

Process Study Model Improvement (PSMI) Breakout Summary

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

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

CPTs

- **Current Round of CPT projects**
 - Initiated in 2010
 - All involve physics development in US climate models
 - All involve engagement from US modeling centers
- **Projects:**
 - **Internal wave ocean mixing**
 - Major subgrid sink for ocean flow kinetic energy
 - Synthesizing previously uncollated microstructure observations to constrain mixing
 - **Stratocumulus to cumulus transition**
 - Sc-Cu transition has a big impact on albedo and tropical circulation
 - Engaging NCEP (and NCAR) in model physics development, using common metrics
 - **Arctic Ocean mixing CPT**
 - Representing subgrid ocean mixing by brine rejection in sea-ice leads
 - Improving ocean mixed layer depth estimates
 - **Cloud parameterization and aerosol indirect effects**
 - Replacing turbulence, shallow convection and large scale cloud scheme in CAM and AM3 with unified scheme
 - Engaging observations from VOCALS and satellites

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
 - *High resolution array to Spurred new observations (KEO) and field activities in Kuroshio region (HOTSPOT, MOVE)*
- **CLIMODE, Clivar Mode Water Dynamic Experiment**
 - to study the dynamics of 'Eighteen Degree Water' (EDW), the subtropical mode water of the North Atlantic
 - *New energy pathway for the circulation that is active at ocean fronts under wintertime forcing*
- **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.
 - *Highly successful field phase (3 MJO events captured), already challenging hypotheses*
- **VOCALS, VAMOS Ocean-Cloud-Atmosphere-Land Study**
 - to develop and promote science leading to improved understanding of the SEP coupled ocean-atmosphere-land system on diurnal to interannual timescales
 - *Cruises and mooring constrained upper ocean heat budget; REx leading to new understanding of importance of aerosols and precipitation in boundary layer clouds*

Current PSMI Process Studies

- **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.
 - *Joint UK/US program extending over 5 years. Tracer release (dye) to evaluate relative contributions from cross-density vs along-density mixing processes. Topography plays a HUGE role.*
- **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
 - *CLIVAR-VAMOS program. Need to improve dilapidated monitoring. New projects funded by NOAA, NSF and World Bank (GPS).*
- **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
 - *Is the water cycle accelerating at a greater rate than models predict? Multi-agency funding, multi-national. Takes place 2012-2013.*

PSMI Panel

Action Items from 2012 Summit

- Panel to assess metrics for CPT success
 - What are the appropriate criteria for CPT success?
 - Improved communication between process scientists (obs. and process modelers) and climate model developers
 - Engagement of major modeling centers *ab initio*
 - Projects should include some low-hanging fruit activities
 - Projects should include some high-risk/high-gain activities
- Panel to discuss the extent to whether best practices for process studies have been followed by the process studies
- Panel to discuss possible strategies for maintaining data/publications archive for process studies