Building a community framework for model evaluation of ACCESS Earth System Models

ACCESS-NRI Model Evaluation and Diagnostics

MED Team (Aug 2023)

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CSIRO In-Kind

Model Evaluation and Diagnostics (MED): Scope

Model Evaluation:

- Model / Observation confrontations
- Experiments comparisons
- Inter-model comparisons (e.g. CMIP)

Diagnostics:

- Monitoring of model runs
- Analysis of outputs

Data processing and delivery:

- Model outputs
- Observational datasets

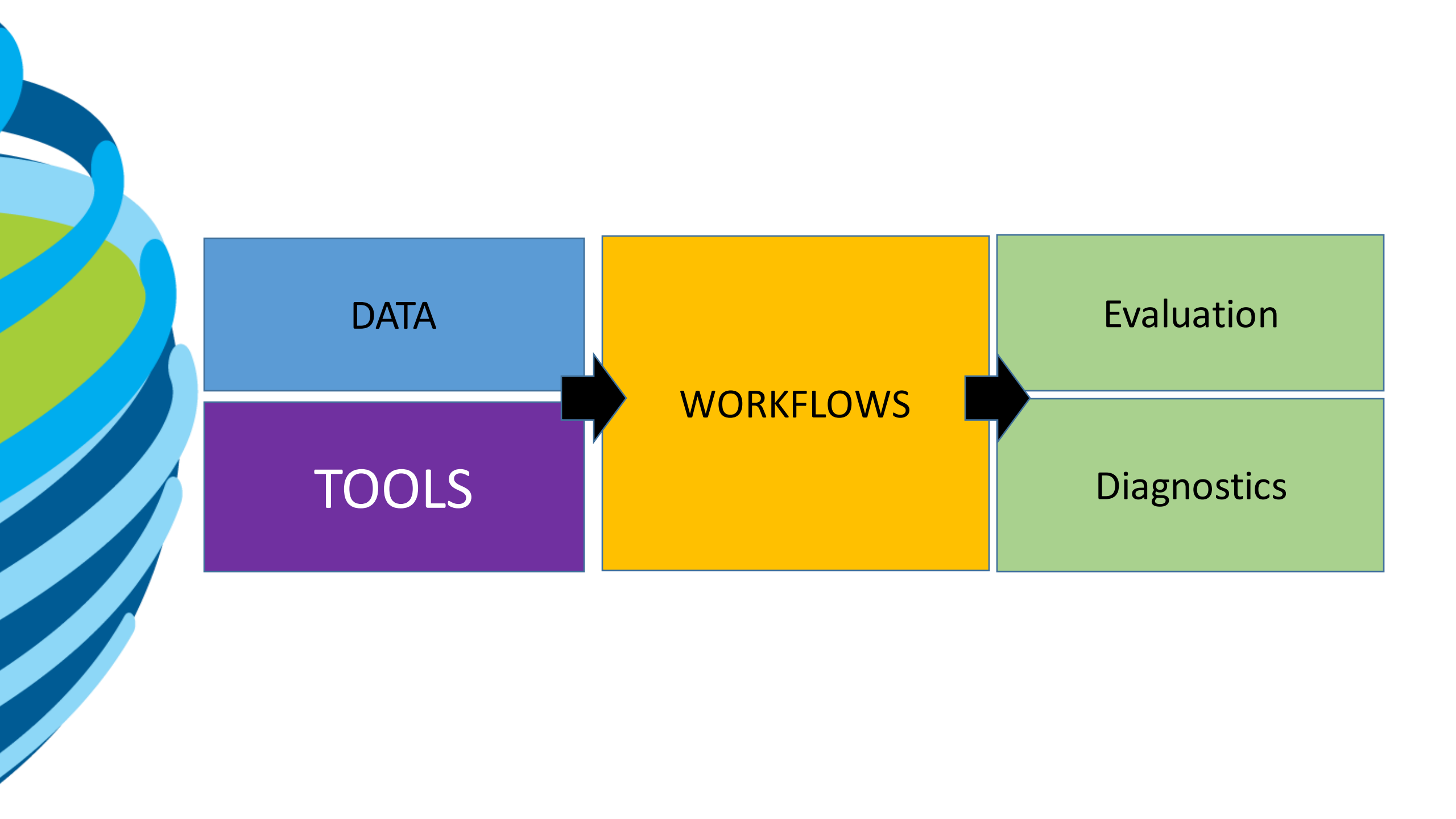
Build confidence in model outputs.
Support understanding of outputs.

