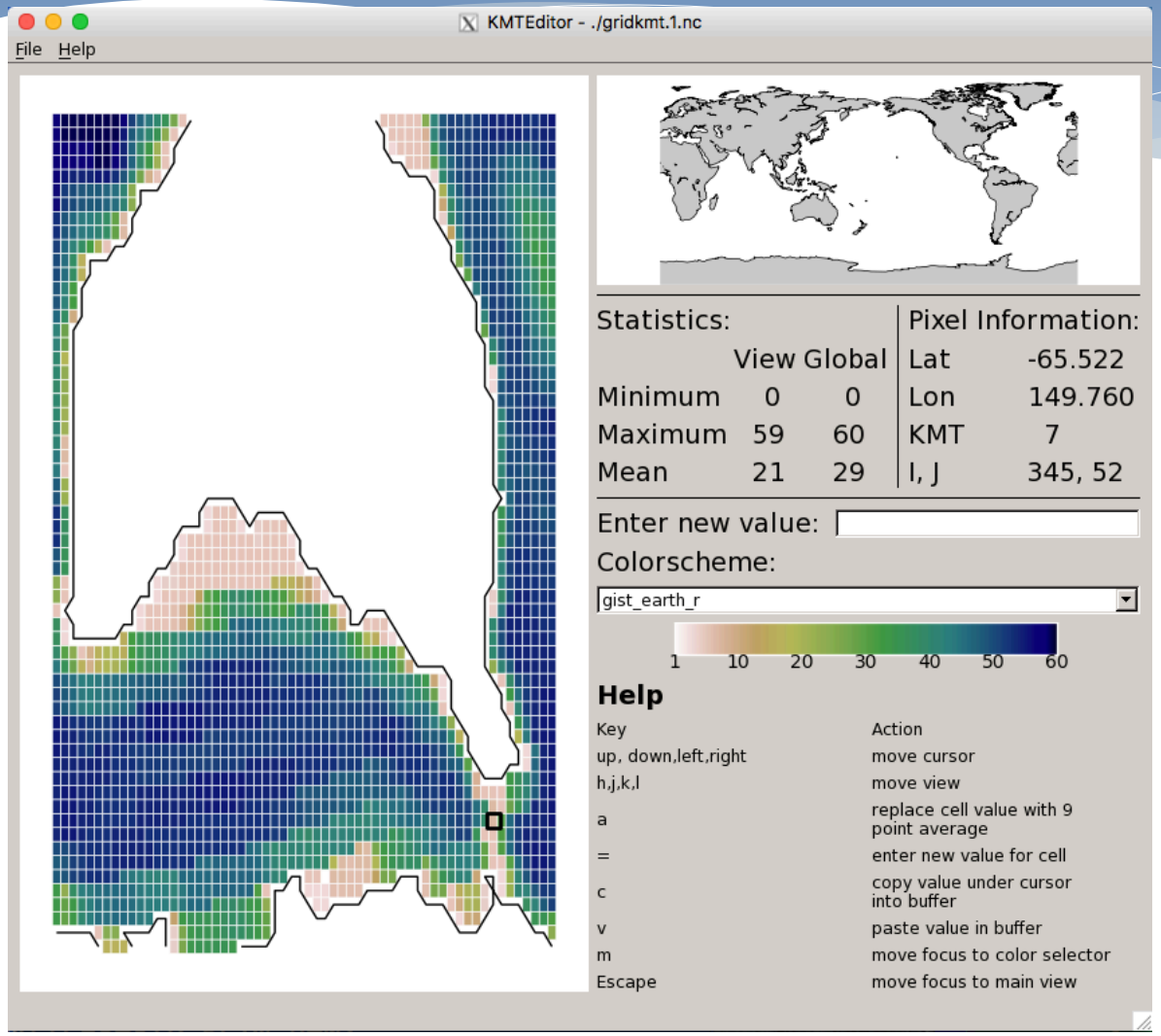


North pole

South pole

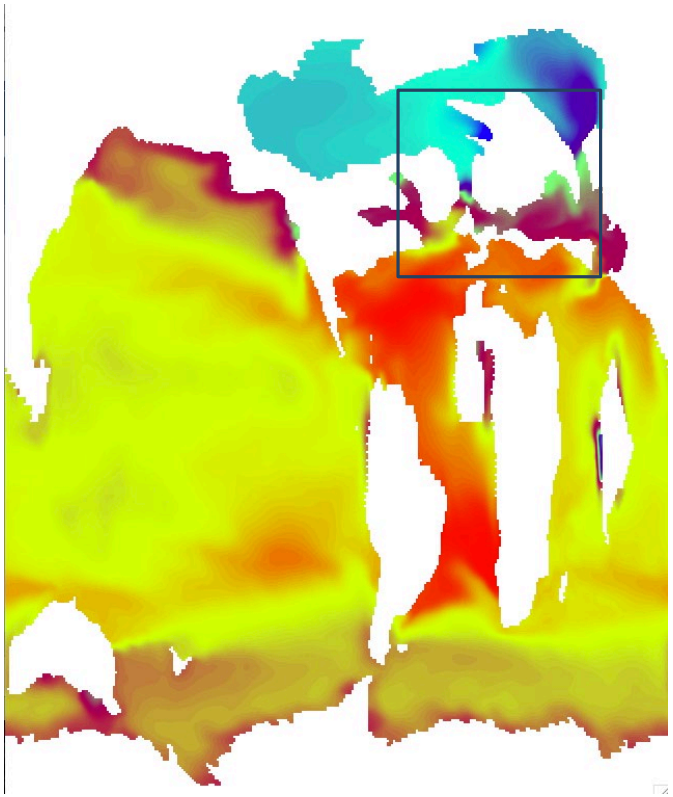


KMT editor

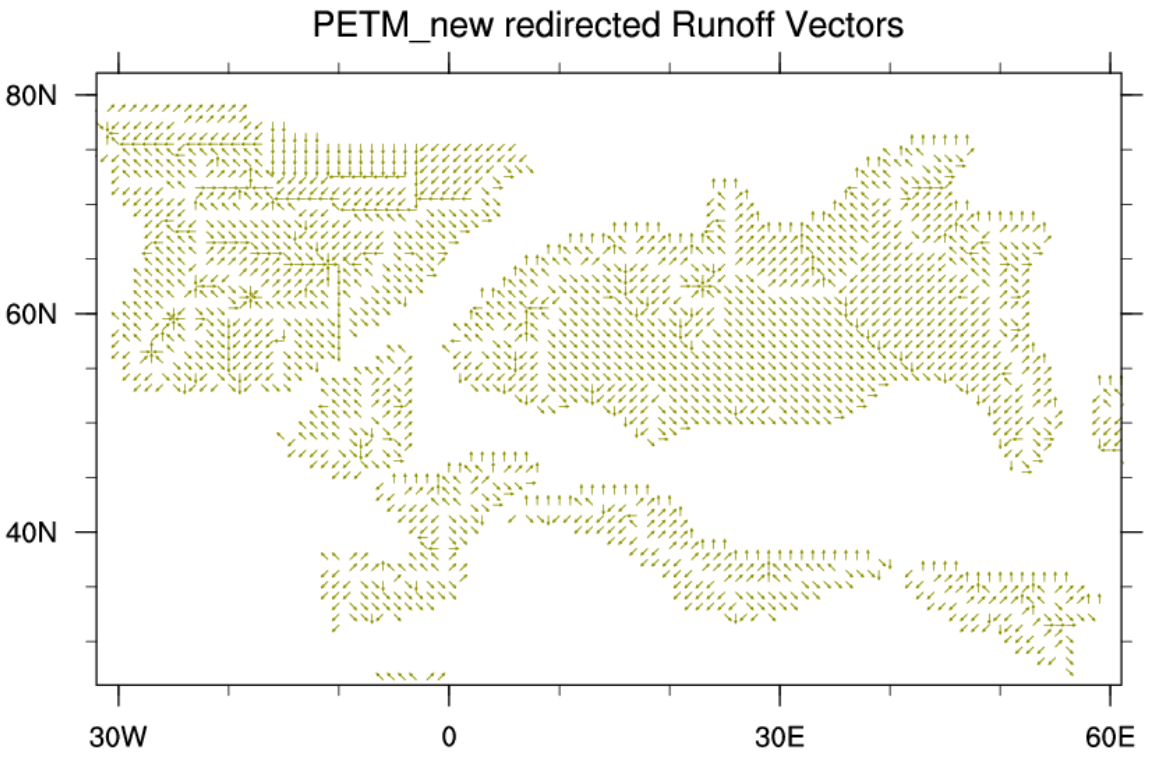


Deepak Chandan
University of Toronto

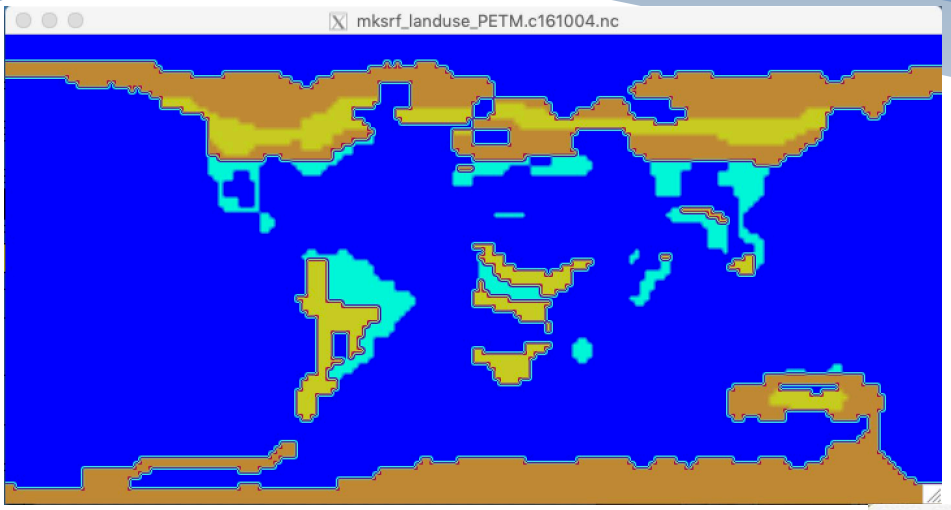
Salinity and Runoff



8↖	1↑	2↗
7←	ref	3→
6↙	5↓	4↘

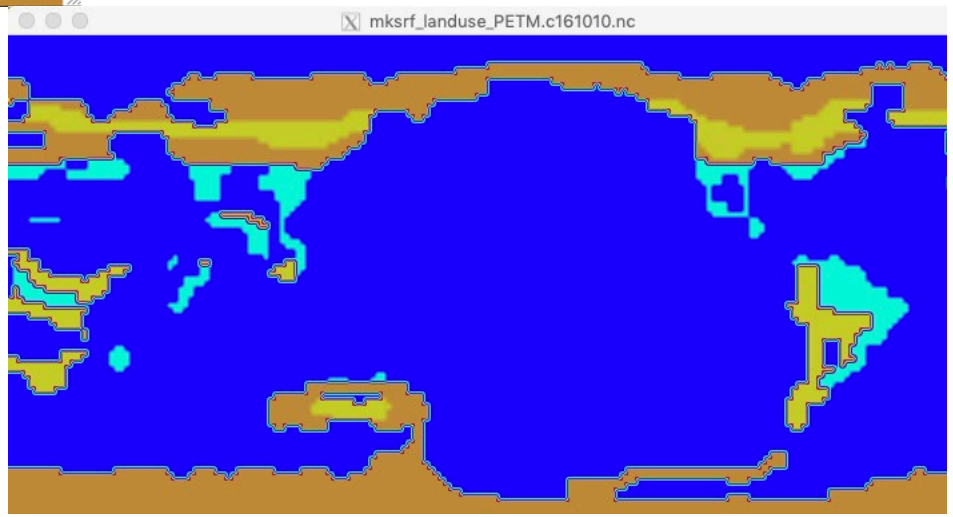


Shift in longitudes

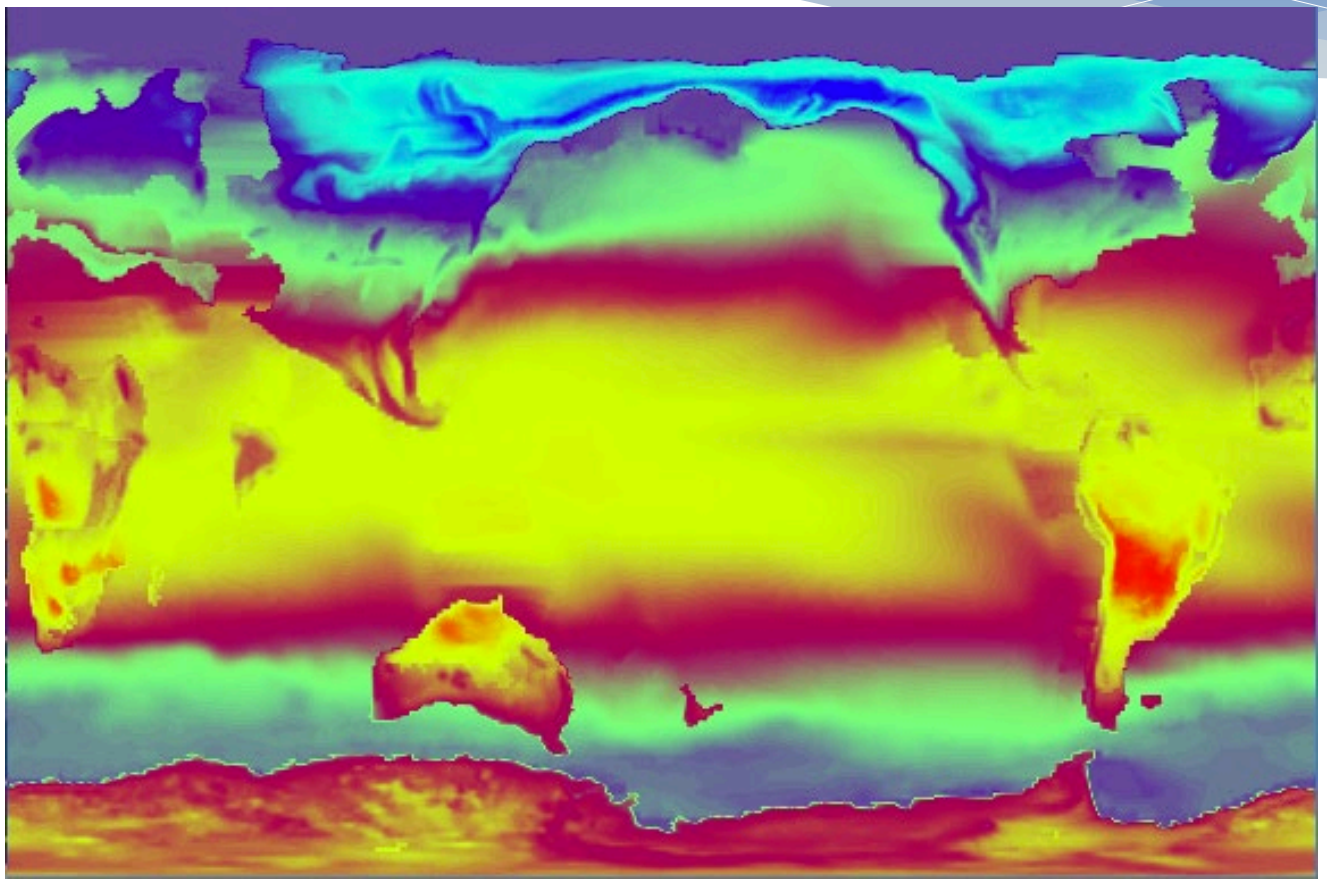


-180 to 180 deg

0 to 360 deg

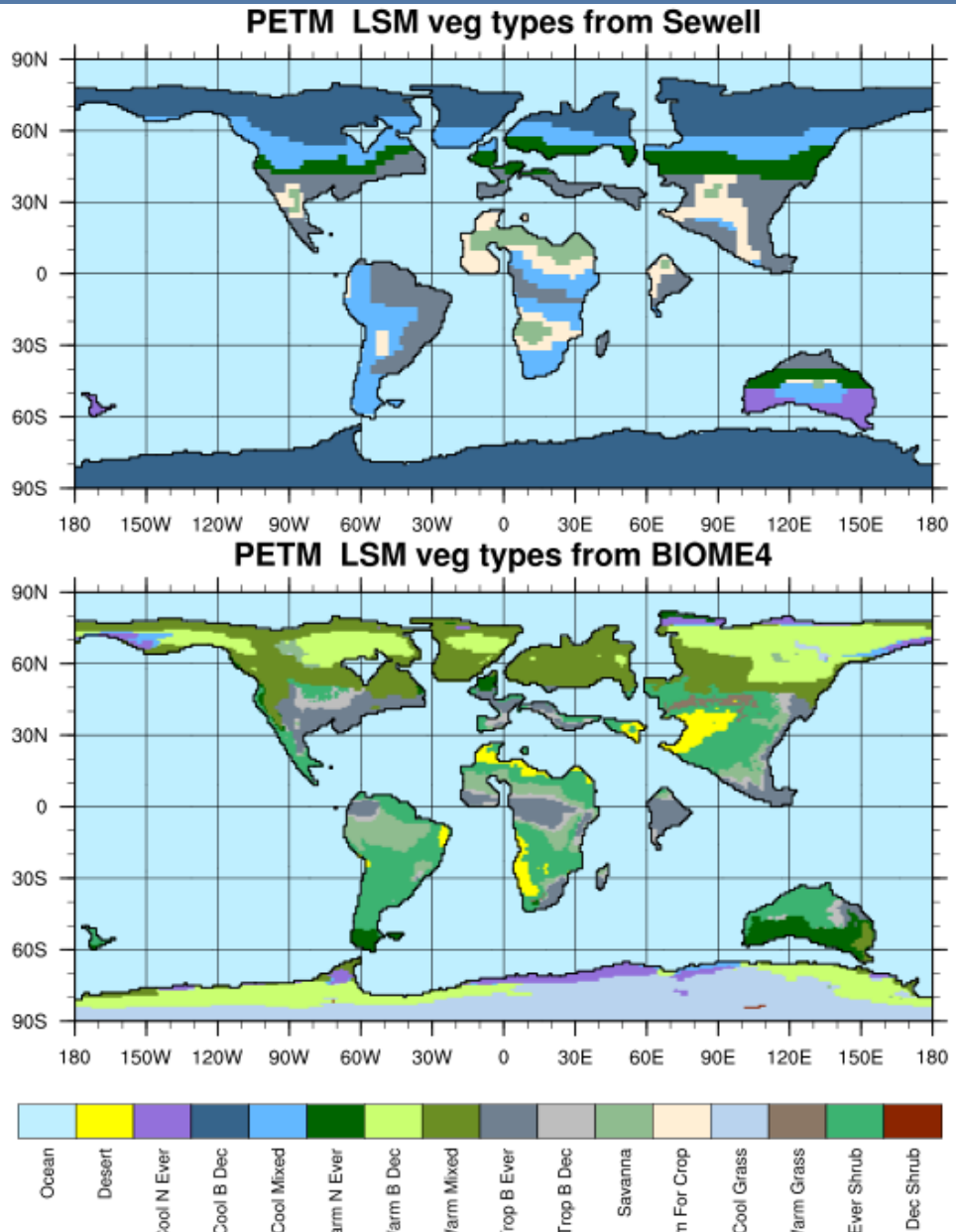


