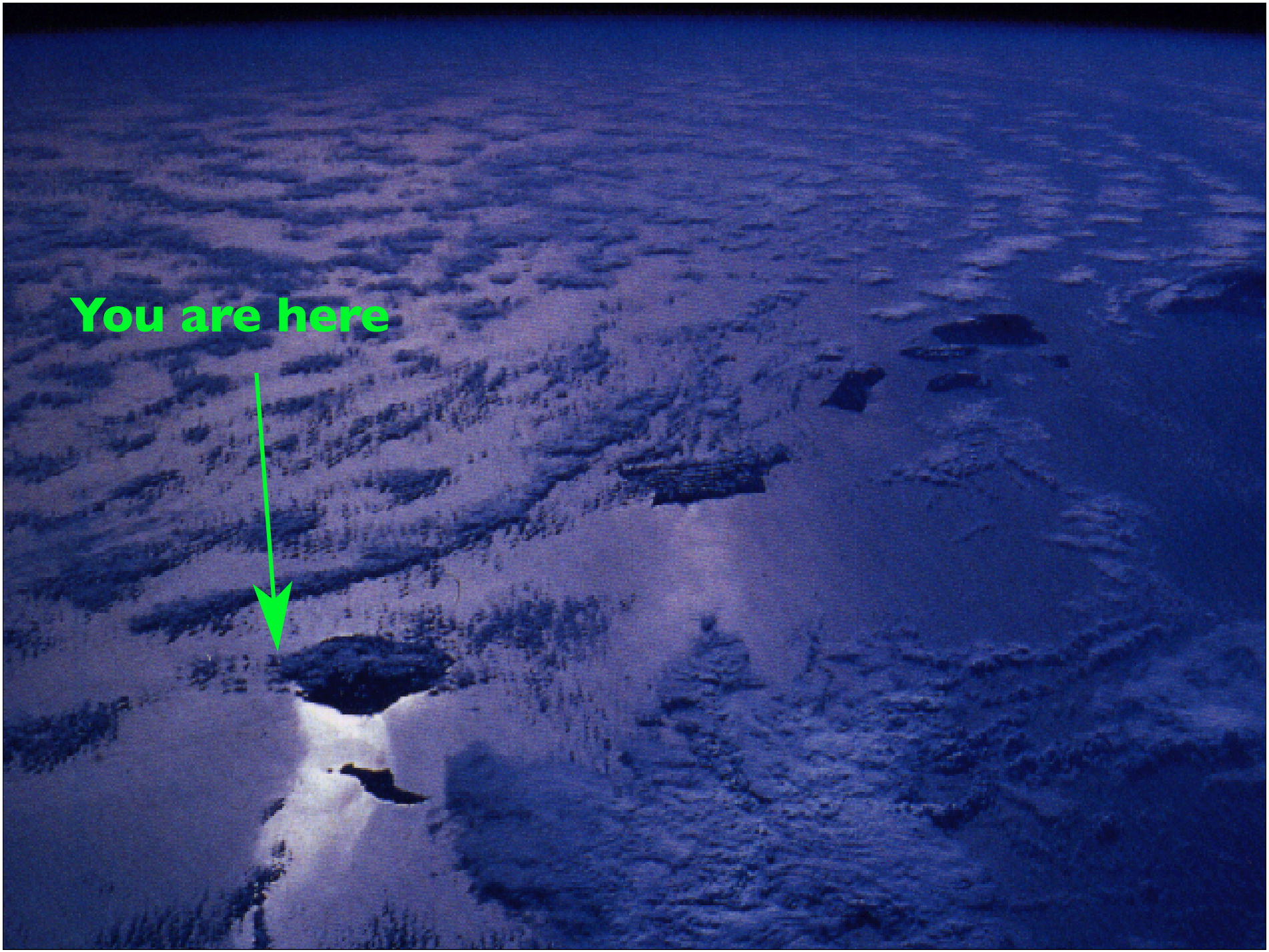
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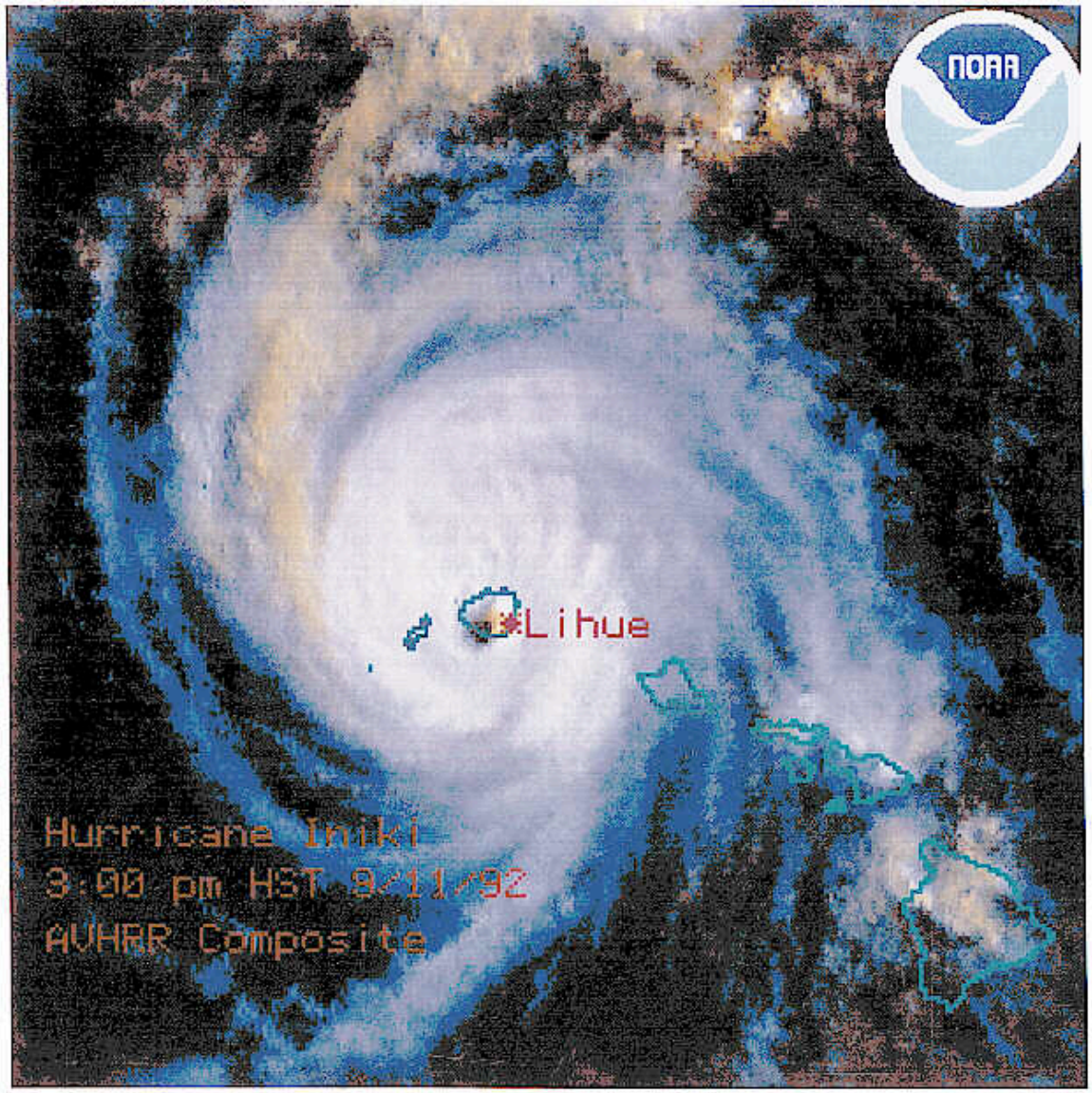
Welcome back!

