

U.S. CLIVAR

Process Study & Model Improvement Panel (PSMIP)

Mission: to reduce the simulation uncertainties in general circulation models used for climate variability prediction and climate change projection through an improved understanding and representation of the physical process governing climate and its variations.

Activities:

- Climate Process Teams***
- Process Studies***
- Working Groups***

U.S. CLIVAR Process Studies (underway & post-field phase):

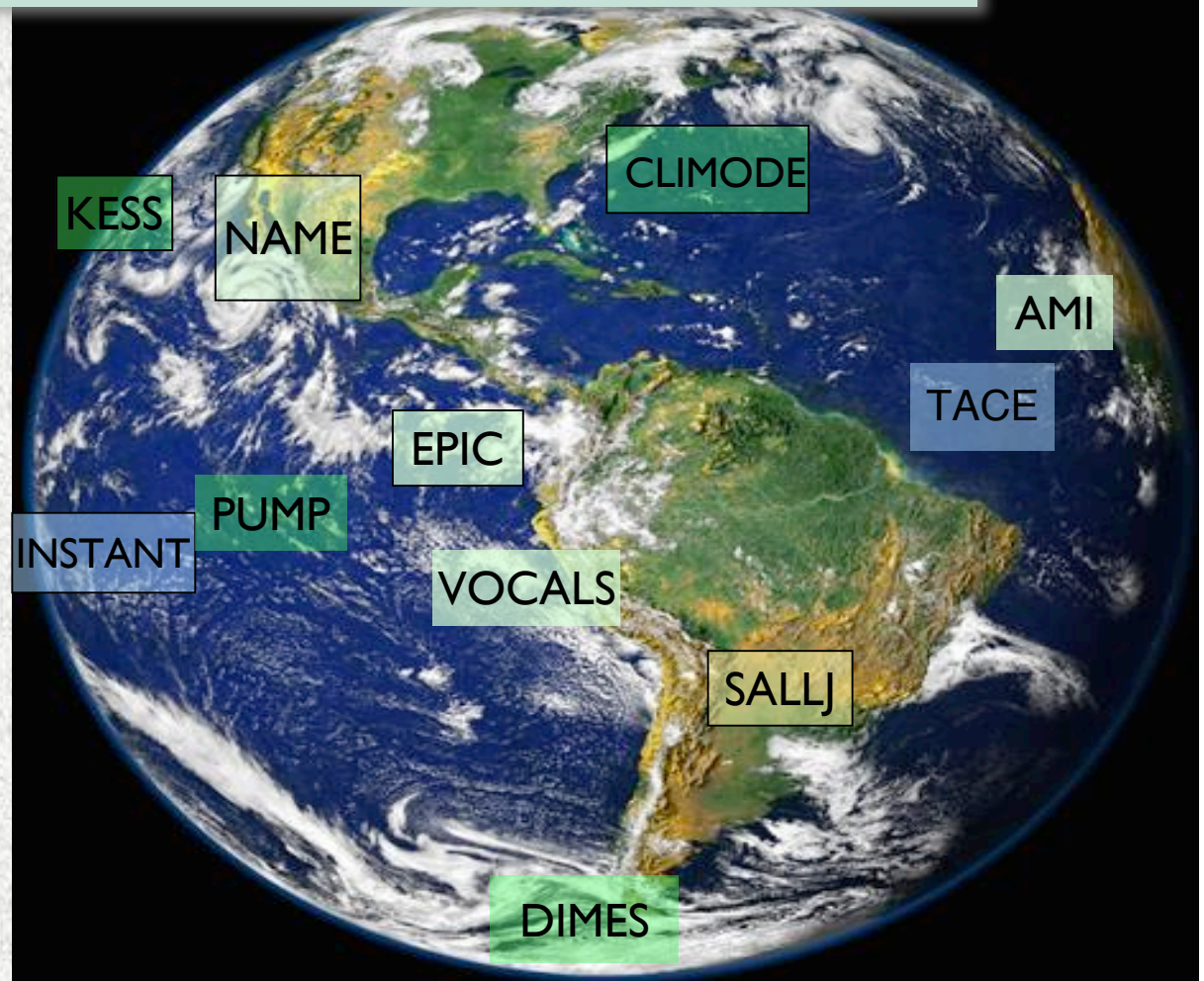
- *EPIC* - Eastern Pacific Investigation of Climate Processes
- *NAME* - North American Monsoon Experiment
- *KESS* - Kuroshio Extension System Study
- *CLIMODE* - Clivar Mode Water Dynamics Experiment

