

15th CMMAP Team Meeting

August 6-8, 2013



Introductions

Elizabeth Barnes - New CSU ATS faculty member

Pat Keyes - PhD student, Stockholm University Resilience Centre

Kathy Partin - CSU Office of Research Integrity

Laura Sample McMeeking - CSU Education

Adam Pearlstein - Little Shop of Physics

Hannah Pechan - Reach

Emily Riley - University of Miami

Leah Lindsey - New CSU grad student

Alex Naegele - New CSU grad student

Sungduk Yu - New grad student at UC Irvine

Keith Roberts - Stony Brook

Keith Oleson - NCAR

External Advisory Panel



Brian Mapes, Chair



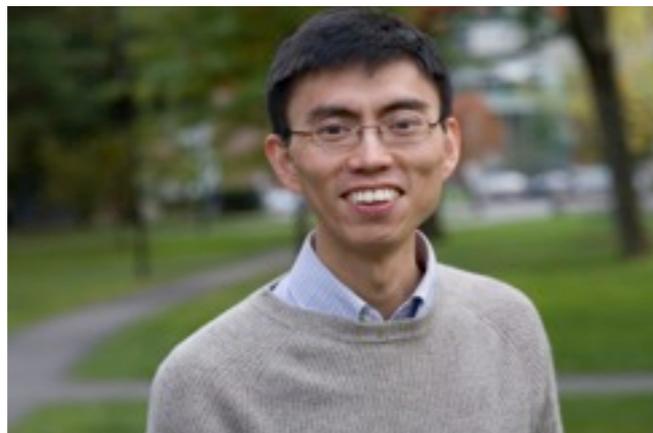
Indira Nair



Tiffany Shaw



Steve Ghan



Zhiming Kuang



Mike Wehner

CMMAP 2013 Summer Interns



CMMAP 2013 Summer Interns



ED Retreat, yesterday



Since our last meeting...

- Annual report
- Site visit
- Little Shop at the Rockies
- Teacher training
- Internships
- Grad student colloquium
- Climate Sense
- Summer School at NCEP



Summer schools

- ◆ ESRL (2011)
- ◆ GFDL (2012)
- ◆ NCEP (2013)



GFSmodelingschool

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The NEMS/GFS Modeling Summer School

The National Centers for Environmental Prediction (NCEP) Environmental Modeling Center (EMC) is pleased to announce a four-day Summer School on the NOAA operational Global Forecast System (GFS) within the NOAA Environmental Modeling System (NEMS) framework. The Summer School will be held at NCEP/EMC at the new NOAA Center for Climate and Weather Prediction in College Park, Maryland on July 29-August 1, 2013.

The aim of the GFS/NEMS Summer School is to train users in the "art" of medium-range global numerical weather modeling: what is normally not documented in papers nor taught in classes. The course will take students through all the steps involved in configuring, running, and analyzing results from the GFS running on parallel supercomputers. The Summer School will contain lectures given by the scientists who developed the GFS and NEMS framework. Topics to be covered include the GFS numerics, dynamics, grid structure, physics, and post processing. Participants will be exposed to the NEMS framework developed to optimize operational implementation of model systems and promote interoperability between components of the earth system required by advanced coupled model systems. The Summer School will be composed of technical lectures/discussion in the mornings and hands-on exercises running the GFS/NEMS in the afternoons.

The Summer School is aimed principally at advanced graduate students, postdocs and research staff that have a specific interest in using the GFS in their research and have an interest in the transition of research into NOAA operations. A general background in atmospheric science is a prerequisite and successful applicants should have experience running large modeling systems on high-performance parallel computers.

Only 15 participants will be selected for this first offering. Computer facilities and accounts will all be provided by NCEP. All other costs associated with travel, lodging and meals must be provided by their home institutions. Registration is free.



