

The Climate Prediction Project

**Global Climate Information for
Regional Adaptation and
Decision-Making in the 21st
Century**

The Climate Prediction Project: Requirements

1. Regional and local prediction on decadal and multi-decadal time scales for adaptation and mitigation (UNFCCC process)
2. Global observations to initialize and constrain models
3. Sustained capacity building and trained scientific work force
4. Strong interaction with stakeholders (users, policy makers, planners, ...)
5. Distributed (national) enhanced computing for collaborative research (predictability, attribution, processes) --> enhanced understanding
6. *A World Computing Facility*: High-end computing power for resolution and complexity (strong collaborations among researchers in climate, computer and mathematical sciences)
7. Specialized experiments to advise decision-making in adaptation, mitigation
8. Infrastructure for diagnostics and training
9. Help IPCC process
10. Public-private partnerships with governmental, foundation and corporate funding

- Process-based model evaluation
 - Identification of relevant processes
 - Include more than ocean & atmosphere
 - Identification of data requirements
 - Include uncertainties of data sets
 - High-resolution model experiments for developing and testing parameterizations
 - Infrastructure for model-data comparison
 - Test proposal that S-I prediction is useful in evaluating shorter-timescale processes (as they occur in climate models)

Data assimilation, analysis, initialization

- Reanalysis datasets for model evaluation
- Improve initialization of ocean component
- Initialization of cryosphere (sea ice, snow)
- Initialization of land surface (vegetation, hydrology)
- **Initialization of coupled models**
 - Different time scales
 - Second-order statistics
 - Physical consistency
- **Observing System Experiments**

Data assimilation, analysis, initialization

- Model bias
 - Reduction and correction
 - Use of observations for assimilation in model with bias – how? (anomaly assimilation, posterior bias correction)
- Specification of model error covariance

Detection and attribution of climate events

- Aid search for proximate causes
- Methodology for operational attribution is a research question
- Near-real time for short-term events (months)
- Retrospective for climate evolution and climate events during the last 100 years
- Closely related to predictability and model performance
- Closely related to operational climate prediction

Metrics

- Data assimilation has defined metrics
- Should have discriminatory power
- Distinguish between customer-defined metrics and metrics characterizing model quality
- **Proxy metrics – can we identify them?**
- Evaluation of long-timescale behavior against instrumental and palaeo-observations
- Establish task force to define metrics for decadal climate prediction
- Establish infrastructure to ease calculation of metrics

Ensembles

- Explore consequences of uncertainty in initial conditions; parameters; structure (resolved and parameterized)
- Quantify role of boundary forcing vs. influence of initial condition
- Quantify forecast skill
- Experimental design for ensemble construction (e.g., fastest growing modes)
- Experimental design for model perturbation and model intercomparison projects