

# Thoughts for PCMDI 5-year proposal

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# General PCMDI mission

- “model evaluation, with new emphasis on
  - implications of errors” [& uncertainties]  
“for future” [climate change] “projections
  - and to aid in model development/improvement”

(Karl Taylor, e-mail, 5/7/7)

# The relationship of this group to the mission

- This group should be entitled “Physical processes diagnosis”
  - “Physical processes” = {clouds, convection, radiation, boundary layer turbulence, aerosols, land-atmosphere interaction} or “fast”-atmosphere physical processes
- Note that I haven’t said the word CAPT yet
  - CAPT is central, but I don’t want us to be solely defined by this activity

# Future Work

4 Components

# Components of Future Work

1. Diagnosis of up-to-date and experimental versions of climate models with ARM data through CAPT (and other approaches)
2. Assessing the climate model representation of moist processes with the newest data (e.g. CloudSat/Calipso)

# Components of Future Work

3. Use of the finer scale models (cloud resolving models) to inform the missing processes
4. Relating climate change projection uncertainties/errors to the error/uncertainties in the representation of physical processes in climate models

# Specific Plans (e.g. 2-5 year?)

1. Traditional CAPT Ideas
2. Emerging data
3. Fine scale cloud modeling
4. Relating cloud feedbacks to errors  
in current climate

# Traditional CAPT Ideas

- Certainly, we will continue to run new ARM field program experiments and run experiments with those that develop new parameterizations. But what can and should we do better?

# Traditional CAPT Ideas

- Identification of structural errors in parameterization and suggestion of what and how to fix? (processed based thinking vs. IOP based thinking)
- What fraction of climate error is apparent in short-range forecasts? Which tendency errors are correlated with state errors?
- Greater exploration of horizontal & vertical resolution sensitivities

# Traditional CAPT Ideas

- Ensemble forecasting (maybe DART) – PDF forecasts (maybe necessary as the models get better)
- More thorough use of ARM data
- Aerosols and aerosol-cloud interactions

# Emerging Data

- CloudSat/Calipso Simulator
  - the climate modeling centers may or may not have the human resources to do this
  - software transfer to climate model code (e.g. ISCCP simulator model)
- Cluster analysis with simulator on model data
- (Tendency errors may be correlated with certain clusters cloud states – K. Williams, J. Climate submitted)
- Are there other emerging data sources? (new analysis data, a scanning cloud radar?)

# Fine-scale modeling

- Cloud resolving modeling – and super-parameterization
- Initial focus: diurnal cycle of precipitation over land
  - diagnosis of MMF, CRM, ARM
  - SCM evaluation and parameterization improvement
- MMF forecast experiments

# Climate Change Projections

- Cloud feedback studies (prospective study of AR4/CMIP3/CFMIP databases)
- What is the relationship of forecasts to cloud feedbacks (T. Del Genio/ K. Williams)?
- Can CRMs/MMFs tell us something about the feedbacks?
- Do we want to tackle the uncertainty in stratocumulus – trade cumulus cloud feedbacks? With what models and data?

# Who are our customers?

- ARM (and DOE ASP?): use of their data to assess models
- Climate modeling centers: evaluation and improvement of leading U. S. climate models
- DOE long-range goal: Reduced uncertainty in climate change projections