U.S. CLIVAR Process Studies (pre-field phase):

- *DIMES* - Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean
- *VOCALS* - VAMOS Ocean-Cloud-Atmosphere-Land Study

Other Process Studies being considered/vetted by PSMIP:

- *mini-PUMP* - downsized Pacific Upwelling and Mixing Process study
- *IASCLIP* - Intra-Americas Study of Climate Processes



PSMIP assigned 2 liaisons to each process study, and sent leadership of all process studies a letter asking for feedback on U.S. CLIVAR 'best practices for process studies'.

Active&post-field phase:

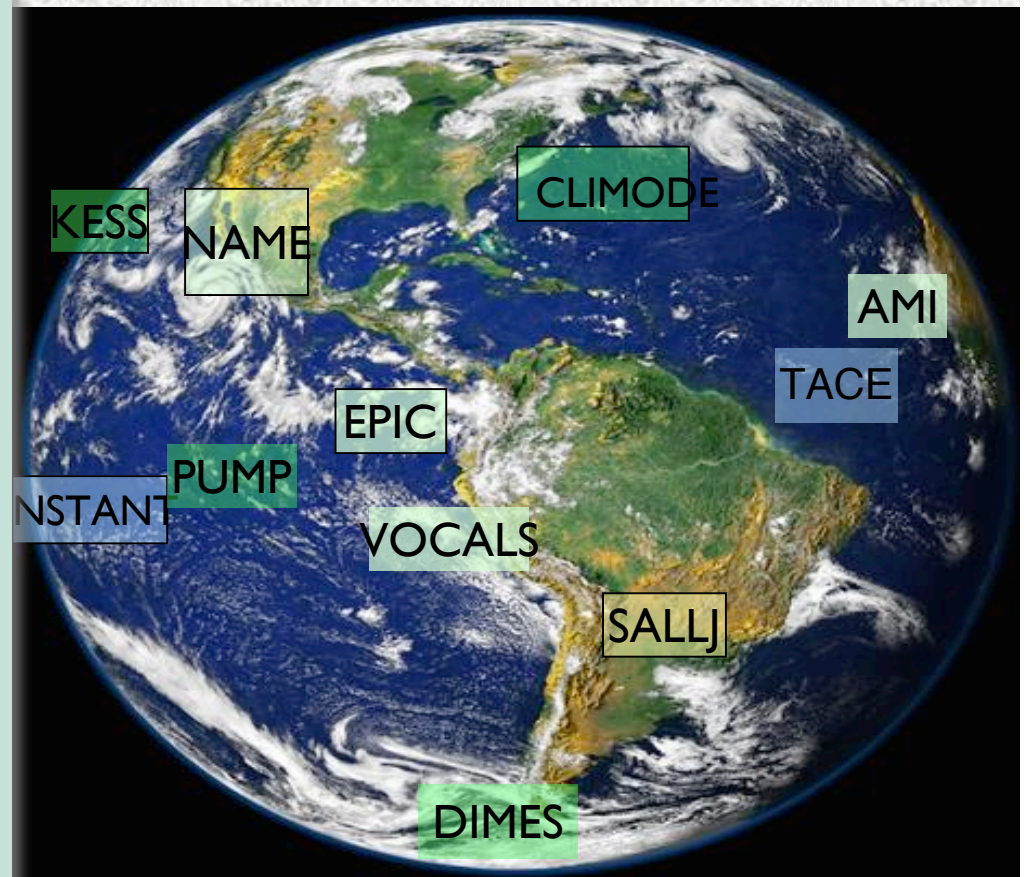
- ***EPIC (Zuidema, Cronin)***
- ***NAME (Sperber, Zeng)***
- ***KESS (Cronin, Joyce)***
- ***CLIMODE (Joyce, Ferrari)***