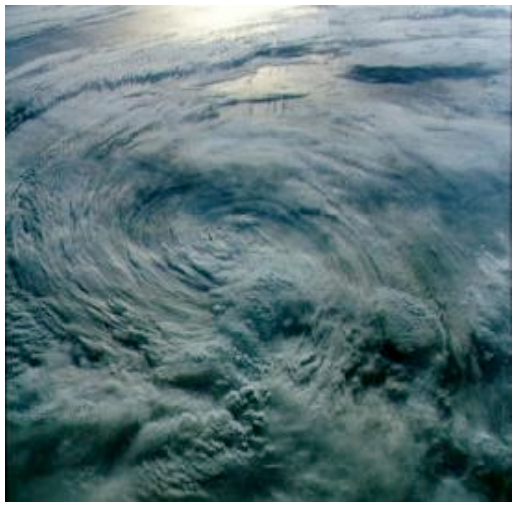

Workshop on
The Future of
Cloud Parameterization

September 11, 1992



Iniki Devastates Kauai

- Originated over Africa
- Category 4 when it hit Kauai: Sustained winds of 145 mph
- 6 deaths
- 1400 houses destroyed on Kauai
- Princeville Hotel took 13 months to re-open
- Greatest destruction on south side of Kauai
- ~2 B$ total storm damage



Colorado State University

Knowledge to Go Places

http://cmmap.colostate.edu/
(will become http://www.cmmap.org/)

UCLA

SCRIPPS INSTITUTION OF OCEANOGRAPHY

Hampton U "Our Home by the Sea"

Geophysical Fluid Dynamics Laboratory 1955 - 2005

CATAMOUNT INSTITUTE

NCAR

NCEP

the City College of New York

Australian Government Bureau of Meteorology

CCSR UNIV. TOKYO

UCSD

UCAR

Office of Science U.S. Department of Energy

GSFC

NASA

UNIVERSITY OF MARYLAND

THE UNIVERSITY OF UTAH

Pacific Northwest National Laboratory Operated by Battelle for the U.S. Department of Energy

