CMIP7 Hackathon breakout group template

Purpose of this document: To be a template for breakout group chairs to drive the discussions such that they are in-scope and to ensure that the discussions are fruitful and helpful as feedback for the ACCESS community.

Who this document is for: For breakout group chairs to lead their groups and for note-takers to help them organize their report.

General considerations

This is a CMIP7 Evaluation hackathon so the focus should be on discussing the communities' needs to evaluate the models and experiments in preparation for the Australian submission to CMIP.

There at least 2 aspects of evaluation:

- Evaluation / diagnostics needed to support model development
- Evaluation of outputs to support research

These two are overlapping of course.

It is important to define the priorities in terms of evaluation within the CMIP7 timeline. (which extends beyond 2026). Tools and metrics will need to be developed ahead of model development as much as possible. One of the primary goals of this hackathon (and thus of the breakout groups) is to curate a prioritized list of action items related to model evaluation needed to facilitate the Australian submission to CMIP and to prioritize metrics for determining whether a model configuration is performing well enough to use for CMIP .

How to report bugs/typos/etc

Throughout the hackathon, please encourage participants to open github issues for specific technical feedback (e.g. for reporting bugs or typos) in the CMIP7-Hackathon repository. There are issue templates and tags to help organize these issues, and the ACCESS NRI team will go through and help curate these issues, e.g. to decide which ones should be shared upstream with ESMValTool directly.

Example schedule for breakout group chairs

Breakout session #1: Tuesday 3:30 – 5:00pm

Primary goal: To meet other group members, set the stage for the breakout groups for the rest of the hackathon, and discuss big picture questions around model evaluation in Australia

Large, domain-specific breakout group: This session will be split into 4 domain-specific groups as follows:

- General diagnostics (e.g. drift/conservation) & Coupled (modes of variability) *(Chair: Yann Planton)*
- Ocean & Ice *(Chair: Pearse Buchanan)*
- Land & Carbon Cycle *(Chair: Tammas Loughran)*
- Atmosphere *(Chair: Kim Reid)*

[Note: If there are any online participants who want to stay for a breakout group, we have two rooms booked with video conference facilities but the rooms won't be large enough if the in-person group is more than ~10 people.]

Example schedule:

3:30 – 3:45pm Group introductions

3:45 – 4:00pm Discuss how breakout groups will work

- Decide on a note taker for each of the large group breakout session (you can decide to have one throughout or rotate across all 3 sessions: Session 1, Session 2, and Session 5). Breakout sessions 3 and 4 will be in smaller groups hacking away, and do not require note-takers.
- Discuss the goals and expectations of the breakout groups
  - To discuss as a community what metrics/workflows are most often used in your domain, what barriers are common, what

items are currently missing from model evaluation in the discipline, etc.
    - To play around as a community with ESMValTool (and ILAMB) and to understand how it can be useful for your domain and what difficulties people are facing.
    - To curate, by the end of the breakout session #5, a prioritized list of issues that the community needs to facilitate Australian submission to CMIP

4:00– 5:00pm Discuss the state of your current evaluation workflow process. Sample questions:

- What tools do you use?
- What are the limitations?
- What are the key metrics that need to be used to support development?
- What are the metrics most important for the Australian community?
- What bias is acceptable / not acceptable for our community?
- How do we track evaluation outcomes while we are developing the model? Do we need a system to track forcing conditions, parameters and evaluation outcomes?
- Which observational/reanalysis products do we need? What simulations do we need to test them?

Breakout session #2: Wednesday 11:15 – 12:45pm

Primary goal: To gain familiarity with the tools that ESMValTool has to offer and to consolidate thoughts and feedback about model evaluation needs for CMIP7

Large, domain-specific breakout group: This session will be split into the same 4 domain-specific groups as the previous breakout session:

- General diagnostics (e.g. drift/conservation) & Coupled (modes of variability) *(Chair: Yann Planton)*
- Ocean & Ice *(Chair: Pearse Buchanan)*

- Land & Carbon Cycle *(Chair: Tammas Loughran)*
- Atmosphere *(Chair: Kim Reid)*

This session comes just after a hands-on introduction to ESMValTool, so we would like participants to explore existing recipes and metrics in ESMValTool. Participants should use this time to gain familiarity with the tools available through ESMValTool and to reflect on some specific questions, as listed below. Ideally group members can begin to reflect on the aspects of ESMValTool that are most useful and most difficult for their domain, so that by the end of the hackathon we can have a useful and prioritized list of needs for the community in order to submit for CMIP7. Note that a more in-depth hacking session on specific recipes/metrics will happen after lunch, so do your best to steer conversations in this larger group around the topics mentioned below.

