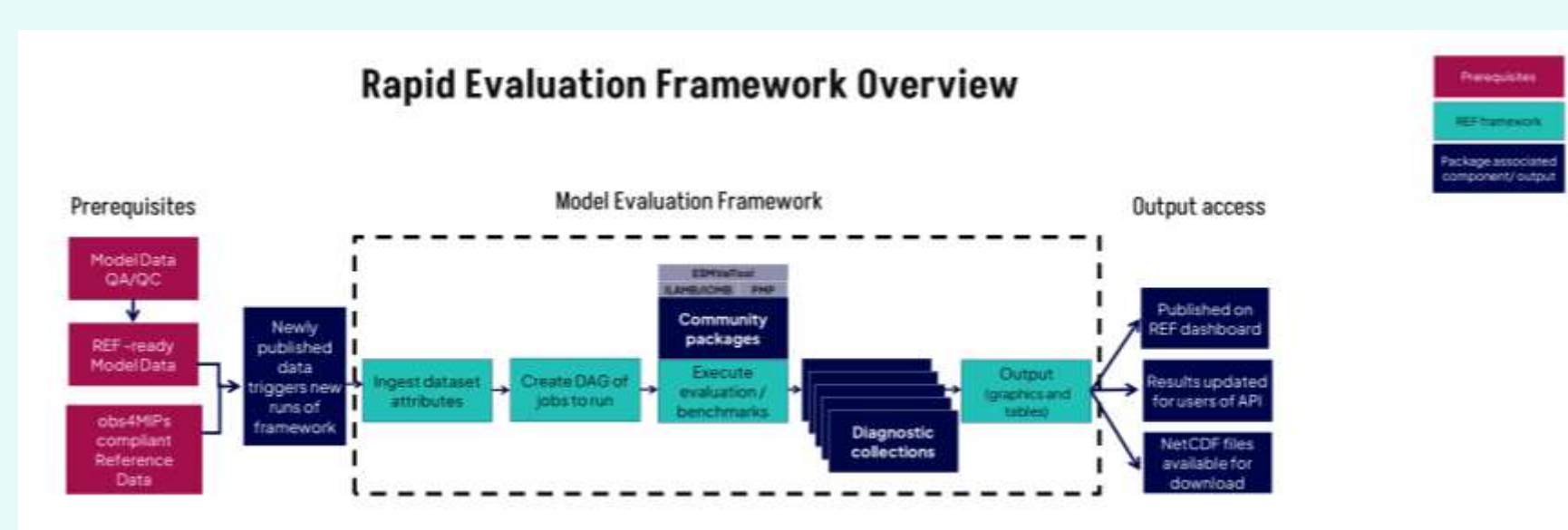


RAPID EVALUATION FRAMEWORK

What is the REF?

The Climate – Rapid Evaluation Framework is community owned, built upon, and compatible with, existing community evaluation packages that incorporates an application programming interface (API) for executing metrics generation from those community evaluation packages.



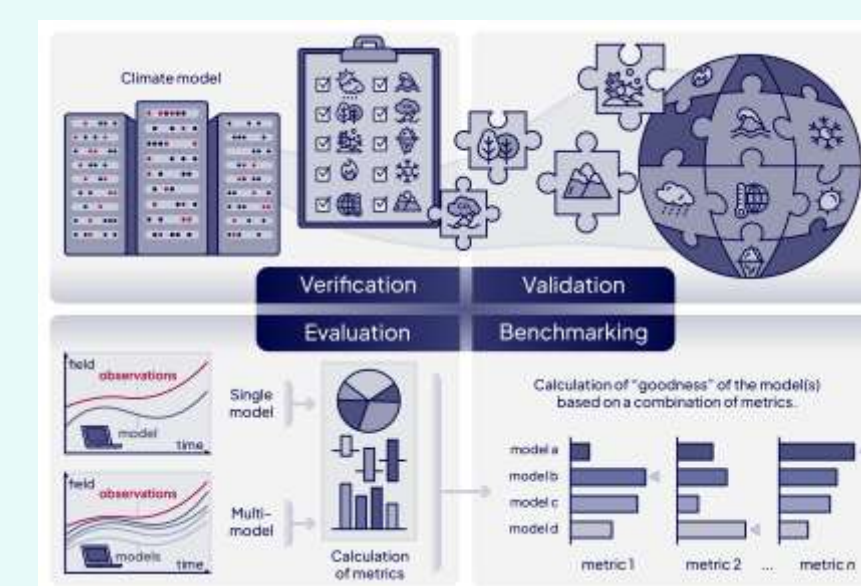
Hoffman, F., Hassler, B., & Model Benchmarking Task Team. (2024). Rapid Evaluation Framework Overview. Zenodo. <https://doi.org/10.5281/zenodo.1459450>

