

# An update on obs4MIPs



## WDAC Observations for Model Evaluation Task Team

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Sasha Ames (LLNL) - Publishing

Sophie Cloché (IPSL) – CFMIP archive

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... and many others

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## Presentation outline

- Quick review and status report
- Opportunities/challenges: solutions in the works
- Transition to supporting CMIP6  
(and other model evaluation) research
- Project needs related to ESGF

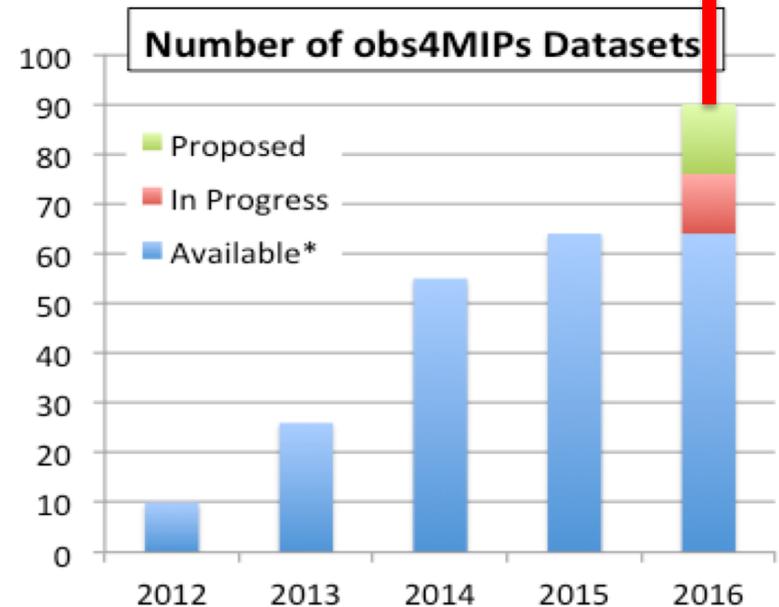
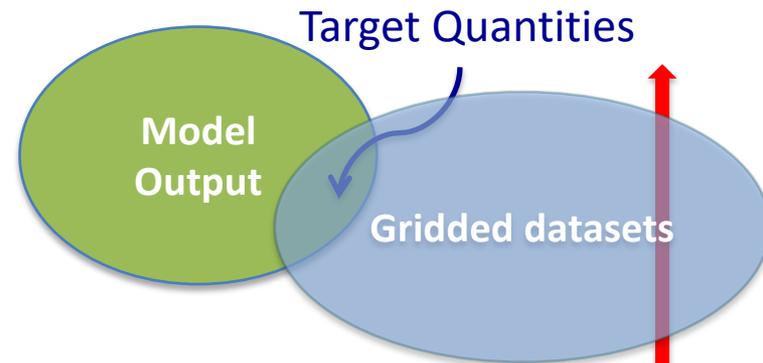
# obs4MIPs

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



- A project for identifying, documenting and disseminating observations for climate model evaluation in WCRP model intercomparisons, notably CMIP.
- Data (and tech notes) accessible with the distributed CMIP model output, adhering to same conventions
- Guided by the WCRP Data Advisory Council obs4MIPS Task Team

**Complete (~125\*)**  
**In Progress\* (~15)**  
**Proposals from Data Call (~100)**



... and growing



# obs4MIPs: The 4 Commandments



1. Use CMIP Standard Model Output<sup>\*</sup> as guide to identify observations
2. Observations to be structured in coordination with the CMIP output (data conventions, common vocabularies and infrastructure)
3. Hosted and searchable side-by-side with CMIP model output on ESGF
4. Include a Technical Note for each variable describing observation and use for model evaluation (at graduate student level)

<sup>\*</sup> obs4MIPs conventions have been updated to be technically aligned with CMIP6

# obs4MIPs origins and milestones



Exploratory meeting at PCMDI with NASA science teams  
2011

Selected NASA datasets published on ESGF  
2012 - 2013

CFMIP-OBS dataset published on ESGF  
2013 - 2014

International endorsement and guidance, WCRP data advisory Council (WDAC)  
2014

CMIP6 planning meeting at NASA HQ  
2014

*Data call identified  
~100 new datasets*

*New contributions  
postponed until new  
data standards in place*

NOAA and ESA prepare contributions  
2017

Strategic preparations to strengthen project in preparation for CMIP6  
2016 - present

# Monitoring datasets across the federation:

Daily scans of ESGF nodes generates a catalog of available datasets

7 nodes, ~125 datasets

Hosted by Department of Energy  
Lawrence Livermore National Laboratory

Powered by ESGF and GGG  
Welcome, Guest | Login | Create Account

**obs4MIPs**  
Observations for Model Intercomparison Project

Home About Us Governance Contact Us

You are at the ESGF@DOE/LLNL node [Technical Support](#)

### Obs4MIPs Data Table

The following table is automatically updated with Obs4MIPs datasets available throughout the Earth System Grid Federation.

