

# **PSMI Panel Breakout**

2012 US CLIVAR Summit,  
Newport Beach, CA

- Introductions
- Orientation
- Breakout Aims

# PSMI Panel Membership, February 2012

<u>PSMI Panel</u>	<u>Institution</u>	<u>Through</u>
J. Thomas Farrar	Woods Hole Ocean. Inst.	Dec 2014
Baylor Fox-Kemper, co-chair	University of Colorado	Dec 2013
Michael Gregg	University of Washington	Dec 2013
Meibing Jin	University of Alaska, Fairbanks	Dec 2013
Markus Jochum	NCAR	Dec 2013
Igor Kamenkovich	RSMAS - University of Miami	Dec 2013
David Lawrence	NCAR	Dec 2012
Gad Levy	NorthWest Research Associates	Dec 2014
Joel Norris	UCSD (Scripps)	Dec 2012
Joellen Russell	University of Arizona	Dec 2012
Rob Wood, co-chair	University of Washington	Dec 2012
Sukyoung Lee	Pennsylvania State University	Dec 2013

# Orientation

The Process Study and Model Improvement (PSMI)

Panel's mission is to **reduce uncertainties in the general circulation models** used for climate variability prediction and climate change projections through an **improved understanding and representation of the physical processes** governing climate and its variation

# PSMI reviews two types of program

- **Climate Process and Modeling Teams (CPTs)**
  - The key aim to speed development of global coupled climate models and reduce uncertainties in climate models by bringing together theoreticians, field observationalists, process modelers and the large modeling centers to concentrate on the scientific problems facing climate models today.
- **Process studies**
  - Field and observational synthesis projects aimed at improving our fundamental understanding of climate-critical processes

# Pilot CPT projects (2003-2006/8)

- Low-Latitude Cloud Feedbacks on Climate Sensitivity
- Ocean Eddy Mixed Layer Interactions
- Ocean Gravity Current Entrainment

# Current CPT projects

- Internal wave ocean mixing
- Stratocumulus to cumulus transition
- Arctic Ocean mixing CPT
- Cloud parameterization and aerosol indirect effects

# Current PSMI Process Studies

- **KESS, Kuroshio Extension System Study**
  - to identify and quantify the dynamic and thermodynamic processes governing the variability of and the interaction between the Kuroshio Extension and the recirculation gyres
- **CLIMODE, Clivar Mode Water Dynamic Experiment**
  - to study the dynamics of 'Eighteen Degree Water' (EDW), the subtropical mode water of the North Atlantic
- **DYNAMO, Dynamics of the Madden-Julian Oscillation**
  - to expedite our understanding of processes key to MJO initiation over the Indian Ocean and our efforts to improve simulation and prediction of the MJO.
- **VOCALS, VAMOS Ocean-Cloud-Atmosphere-Land Study**
  - to develop and promote scientific activities leading to improved understanding of the SEP coupled ocean-atmosphere-land system on diurnal to inter-annual timescales
- **DIMES, Diapycnal and Isopycnal Mixing Experiment in the Southern ocean**
  - to measure diapycnal and isopycnal mixing in the Southern Ocean, along the tilting isopycnals of the Antarctic Circumpolar Current.
- **IASCLiP, Intra-American Studies of Climate Processes**
  - to estimate and exploit potential predictability of warm-season weather and climate in the IAS region, mainly on intraseasonal to interannual time scales, based on improved understanding and modeling of relevant physical and dynamical processes
- **SPURS, Salinity Processes in the Upper Ocean Regional Study**
  - to understand processes controlling upper ocean salinity in the salinity maximum region of the North Atlantic

# Breakout agenda

**1315 – 1345:** Internal wave ocean mixing CPT (Jen MacKinnon)

**1345 – 1415:** Sc to Cu transition CPT (Roberto Mechoso)

**1415 – 1445:** Arctic Ocean mixing CPT (Meibing Jin)

***1445 -- 1500: Break***

**1500 – 1530:** Cloud param. & aerosol indirect effects CPT (Rob Wood)

**1530 – 1600: General discussion on CPTs. Successes, pitfalls, lessons**

**1600 – 1620:** Trace gas measurements (Christian Frankenberg)

**1620 -- 1640:** KESS (Meghan Cronin via telephone)

**1640 – 1700:** CLIMODE (Leif Thomas)

**1700 – 1720:** DYNAMO (Chidong Zhang)

# Breakout agenda

Thursday, July 19, 2012 (0800-0955)

**0800 – 0820:** KESS (Meghan Cronin)

**0820 – 0835:** VOCALS (Rob Wood)

**0835 – 0850:** DIMES (Baylor Fox-Kemper)

**0850 – 0910:** IASCLIP (Art Douglas)

**0910 – 0925:** SPURS (Tom Farrar)

**0925 – 0935:** Go-Amazon update (Courtney Schumacher)

**0935 – 0955:** Discussion



# CPT practices and motivating questions

## – the big picture

- Scientists and agencies saw a problem with the rate at which new process understanding was being translated into improvements in climate model physics
- Need to break down walls between process and climate modeling communities
- CPTs instigated to attempt to break down walls and instigate collaborations and a new way of making progress

# Pilot CPT projects (2003-2006/8)

- Low-Latitude Cloud Feedbacks on Climate Sensitivity
- Ocean Eddy Mixed Layer Interactions
- Ocean Gravity Current Entrainment

# Current CPT projects

- Internal wave ocean mixing
- Stratocumulus to cumulus transition
- Arctic Ocean mixing CPT
- Cloud parameterization and aerosol indirect effects

# Best practices for model parameterization development

- Are there universal procedures/approaches that can be applied to succeed in more effective translation of new process understanding into models?
- Are there fundamental procedural differences between adding a new process into a model (e.g. aerosols) vs improving existing physics (e.g. clouds or ocean mixing)?
- What are the metrics for success? Which CPTs were successful?

# Best practices for process studies

- Megan F. Cronin, Sonya Legg, Paquita Zuidema, 2009: CLIMATE RESEARCH: Best Practices For Process Studies. *Bull. Amer. Meteor. Soc.*, **90**, 917–918.
- Modelers and observationalists should be integrated in the study from the planning stage onward.
- Integrated and synthesized datasets should be generated from the process study observations to provide model-comparable data that can be used as benchmarks for assessing and validating models. Furthermore, diagnostics shown in much-cited published figures should be provided in digital format as “synthesis products.”
- Broad use of the data should be encouraged through
  - open data policies;
  - centralized access to all components of the experiment; and
  - data archiving in a user-friendly format, and with sampling information (“metadata”) that is necessary for understanding the measurement

# PSMI Discussion

# PSMI Panel

## Action Items from 2011 Summit

- **A Southern Ocean US CLIVAR working group will be proposed in the Fall**
  - Two groups were proposed with relevance to the Southern Ocean, and both were supported:
    - Heat and Carbon Uptake by the Southern Ocean (Joellen Russell);
    - Oceanic carbon uptake in the CMIP5 models (Annalisa Bracco)
- **Discussion on the CPTs and on ‘Best Practices for Parameterization’.**
  - A WCRP/WWRP workshop on the Physics of Weather and Climate Models was held in Pasadena and the issue of best practices was to be discussed with a view towards producing a report with recommendations that will be submitted for publication in BAMS.
  - Joao Teixeira and co-organizers are currently writing the workshop report.
- **Panel will get in touch with DIMES PIs to clarify situation regarding archiving of microstructure observations.**
  - DIMES PIs contacted, archiving improved