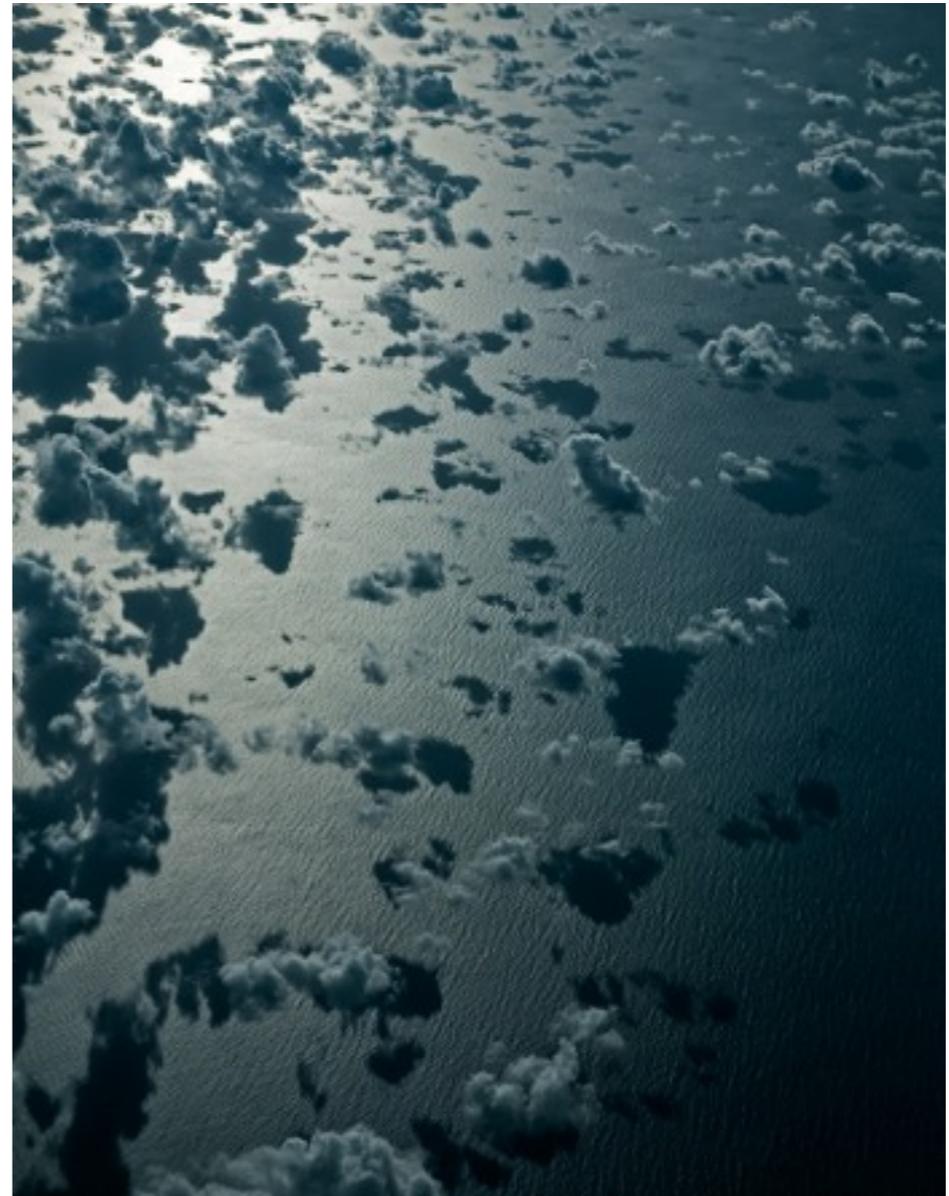
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- SP-CESM Workshop



First SP-CAM Tutorial

- ◆ We plan to do this again each summer.
- ◆ We hope to coordinate with the CESM tutorial next year.
- ◆ Your suggestions for improvements will be appreciated.



