An aerial photograph showing a vast expanse of white, puffy cumulus clouds stretching across the horizon. The clouds are densely packed and vary in height, creating a textured, three-dimensional appearance. The sky above is a clear, pale blue, and the overall scene is bright and airy.

**EAP meeting, September 08**

**Introductions**

# Opening Remarks by Kerry Emanuel



15E25049

# Agenda, I

## SEPTEMBER 28, 2008

7:30 PM Panel dinner at Young's Vietnamese Cafe

## SEPTEMBER 29, 2008

7:30 AM Panel breakfast at the Marriott

8:30 Opening remarks, David & Kerry

8:45 Overview, David

9:15 Giga-LES, Marat Khairoutdinov

10:00 Break

10:15 Low-cloud feedback, Matt Wyant

10:45 The MJO, Kate Thayer-Calder & Jim Benedict

11:15 Education and Diversity Introduction, Christine Aguilar & Melissa Burt

11:25 Climate Policy Outreach & Inreach, Michele Betsill

11:35 Changing Climates @ CSU, SueEllen Campbell

11:55 Lunch

## Agenda, 2

- 1:10 PM Diversity in Atmospheric Science, [Melissa Burt & Rajul Pandya](#)
- 1:30 Psychological, social & cultural factors in interest & participation, accomplishments & challenges in STEM education & careers, [Silvia Canetto](#)
- 1:45 Little Shop of Physics Process & Impact, [Mike Lacy](#)
- 1:55 Mentoring, [Christine Aguilar](#)
- 2:00 Education and Diversity Summary, [Scott Denning](#)
  
- 2:10 VVM and GCRM, [Celal Konor & Ross Heikes](#)
- 3:10 Break
  
- 3:25 Knowledge Transfer, [Wayne Schubert & Bill Collins](#)
- 4:10 Q3D MMF, [Joon-Hee Jung](#)
- 4:40 Management, [Cindy Carrick](#)
- 5:00 Adjourn
- 5:30 Dinner at David Randall's house

### **SEPTEMBER 29, 2008**

- 8:30 AM **Panel drafts report**
- 11:00 Presentation of report to CMMAP management
- 12:00 PM Adjourn

# Highlights of the past year I

## ◆ Research

- ▲ Analysis of MJO
- ▲ Giga-LES
- ▲ Q3D MMF progress
- ▲ GCRM progress
- ▲ Improved parameterizations
- ▲ INCITE award

## ◆ KT successes

- ▲ Launch of JAMES
- ▲ Contract for book
- ▲ Interactions with NCEP
- ▲ Interactions with NCAR

# Highlights of the past year 2

## ◆ Education & Diversity

- ▲ Changing Climates

- ▲ Recruiting successes

- ▲ Second Colorado Global Climate Conference

- ▲ Teacher training activities

- ▲ Graduate student colloquium

## ◆ Management

# Our future home



# **Consolidation and prioritization of research objectives**



# Before

1. Extend, evaluate and apply the prototype MMF.
2. Develop a second-generation MMF and a GCRM.
3. Develop and test improved microphysics parameterizations for CRMs.
4. Develop improved parameterizations of boundary-layer clouds and turbulence for use in CRMs.
5. Test sensitivity of CRMs to more detailed radiation calculations.
6. Analyze, evaluate, and interpret MMF and GCRM results using emerging datasets.
7. Accelerate improvement of conventional parameterizations.
8. Acquire and make optimal use of large computational and data storage resources.

# After

1. Extend, evaluate and apply the prototype MMF.

**2. Develop a second-generation MMF and a GCRM.**

3. Develop and test improved parameterizations for CRMs.

4. Analyze, evaluate, and interpret MMF and GCRM results using emerging datasets.

**5. Accelerate improvement of conventional parameterizations.**

6. Acquire and make optimal use of large computational and data storage resources.

## **Now a few miscellaneous items:**

- ◆ **Land surface research**
- ◆ **NCEP collaboration**
- ◆ **Conventional parameterizations**
- ◆ **Interactions with GCRM work outside of CMMAP**
- ◆ **Adventures in computing**