ACCESS-NRI MED GOALS

- **Establishing community guidelines and standards for model evaluation and diagnostics**.
- **Developing and maintaining model evaluation and diagnostics tools.**
- Establish and Support **Evaluation and Diagnostics workflow** across model components (ocean, atmosphere, ice, land, etc) and configurations (ESM).
- **Establishing links with the international community around Model Evaluation**

ACCESS-NRI MED GOALS

- Facilitate access to **observational datasets** and community experiments.
- Maintaining a **core of commonly used recipes** and curating/testing new contributions from the community.
- **Generate diagnostics and evaluate models/configurations** to support model development.
- Release and support evaluation outputs (CMIP)


DATA
TOOLS
WORKFLOWS
Evaluation
Diagnostics

Working Groups Inputs

WORKFLOWS
(Domain Specific)

DATA

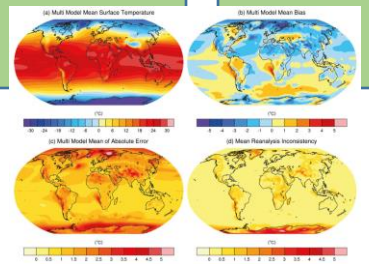
TOOLS

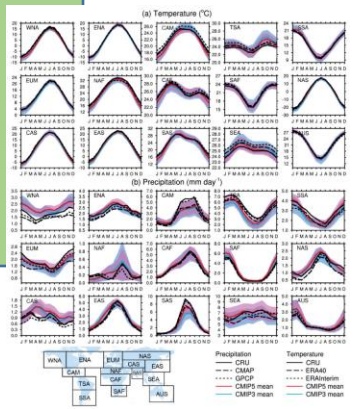
- Analysis Environments (Conda)
- Evaluation and Diagnostics Framework
- Data access and processing
- Scientific Analyses (Recipes, Metrics)
- Output delivery (visualisation, monitoring)

Community feedback

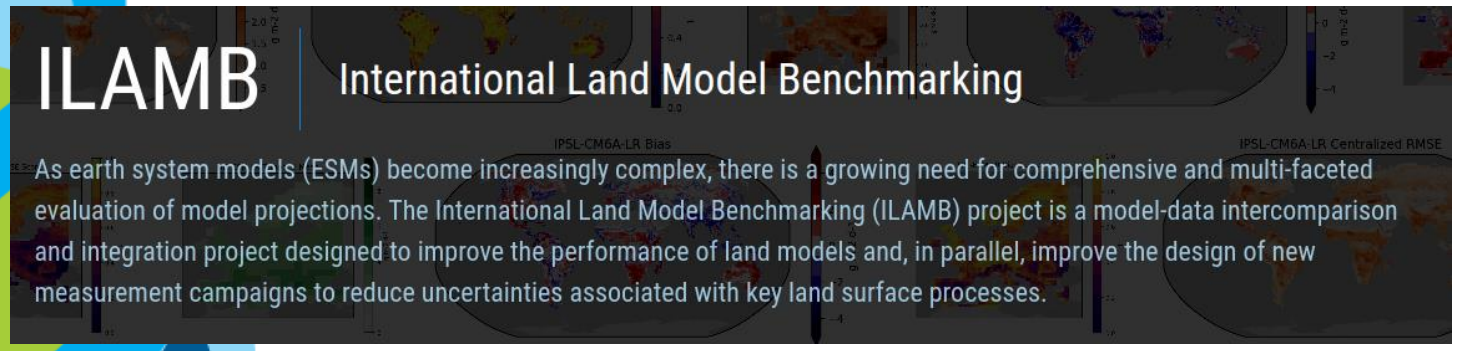
Evaluation

Diagnostics





International efforts: Open source / collaboration is key



COSIMA/**cosima-recipes**

Example recipes for analyzing model output using the cosima-cookbook infrastructure

25 Contributors · 49 Issues · 35 Stars · 45 Forks

...and many others

GitHub

It is also important to have common tools!!!

What is ILAMB?

ILAMB = International Land Model Benchmarking

- Community: International group of modelers and scientists enthusiastic about model benchmarking.
- Datasets: curated collection of datasets formatted for easy comparison
- Methods: innovative assembly of techniques for benchmarking models.
- Software: open-source python package which you can tailor do your needs.
- Results: catalog of comparisons which you can access.

ACCESS
Australian Earth System Simulator
National Research Infrastructure

Workshop 2023

ILAMB development is primarily performed by the RUBISCO Science Focus Area and supported by the RGMA Activity of the EESSD division of the BER program in the DOE's Office of Science.