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- Reach business plan and IP licensing from CSU



Reach



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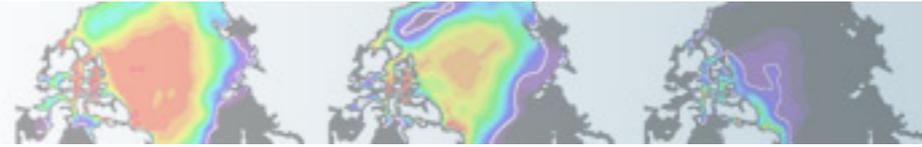
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- C-level rise



C-Level Rise

- ◆ Climate change summer school
 - ▲ Climate Change Science
(*Scientific American* level)
 - ▲ Sustainability
 - ▲ New Energy Economy
- ◆ Aimed at “C-level” corporate executives
- ◆ Several thousand dollars per seat
- ◆ A few paid outside lecturers
- ◆ Three or four days, June 2014
- ◆ CSU conference facility in Denver





A few weeks ago, NCAR released the Super-parameterized Community Atmosphere Model (SP-CAM) as a supported branch of Community Earth System Model (CESM).

EOS

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

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PAGES 221–228

A Community Atmosphere Model With Superparameterized Clouds

PAGES 221–222

Simulations by climate models are used to project the climate change expected as atmospheric greenhouse gas concentrations rise. How much will the Earth warm? Will south Asia experience stronger monsoons in the future? Will the American Southwest continue to desiccate? How soon will the Arctic become ice free? How fast and how much will sea level rise? Climate models rely on the idea that sound physical principles can be used to translate basic information, such as emissions of carbon dioxide and aerosols, into changes in the energy balance that influence the formation of clouds, which over time play a key role in shaping future climate response to the emissions.

However, producing virtual clouds from lines of code is not an easy task. Thus, the realism and reliability of climate simulations continues to be limited by the deficiencies of the cloud parameterizations used in global

and Smolarkiewicz, 1999]. Grabowski [2001] subsequently applied the concept to an idealized global simulation and found evidence of large-scale organization of convection.

Inspired by the results of Grabowski and Smolarkiewicz, Colorado State University (CSU) scientists Marat Khairoutdinov and David Randall created a multiscale version of the Community Atmosphere Model (CAM) [Khairoutdinov and Randall, 2001]. They removed the cloud parameterizations of CAM and replaced them with a two-dimensional version of Khairoutdinov's cloud-resolving model (CRM). This model used periodic lateral boundary conditions, so that clouds moving out of the CRM domain on one lateral boundary return to the domain on the opposite boundary. They dubbed the embedded CRM a superparameterization and called the global atmospheric model that uses the superparameterization a multiscale