UNIVERSITY OF WASHINGTON

IBM

AVML

THOMPSON SCHOOL DISTRICT

Poudre School District

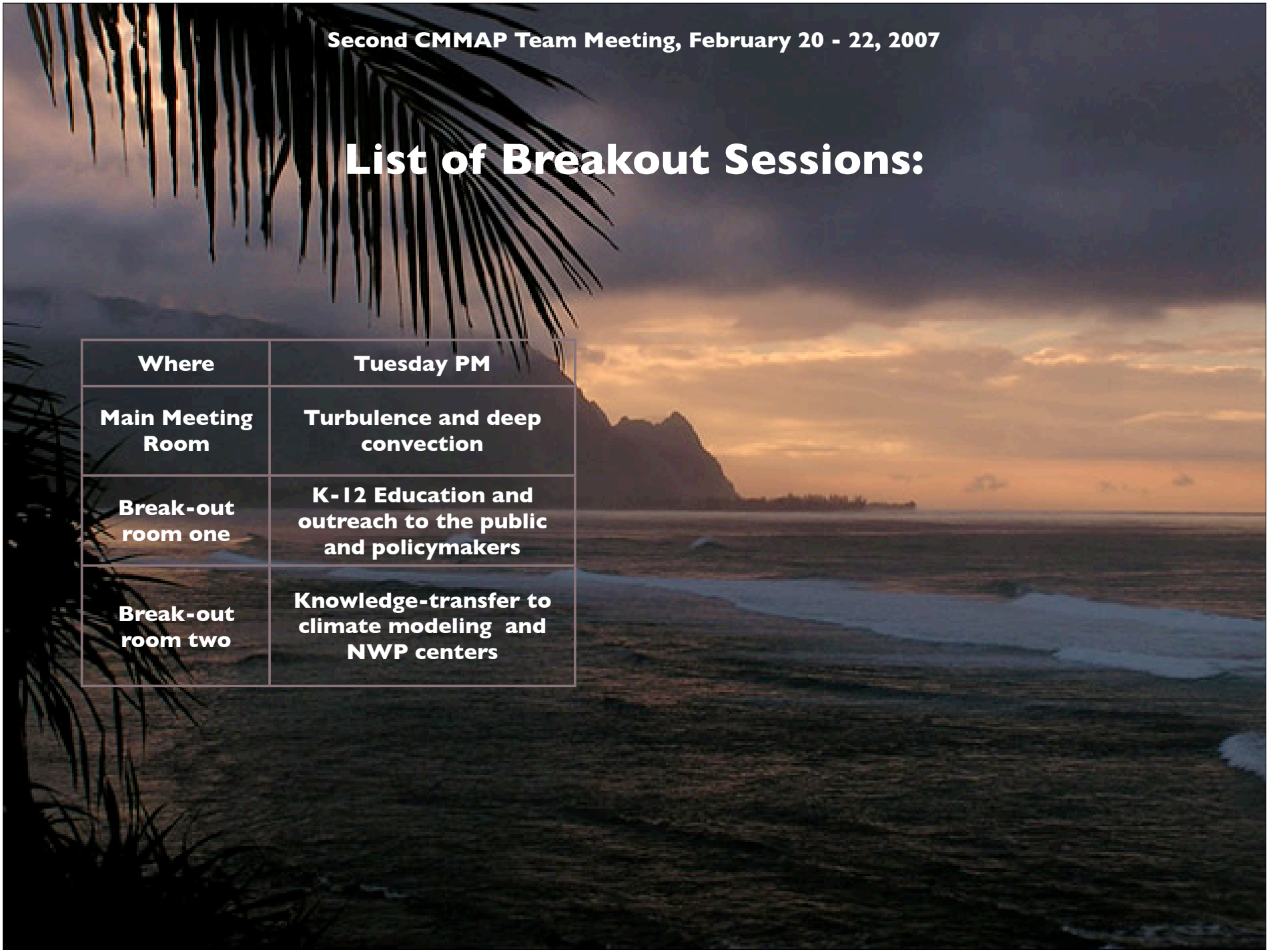

Introductions

Jay Fein


Cindy Carrick

Second CMMAP Team Meeting, February 20 - 22, 2007

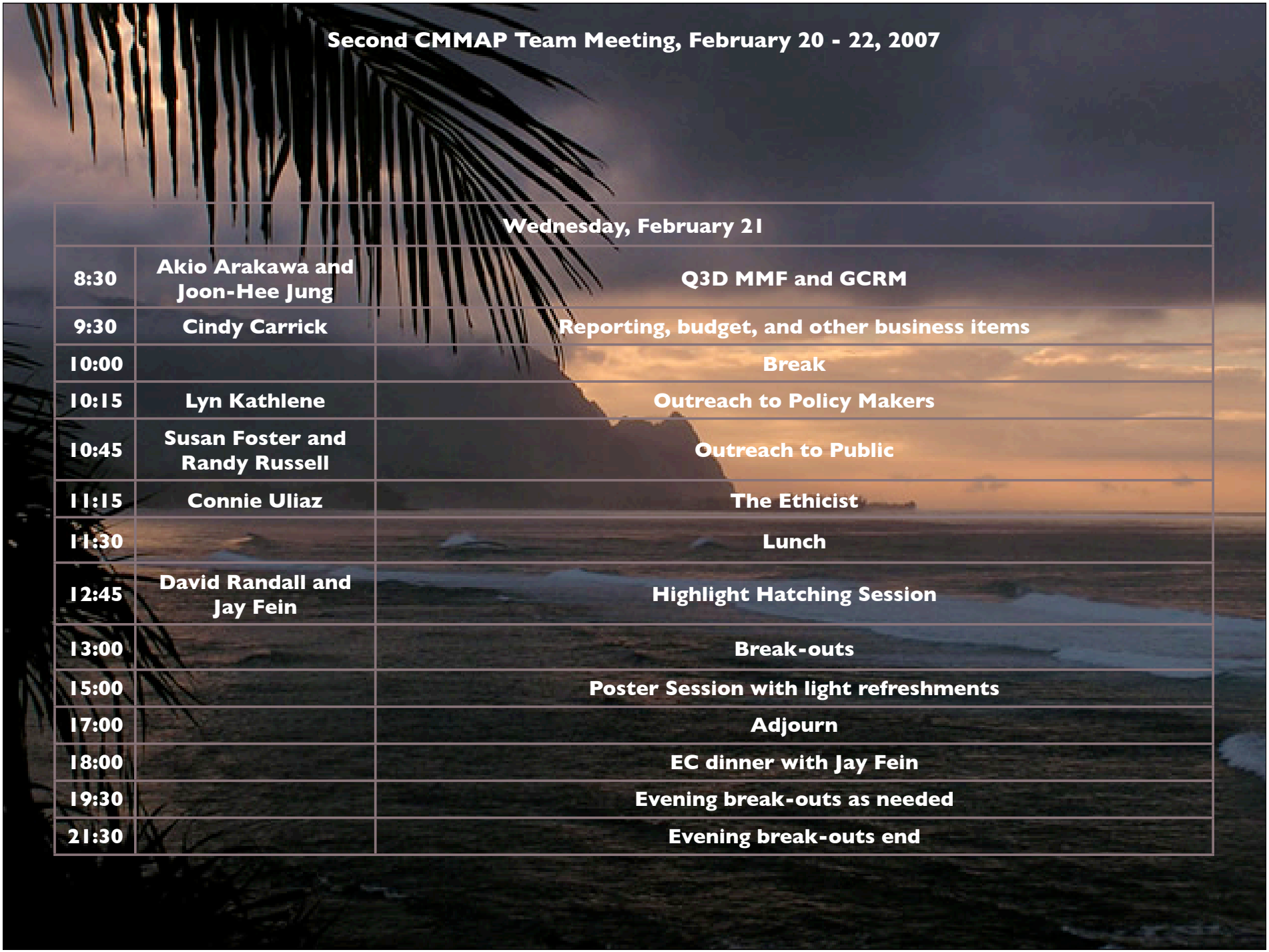
Tuesday, February 20, 2007		
8:30	David Randall Jay Fein Cindy Carrick	Opening remarks/Agenda/Logistics
8:45	David Randall	State of the Center
9:15	David Randall	Overview of Research progress
9:35	Scott Denning	Overview of Education and Diversity progress
9:55	Wayne Schubert	Overview of Knowledge Transfer progress
10:15		Break
10:30	Chin-Hoh Moeng Steve Krueger	Focus on deep and shallow convection, and turbulence
10:50	Bjorn Stevens Chris Bretherton	Focus on low-cloud feedbacks
11:10	Dave Swartz Christine Aguilar	Progress in K-12 Education
11:30		Lunch
12:45	Duane Waliser	From Cloud Ice to the MJO: Studies and Plans for Addressing Tropical Convection Challenges
13:45	WG Chairs	Summary of research progress by August 2006 WGs (10 mins each)
14:45		Break
15:00		Break-outs
17:00		Adjourn for the day
18:00		Reception
20:00		Reception ends



Second CMMAP Team Meeting, February 20 - 22, 2007

List of Breakout Sessions:

