

WCRP Community-wide Consultation on Model Evaluation and Improvement

Please complete the following template by writing your answers into the boxes below the questions, sending any supplementary material such as clearly labeled figures in a separate file. Please submit your response electronically by **15 September 2009** to Anna Pirani at apirani@princeton.edu.

Q1: Please state your particular area of interest, e.g. global or regional climate or NWP modeling, seasonal prediction, sea-ice feedbacks, monsoons, troposphere-stratosphere exchanges, etc.
-Global and regional operational NWP modeling, especially short range forecasting of high impact weather events.

Q2: Given your interest, what would you consider/identify as the KEY uncertainties/deficiencies/problems of current models? What do you think should be evaluated/improved as a priority in models in terms of parameterization and/or interactions among processes? (Give references and/or one key figure where possible)
- Current modelling systems are tuned towards the mode of the distribution (PDF) whereas the whole PDF, including the extreme events ("outliers"), are more and more needed by the users.
- The limited predictability of the atmosphere, in particular on the mesoscale, reduces the skill and usefulness of deterministic convection resolving models.
- The consistency and interaction between the different parameterisation schemes in a model as well as between the physics package and the dynamical core is not satisfactory.
- Most existing parameterisation schemes do not properly adapt to changes of the model resolution which leads to a lack of convergence of model simulations; e.g. the usual 1D column approach in physical parameterizations is not applicable for km-scale models.

Q3: Do you see a particular gap (in knowledge, in observations or in practice) that would need to be filled, or a particular connection between different modeling communities or between modeling, process studies and observations that should be made a priority?
- Data assimilation methods for convection resolving models with grid spacing below 3 km.
- Assessment and modelling of the predictability of convective scale flow.
- Simulation of clouds and cloud-radiation feedback in NWP models
- Higher resolution global observations of the wind field, especially over the oceans.
- High resolution observations of moisture (in all phases), especially in the PBL and lower troposphere.

Q4: Do you see any particular resource or opportunity within the modeling/process study/observational/theoretical community (e.g. new results, new observations) that would be particularly useful and should be exploited to tackle this problem?
- Intensification of model intercomparison studies for well documented/observed situations with particular emphasis on the profound diagnosis of the causes of discrepancies rather than the description of their existence.
- Exploitation of very high resolution models (LES/DNS) in conjunction with advanced simulation of relevant diabatic processes like radiation, cloud microphysics, etc in order to provide the foundation for improved 'coarser' scale simulations.
- Use of "stochastic physics" in NWP and climate models with the goal of a better representation of the dynamical effects of unresolved scales.

Q5 What would best accelerate progress on the topics raised in questions 1-4? Do you have suggestions for new initiatives (new process studies, field campaigns, or new collaborative approaches, eg international Working Groups, Climate Process Teams)?

- Convince funding agencies that resources need to be channeled to model development as well as to a closer interaction between model developer, model user and data provider groups.
- Communicate the needs of NWP to the academic community; initiate (multi-)national collaborative projects between the NWP and the academic community with well-defined targets to further advance the knowledge and the quality of modelling itself.
- Develop an internationally agreed metrics to measure the progress in NWP on all forecasting scales from global to mesoscale.

Q6: Any other suggestions/issues to be raised?

- Convince policy makers that funding is needed not only for climate change scenario calculations but for the development and improvement of NWP and climate models, too.