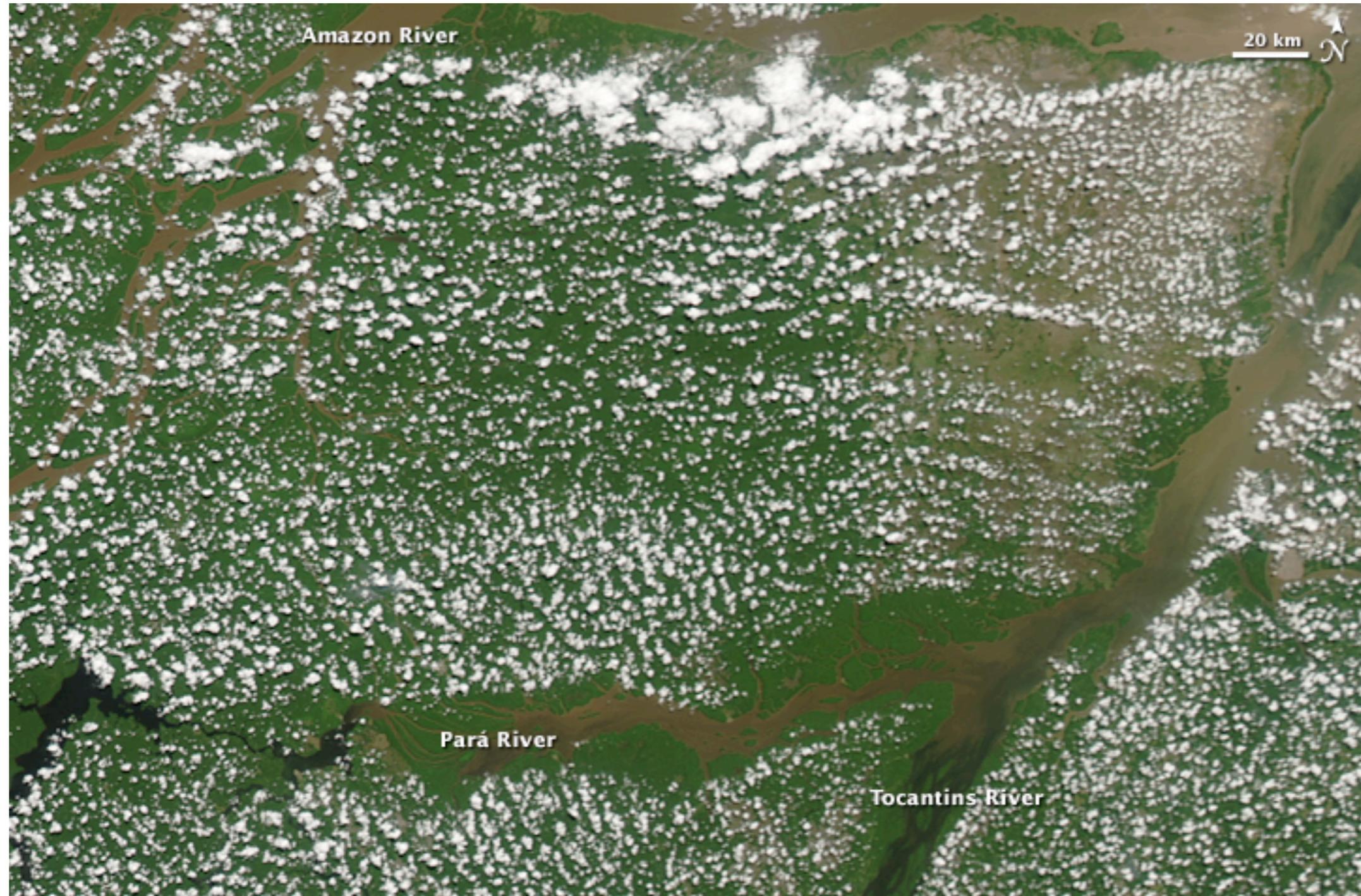
modeling framework (MMF). The particular MMF based on their CAM is now called the superparameterized-CAM (SP-CAM).

Over the past several years, scientists from many institutions have explored the ability of SP-CAM to simulate tropical weather systems, the day-night changes of precipitation, the Asian and African monsoons, and other climate phenomena. Cristiana Stan of the Center for Ocean-Land-Atmosphere Studies at George Mason University found that SP-CAM gives improved results when coupled to an ocean model [Stan *et al.*, 2010], and follow-on studies have explored SP-CAM's utility when used as the atmospheric component of the Community Earth System Model (CESM); the coupled model with the atmospheric superparameterization is called SP-CESM. Meanwhile, a second MMF, based on a different global model and a different CRM, has been created by Tao *et al.* [2009].

Much of the research on these multiscale models has been performed under the auspices of the Center for Multiscale Modeling of Atmospheric Processes, a National Science Foundation (NSF) Science and Technology Center for which the lead institution is CSU. Through these modeling efforts, scientists in

[https://svn-ccsm-release.cgd.ucar.edu/
model_development_releases/spcam2_0-
cesm1_1_1/](https://svn-ccsm-release.cgd.ucar.edu/model_development_releases/spcam2_0-cesm1_1_1/)

