

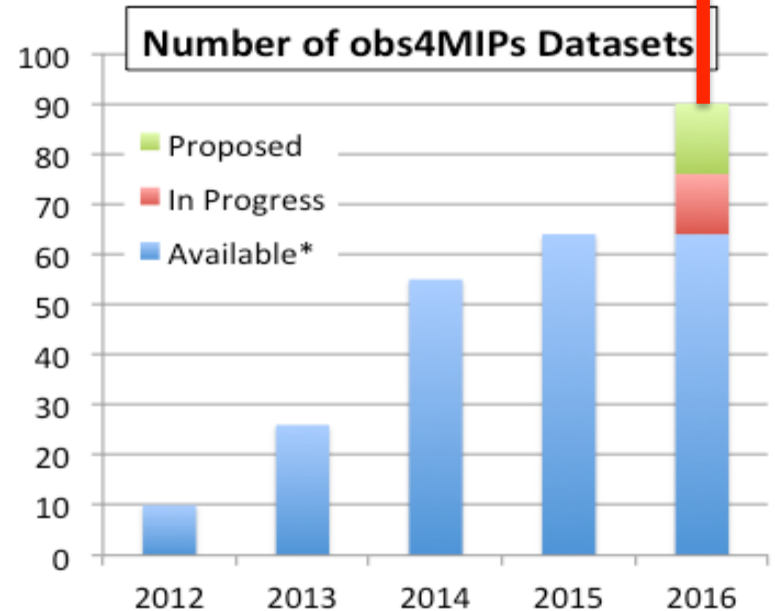
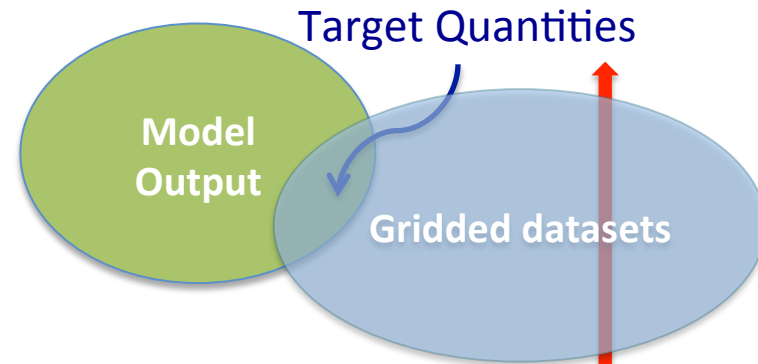
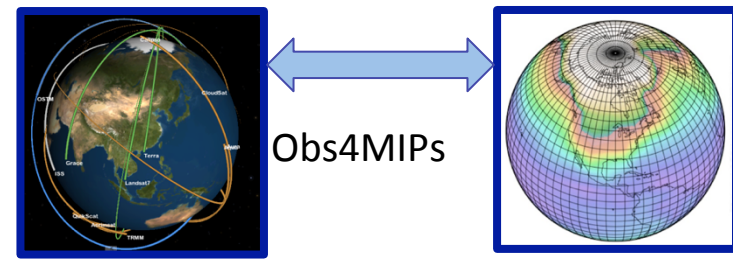
**An update on
obs4MIPs,
evaluation tools for CMIP6,
and the WGNE/WGCM climate model diagnostic & metrics panel**

Peter Gleckler (PCMDI) and Veronika Eyring (DLR)

obs4MIPs

<https://www.earthsystemcog.org/projects/obs4mips/>

- A Project for identifying, documenting and disseminating observations for climate model evaluation.
- Data sets accessible on the ESGF alongside CMIP model output, **adhering to the same data conventions**
- Guided by the WCRP Data Advisory Council obs4MIPS Task Team



.... and growing!

WDAC Observations for Model Evaluation Task Team

Peter Gleckler, co-chair, PCMDI and Duane Waliser, co-chair, JPL/NASA

Mike Bosilovich, GSFC/NASA

Helene Chepfer, IPSL

Veronika Eyring, DLR

Robert Ferraro, JPL/NASA

Pierre-Phillipe Mathieu, ESA

Jerry Potter GSFC

Roger Saunders, UKMO

Jörg Schulz, EUMETSAT

Karl Taylor, PCMDI

Jean-Noël Thépaut, ECMWF

Additional regular contributors: Otis Brown, Michel Rixen, Sophie Cloché (IPSL)

Tsengdar Lee (NASA) and Renu Joseph (DOE)