Example schedule:

11:15 – 12:00pm Participants should explore existing recipes and metrics in ESMValTool for their research domain and consider the following questions:

- Can you find what you need (link to ESMValTool recipes)?
- Are the recipes/diagnostics fit for purpose? Do they need to be improved (give examples, which ones)?
- Do we need to develop new recipes/diagnostics (which ones? Any relevant papers?)?
- What other tools are we using that would complement ESMValTool? How can ILAMB best be used alongside ESMValTool?
- What code/scripts are we already using regularly that we might want to incorporate into ESMValTool? (ACCESS-NRI can help curate and convert into ESMValTool formats)

12:00 – 12:30pm Participants should consider observational datasets that currently work with ESMValTool. In the context of CMIP evaluation, the observational datasets need to be CMORised (or at least be interoperable with CMIP model outputs). ACCESS-NRI, ESMValTool and ILAMB support a range of such datasets (link to observational datasets on NCI). Participants should consider the following:

- Which datasets are missing? Can you name any specific datasets that you think should be added?

12:30 – 12:45pm What training would be helpful?

- Would more training in specific topics be helpful for you? If so, which topics?
- Which training formats are preferred? (Synchronous video tutorials, recorded tutorials on youtube, drop-in-style office hours, etc.)

Breakout session #3: Wednesday 2:00 – 5:00pm

Primary goal: To play around with and test ESMValTool recipes on relevant datasets.

This session will focus on hands-on learning and applications of ESMValTool for discipline-specific needs. We would like participants to test recipes on specific datasets to provide some guidance for ACCESS model development efforts. These specific datasets will be shared with participants during the plenary session that directly precedes this breakout.

Small breakout groups: in this session participants are encouraged to split into small 2- to 4-person groups that should be self-organized by participants. Domain group leads can help folks organize as needed. You can also remind participants to take breaks as needed, since this is a long 3-hour session, and there is still another hour after this breakout session to report back to all hackathon attendees. Coffee/tea and light refreshments will be available in the canteen for these informal breaks.

Example schedule:

2:00 – 2:15pm Have participants decide on specific recipes/metrics/datasets that they want to work on and break into small groups.

2:15 – 5:00pm Work in small groups to play around with and test ESMValTool recipes. To help groups get started, you could have them consider the following:

- Check any provided ILAMB output (if relevant for your domain) to see where model output diverges.

- Run an existing ESMValTool recipe with some of the sample datasets that the ACCESS community wants to test
- Write a new recipe that is relevant to your discipline
- Write up GitHub issues in the CMIP7-Hackathon repo for any bugs, typos, missing metrics, or other issues you run into

Breakout session #4: Thursday 9:00 – 11:00am

Primary goal: To continue to play around with and test ESMValTool recipes on relevant datasets.

Small breakout groups: in this session participants are encouraged to either stay in their small groups or split into new 2- to 4-person groups.

This session is a continuation of the previous breakout session – more time for participants to work in small groups and test ESMValTool recipes. Please take breaks when needed. Coffee/tea and light refreshments available in the canteen.

Breakout session #5: Thursday 11:00am – 12:00pm

Primary goal: To discuss in the larger domain-specific groups the primary issues/needs/barriers to model evaluation for CMIP7 and, importantly, to prioritize this list of needs/action items.

Large, domain-specific breakout group: This session will be split into the same 4 domain-specific groups as the first two breakout sessions:

- General diagnostics (e.g. drift/conservation) & Coupled (modes of variability) *(Chair: Yann Planton)*
- Ocean & Ice *(Chair: Serena Schroeter)*
- Land & Carbon Cycle *(Chair: Tammas Loughran)*
- Atmosphere *(Chair: TBD volunteer as Kim is not here Thursday)*

This session should be used to finalize discussions on all of the previous topics, and to create a prioritized list of needs/desires from your community in order to address concerns/barriers to model evaluation for CMIP7. The idea is that the ACCESS community would like to come home from this workshop with a roadmap of action items from each research domain, with an understanding of what the most time-pressing items are.

We include a table below where the note-taker can prioritize items (with highest priority listed at the top, and lowest priority at the bottom), and indicate the timescale that the group would ideally like these issues addressed by. Feel free to edit the table as your group sees fit. We provide two example rows (with entirely fabricated content for demonstration only) to capture the type of feedback we are looking for.

Issue/Need identified, listed with the highest priority first	**Detailed description**	**Link to GitHub issue (if applicable)**	**Desired timeframe to resolve this issue**	**Details about the timeframe**
Example: Missing observational dataset XXX	*It is important for the sea-ice community that we have this dataset to compare our models against, because it is the only dataset that has daily frequency of XX variable*	*[If a GitHub issue has been raised, either in the CMIP7-Hackathon repo or elsewhere, link to it here]*	*Sept. 2024*	*We will need this dataset to benchmark against during model development, and we are planning to implement this new variable starting in Sept. 2024, so will need this dataset for benchmarking at that time*
Example: Missing recipe for average SST	*For the ocean community, we will need a robust recipe to compare average SST across all models and a set of observational datasets*	*[If a GitHub issue has been raised, either in the CMIP7-Hackathon repo or elsewhere, link to it here]*	*June 2025*	*Ideally this is resolved by the time we finish model development phase, which will be in June 2025.*