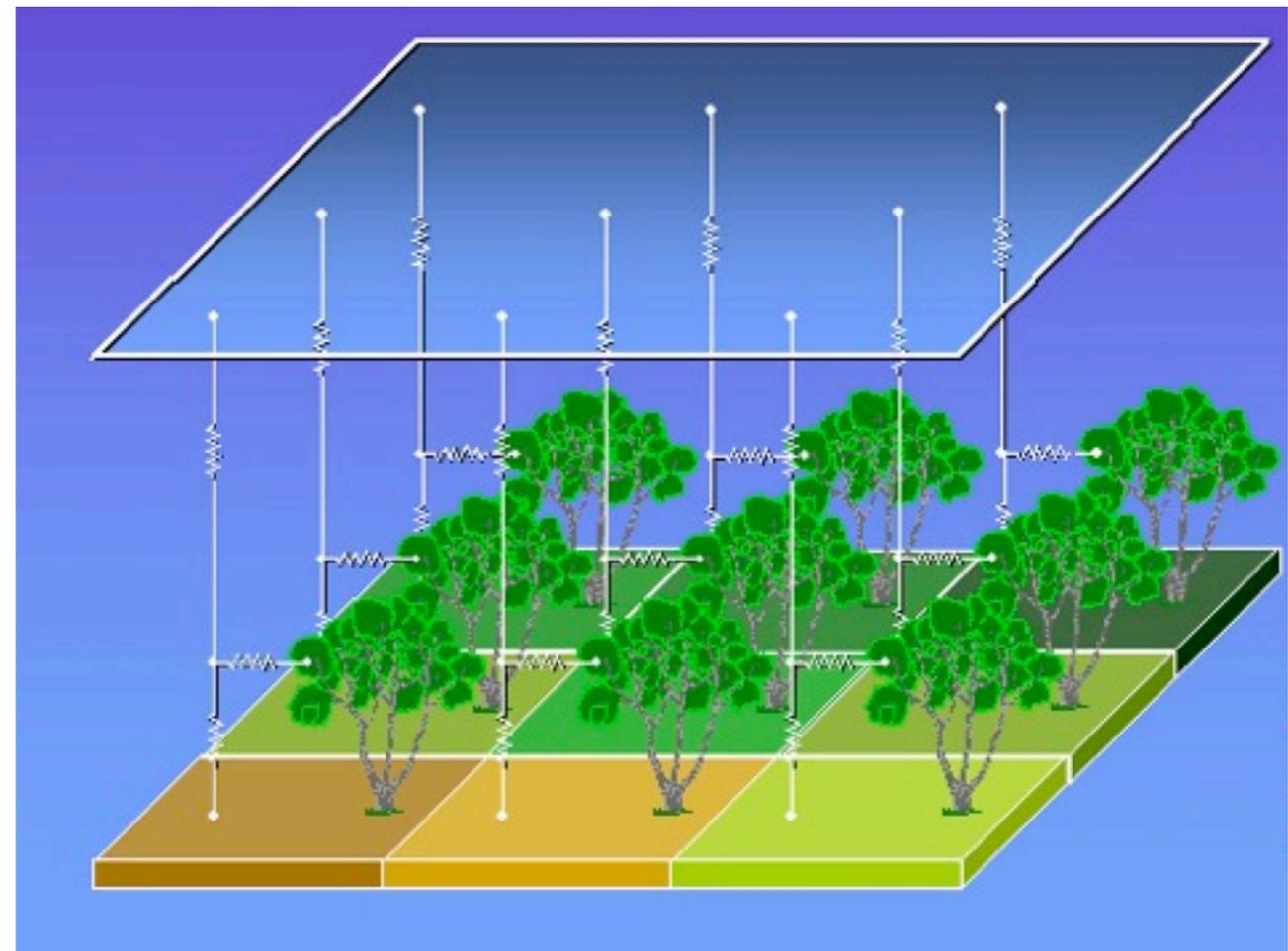
Multiscale interactions of the atmosphere and land surface



Land-Atmosphere Coupling

- Community model: Many land “tiles” exchange with a single atmospheric column
- Prototype model: Each atmospheric column has many cloud-resolving cells, but just one land surface!
- Next generation: Couple land and atmosphere on CRM grid instead

Exchanges of radiation, sensible heat, water, carbon, & momentum



Heterogeneous vegetation, topography, and soil moisture

Two New Giga-LES Runs

- ◆ 100 m horizontal resolution, 204.8 x 204.8 km horizontal domain, 256 layers into the middle stratosphere
- ◆ Ocean case based on TWP-ICE
- ◆ Land case based on M3CE case in Oklahoma
- ◆ Both runs under way
- ◆ Parallel runs with lower resolution