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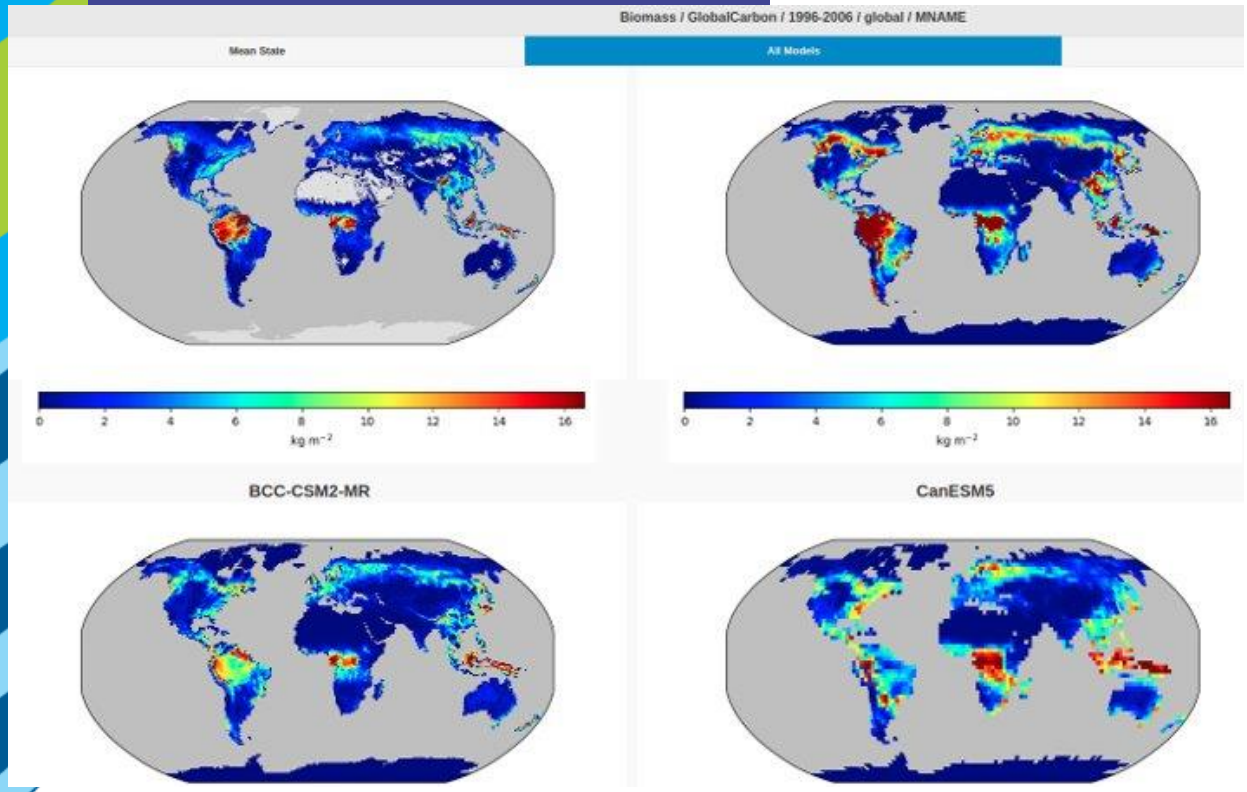
