With finite computing resources there are always tradeoffs. If there were an internationally coordinated 'Large Ensemble' program – what type of ensembles should be the focus?

Answer = DIVERSITY!

No consensus.

Many groups discussed the tradeoff between resolution and number of ensemble members.

Example reports on tradeoff between resolution and ensemble size:

"There was no consensus on whether to sacrifice resolution for ensemble size."

"Very clear trade off between resolution (often related to model quality) and number of ensemble members "

"Practical perspective: resolution vs. number of members for adaptation"

"Extremes: need as many ensemble members as possible."

"Extremes: need high resolution to assess impacts"

"Suggestion to have higher spatial resolution and fewer ensemble members."

"Group gave priority given to members over resolution."

Consensus from multiple groups: We have multiple large initial condition ensembles now publicly available. Need to analyze them.

"do we need more initial condition ensembles? We now have a lot."

"Do we need a LE MIP, before we analyze what we have? I.e., there is so much simulated data that already exists that has not been analyzed that we do not yet have a good grasp of the interesting and important questions. Allow a few years for questions to organically develop prior to coordinating protocols."

"the view was expressed by a number of people that since we already have large ensembles for a number of models, there could be value in having less members with more advanced models e.g., higher resolution."

"Should spend more time coordinating analyses, methods before we move forward and make new ensembles"

Micro vs. Macro initialization

Consensus from multiple groups: Macro needed

"Initial conditions: consensus on taking start years from a long 1850 control run, sampled every 20-40 years to span a wide range of states"

"group consensus was to have a combination of these, i.e. to perform micro initializations on a range of macro states."

"Discussion on initialization method. Had a vote on macro versus micro. 14 votes for macro, 0 votes for micro. "

"Macro preferred over micro to provide larger differences in the initial state, Use both atmosphere and ocean initializations"

"Most participants favored macro-perturbations, and questioned whether micro-perturbations add value to large ensemble studies, given that ocean memory is important"

Challenges of coordinated perturbed physics experiments.

“Hard to do international perturbed physics ensemble effort because each model has different parameterizations to begin with! So can’t do the same perturbations across models.”

“Perturbed parameter large ensembles can teach you a lot about a single model (good for model development).”

“Perturbed physics (3) (but it would have to be clear what the specific target is e.g., focus on an aspect where the model is performing poorly)”

“The group considers that the perturbed physics ensembles may not be the highest priority as compared to the initial condition (both atmosphere and ocean) large ensembles”

Food for thought

“People time is a constraint when considering the various large ensemble design and types, not only limited by computer times”

“We went around – How many members needed if you were to do an ensemble: 20, 30, 7, 500, 15-20, 50, 30, 40, 20 20, 15, 20” Is there information that we can/should collect from YOU ALL right now that is useful for informing future directions in climate modeling, large ensembles?