The REF operates with the following packages:



What is model evaluation?

As climate models become increasingly complex, systematic and comprehensive evaluation and benchmarking is needed, through comparison with best-available observational data to assess model fidelity across a wide range of variables.



Hassler, et al. (2025). Definition of the terms model verification, process validation, evaluation and benchmarking for use in the climate model context. Zenodo. <https://doi.org/10.5281/zenodo.17649533>

Right: Lembo, V., Hassler, B., Dingley, B., & Model Benchmarking Task Team. (2024). Different approaches that are most commonly used for the evaluation and benchmarking of climate models. Zenodo. <https://doi.org/10.5281/zenodo.13924504>

Model evaluation is the process of assessing simulations against one or more observational data sets



Evaluation using reference datasets can only be done for the historical period, and only for variables or processes for which observations or reanalysis data are available. Model evaluation can be done for a single model or in a multi-model context.

- A **diagnostic** is a comparison of model outputs (individual variables or combinations of variables) with either a reference dataset or an intercomparison across models of a model variable or some combination of model variables.
 - A **metric** is a single statistical evaluation contained within a diagnostic. A diagnostic may consist of more than one metric.
- These terms are defined in the Hoffman et al 2026 paper*

Diagnostic collections

The REF has diagnostic collections organised into realms to align with the CMIP data request:

- Oceans & Sea ice - 6 diagnostic collections
- Atmosphere - 7 diagnostic collections
- Land & Land ice - 8 diagnostic collections
- Earth System - 5 diagnostic collections
- Impacts & Adaptation - 2 diagnostic collections



CMIP Model Benchmarking Task Team. (2024). CMIP7 Assessment Fast Track Diagnostics list for the Rapid Evaluation Framework (Data set). Zenodo. <https://doi.org/10.5281/zenodo.14284372>

Reference datasets

The Model Benchmarking Task Team have selected a minimum of one reference dataset per variable per diagnostic, where appropriate to use a reference dataset. These datasets have been reviewed by the obs4MIPs Steering Panel for compliance with Obs4MIPs Data Specifications.

All dataset providers have been notified of the REF uncertainty checklist and asked to supply, and ability to do so, the information within it.



Find out more on the climate-ref website

REF-ready model data

If your data and metadata are perfect, then they are already REF-ready!

Making your data REF-ready may involve integrating additional metadata checks into your workflow but it also helps improve robust use, and access, to downstream users

A quality checklist has been devised based on elements that caused errors for model evaluation use of CMIP6 simulations.



Find out more on the climate-ref website

Accessing and using the REF responsibly

Access online: dashboard.climate-ref.org

Access containerised version from: climate-ref.org

Users are encouraged to consider the REF as a living and evolving framework rather than a static product. REF benchmarking represents an initial step toward validation but does not constitute a full validation exercise on its own.

It is important that users of the REF take responsibility for their use of the outputs. They require scientific interpretation. Guidance for using the REF responsibly is available:



Find out more on the climate-ref website

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