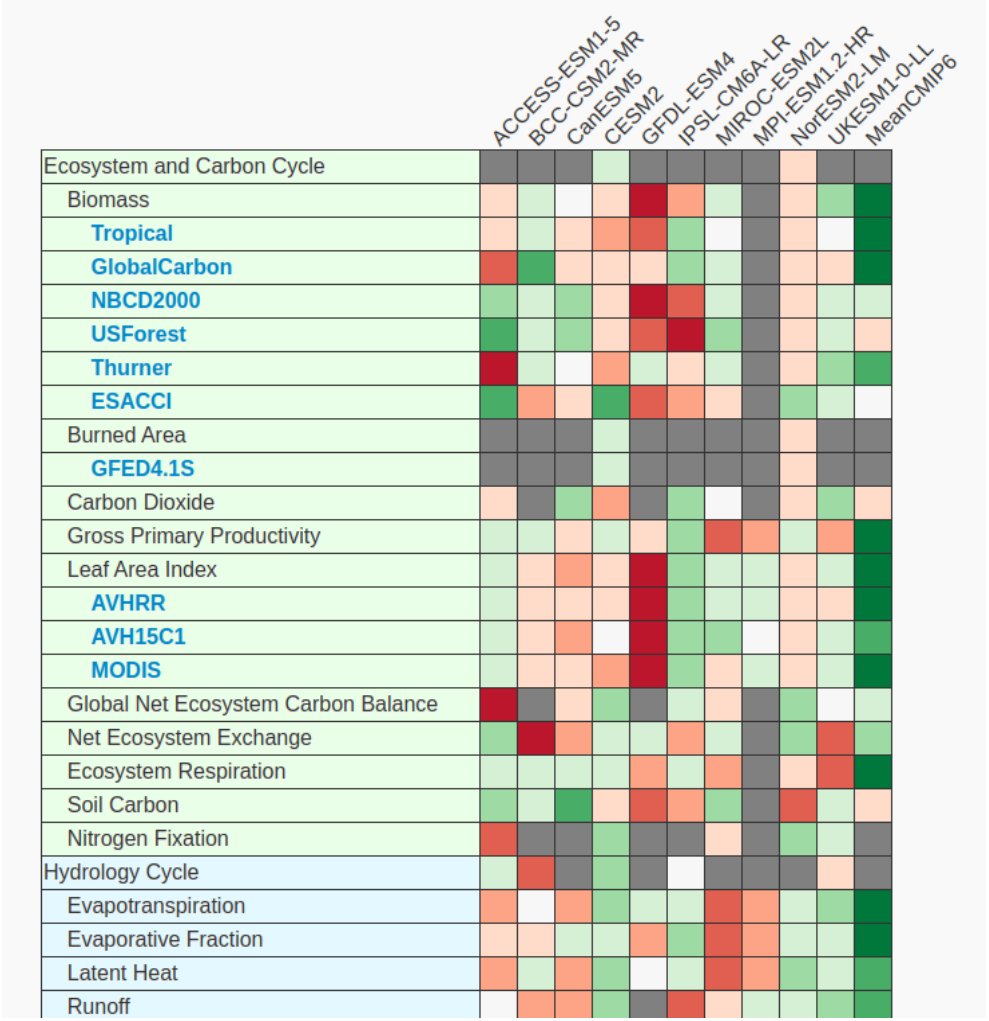
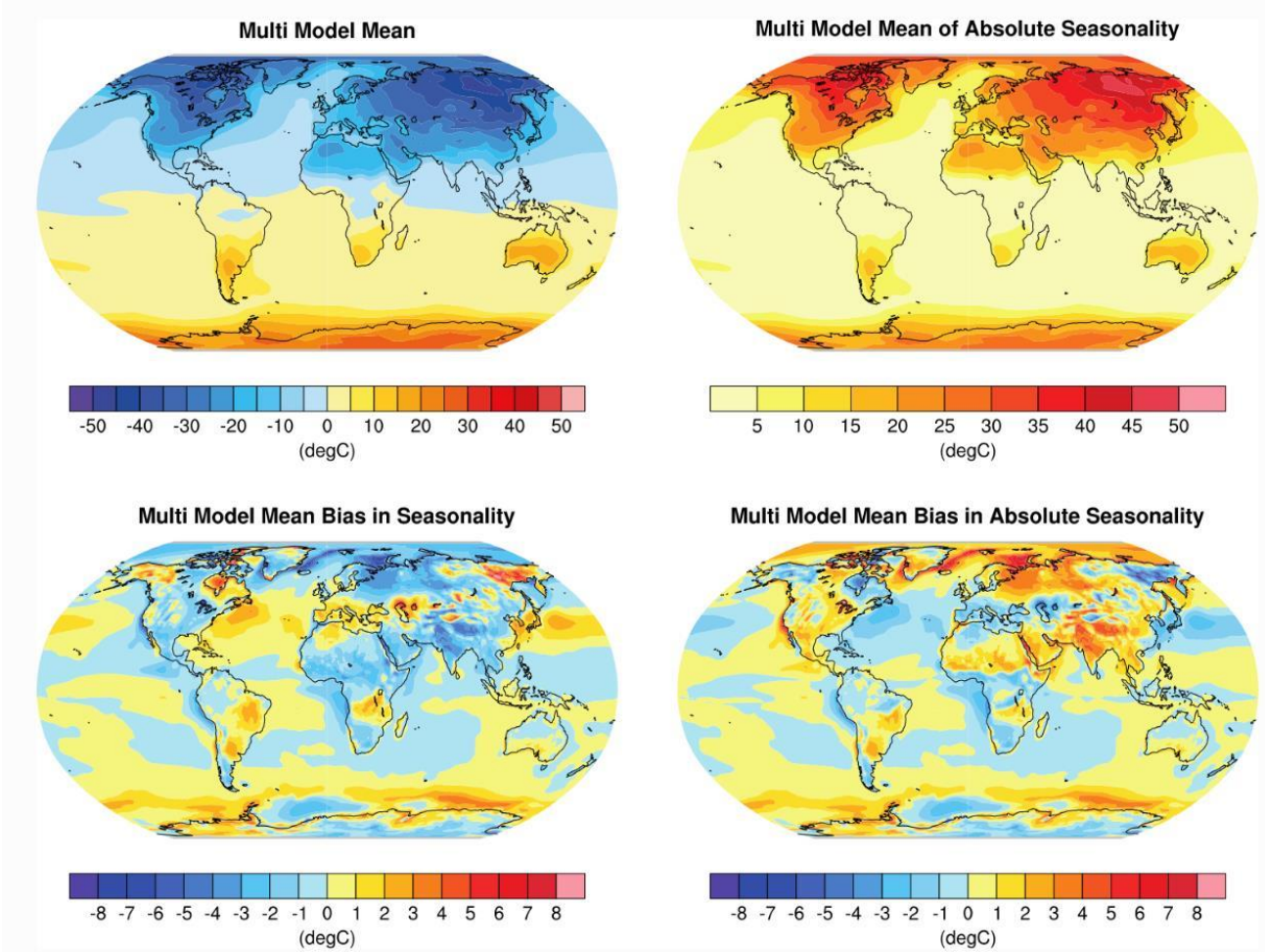