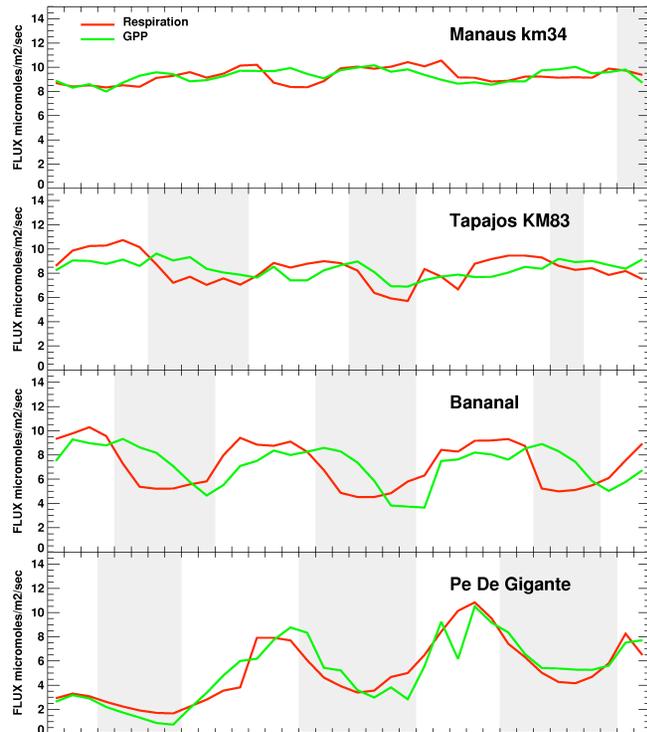
# Land Surface Research



# Heterogeneity

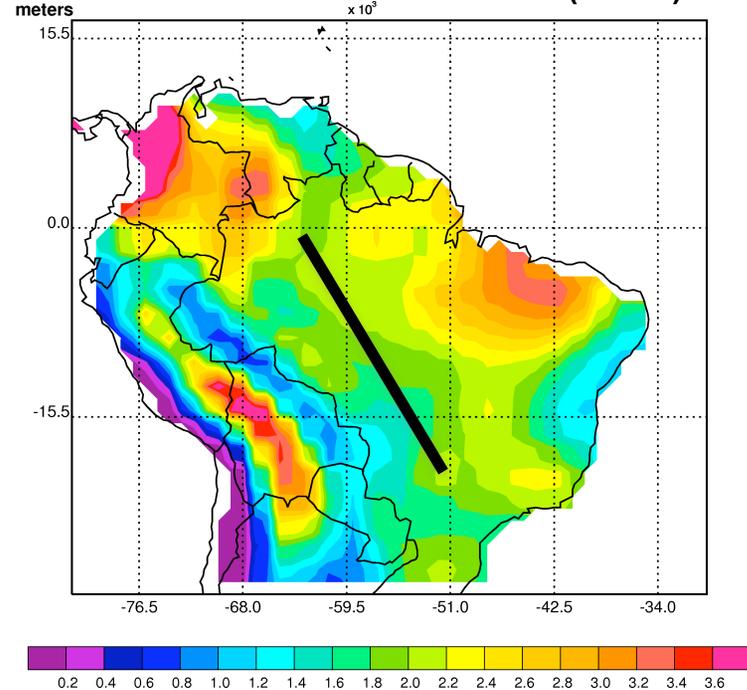
- Current global climate models have a single atmospheric column above each land grid cell, or non-spatially-explicit, flux-weighted “tiles” of different land-surface types
- Early MMF experiments reversed this structure: hundreds of atmospheric columns over a single land point
- In MMF, the hydrology, ecosystem physiology, and biogeochemistry interact at cloud scale!
- How to sample/parameterize heterogeneity?

# Improved Soil Hydrology



Jul 23, 2008

MEAN ANNUAL PRECIPITATION (NCEP)



Most climate models have difficulty sustaining photosynthesis and evapotranspiration in tropical forests during severe seasonal drought