Where	Tuesday PM
Main Meeting Room	Turbulence and deep convection
Break-out room one	K-12 Education and outreach to the public and policymakers
Break-out room two	Knowledge-transfer to climate modeling and NWP centers



Second CMMAP Team Meeting, February 20 - 22, 2007

Wednesday, February 21		
8:30	Akio Arakawa and Joon-Hee Jung	Q3D MMF and GCRM
9:30	Cindy Carrick	Reporting, budget, and other business items
10:00		Break
10:15	Lyn Kathlene	Outreach to Policy Makers
10:45	Susan Foster and Randy Russell	Outreach to Public
11:15	Connie Uliaz	The Ethicist
11:30		Lunch
12:45	David Randall and Jay Fein	Highlight Hatching Session
13:00		Break-outs
15:00		Poster Session with light refreshments
17:00		Adjourn
18:00		EC dinner with Jay Fein
19:30		Evening break-outs as needed
21:30		Evening break-outs end

List of Breakout Sessions:

Where	Tuesday PM	Wednesday PM
Main Meeting Room	Turbulence and deep convection	Future tools
Break-out room one	K-12 Education and outreach to the public and policymakers	Low-cloud feedbacks
Break-out room two	Knowledge-transfer to climate modeling and NWP centers	Undergraduate and graduate education, and teaching future teachers