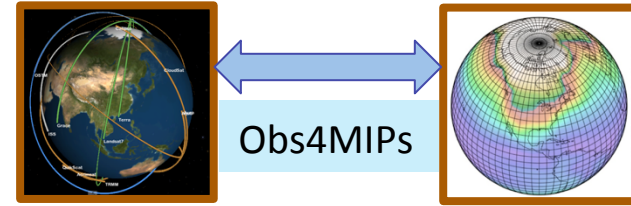
Luca Cinquini (JPL) – CoG technical support

Denis Nadeu (PCMDI) – ezCMOR development

Jim Biard (NCEI) and Matthias Tuma (WCRP)

... and many others


obs4MIPs: The 4 Commandments




1. Use the CMIP5* Standard Model Output as guideline for selecting observations
2. Observations to be formatted the same as CMIP Model output (e.g. NetCDF files, CF Convention)
3. Hosted side by side on the ESGF with CMIP model output
4. Include a Technical Note for each variable describing observation and use for model evaluation (at graduate student level) – possible coordination with ESDOCS

* obs4MIPs conventions are being updated to be consistent with CMIP6

Data access and project connectedness

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If you had an openid issued by the old "hydra.fsl.noaa.gov" server, your new openid will contain the string "esgf.esrl.noaa.gov" instead.
For example, instead of using: https://hydra.fsl.noaa.gov/esgf/oidp/openid/your_username
use instead: https://esgf.esrl.noaa.gov/esgf/oidp/openid/your_username
(or choose "NOAA/ESRL" in the openid pull down menu).
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Obs4MIPs

You are at the CoG-CU node

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Enter Text: [Search](#) [Reset](#) Display 10 results per page [More Search Options](#)

Show All Replicas Show All Versions Search Local Node Only (Including All Replicas)

Total Number of Results: 79
-1- 2 3 4 5 6 Next >>
Please login to add search results to your Data Cart
Expert Users: you may display the search URL and return results as XML or return results as JSON

- obs4MIPs TES Mole Fraction of O3 L3 Monthly Data**
Description: Obs- TES model output prepared for obs4MIPs NASA-JPL observation
Data Node: esgf-data.jpl.nasa.gov
Version: 20110608
Total Number of Files (for all variables): 3
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs AIRS Air Temperature L3 Monthly Data**
Description: Obs-AIRS model output prepared for obs4MIPs NASA-JPL observation
Data Node: esgf-data.jpl.nasa.gov
Version: 20110608
Total Number of Files (for all variables): 3
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs MLS Air Temperature L3 Monthly Data**
Description: Obs-MLS model output prepared for obs4MIPs NASA-JPL observation
Data Node: esgf-data.jpl.nasa.gov
Version: 20111025
Total Number of Files (for all variables): 3
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs QuikSCAT Northward Near-Surface Wind L2B Monthly Data**
Description: Obs-QuikSCAT model output prepared for obs4MIPs NASA-JPL observation
Data Node: esgf-data.jpl.nasa.gov
Version: 20120411
Total Number of Files (for all variables): 3
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs QuikSCAT Eastward Near-Surface Wind L2B Monthly Data**
Description: Obs-QuikSCAT model output prepared for obs4MIPs NASA-JPL observation
Data Node: esgf-data.jpl.nasa.gov
Version: 20120411
Total Number of Files (for all variables): 3
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs.NASA-JPL.GNSS_RO.zg.monClim**
Description: Obs-GNSS RO output prepared for obs4MIPs NASA-JPL retrievals
Data Node: esgf-data.jpl.nasa.gov
Version: 20160601
Total Number of Files (for all variables): 1
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs MLS Mass Fraction of Cloud Ice L3 Monthly Data**
Description: Obs-MLS model output prepared for obs4MIPs NASA-JPL observation
Data Node: esgf-data.jpl.nasa.gov
Version: 20160504
Total Number of Files (for all variables): 1
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs SSMI Water Vapor NASA EOSDIS Data Level 3 Monthly Data**
Description: Monthly mean total precipitable water (total column water vapor) on a 1.0 degree grid made from RSS Version-7 microwave radiometer data
Data Node: esgf-data.jpl.nasa.gov
Version: 20160523
Total Number of Files (for all variables): 2
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)
- obs4MIPs SSMI Near-Surface Wind Speed NASA EOSDIS Data Level 3 Monthly Data**
Description: Monthly mean near surface windspeed on a 1.0 degree grid made from RSS Version-7 microwave radiometer data
Data Node: esgf-data.jpl.nasa.gov
Version: 20160523
Total Number of Files (for all variables): 2
[Show Metadata](#) | [Show Files](#) | [THREDDS Catalog](#) | [WGET Script](#) | [LAS Visualization](#) | [Tech Note](#) | [Globus Download](#)