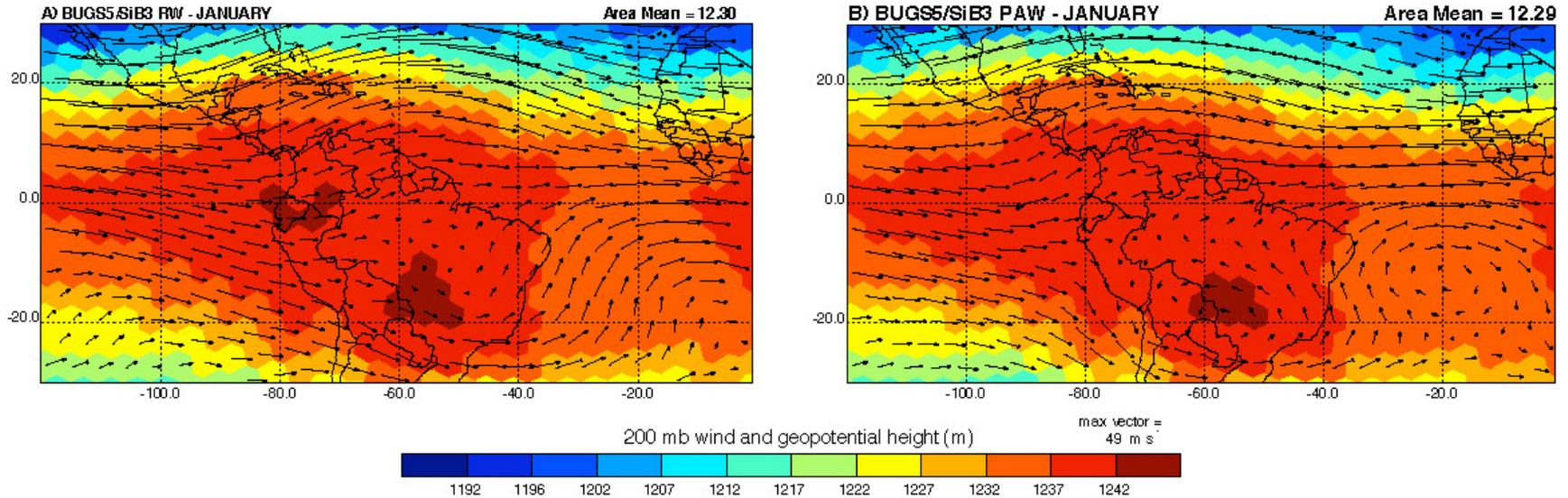
Modified root physiology in SiB allows forests to tap deep soil moisture during dry season

Substantial improvement in simulated seasonal cycles at Amazon flux towers

# Soils Influence Circulation!

Control

Deep Roots

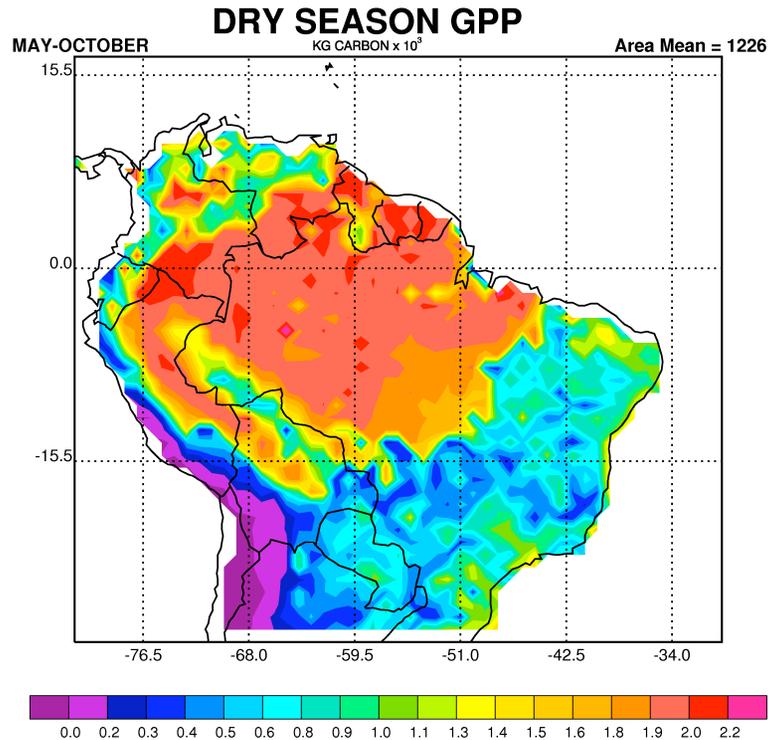


Improved soil hydrology in land component leads to greater water vapor export during dry season, cooler PBL, and earlier transition to onset of rains

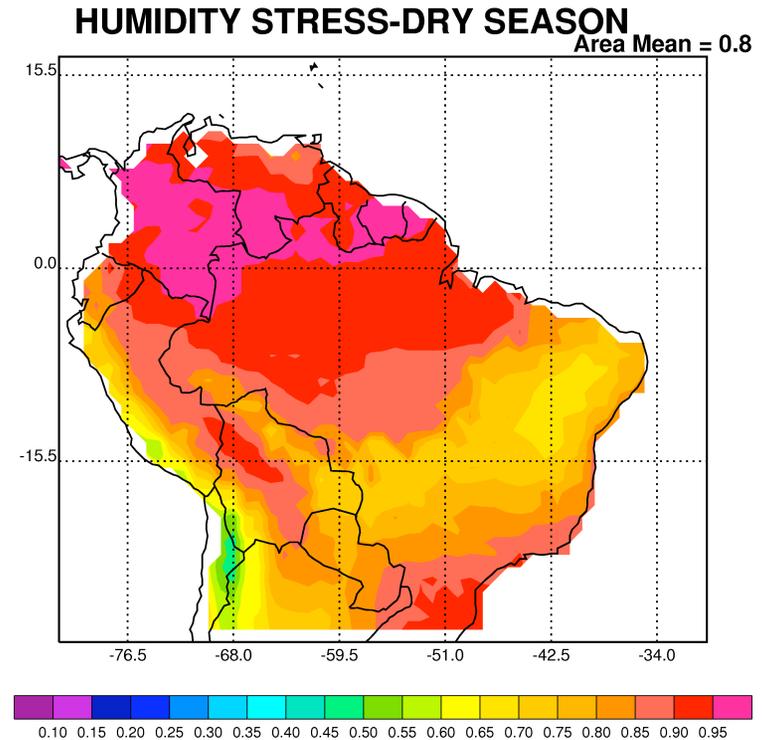
During wet season, stronger convective heating enhances Bolivian high and water vapor convergence into Amazon Basin