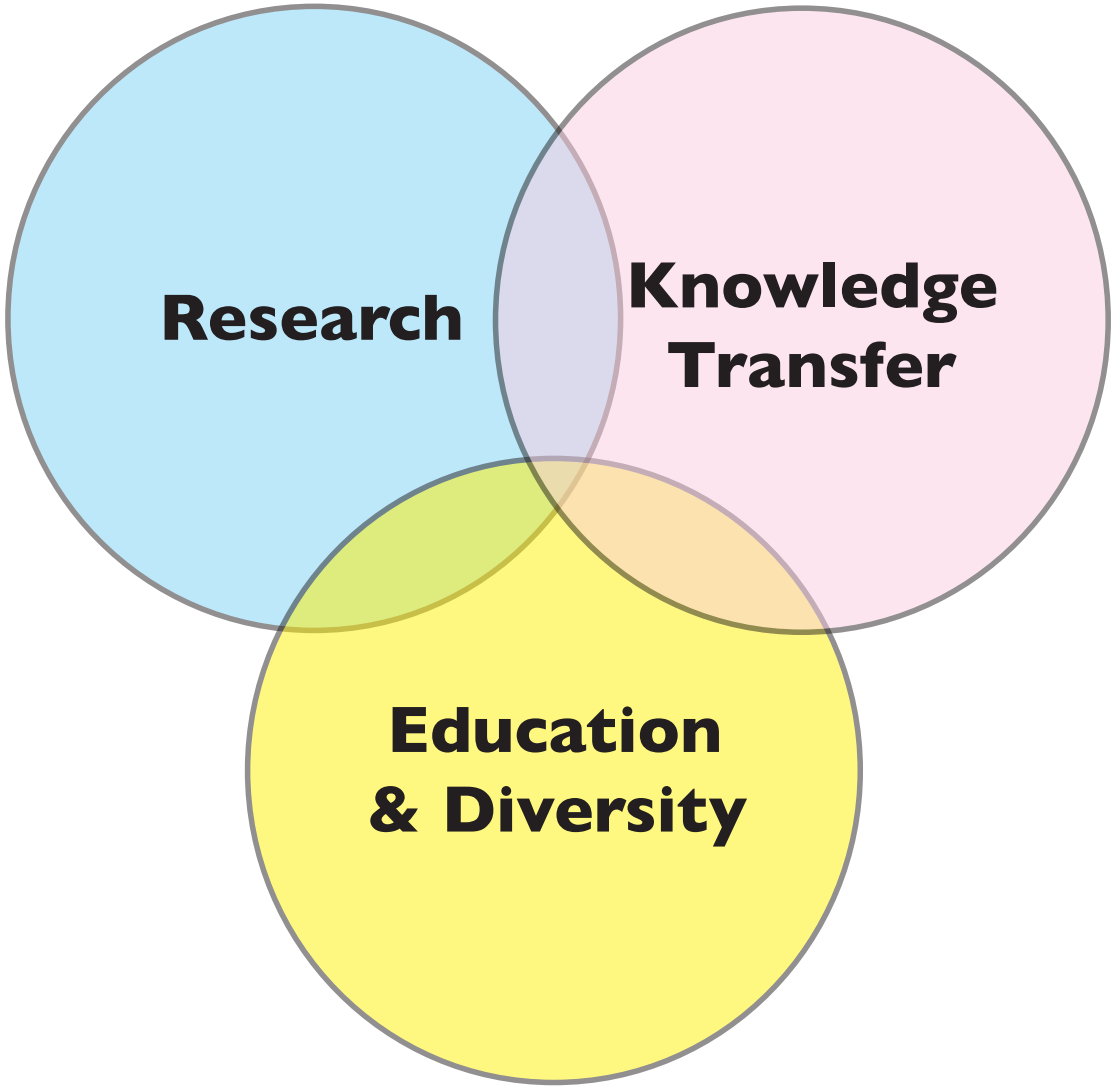
Second CMMAP Team Meeting, February 20 - 22, 2007

Thursday, February 22, 2007		
8:30	Marat Khairoutdinov Mitch Moncrieff	Focus on the MJO
9:00	Christine Aguilar and Jan Lanting	It's up in the Air: Little Shop of Physics
9:30		Break-outs
10:30		Break
10:45		Break-outs
11:45		Lunch
13:00	Theme Leaders	Reports from Break-outs (10 mins each)
14:30	David Randall	Wrap-up
15:00		End of meeting

Second CMMAP Team Meeting, February 20 - 22, 2007

List of Breakout Sessions:

Where	Tuesday PM	Wednesday PM	Thursday AM
Main Meeting Room	Turbulence and deep convection	Future tools	MJO
Break-out room one	K-12 Education and outreach to the public and policymakers	Low-cloud feedbacks	Journal and book
Break-out room two	Knowledge-transfer to climate modeling and NWP centers	Undergraduate and graduate education, and teaching future teachers	Increasing the diversity of climate scientists


Research
Knowledge Transfer
Education & Diversity

State of the Center

This whole meeting is about the State of the Center.

I will just mention a few things now:

- New "Research Themes"
- Administrative progress and plans

Research Objectives from the Strategic Plan

(8 out of 24 total)