- Obs4MIPs data (and ana4MIPs) are available on ESGF through the CoG
- Current contributions (~80) have been made to 7 different nodes
- ~100 additional datasets have been proposed to the Task Team

Technical considerations:

Making observational data consistent with CMIP model output

- CMOR3 can accommodate gridded observations – a big improvement
- Making the process easier - CMOR3 is being made available with a python interface with examples of how to prepare gridded datasets
- obs4MIPs conventions:
 - Controlled vocabulary is being synchronized with CMIP6
 - To be revised soon after CMIP6 data conventions are finalized
- Efforts are underway to accommodate
 - in-situ data
 - Ancillary information (uncertainties, addnl supporting data and metadata)

obs4MIPs

Dataset Suitability & Maturity Indicators (DRAFT)

Technical Requirements			
Meets obs4MIPs data technical requirements	Data suitably processed with CMOR and/or consistent with obs4MIPs standards	Largely complete with minor metadata inconsistencies	Non-compliant. Should be removed from database!
Includes obs4MIPs technical note information	Complete technical note information provided	Technical note information incomplete and/or could be improved	Technical note not provided
Dataset Suitability and Maturity			
Closeness or robustness of measurement to observed reference quantity	Firmly established and/or validated methodology	Indirect means of calculation or observations only providing partial constraint (e.g. ocean surface latent heat flux)	Largely model-derived quantity (e.g. LAI, root zone soil moisture, NPP)
Maturity with respect to climate model evaluation	Multiple peer-reviewed examples of application to CMIP climate model evaluation	One peer-reviewed example of application to CMIP climate and/or examples of other sorts of model evaluation.	As of DATE-TBS, no significant application to climate model evaluation
Provision for robust uncertainty information	Uncertainty information provided per retrieval/grid point	General uncertainty information given relative to the methodology and dataset as a whole - backed by actual field/in-situ validation exercises	No uncertainty information provided
Complexity of Model Observation Comparison	One to one comparison (e.g. apples to apples)	Requires some post processing of model output (e.g. vertical integral, ratio, application of vertical retrieval weighting function)	Requires forward model to be run on model simulation output