CPT proposal

- Led by Steve Krueger
- Collaboration with NCEP
- Major changes to GFS physical parameterizations
 - Turbulence
 - Convection
 - Radiation



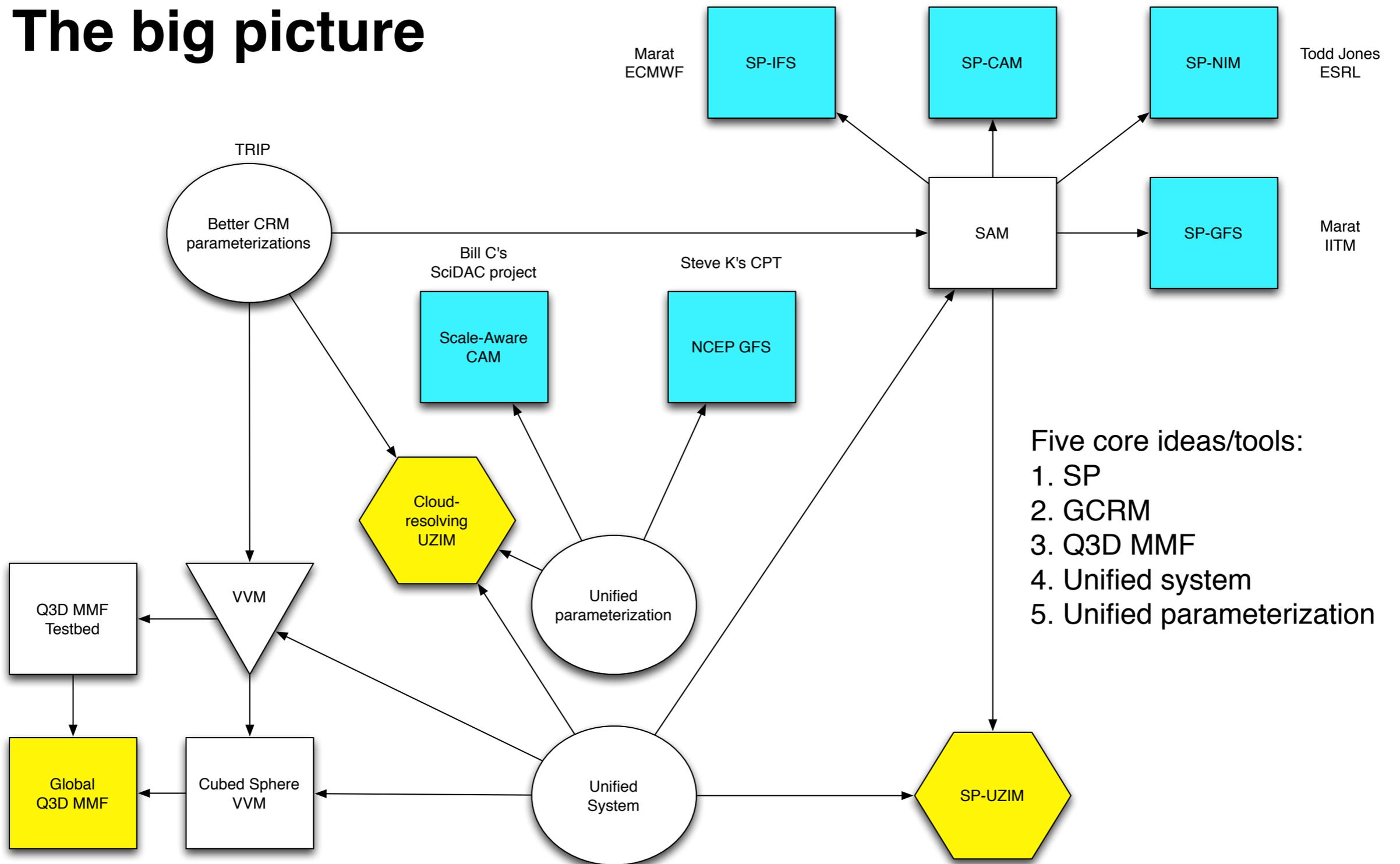
Funded.