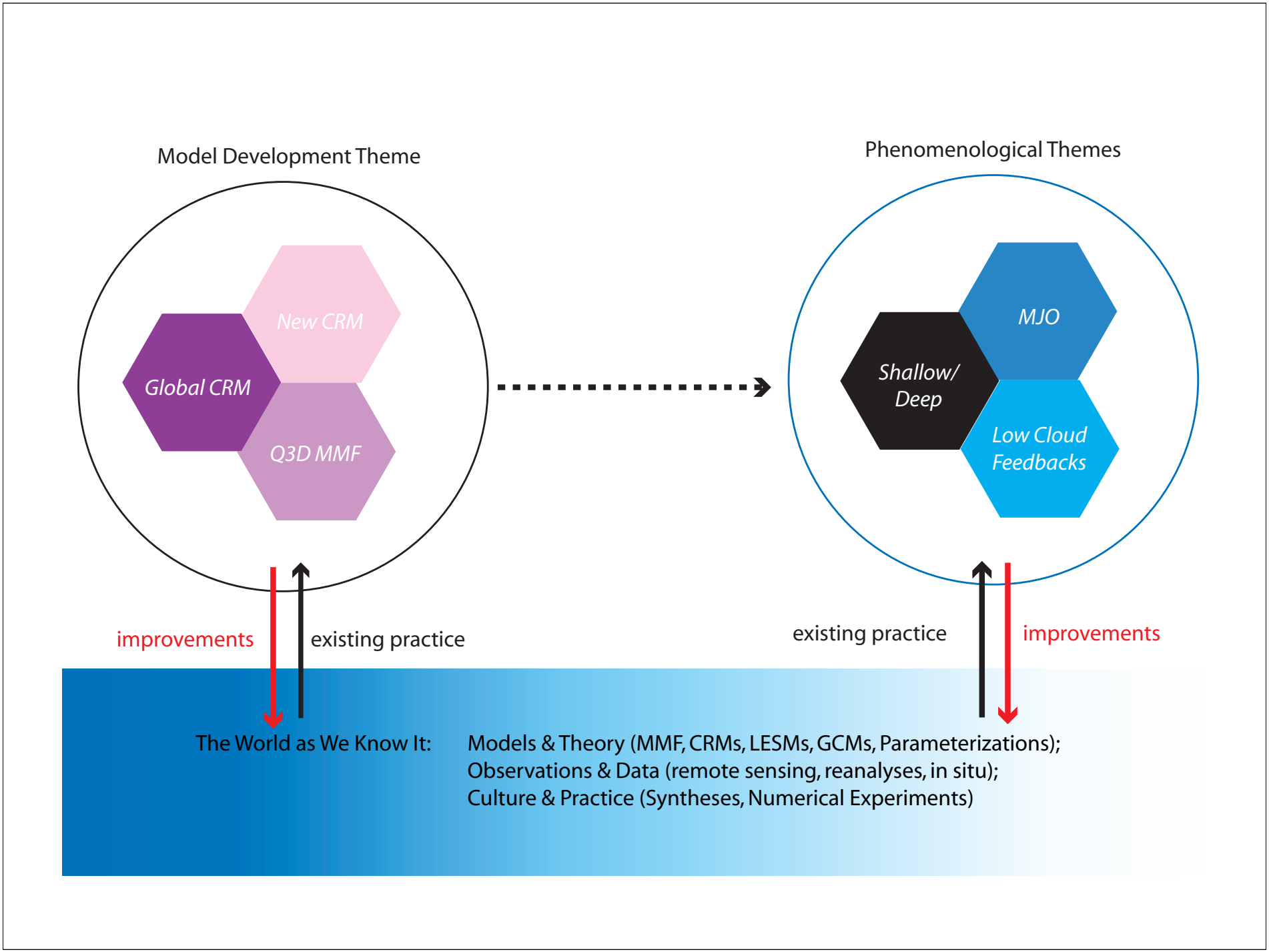
Objective	Team Leader
1. Extensions, evaluations and applications of the prototype MMF	Khairoutdinov
2. Development of a second-generation MMF	Arakawa/Randall
3. Develop and test improved microphysics parameterizations for MMFs and GCRMs	Krueger/Kreidenweis
4. Develop improved parameterizations of boundary-layer clouds and turbulence for use in MMFs and GCRMs	Bretherton/Moeng
5. Test sensitivity of CSRMs to more detailed radiation calculations	Barker
6. Innovative analysis, evaluation and interpretation of MMF results using emerging datasets	Rossow
7. Accelerating improvement of conventional parameterizations	Stevens
8. Optimal use of computational and data storage resources	Helly

List of Working Groups from August 06 meeting:

#	Objective(s)	Leader(s)	When
1	Extensions, evaluations, and applications of the prototype MMF(s)	Khairoutdinov	Tuesday PM
2	Development of a second-generation MMF, and a global cloud-resolving model	Randall and Arakawa	Wednesday AM
3	Development and testing of improved parameterizations of microphysics and radiation for use in CSRMS, MMFs, and GCRMs	Krueger, Kreidenweis, and Barker	Wednesday AM
4	Development and testing of improved parameterizations of boundary-layer clouds and turbulence for use in CSRMS, MMFs, and GCRMs -- *Will meet together with WG 6*	Bretherton and Moeng	Thursday AM
5	Innovative analysis, evaluation, and interpretation of MMF results using emerging datasets	Rossow	Wednesday AM
6	Accelerated improvement of conventional parameterizations -- *Will meet together with WG 4*	Stevens	Thursday AM
7	Optimal use of computational and data storage resources	Helly	Thursday AM
8	K-12 Education and outreach to the public and policymakers	Jones, Denning, Foster, and Kathlene	Tuesday PM
9	Undergraduate and graduate education, and teaching future teachers	Denning and Drossman	Wednesday AM
10	Increasing the diversity of climate scientists	Pandya, El Hakim, Denning, Canetto	Thursday AM
11	Knowledge-transfer to climate modeling centers	Collins	Thursday AM
12	Knowledge transfer to numerical weather prediction centers	Jakob	Tuesday PM
13	New open-access journal	Schubert	Tuesday PM
14	Book on the history of global modeling	Donner	Wednesday AM

Feedback from August 06 meeting

- Too many Working Groups
- Need more Working Group time
- Need some focus towards applications of models


Model Development Theme
New CRM
Global CRM
Q3D MMF
Phenomenological Themes
MJO
Shallow/
Deep
Low Cloud
Feedbacks
improvements
existing practice
existing practice
improvements
The World as We Know It:
Models & Theory (MMF, CRMs, LESMs, GCMs, Parameterizations);
Observations & Data (remote sensing, reanalyses, in situ);
Culture & Practice (Syntheses, Numerical Experiments)

Research Themes

- Future tools, aka Q3D
- MJO
- Deep and shallow convection, and turbulence, aka "Deep and shallow"
- Low-cloud feedbacks

Each theme will benefit from model development, and will need large computing resources.