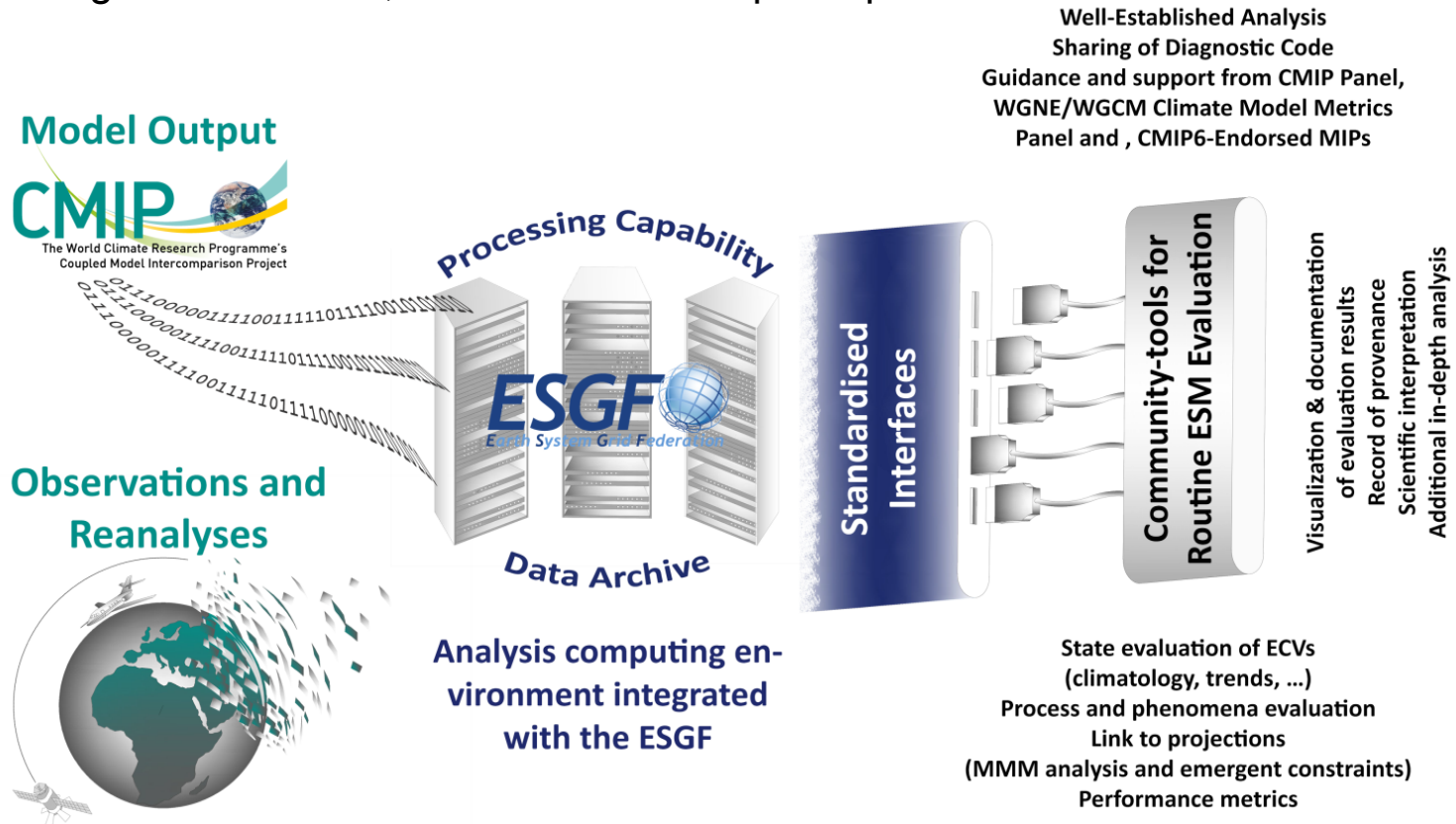
Towards improved and more routine Earth system model evaluation in CMIP



Veronika Eyring¹, Peter J. Gleckler², Christoph Heinze³, Ronald J. Stouffer⁴, Karl E. Taylor², V. Balaji^{4,5}, Eric Guilyardi^{6,7}, Sylvie Joussaume⁸, Stephan Kindermann⁹, Bryan N. Lawrence^{7,10}, Gerald A. Meehl¹¹, Mattia Righi¹, and Dean N. Williams²

Envisaged Workflow for Model Evaluation in CMIP

- We argue that the community has reached a critical juncture at which many baseline aspects of ESM evaluation need to be performed much more efficiently
- The resulting, increasingly systematic characterization of models will, compared with early phases of CMIP, more quickly and openly identify strengths & weaknesses of the simulations.
- This activity also aims to assist modelling groups in improving their models
- Running alongside the ESGF, as soon as the output is published