# Spatial Gradients

Jul 23, 2008



Jul 25, 2008



Using the MMF, we can investigate the 'transitional forest', or the region on the edge of the tropical forest which forms the interface between the savanna and the main body of the tropical forest. This region is important to the initiation of the wet season, and surface fluxes in this region are important to the overall ecophysiology in Amazonia.

Coupled SiB-SAM being used to investigate role of humidity gradients; evaluate at flux towers and implement globally in MMF

# Interactions with NCEP

- ◆ **External Review of NOAA's Climate Research and Modeling Program (DR, Panel Chair; SD & WC, Panel Members)**
- ◆ **Two proposals to NOAA with NCEP collaborators**
- ◆ **Visit to NCEP by DR & SK**
- ◆ **COLA connection**

# Proposal to NOAA from Steve Krueger & Hua-Lu Pan

We propose to improve the representation of convectively generated clouds in the GFS, including clouds produced by detrainment from deep convection, and that of deep convection itself. We will address problems identified in our previous, published comparisons of the GFS SCM with CRM results, ARM cloud radar observations, and ISCCP cloud type frequencies. A new parameterization will be developed that will predict the evolution of the SGS distribution of IWP. The parameterization will include sources IWP due to convection, decay of IWP due to precipitation, and spreading due to shear and mesoscale anvil circulations. This parameterization be combined with the already predicted vertical distribution of grid-averaged non-convective cloud ice and generalized overlap assumptions (such as vertical decorrelation scales obtained from cloud radar observations) to allow SGS microphysics and SGS radiative flux calculations.

The new parameterizations will be based on 3D cloud-resolving model simulations, and evaluated and tuned using satellite retrievals of IWP and precipitation and their relationships, vertical cloud structure characteristics from CloudSat, as well as global MMF simulations, which have the advantage of resolving mesoscale cloud structure on a global scale, including cloud mass flux, precipitation, and evolving cloud ice.

# **Proposal to NOAA from Joao Teixeira, Zoltan Toth, & Steve Krueger**

The proposal deals with stochastic convection parameterizations. The objectives of the project are to develop more sophisticated versions of a stochastic convection parameterization originally developed under a NOAA/THORPEX grant and to implement the current and these new versions in the NCEP coupled Climate Forecast System.

To improve the stochastic convection parameterization we need better estimates of the PDFs of thermodynamic variables. This will be done by using satellite observations and CMMAP simulations (CRM, giga-LES; and SP-CAM).

# Conventional parameterizations

- ◆ **NCEP interactions mentioned above**
- ◆ **MJO studies (grad students Jim B & Kate T-C)**
- ◆ **Stochastic convection study at CSU (grad student Todd Jones)**
- ◆ **Microphysics parameterization of Hugh Morrison**
- ◆ **Turbulence work by Anning Cheng (NASA Langley), Cara-Lyn Lappen (CSU), and grad students Tak Yamaguchi (CSU) and Grant Firl (CSU)**
- ◆ **Collaboration on cumulus parameterization with Minoru Chikira of JAMSTEC**
- ◆ **Radiation codes being tested in both GCM and CRM at CSU**
- ◆ **Land-surface parameterization mentioned above**

# **Interactions with GCRM work outside of CMMAP**

- ◆ **Sloan Workshop on Modeling, Royal Society**
- ◆ **Visit of Hiroaki Miura to CSU for two years**
- ◆ **World Modeling Summit**
- ◆ **Collaboration with Berkeley group**
- ◆ **Skamarock meeting at NCAR, Sept 08**

# Adventures in computing

- ◆ **INCITE Award**
- ◆ **Brookhaven/Stony Brook BlueGene**
- ◆ **Helly proposals, including MRI**
- ◆ **Pending NCAR requests**
- ◆ **Berkeley collaboration**
- ◆ **Illinois supercomputer readiness proposal  
(Petascale Computing Resource  
Allocations -- PRAC)**