Each theme will involve individual efforts, and also coordinated multi-investigator analyses of large calculations.

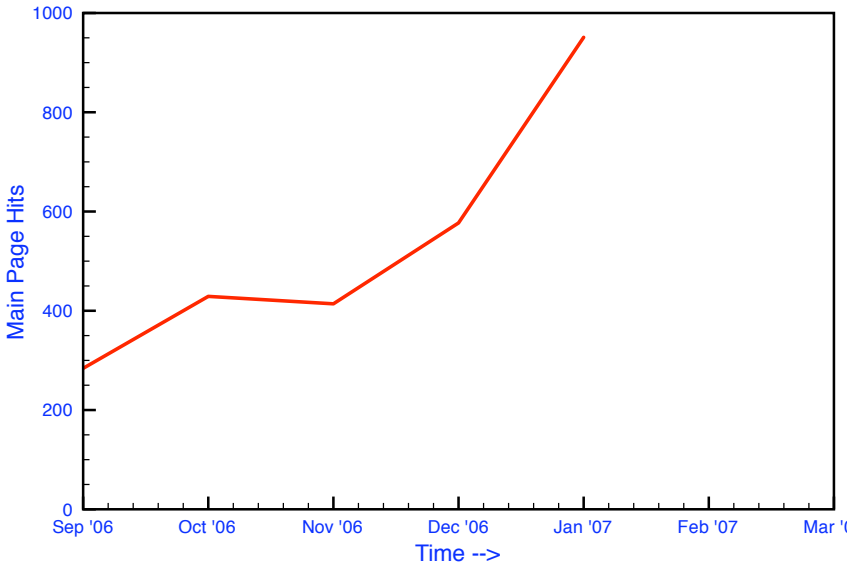
Research Objectives from the Strategic Plan

(8 out of 24 total)

Objective	Team Leader	Relevant Research Theme(s)
1. Extensions, evaluations and applications of the prototype MMF	Khairoutdinov	All
2. Development of a second-generation MMF	Arakawa/Randall	Future Tools
3. Develop and test improved microphysics parameterizations for MMFs and GCRMs	Krueger/Kreidenweis	All
4. Develop improved parameterizations of boundary-layer clouds and turbulence for use in MMFs and GCRMs	Bretherton/Moeng	All
5. Test sensitivity of CSRMs to more detailed radiation calculations	Barker	All
6. Innovative analysis, evaluation and interpretation of MMF results using emerging datasets	Rossow	All
7. Accelerating improvement of conventional parameterizations	Stevens	MJO Low-cloud feedback Conv and Turb
8. Optimal use of computational and data storage resources	Helly	All

Administrative developments since August 06

- All sub-awards are in place.
- Christine Aguilar has been hired as Science Education Manager.
- Roger Ames has been hired as Knowledge Transfer Manager (starting on March 1).
- Mostafa El Kady has been hired as IT specialist.
- Reporting database has been created by Cindy and Mostafa.
- Web page is getting better.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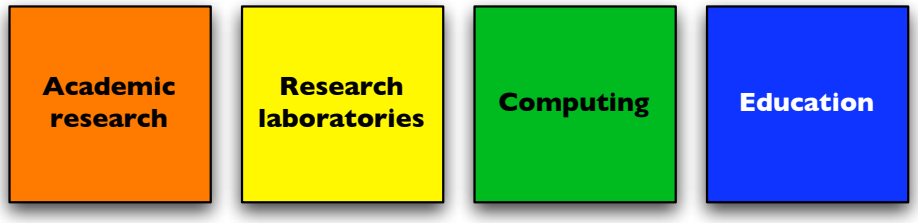
Main Page Hits
Sep '06
Oct '06
Nov '06
Dec '06
Jan '07
Feb '07
Time -->

Design of CMMAP Building Under Way

What's coming up

- Reporting, reporting, reporting
- Site Review, May 31 - June 1 (with a rehearsal on May 30)
- Full Team Meeting, Fort Collins, August 7-9
- External Advisory Panel meeting, September 24-25
- Additional smaller meetings, TBD
- Hiring of CMMAP Financial Analyst and Coordinator
- Ground-breaking for building, Fall 2007

External Advisory Panel



Prof. Kerry Emanuel of the Massachusetts Institute of Technology has agreed to be the first Chair of the EAP.

