



# Toward community-based evaluation of climate models: Obs4MIPs, the metrics panel and evaluation tools for CMIP6

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WGCM18, Grainau/Garmisch-Partenkirchen, October 8-10, 2014

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# Opportunities . . .

- As an ongoing exercise, the DECK provides a design target
- Scientists and software developers can further exploit the data conventions
- Many modeling groups now maintain a CMIP compliant data stream
- This environment commonality presents possibilities to greatly advance how we evaluate models by:
  - Applying same data conventions, more effectively organize observations used for model evaluation (obs4MIPs)
  - Retain CMIP evaluation capabilities for repeated use

# obs4MIPs update

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

- ☒ A centralizing activity of the WCRP Data Advisory Council (WDAC)
- ☒ Now hosted on CoG with direct data search on ESGF
- ☒ All data is technically aligned with CMIP data structure
- ☒ Over 50 products with technical notes, and growing

## WDAC observations for model evaluation task team:

D. Waliser and P. Gleckler (co-chairs), S. Bony, M. Bosilovich, H. Chepfer, V. Eyring, R. Ferraro, R. Saunders, J. Schultz, K. Taylor, J-N Thepaut



.... and growing!



## Obs4MIPs

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## Satellite Products

Tech notes are available as indicated below for specific datasets.

CMIP Protocol Variables	Data Source	Time Period	Comments	QC?	TechNote?
<b>clisccp ; albisccp ; cttisccp ; cttisccp ; pctisccp</b> - ISCCP Cloud Area Fraction (Joint histogram of optical thickness and cloud top pressure) ...	ISCCP	1983-2008	CFMIP2 variable contributed by CFMIP-OBS		
<b>ta, hus</b> - Atm Temp, Specific Humidity	AIRS ( $\geq 300$ hPa)	9/02 - 5/11	AIRS +MLS needed to cover all required pressure levels	Y	Y
<b>ta, hus</b> - Atm Temp, Specific Humidity	MLS ( $< 300$ hPa)	8/04 - 12/10	AIRS +MLS needed to cover all required pressure levels	Y	Y
<b>tos</b> - Sea Surface Temperature	AMSR-E	6/02 - 12/10		Y	Y
<b>rlut, rlutcs, rsdt, rsut, rsutcs</b> - TOA outgoing LW & SW Radiation, Incident SW Radiation	CERES	3/00 - 6/11		Y	Y
<b>rlids, rldscs, rlus, rsds, rsdscs, rsus, rsuscs</b> - Surface down- and upwelling LW & SW Radiation	CERES	3/00 - 2/10	Some isolated inconsistent data values. An update is in progress.		Y



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Parent projects (0)

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Ana4MIPs

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*Start typing, or use the 'Delete' key to  
show all available tags.*

Direct access  
to data on  
ESGF

# obs4MIPs-CMIP6 meeting

NASA HQ, Washington D.C., April 30 – May 1, 2014

## Several consensus recommendations:

- ☒ Expand the dataset holdings (no consensus on priorities)
  - Higher frequency data and model output for more process-oriented evaluation, e.g., a “golden era” of sampling?
  - Relax the strictness of the model equivalent requirement
  - Reliable and defensible error characterization/estimation of observations

BAMS meeting summary (Ferraro et al., in review) with detailed meeting report to be made available on obs4MIPs CoG

# Advancing obs4MIPs

## Challenges:

- Task team refining protocol for including and documenting products (e.g., establishing a maturity matrix)
- Lots of technical details (preparing data, publishing on ESGF, etc.) .... WIP is made aware of infrastructural challenges

## Opportunities

- More emphasis on higher frequency satellite data
- Setting a precedent for other observational communities
- Further alignment with CMIP (e.g., server side analysis via ESGF)

# The WGNE/WGCM Climate Model Metrics Panel

Members: B. Ebert, V. Eyring, P. Friedlingstein, P. Gleckler (chair), H. Hewitt, Simon Marsland, R Pincus, K Taylor

## Status report

Successfully promoted the development of model performance metrics

Identified some useful benchmarks (well-established in literature)

Monitored a rapidly evolving research topic (e.g., skill scores, process oriented, model independence, emergent constraints, ...)

Have *not* selected a "limited set of most important" limited set

Strategy for CMIP6 now formulated

## Making analysis capabilities more accessible for repeated use

- The metrics panel working to develop a catalogue of CMIP related analysis tools and monitoring characteristics such as:
  - What software is required (e.g., CDO, R, NCL, CDAT, python, Fortran, etc)?
  - Are codes designed to work, as is, with the CMIP data structure?
  - What is the installation procedure/effort required?
  - .....
- Metrics panel to motivate adherence to CMIP standards, and encourage CMIP research community (MIPs) to contribute “shareable” codes
- Significant technical challenge, but potential for great benefit

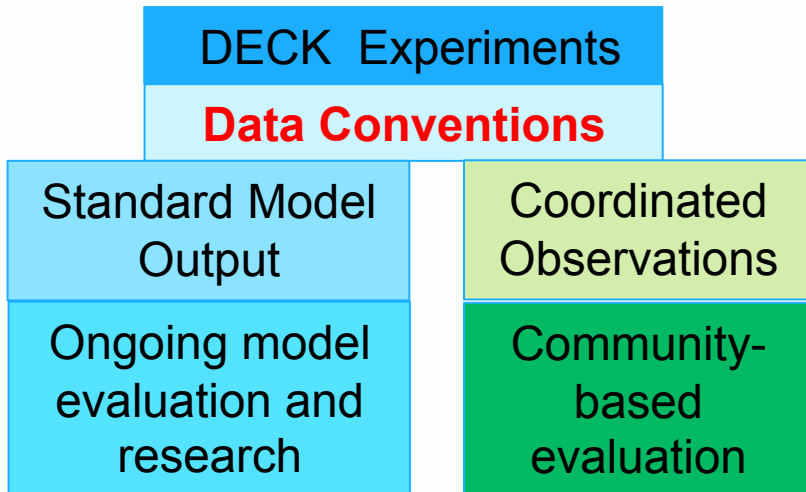


# Recent examples of developing capabilities for model evaluation

- PCMDI's metrics package / ESMValTool
- NCAR Climate variability and diagnostics package
- CFMIP diagnostics and metrics codes
- ILAMB benchmarking
- GEWEX GASS
- Toolkit for Extreme Climate Analysis (TECA)

.....

# Summary



## Significant challenges (examples)

- Many hurdles to organize a diversity of observations
- Scientists use different analysis tools (will continue to do so), complicating collaboration/sharing

## Possibilities for CMIP6 and beyond

- At a minimum – some useful tools made available to modeling groups, standard diagnostics performed on all simulations with better access to obs
- Target – a transformation in how we do collaborative research