Nathan Arnold

NOAA C & GC Postdoctoral Fellowship at CSU
Starting ~ November 1, 2013



The big picture



Year 8:

**The past gets bigger,
and the future shrinks.**



Preparing for ramp-down

The current Year 8 of CMMAP, which ends next June 30, is the last year of full funding.

We go to 80% of full funding in Year 9, and 63% of full funding in Year 10.

And then we go to zero.

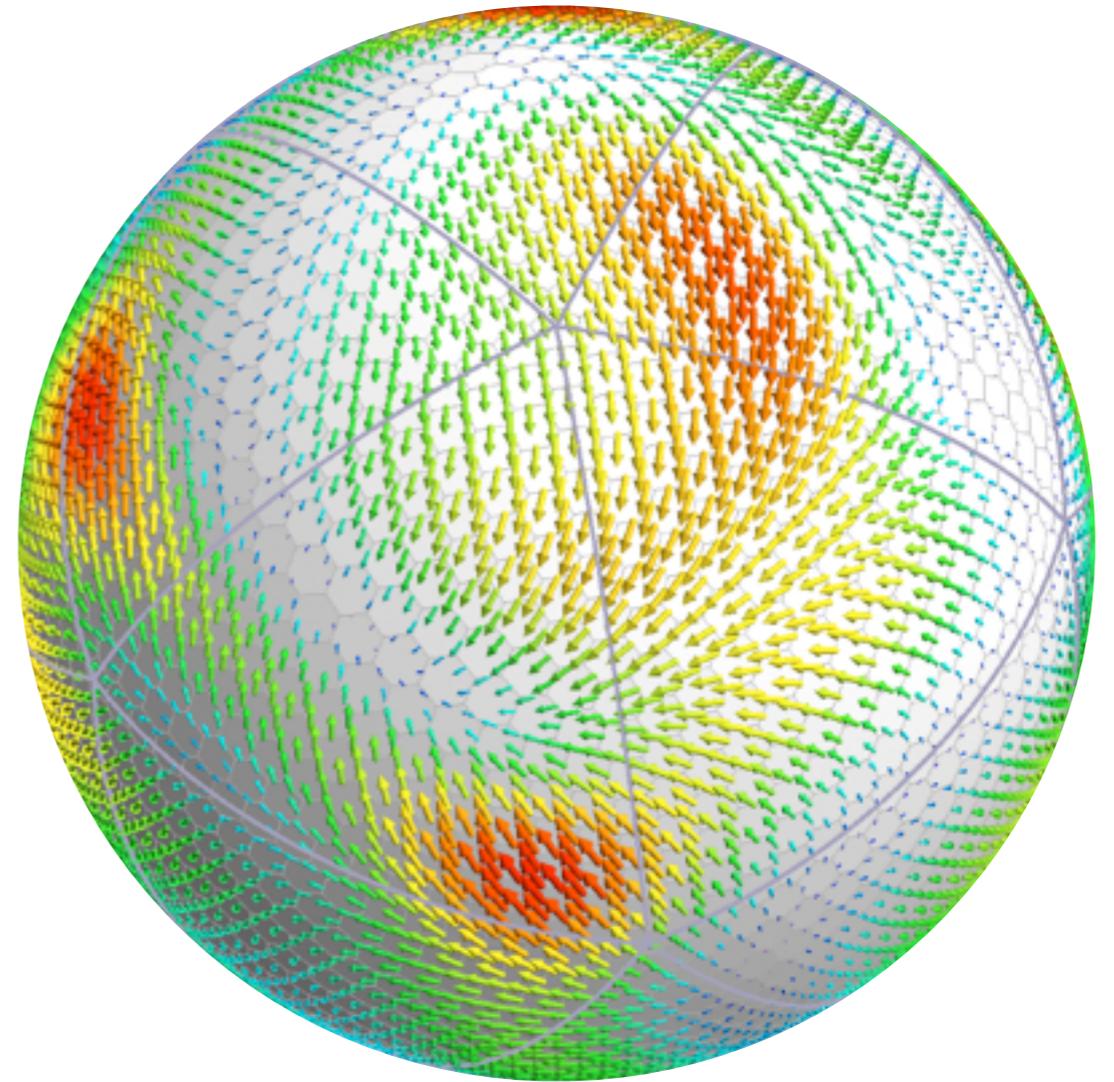
Cuts will be distributed across all parts of the project. The EC has planned this out.