Instrument	Dataset Name	Variables	Tech Note	Maturity Indicators
AIRS	obs4mips.NASA-JPL_AIRS.hus.mon	Specific Humidity Specific Humidity Number of Observations Specific Humidity Standard Error		
AIRS	obs4mips.NASA-JPL_AIRS.ta.mon	Air Temperature Air Temperature Number of Observations Air Temperature Standard Error		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.husStderr.gn	Specific Humidity standard error		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.husNobs.gn	Specific Humidity number of observations		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.hurStderr.gn	Relative Humidity standard error		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.hurNobs.gn	Relative Humidity number of observations		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.hus.gn	Specific Humidity		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.hur.gn	Relative Humidity		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.taStderr.gn	Air Temperature standard error		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.ta.gn	Air Temperature		
AIRS-TA-2-0	obs4MIPs.NASA-JPL_AIRS-TA-2-0.mon.taNobs.gn	Air Temperature number of observations		
AMSRE	obs4mips.REMSS.AMSRE.tos.mon	Sea Surface Temperature Sea Surface Temperature Number of Observations Sea Surface Temperature Standard Error		
ARC-SST-1-1	obs4MIPs.UOE.ARC-SST-1-1.mon	sea surface temperature		
ATSR2-AATSR	obs4mips.SU.ATSR2-AATSR.od550aer.mon	latitude longitude Ambient Aerosol Optical Thickness at 550 nm time		
AVISO	obs4mips.CNES.AVISO.zos.mon	Sea Surface Height Above Geoid Sea Surface Height Above Geoid Number of Observations Sea Surface Height Above Geoid Standard Error		
CERES-EBAF	obs4MIPs.NASA-LaRC.CERES-EBAF.atmos.mon	TOA Outgoing Longwave Radiation TOA Outgoing Clear-Sky Longwave Radiation TOA Incident Shortwave Radiation TOA Outgoing Shortwave Radiation TOA Outgoing Clear-Sky Shortwave Radiation		
CERES-EBAF_Surface	obs4MIPs.NASA-LaRC.CERES-EBAF_Surface.atmos.mon	Surface Downwelling Longwave Radiation Surface Downwelling Clear-Sky Longwave Radiation Surface Upwelling Longwave Radiation Surface Downwelling Shortwave Radiation Surface Downwelling Clear-Sky Shortwave Radiation Surface Upwelling Shortwave Radiation Surface Upwelling Clear-Sky Shortwave Radiation		
CFMIP-Obs-CALIPSO	obs4MIPs.CFMIP-Obs.CALIPSO.Scattering.Ratio.srbox2.L3.Monthly.Day.Time.Data	CALIPSO Scattering Ratio		
CFMIP-Obs-CALIPSO	obs4MIPs.CFMIP-Obs.CALIPSO.Scattering.Ratio.srbox2.L3.Monthly.Data	CALIPSO Scattering Ratio		
CFMIP-Obs-CALIPSO	obs4MIPs.CFMIP-Obs.CALIPSO.Scattering.Ratio.srbox2.L3.Monthly.Night.Time.Data	CALIPSO Scattering Ratio		
CFMIP-Obs-CALIPSO	obs4MIPs.CFMIP-Obs.CALIPSO.Scattering.Ratio.CFAD.L3.Monthly.Night.Time.Data	CALIPSO Scattering Ratio		
CFMIP-Obs-CALIPSO	obs4MIPs.CFMIP-Obs.CALIPSO.Scattering.Ratio.CFAD.L3.Monthly.Day.Time.Data	CALIPSO Scattering Ratio		

# obs4MIPs planning meeting for CMIP6

April 2014, NASA HQ but still relevant!