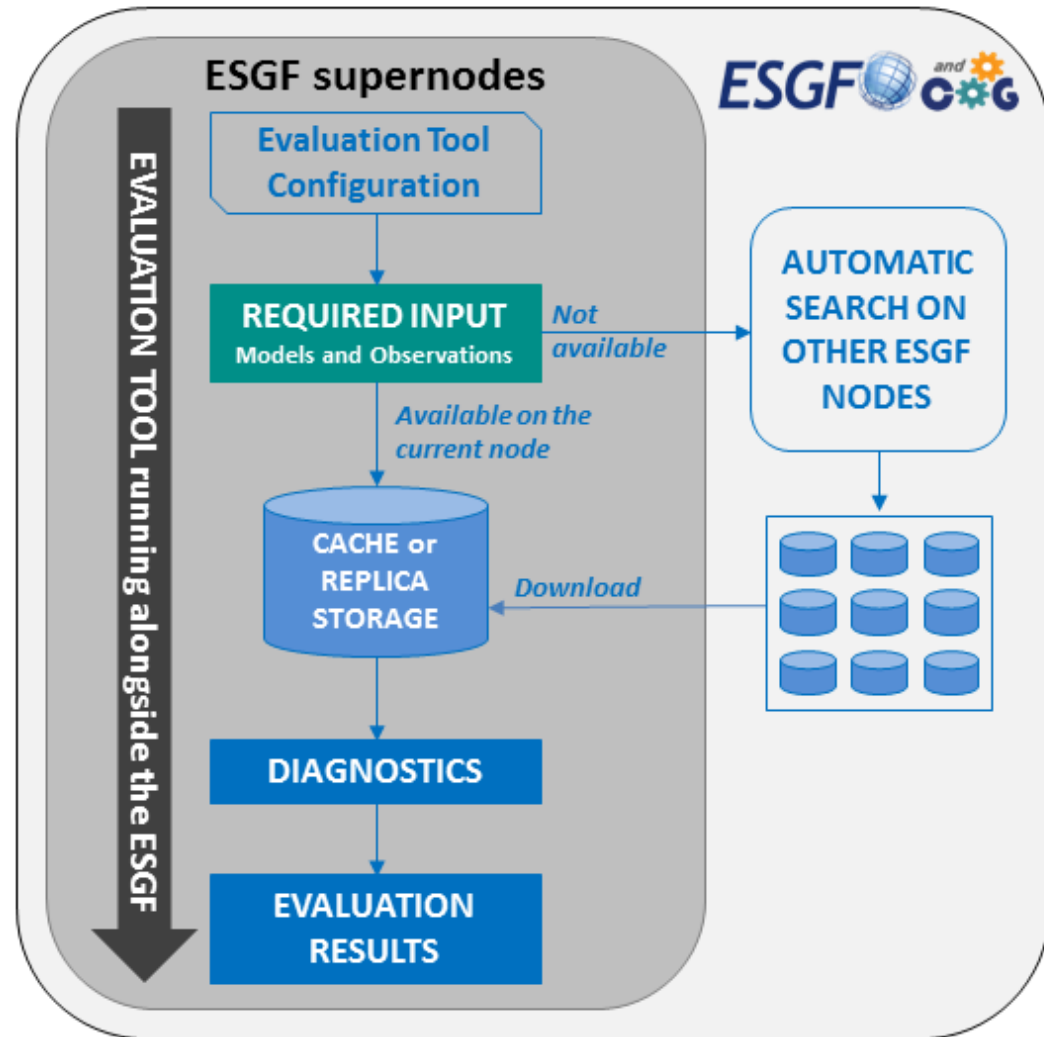
Envisaged Workflow for Model Evaluation in CMIP6

- Quasi-operational / Centrally executed / Data to Code -

Due to the **high volume of the data** in CMIP6, ESGF replication is likely to be **slow** (took months in CMIP5)

It was therefore recommended to the ESGF teams that the **data used by the CMIP evaluation tools** be replicated with **higher priority**.

