USCLIVAR POS Breakout

10 JUL 2013

Session 1: Observations, Science and Society

- Framework on Ocean Observing
  - While golden age of observations should continue through 2020, Requirements are plateaued at 62% of planned capacity for ECVs
  - Intended to address plateau, economy pushes back
  - Note: Variable based approach (e.g., ECVs) provides some permanency in that core variables will be as important tomorrow as today
- Modes of Climate Variability
  - What obs are needed to better understand PDO ?
  - Flux anomalies are most critical to assess the imprint of AMOC on the atmosphere

Large scale influence on extremes working group

- Connecting heat/cold wave occurrence in climate change
  - Need to consider non-stationarity in climate extremes
- While USCLIVAR focus is understanding and data, foster connections with users (explore societal needs with PPAI)
- Complexities will require a sustained effort to make significant progress; however, enhanced coordination among existing national and international efforts that have overlapping interests could likely speed things up a great deal.
- Revisit Extremes issues following the upcoming working group workshop (September 2013)

Session 2: Surface Flux / Reanalysis Joint with PPAI

- Surface Fluxes - many (15-20) observationally based data products with substantial variance
  - Calls for algorithm and measurement improvements
  - Suggested a field experiment to close budget, including fluxes, transports though, uncertainty needs come first
  - Need: Improve data collection for evaluation (should consider Obs4MIPS, discussed below)
- Ocean Reanalyses workshop
  - Many available (time to consolidate?)
  - Ensemble shows good agreement
  - Progress in representing AMOC but significant scatter still present
  - Should RAPID be assimilated? (perhaps certain tests)

Surface Flux / Reanalysis Joint with PPAI (cont.)

- Links with Land Processes (and GEWEX)
  - Land feedback and processes provide a vital connection between climate and society
  - Drought feedback a prime example, but cold season snow cover is not insignificant
  - WCRP Grand Challenges provide opportunity to include some interdisciplinary topics that are related to USCLIVAR goals (collab. w. GEWEX DAP)
- Initial Conditions for Seasonal Predictions
  - Coupled analyses going on at several centers
  - SST assimilation yields Forecast improvements
  - Many questions remain on the sensitivity of forecasts to the observing system, uncertainties and model biases

Surface Flux / Reanalysis Joint with PPAI (cont.)

- What's next for Reanalysis in USCLIVAR?
  - USCLIVAR has played a role in directing reanalysis management and centers toward development of Integrated Earth System Analyses
  - What then are the critical metrics of success for USCLIVAR goals (incl WG, CPT and ST)
  - obs4MIPS/ana4MIPS could provide a platform for comparison, evaluation and assessment
  - Assimilated observations and their forecast departures are a largely untapped source of model error
  - Some semantic ambiguity in the ToR may need revisions or just clear definitions

Role of satellite data in climate observing system

Polar Climate

Need long consistent records of sea ice and snow thickness; better coverage of vertical atmospheric and oceanic profiles; improved description of polar climate through high-resolution, data-assimilating models with closed energy and water budgets; observationally-based, physical-process-oriented matrix for evaluating climate models.

Sea level

Use sea level information to decipher uncertainties in surface forcing fields by comparing resulting sea level changes against observations and thereby learn more about accuracy of forcing, a strategy that is being pursued in ocean syntheses efforts. Regional trends in sea level related to changes in wind forcing, emphasizes need for long consistent wind observations.

Satellite observations, subsurface sensing, and continuity

Ocean remote sensing challenges for CLIVAR research include measurement continuity, intercalibration of satellite retrievals, e.g., vector winds, and inferences about subsurface, e.g., mixed layer and deep ocean. Maintaining ocean wind observations and utilizing international collaborations for data access are critically important.

Role of satellite data (continued)

Water cycle missions and decadal survey

Design instruments to more directly respond to multiple science and application needs. Use multiple data products to extract consistent Essential Climate Variables, e.g., through data assimilation. In preparation for next decadal survey, connections to the instrument engineers should begin early, and more workshops are expected. Incorporate Level 4 data processing well in advance.

DoE Integrated Water Cycle Workshop

Advance scientific understanding and predictive modeling and uncertainty quantification of the integrated human-earth system, multiscale atmospheric and terrestrial processes, and their links with water resources.

Obs4MIPs

Established satellite observation capability for the climate modeling community to support model-to-data intercomparison. Effort could be expanded to include in-situ observations and ocean/atmosphere (re)analyses mean and spread. In collaboration with ana4MIPS could provide a platform for conducting a reanalysis intercomparison project.

Tropical variability and observations

Measurements needed for understanding ENSO

Differences in amplitude and longitudinal location of ENSO events can result in important differences in impacts. Continuation of TAO/TRITON observations of surface and subsurface temperature, upper-ocean velocities, surface winds, and surface heat fluxes is fundamental for understanding characteristics, dynamics, and origin of different ENSO flavors, assessing predictability, and evaluations and adjustment of climate models.

Upper ocean processes and tropical moored arrays

Degradation since mid-2012 of TAO array is symptomatic of ship time underfunding, which has also impacted other observing system components. Need to maintain existing in-situ ocean observing system for uninterrupted climate time series in all ocean basins. Requires continued assessment of various components of observing system, while recognizing interdependencies, e.g., ship time used to deploy Both TAO and Argo floats.

TAO Observing System Experiments

TAO/TRITON array is cornerstone of ENSO observing system. Observing System Experiments (OSEs) are being used to assess relative role of TAO and Argo data towards constraining upper ocean thermal structure and ocean currents in ocean reanalysis. U.S. CLIVAR and CLIVAR should support national and international

Wrap up discussions

- **Noted Gaps**
  - **TAO/TRITON** issues cannot be overstated; will degrade seasonal predictions.
  - **Sea level** could use more attention in US CLIVAR, agencies are already moving on it. What unique role can US CLIVAR play, e.g., focus on storm surge and extremes? Panel collaborations?
  - **Ocean remote sensing** challenges for CLIVAR science include continuity and intercalibration of satellite retrievals, surface wind and flux observations, high latitude observations, and inferences about subsurface, e.g., mixed layer and deep ocean.
  - **Because of data gaps** need to involve other countries, especially Chinese.

Wrap up discussions (continued)

- **Some recommendations**
  - **Re-emphasize climate and ocean ecosystem connections**, fisheries, and economic aspects.
  - **Understand old synoptic measurements** in light of new observations of ocean variability.
  - **Terms of reference** should be more active. Can/should we narrow them down?
  - **How do you evaluate/assess best practices?** What has been successful?
  - **Interactions with other panels.** PSMI panel can be motivated or help explain (re)analyses innovation/increments/residuals.

Wrap up discussions (continued)

- **Possible future working groups**
  - Storm surges and other sea level extremes.
  - Air sea fluxes, mixed layer, and balancing budgets.
  - Deep ocean response to climate variability.
  - Coupled-ocean-atmosphere (re)analyses development, evaluation, and intercomparison.
  - Ana4MIPs (analyses for model intercomparisons)
  - Coastal observations
  - Ecosystems
- **Discussions on working groups were wholly exploratory and need further, broad input**