Pre-field phase:

- ***DIMES (Ferrari, Joyce)***
- ***VOCALS (Zuidema, Flatau)***

Planning phase:

- ***mini-PUMP (Large, Cronin)***
- ***IASCLIP (Zeng, ?)***



PSMIP's Best Practices:

- (1) Entrain modelers during the early planning stages of process studies;**
- (2) Create synthesis data sets that can be used as benchmarks for assessing and validating models; and**
- (3) Encourage broad use of data gathered during the process study by**
 - (a) supporting an open data policy,**
 - (b) developing and ensuring centralized access to all components of the experiment, and**
 - (c) archiving data in a format intended for broad use.**

U.S. CLIVAR Working Group Western Boundary Current Ocean-Atmosphere Interaction

Terms of Reference:

- Bring together the KESS, CLIMODE and other western boundary current atmosphere-ocean interaction groups for a synthesis of results
- Identify shortcomings in atmosphere, ocean, and coupled models that need to be addressed to accurately model western boundary current atmosphere-ocean interaction
- Identify observational gaps and modeling experiments that would answer outstanding issues

Group has had monthly telecons since Feb 2007. To be discussed further by Kathie Kelly...

Climate Process Teams

Current status:

- Multi-institutional collaborations between model developers and process observationalists/theoreticians/modelers to improve climate model representation of physical processes.
- Two ocean mixing CPTs currently funded until August 2008

Past year's panel effort

- Identified requirements for successful CPTs from experience with pilot CPTs
- Initiated discussion with modeling centers to identify key processes which would benefit from future CPTs

Plans for next few months

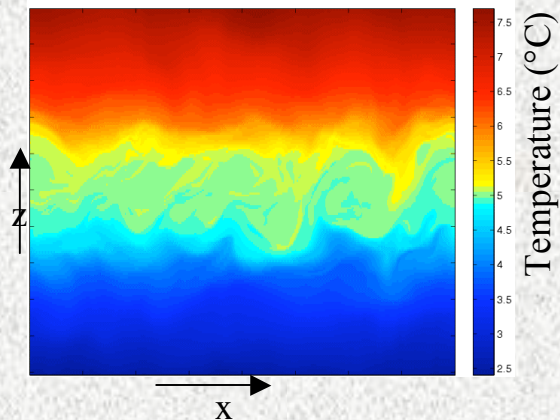
- Formulate committee to write white paper(s) identifying areas ``ripe'' for CPTs
- Work with IAG to develop call for proposals for new CPTs in 2008.

Science Result: New parameterization of shear-driven mixing

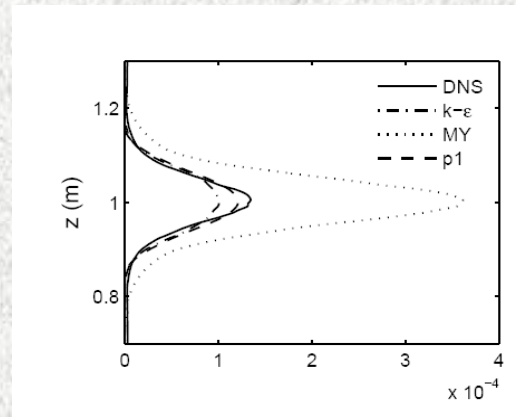
Product of Gravity Current Entrainment Climate Process Team, developed by Laura Jackson and Robert Hallberg (GFDL), implemented in Hallberg Isopycnal Model, ocean component of CM2.2 GFDL coupled model. Suitable for z-coordinate models too.

$$\frac{\partial^2 \kappa}{\partial z^2} - \frac{\kappa}{L_B^2} = -2SF(Ri)$$

$$F(Ri) = \frac{0.15(1 - Ri / Ri_c)}{(1 - 0.9Ri / Ri_c)}$$



3D high res simulation



Diffusivities diagnosed from simulation and predicted by different parameterizations (new parameterization = p1)

New parameterization contains no dimensional constants. Tuned by comparison with lab expts & high res. numerical simulations. Produces good results for mixing in both Nordic overflows and Equatorial undercurrent with no additional tuning – a first for climate models!