CMIP

Best Practices for MIPs

General guidance on setting up a MIP

CMIP's long experience in coordinating model intercomparisons has helped identify a set of practices that allow broad participation and efficient use of resources, which are summarized here.

1. **Articulate the hypothesis**: Clearly define what new knowledge will be gained by the experiments. MIPs that define key metrics that can be calculated and compared with observed quantities are particularly useful in this regard.
2. **Clarify the experimental design and data requirements:** Experimental designs which help separate robust model agreement from informative inter-model differences are key to the utility of MIP results. Clear design and description of a MIP and its individual experiments, articulation of data requirements, and resource planning is essential to ensure uniform conformance to protocols by contributors and the production of comparable results that meet the design goals.
3. **Leverage past experience**: An awareness of previous model experiments and care in avoiding unnecessary near duplication of those will free resources and focus effort on novel questions. Design should explicitly take into account the extent to which modestly different forcings, experiments, or model versions are compelling motivation for new experiments.
4. **Develop prototype experiments**: Prior to proposing MIP experiments, prototype experiments should be performed with at least one model. Justification should be provided explaining why the prototype results are insufficient and need to be augmented with results from a multi-model ensemble. Dependencies or links to existing (or proposed) experiments and associated available simulations should also be identified.
5. **Foster transparent and inclusive collaboration**: MIPs co-designed by a wide range of individuals, communities, and institutions contributing ideas, simulations, results, or analysis help move the field forward. Reaching out early to modelling centres and/or other participants can help secure sufficient commitments to assure the experimental goals can be met. MIPs are encouraged to consider all aspects of diversity (e.g., geographical, gender, career stage) when building their leadership team in line with WCRP goals (see Section 6 WCRP Guidelines on Membership and Responsibilities)
6. **Coordinate with other MIPs:** Consider registering your MIP. This includes a brief description of initial plans and is meant to identify potential duplications and foster opportunities to coordinate across MIP activities.
7. **Document the approach comprehensively:** Description papers subject the MIP design to a process of peer review. Such papers provide the goals of the MIP and the rationale for each of the planned experiments. The experiment protocols should be defined as clearly as possible. "Living" experiment documentation on a website or other easily accessible platform can ensure that up-to-date information is readily available for those seeking to conduct the experiments.
8. **Prioritize anticipated experiments**: Explicit prioritization ("tiers") of experiments allows contributors to usefully participate at whatever level of effort best suits them for a spectrum of levels of engagement.
9. **Support contributors and users:** Anticipate how the data will be prepared and distributed so that the scientific findings can be published including testing diagnostics across models to assure data comparability.
10. **Acknowledge contributions**: Where MIP analysts are distinct from the groups contributing results encourage inclusion of data providers as co-authors (especially in early publications). Data citation is a further mechanism of acknowledgment.

Conforming with CMIP Practices

In addition to following the above "best practices", a MIP may want to take advantage of the data standards and infrastructure that support the most recent phase of CMIP. In some cases, the CMIP panel and IPO may be able to provide additional input and services that may increase the potential scientific impact of a MIP. Insistence on the latest standards and adoption of the same controlled vocabularies used in previous CMIP phases can reduce the overhead on modeling group participation and facilitate community analysis of MIP results. While the CMIP7 technical specifications are still under development, they will rely heavily on the CMIP6 requirements which were discussed generally in Balaji et al., 2018 and were fully detailed on the CMIP6 website in the Guide to CMIP6 Participation.