Selected consensus recommendations that applied to all of the meeting topic areas:

- **Expand the inventory**
- **Include more higher frequency data**
- **Reliable and defensible **error characterization**/estimation of observations**
- **Include datasets in support of **off-line simulators** (prime example: COSP—Cloud Feedback Model Intercomparison Project [CFMIP] Observation Simulator Package)**
- **Collocated observations, including in-situ datasets** for processes level diagnostics
- **Precise definitions of data products** (what's actually being reported), including biases, and precise definitions of the model output variables are required

**USERS LOVE IT BUT THEY WANT EVERYTHING!**

- Two enhancements, addressing recommendations from 2014 workshop:
  - obs4MIPs [data indicators](#) now well defined
  - [Mechanism for including Supplemental Information](#)
- CMIP6/obs4MIPs data convention integration completed  
**([obs4MIPs Data Specifications ODS 2.1](#))**
- Management of controlled vocabularies now established on GitHub
- Collaboration with ES-DOC to handle obs4MIPs tech notes, DOI's
- CoG site recently transferred to LLNL, currently testing for transition
- Periodic team telecons, presentations at scientific meetings
- Two manuscripts in-prep (#1 strategy, #2 data description governance)

# obs4MIPs Dataset Suitability & Maturity Indicators

Enables us to expand what data gets included

<b>Technical Requirements</b>		<b>Dataset Suitability and Maturity</b>			<b>Comparison Complexity</b>
Meets obs4MIPs data technical requirements	Includes obs4MIPs technical note information	Closeness or robustness of measurement to observed reference quantity	Maturity with respect to climate model evaluation	Provision for robust uncertainty information	Complexity of Model Observation Comparison
Data suitably processed with CMOR and/or consistent with obs4MIPs standards	Complete technical note information provided	Measurement approach provides a very close relationship to observation quantity	Multiple peer-reviewed examples of application to climate model evaluation	Uncertainty information provided per retrieval/grid point	Comparison can be made directly with CMIP model output variable
Largely complete with minor metadata inconsistencies	Technical note information incomplete and/or could be improved	Measurement approach requires complex and/or non-linear retrieval methods and/or subjective inferences/definitions	One peer-reviewed example of application to climate or component model evaluation.	General uncertainty information given relative to the methodology and dataset as a whole - backed by actual field/in-situ validation exercises	Comparison requires some simple post processing of CMIP output variable(s) (e.g. vertical integral or ratio of two variables)
Non-compliant. Should be removed from database!	Technical note not provided	Measurement approach requires significant use/influence from complex or weakly constrained model and/or has significant ambiguity in definition(s)	No peer-reviewed examples of application to model evaluation	No uncertainty information provided	Comparison requires complex processing of CMIP output (e.g. "simulator", budget calculation)

- Institute +
- Instrument +
- Time Frequency +
- Realm +
- Variable +
- Variable Long Name +
- CF Standard Name +
- Data Node -
- esgf-data.jpl.nasa.gov (16)

Enter Text:

Display 10 results per page [More Search Options](#)

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

Search Constraints:  esgf-data.jpl.nasa.gov

Total Number of Results: 16

<< Previous 1 -2-

[Add all displayed results to Data Cart](#) [Remove all displayed results from Data Cart](#)

Expert Users: you may display the search URL and return results as XML or return results as JSON

- 11. **obs4mips.RSS.SSMI.sfcWind.mon**  
Data Node: esgf-data.jpl.nasa.gov  
Version: 20160523  
Total Number of Files (for all variables): 2  
Full Dataset Services: [Show Metadata](#) [List Files](#) [THREDDS Catalog](#) [WGET Script](#) [LAS Visualization](#) [summary](#) [Globus Download](#)  
       
[Add to Data Cart](#)
- 12. **obs4mips.NASA-JPL.GNSS\_RO.ta.monClim**  
Data Node: esgf-data.jpl.nasa.gov  
Version: 20160601  
Total Number of Files (for all variables): 1  
Full Dataset Services: [Show Metadata](#) [List Files](#) [THREDDS Catalog](#) [WGET Script](#) [LAS Visualization](#) [summary](#) [Globus Download](#)  
       
[Add to Data Cart](#)
- 13. **obs4mips.REMSS.AMSRE.tos.mon**  
Data Node: esgf-data.jpl.nasa.gov  
Version: 20111031  
Total Number of Files (for all variables): 3  
Full Dataset Services: [Show Metadata](#) [List Files](#) [THREDDS Catalog](#) [WGET Script](#) [LAS Visualization](#) [summary](#) [Globus Download](#)  
       
[Add to Data Cart](#)
- 14. **obs4mips.NASA-JPL.QuikSCAT.sfcWind.mon**  
Data Node: esgf-data.jpl.nasa.gov  
Version: 20120411  
Total Number of Files (for all variables): 3  
Full Dataset Services: [Show Metadata](#) [List Files](#) [THREDDS Catalog](#) [WGET Script](#) [LAS Visualization](#) [summary](#) [Globus Download](#)  
       
[Add to Data Cart](#)
- 15. **obs4mips.CNES.AVISO.zos.mon**  
Data Node: esgf-data.jpl.nasa.gov  
Version: 20110829  
Total Number of Files (for all variables): 3  
Full Dataset Services: [Show Metadata](#) [List Files](#) [THREDDS Catalog](#) [WGET Script](#) [LAS Visualization](#) [summary](#) [Globus Download](#)  
       