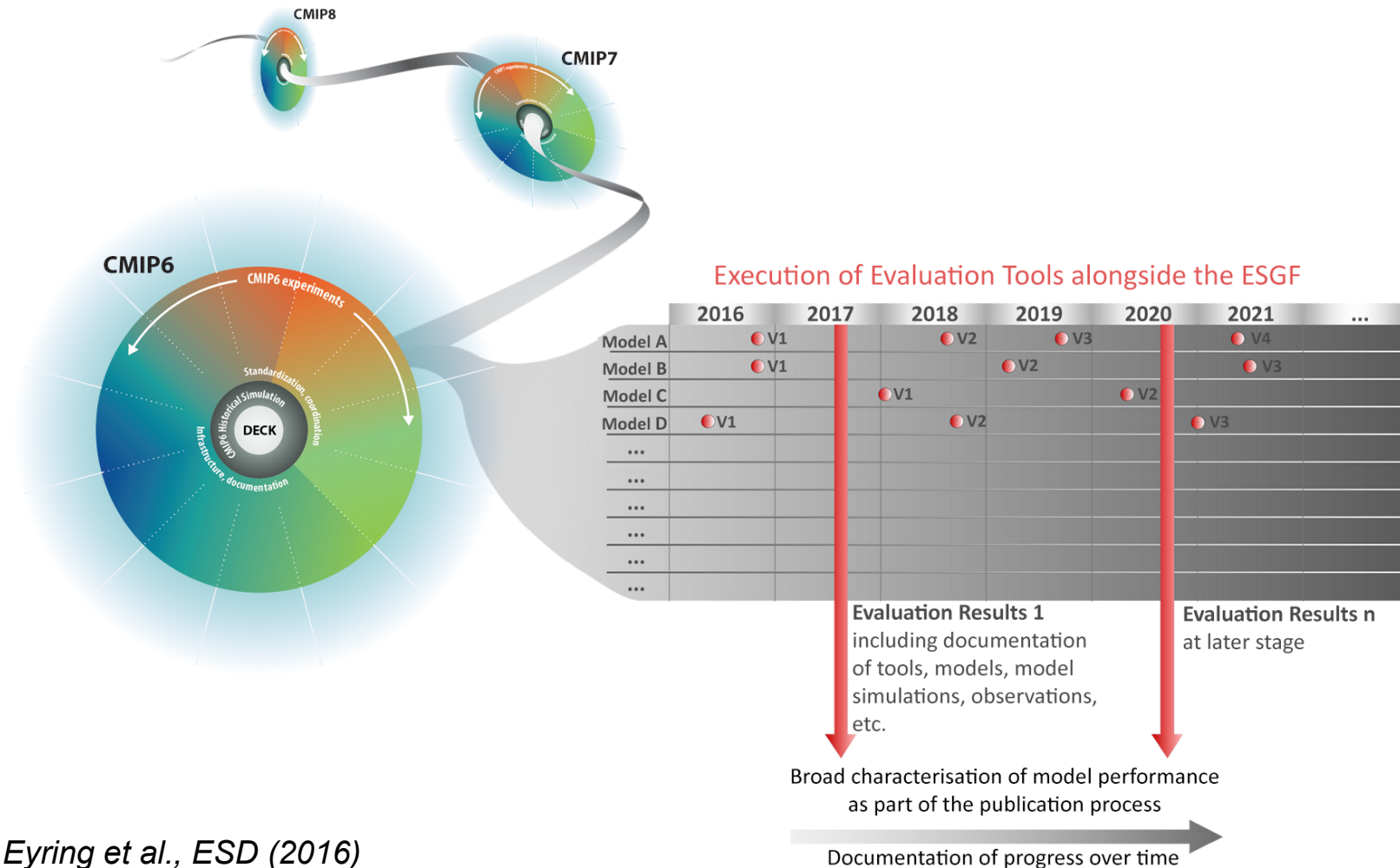
This should substantially **speed up** the evaluation of model results after submission of the simulation output to the ESGF



Long-term vision for model evaluation workflow in CMIP

- Operational / Part of Publication Process / Code to Data -

- Evaluation tools to be further developed to ensure that performance and process-based metrics definitions in these tools evolve as scientific knowledge progresses
- Will also allow to monitor progress over time



Developing capabilities likely to be used in CMIP6 with the intent of making all codes and results publically available

A few examples:

- ESMValTool (with CVDP and several others)
- PCMDI Metrics Package
- ILAMB

... there other capabilities that have not made routine use in CMIP a priority

WGNE/WGCM climate model diagnostic and metrics panel



Following WMAC recommendation

Members have relevant/diverse experience, and liaison with key WCRP activities:

Beth Ebert (BMRC) – JWGV/WWRP, **WMO forecast metrics**

Veronika Eyring (DLR Germany) – WGCM/SPARC/CMIP6, **stratosphere, ESMs**

Pierre Friedlingstein (U. Exeter) – IGBP, **carbon cycle**

Peter Gleckler (PCMDI), chair – WDAC, **atmosphere and ocean**

Simon Marsland (CSIRO) – CLIVAR OMDP, WGCM, **ocean**

Robert Pincus (NOAA) – GEWEX/GCSS, **clouds/radiation**

Karl Taylor (PCMDI) – WGCM/CMIP, **atmosphere, CMIP**

Keith Williams (UK Met office) – WGNE, **Transpose AMIP, clouds**

Diagnostics and Metrics panel tasked to raise awareness and coordination of developing capabilities in CMIP6

- Establish and maintain a catalogue of developing tools and capabilities as a resource for modeling groups and CMIP analysts
- Encourage “best practices”: target CMIP data, open source, documentation, support, etc.
- Identify and encourage synergies where possible

The panels' catalogue of developing capabilities

- What analysis does this capability offer?
- Is it intended for use as a team capability or made available for others to use?
- How does one download and install the software?
- How is version control maintained? Support?
- What are the software dependencies?
- Is it designed to work easily with the CMIP data structure?
- Is it suitably documented?
- Does it include functional test cases?
- Are there opportunities for users to contribute to the capability?

A new paradigm for CMIP...

- Peer-reviewed research publications will continue to be the primary deliverable of CMIP, however...
- We can expect CMIP6 results from many well-established diagnostics and metrics to be made much more efficiently and readily available
- Lots of questions and issues regarding traceability/reproducibility, citation of results, level of access, etc.