Artifacts from modern inputs



Surface Temp
At 0.25 deg

Vegetation Inputs



Paleoclimate Resources for CESM

nanr edited this page on Dec 1, 2016 · 15 revisions

CESM1.2 Paleoclimate Documentation

- Documentation
- Scripts/Codes

User Contributions

We invite users to contribute to this wiki by adding code, suggestions for alternate methods, corrections, or any helpful suggestions for other modelers who are attempting to use the CESM model for paleoclimate applications. Contact [Bette Otto-Bliesner] (mailto:ottobli@ucar.edu) for access.

CESM Model homepage

Pages 1

User input/Comments

Clone this wiki locally

https://github.com/CESM-Dev

CESM-Development / **paleoToolkit**

Watch 9 Star 9 Fork 7

Code Issues 0 Pull requests 1 Projects 0 Wiki Insights

Branch: master **paleoToolkit** / cesm1 / lnd / **paleo_mkraw** /

Create new file | Upload files | Find file | History

jedwards4b new paleoToolkit git repo — Latest commit `f4f0da3` on Jan 27, 2016

..

paleo_mkraw_cesm1.F90	new paleoToolkit git repo	3 years ago
paleo_mkraw_cesm1_public.csh	new paleoToolkit git repo	3 years ago
paleo_mkraw_cesm1_sed.F90	new paleoToolkit git repo	3 years ago

RESOURCES FOR CESM1.2 PALEOSIMULATIONS

NAN ROSENBLOOM
ESTHER BRADY
BETTE OTTO-BLIESNER

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Summary and future plans

* Streamlined set of deep-time tools will be released to community later this year (GitHub)
* Model code, compsets, enhanced diagnostic tools and on-line documentation released at same time
* We'll provide support for tools on Cheyenne (or current NCAR machine) including executables
* Underlying code will be made available for users to port to their own machine, but support will be limited
* Work on Quaternary tools will follow (2020)
* Updates for CESM2 will also happen next year
* Toolkit is a moving target – will benefit with regular updates and input from the community
* Questions? mvr@ucar.edu