WGCM and CMIP

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Links to the WCRP Strategic and Implementation Plans

- WGCM and its Panels are well situated within the WCRP structure at the moment, and serve as the primary foci for discussions among modelling centres, data centres, and infrastructure providers on many topics.

- WGCM and CMIP produce some of the most visible and influential outcomes of WCRP, and leverage a huge investment by many countries, institutions and funding agencies.

- Our concerns related to the Strategic Plan continue to relate to maintaining (ideally improving) this visibility and effectiveness.

- We believe that WGCM has played a crucial role in both fundamental model development and coordinated intercomparison projects, providing high-profile input to climate assessments and policy development. These activities should remain core features of the WCRP going forward.
Emerging issues

- CMIP has grown into a very large and complex multi-national undertaking. Although it mobilizes a huge (~ $1B) investment, and its results are essential to a vast array of stakeholders, it is organized by a small group of passionate volunteers in the CMIP Panel and WIP. It is not sustainable in its current form.
  - Recent call for an International CMIP Office will be a helpful step.
  - WGCM will pursue broad consultations in planning the scope and organization of CMIP7.
  - Need to raise the profile and insure ongoing support for vital infrastructure.

- WGCM represents the primary mechanism for interaction and coordination amongst climate (Earth System) modelling centres.
  - This has implications for membership, organizational structure, leadership and future role.

- New scientific priorities such as better understanding modelled climate sensitivity and analyzing/interpreting multi-model ensemble.
Additional Slides
Progress and achievements

- Model simulations for CMIP6 are progressing rapidly, with community having now designed an implemented 312 distinct CMIP experiments.

- Result being used in IPCC AR6 report in prep.

- Model output now being served by ESGF from 38 institutions (56 models or versions).

Progress and achievements

Model results continually being added to archive.
- currently 7.5 PB of data and climbing (compared to 1.7 PB total in CMIP5)

http://esgf-ui.cmcc.it/esgf-dashboard-ui/federated-view.html
Progress and achievements

- As a follow-up to the Barcelona CMIP workshop, held in March, 2019, former WGCM co-Chair, Jerry Meehl, has led the development and submission of a paper laying out the history of quantifying climate sensitivity and comparing the CMIP6 multi-model ensemble sensitivity to previous results.

Routine Evaluation in CMIP

- A range of sophisticated evaluation tools have been developed to allow streamlined access to the CMIP data archived on the ESGF.
- These tools are being extensively used by the climate research community, and by several IPCC AR6 chapter teams to undertake analysis and produce figures.

Right et al, GMD, 2020 and Eyring et al., GMD, 2020
CMIP Future

- CMIP6 was very ambitious!
- 23 endorsed MIPs; >300 experiments.
- Results will fuel climate research for years to come (CMIP5 results continue to be used; > 1100 publications self-reported at https://cmip-publications.llnl.gov/ which is certainly an underestimate.
- CMIP results also fuel a vast range of derived climate information products and services.
- However, logistics of organizing and delivering this massive effort is straining the capabilities of the CMIP Panel and WIP (currently with no dedicated project office). CMIP is at risk and is not sustainable as is.
CMIP essential infrastructure is currently delivered by volunteers, by the WGCM members, the CMIP Panel, the WGCM Infrastructure Panel (WIP), and the individual scientists and their institutions, in often unfunded efforts.

Infrastructure includes:

- ‘forcing data’ for climate model simulations
- development of data formats and standards
- documentation and software to contribute model output to the ESGF and allows users from around the world to access this massive multi-model data set.
- The distributed but integrated hardware that permits archival and dissemination of CMIP model output to the wide community.
• WGCM, CMIP Panel, and WIP will undertake a substantive consultation in the coming year involving the climate science community, modelling centres, data centres, and other stakeholders to develop plans for CMIP7.
  – There are currently a range of views on the way forward.
  – We will need to maintain consistency with ongoing WCRP Implementation planning.

• Considerations will necessarily include modelling centre capacity and ongoing interest, issues around forcing data, output archival and dissemination, scientific goals and other stakeholder needs, etc..

• Call for CMIP International Office is currently out, and interest in hosting such an office has already been expressed.
  – This will be a huge help.
Multi-Model Ensembles

• An increasingly important research problem involves the analysis of, and extraction of information from, large multi-model ensembles (MMEs) like that produced by CMIP.

• Many of the models share components. Some are largely independent whereas others are modest variations. All have errors/biases of different kinds, in different variables and in different regions.

• There is a need to motivate and perhaps coordinate enhanced research on the analysis of MMEs and LMEs (large individual model ensembles) so as to better quantify confidence/uncertainty in the results of these ensembles and the assessments and products derived from them.