What is ESMValTool?

ESMValTool
Earth System Model Evaluation Tool

- Helps to analyze climate data
- Provides provenance and citation information.
- Supports several programming languages and operating systems.
- Helps efficient data processing.



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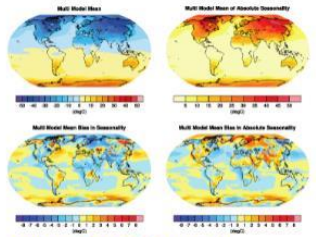
It facilitates the analysis of Earth system model's data.

What can ESMValTool do for you?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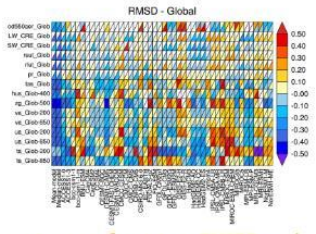

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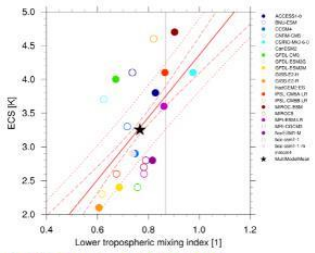

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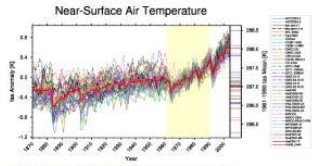

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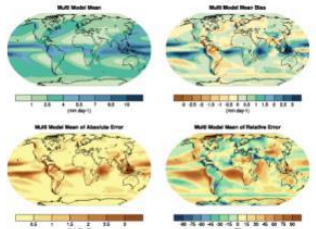
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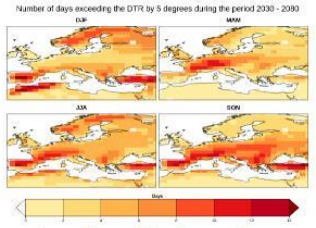

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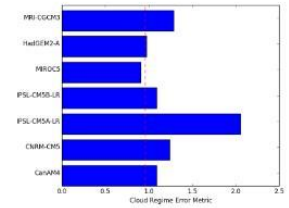
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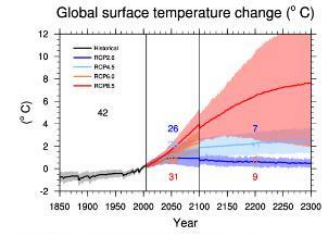

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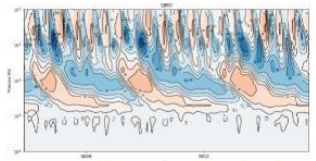
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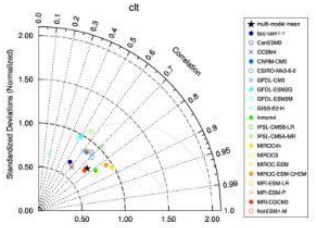