If you want to discuss your funding for Years 9 and 10, please see me during this meeting.

Grad students: Don't panic!

New Institute at CSU

- System for computation, data archival, and a super-fast network connection
- Support for 15-20 graduate student modelers-in-training
- Two international workshops per year
- Visiting scientists
- Research and administrative staff



Detailed discussions are under way with the CSU administration.

Brainstorming Session

On Wednesday morning, Mike Pritchard and Robert Pincus will lead a discussion of research initiatives and collaborations that can continue beyond Year 10.

Please be thinking about what you can contribute to that discussion.



Name-the-Institute Contest

- **IMMAP**
- **iIMMAP**
- **ICRE** - Institute for Climate Research & Education
- **IREC** - Institute for Research & Education on Climate
- **iTBD**
- ... ?

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Tuesday, August 6, 2013

8:30	David Randall	Opening remarks and updates
9:00	Wojciech Grabowski	Growth of cloud droplet and raindrops in turbulent clouds
9:45	<i>Break</i>	
10:00	Pechan/Donnelson	Non-profit (Reach) updates and discussion
10:30	Parker Kraus	Sub-grid scale/wetlands
11:30	<i>Lunch on your own</i>	
1:00	Zhiming Kuang	Some thoughts on tropical transients
2:00	Breakout - Team Leads	Breakout Session #1 [Dynamical Frameworks and Education/Diversity]
3:00	<i>Break</i>	
3:15		Breakout Session #1 Continues
4:15	John Calderazzo	Climate Sense Magazine
4:45	John Helly	Ethics session - publishing legacy data
	<i>Break before Dinner</i>	
6:00	Team Dinner - Dave and Mary Kay Randall's Home	

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Wednesday, August 7, 2013

8:30	Pincus/Pritchard/ Somerville	IMMAP Discussion
9:30	Breakout - Team Leads	Breakout Session #2 [Clouds and Climate and Multiscale Land Surface]
10:15	<i>Break</i>	
10:30		Breakout Session #2 Continues
11:45	<i>Lunch on your own</i>	
1:00	Charlotte DeMott	The Role of Air-Sea Interaction in the SPCCSM3 MJO
2:00	Breakout - Team Leads	Breakout Session #3 [Physical Processes & Cyber Infrastructure]
3:00	<i>Break</i>	
3:15		Breakout Session #3 Continues
4:15	Howard Drossman	New models for learning provide insights into assessment
5:15	Meeting Ends for the Day	
	Poster Session and Reception in Hilton Atrium	

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Thursday, August 8, 2013		
8:30	Joon-Hee Jung	Modeling the moist-convective atmosphere with a Q3-D MMF
9:15	Kathy Partin	Ethics Session [Research Integrity and Compliance Review]
9:45	<i>Break</i>	
10:00	Breakout - Team Leads	Breakout Session #4 [Coupled Models and Climate Change, and Knowledge Transfer]
12:00	<i>Lunch on your own</i>	
1:30	Breakout - Team Leads	Working Group Summaries and Action Items
3:00	END OF MEETING	

I 5th CMMAP Team Meeting

August 6 - 8, 2013

List of Breakout Sessions:

	Breakout Session #1 Tuesday PM	Breakout Session #2 Wednesday AM	Breakout Session #3 Wednesday PM	Breakout Session #4 Thursday AM
Main Meeting Room <i>Salon III</i>	Education and Diversity	Clouds and Climate	Physical Processes	Knowledge Transfer
Breakout Room <i>Green & Gold Room</i>	Dynamical Frameworks	Multiscale Land Surface	Cyber Infrastructure	Coupled Models and Climate Change

Wojciech Grabowski