Other members:

Alan Betts
Sandrine Bony
John Drake
Walter Oechel
Olivier Pauluis

Research Overview

Quasi-3D MMF

- Tests of Q3D in regional model, with full 3D for comparison
- Parallelization of VVCM
  - Enables large-domain tests
  - Tropical cyclones?
- GCRM funded under SciDAC
  - 5-year cooperative agreement
  - Hexagonal VVCM under construction now
- New pseudo-anelastic system

Conventional MMF(s)

- A goal with the SuperCAM is to make a coupled simulation
- We are "looking inside" the model more
- CSU Geodesic MMF
  - Debugging complete
  - SiB integrated into SAM
- Goddard MMF development continues
  - Tropical cyclone applications eyed
  - Current focus on improved scalability

Improved parameterizations of turbulence and shallow convection

- HOC at Langley/AS&M, tested in SAM
- Mini-LES at CSU
- ADHOC at CSU
- Planned large-domain LES of trade cumuli
- Planned large-domain LES of deep convection

Improved parameterizations of cloud microphysics and aerosols

- **Development of Morrison and Heymsfield microphysics schemes**
- **Implementation of Morrison microphysics in SAM**
- **Probably more, that I am not aware of yet (but I need to know about these things)**

Improved parameterizations of radiative transfer

- **Stochastic cloud-radiation scheme (Scripps)**
- **RRTMG into SAM (NCAR/U CO)**

The GCM as Scientific Water Hole

A Disconnect at the Water Hole

- **What cloud-observers measure, GCMs don't simulate.**
- **What cloud-resolving models simulate, GCMs don't simulate.**

Addressing the disconnect

- **Tests with SCMs, CRMs, and LESMs, through case studies based on field experiments**
- **A harmonic convergence of GCMs and CRMs**

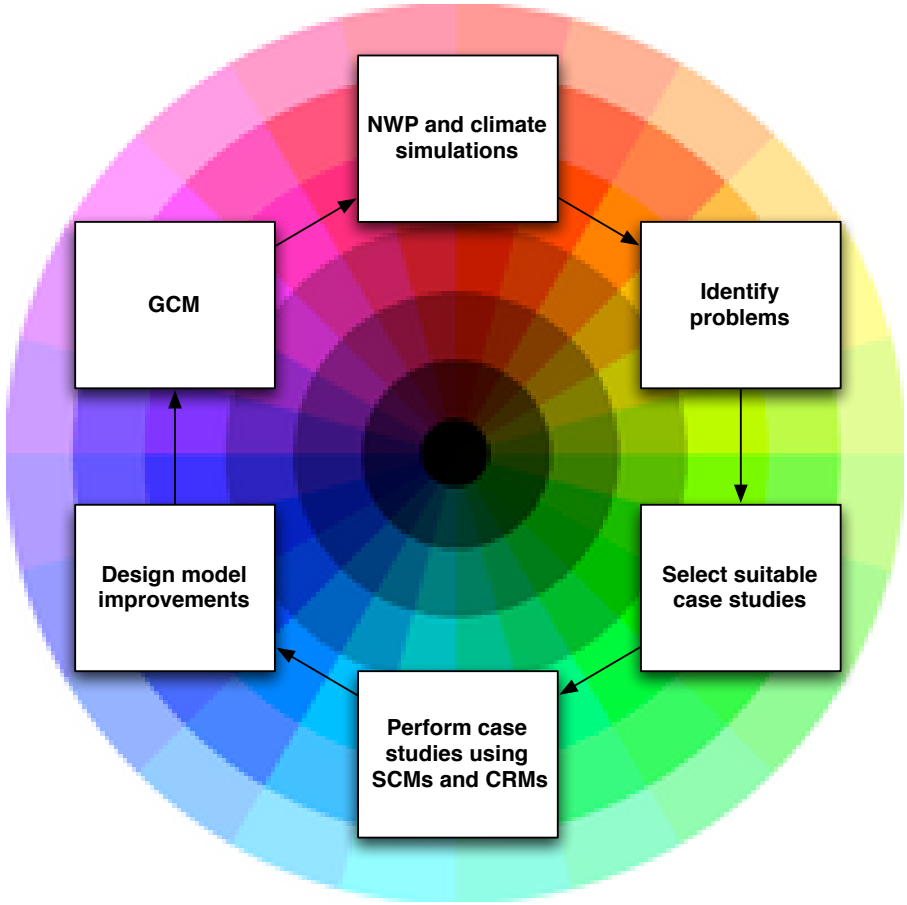


Diagram from Christian Jakob


Questions?

Research Working Group Updates

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7	Optimal use of computational and data storage resources	Helly	Thursday AM

From Bill Rossow

1. We have now pretty thoroughly tested the "regime identification" procedure for the tropics that is applied to the output of the ISCCP emulator, so if the model have this diagnostic output, then the clustering analysis (code online at ISCCP) can be applied as well. We are still doing analyses of the observations but it is already clear that these regimes switch in very clear ways over diurnal, MJO, seasonal, (maybe QBO), ENSO cycles so all of this can be tested. The observational results from ISCCP are online, too.

2. We're still working on the analysis but it is very clear that this approach works well for midlatitude cyclones, particularly at identifying the cold-front convection. We have analysis results but they are not online... maybe in the next few months.

3. We plan to apply the method to the whole globe, rather than regionally, to see what we get and whether it can be interpreted meaningfully.

In summary, the ISCCP Emulator and Cluster Analysis codes are available and observational results are available for the tropics, so model experiments can now be compared using these tools (there are a couple of other GCM groups doing this, at least UKMO and GISS, with a paper or two having been submitted).