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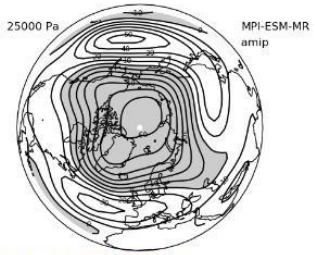

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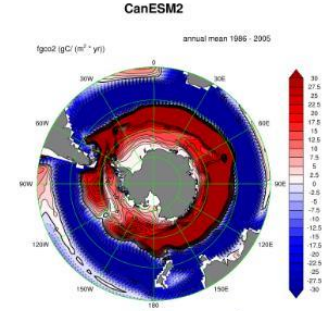


recipe_russell18jgr.yml

- A collection of scripts with extensive documentation. https://docs.esmvaltool.org/
- An online tutorial https://esmvalgroup.github.io/ESMValTool_Tutorial/

Challenge: Processing of Data

Utilities
- Load Concatenate, save files
- Fix metadata, or CF (Standard) compliance.
- Adjust CF compliance strictness

Time
- Extract seasons, months, annual averages
- Average long time dimension

Area / Volume
- Regrid
- Extract regions
- Extract Depth range or specific depth
- Extract transect
- Averages, weighted by area, volume etc.
- Depth integration
- Zonal mean

Masks
- Mask regions

Multi-model statistics

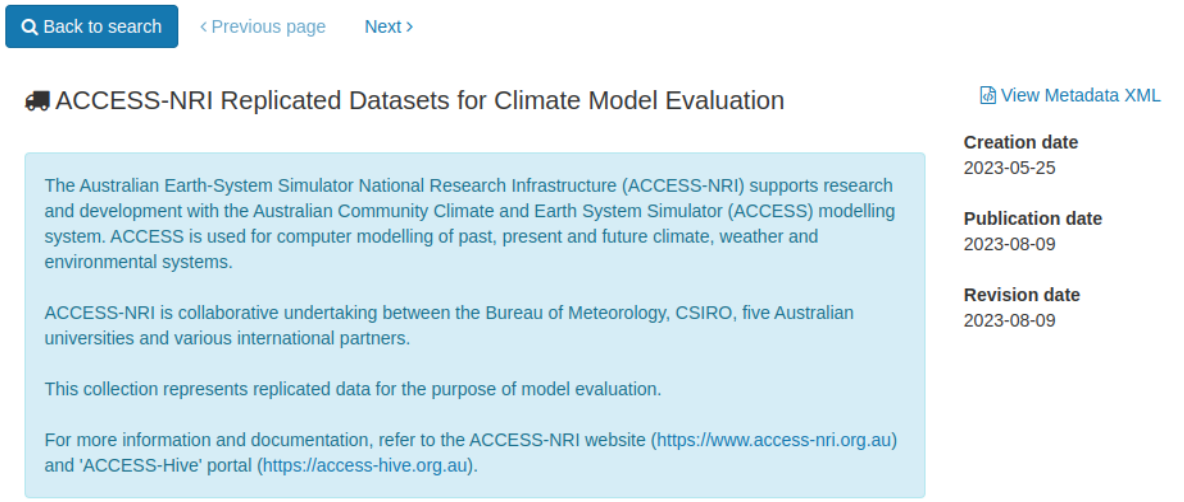
Standardisation still lacking... File formats, metadata information, variable names etc.

Data: Observations and Model Outputs

- **ACCESS-NRI Observation Data collection at NCI: ct11**

Challenges:

- **Many datasets**
- **Many formats**
- **Licensing?**



Model Outputs:

Models produce large amounts of outputs that need to be processed and indexed 100s of TB of data available on NCI.

INTAKE

SEE YOU AT THE WORKSHOP !!

MED PHASE 1 (2022)

LAND Evaluation Workflow v1

OCEAN Evaluation Workflow v1

ATMOSPHERE Evaluation Workflow v1

ILAMB

ESMValTool

Indexing v1

Working Groups Inputs

Core Land Observations

Core Ocean Observations

Core Atm Observations

ACCESS Live Diagnostics v1

Working Groups Inputs

Core Land Recipes

Core Ocean Recipes

Core Atm Recipes

ACCESS-NRI Workshop

MED Tracker

ACCESS-MED Portal

Analysis Envs

Continous Testing

Training Material / Documentation