[Add to Data Cart](#)
- 16. **obs4mips.NASA-JPL.TES.tro3.mon**  
Data Node: esgf-data.jpl.nasa.gov  
Version: 20110608  
Total Number of Files (for all variables): 3  
Full Dataset Services: [Show Metadata](#) [List Files](#) [THREDDS Catalog](#) [WGET Script](#) [LAS Visualization](#) [summary](#) [Supplementary Data](#) [Globus Download](#)      
[Add to Data Cart](#)

Color coded readiness indicators

Supplemental Information is "free form", accessible from "best estimate" but not searchable independently

Prototyped with JPL data

# Transitioning to new data standards

## Enabling an improved set of search facets



- Currently, most published data adheres to original standards
- Updating existing data to be ODS2.1 compliant is considered best option
- Inserting new attributes is trivial (CMOR not req'd), but registering content and re-publishing is required

GOAL: Implementing new set of search facets federation-wide

STRATEGY: Experiment with transition from old to new (data and facets) at a single node, with intent of providing template for other obs4MIPs nodes

# Technical Coordination of CMIP6 and obs4MIPs

Global attributes, Controlled Vocabulary (CV),  
Registered Content (RC), and Data Reference Syntax (DRS)



## Some key predefined global attributes in ODS2.1

Institution\_id (RC)

Variable\_id (CV)

Source\_id (RC)

Source\_version\_number (RC)

Region (CV)

Nominal\_resolution (CV)

Variant\_label

*Sample*

NOAA-NCEI'

'sfcWind'

'NOAA-NCEI-SeaWinds-1-2'

'1.2'

'global ocean'

'1x1 degree'

"BE" – "best estimate"

NEW!

CV and RC [maintained on obs4MIPs github](#)

# Tackling the transition

## Development site at LLNL

<https://esgf-fedtest.llnl.gov/search/obs4mips-llnl-dev/>

- Original NASA-JPL datasets have been updated to be ODS2.1 compliant
- Currently experimenting with new facet configuration for transition
- Transition will take time, but better to advance rather than reliance on stop gaps
- LLNL site with new facets, examples for supplemental information and dataset indicators can serve as example for other obs4MIPs sites

Home

Common

Source ID	+
Product	+
Realm	+
Variable	+
Variable Long Name	+
CF Standard Name	+
Data Node	+

CMIP5-era

Institute
Time Frequency

CMIP6-era

Institution ID	+
Frequency	+
Grid Label	+
Nominal Resolution	+
Region	+
Source Type	+
Source Version	+
Variant Label	+

# 2019 Targets

Winter'19	Spring'19	Summer'19	Fall'19	Winter'20
Re-publish existing obs4MIPs data as ODS2.1 compliant				
<i>JPL datasets</i>	<i>GSFC datasets</i>	<i>CFMIP-OBS?</i>		
Publish new contributions already compliant with ODS2.1				
<i>NOAA-NCEI datasets</i>	<i>ESA CCI</i>			
	Begin to address proposed contributions from broader community			
		<i>Submit two papers (strategy and conventions)</i>		

# What is needed to advance/improve obs4MIPs?

- PrePARE needs to be generalized to accommodate observations – among other things, this would ease the requirement for using CMOR
- Streamlined publication process (web based or other approach to open up numbers who can do it), especially providers with smaller holdings
- While a great deal of infrastructure is functioning well, a broader obs4MIPs would require more people doing hands on work.
- At some point, there will likely be a need to revisit how it is supported and governed.
- The [WGCM's WIP](#) may serve as a good example of how to do this, and perhaps could be further leveraged.

# Summary and Perspective

- obs4MIPs will facilitate CMIP6 model evaluation and research
- obs4MIPs task team has addressed many recommendations (e.g., enable more data and information to be included)
- Ongoing challenge: “greasing the wheels” for obs4MIPs data preparation and ESGF publication
- Goal for coming year is to get data in place for CMIP6, starting with a “transition facet template” to be turned on at LLNL in early 2019. Needs to accommodate data old and new (ODS 2.1 compliant) data.
- Efforts to advance obs4MIPs remain focused on gridded datasets. Expanding the scope to include in-situ data will required new contributors prepared to do substantial work

## Links to related material

- [CMIP6 data specifications](#)
- [obs4MIPs data specifications](#)
- [obs4MIPs tables controlled vocabulary \(github\)](#)
- [Draft user guide for preparing obs4MIPs \(google docs\)](#)

**EXTRAS**

# An update on obs4MIPs



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