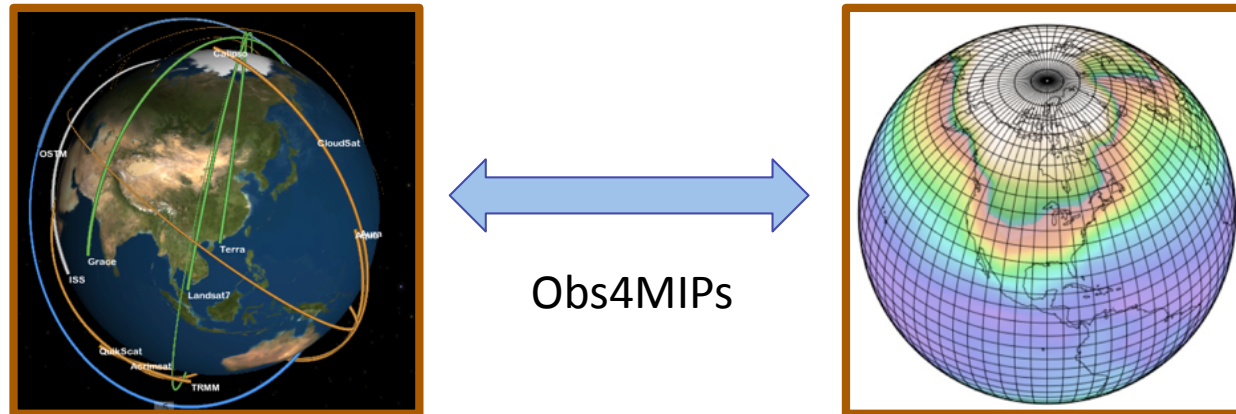


Observations for Model Intercomparison Projects (obs4MIPs): Facilitating the use of Satellite Data to Evaluate Climate Models



Jet Propulsion Laboratory
California Institute of Technology



Robert Ferraro (JPL), Peter Gleckler (PCMDI) and Karl Taylor (PCMDI), Duane Waliser (JPL)

NASA obs4MIPs Working Group
NASA HQ (Tsengdar Lee and Jack Kaye), DOE OBER (Renu Joseph)
ESG development (DeanWilliams, Luca Cinquini, Dan Crichton, etc.),
NASA satellite mission teams (e.g. CERES, AIRS, TES, MLS, MODIS, OVWs, REMSS, AVISO, TRMM)


CFMIP-OBS
Helene Chepfer, Gregory Cesana and Karim Ramage, with help from Yuying Zhang (LLNL), Roger Marchand (U. Washington), Robert Pincus (NOAA)



WGCM17, Victoria, October 2-4, 2013

Model and Observation Overlap

For what quantities are these comparisons viable?



ESGF Portal

Jet Propulsion Laboratory
California Institute of Technology

Welcome to this ESGF P2P Node

ESGF
Earth System Grid Federation

NASA obs4MIPs

These NASA datasets are provided as part of an experimental activity to increase the usability of NASA satellite observational data for the model and model analysis communities. These are not standard NASA satellite instrument products. They may have been reprocessed, reformatted, or created solely for comparisons with the CMIP5 model. Community feedback to improve and validate the datasets for modeling usage is appreciated.

Quick Links

- Create Account
- MyProxyLogin
- Expert Search (XML)
- Wget Script Generator
- ESGF Integrated RSS feed
- Contact ESFG

Instructions

- ESGF Full User Guide
- Search Help
- Search Controlled Vocabulary

CMOR Table Atmos: Monthly Mean Atmospheric Fields and Some Surface Fields

(All Saved on the Atmospheric Grid)

In CMOR Table Atmos: 2-D fields on atmospheric grid

priority	long name	units	comment	operations	output variable name
1	Near Surface Air Temperature	K	near surface (usually 2 meter) air temperature		tas
1	Surface Temperature	K	"skin" temperature (i.e., SST for ocean nodes)		ts
1	Daily Minimum Near Surface Air Temperature	K	monthly mean of the daily minimum near-surface (usually 2 meter) air temperature		tasmin
1	Daily Maximum Near Surface Air Temperature	K	monthly mean of the daily maximum near-surface (usually 2 meter) air temperature		tasmax
1	Sea Level Pressure	Pa	sea, in general, the same as surface pressure		psl
1	Surface Air Pressure	Pa	sea, in general, the same as mean sea level pressure		ps
1	Eastward Near Surface Wind	ms s ⁻¹	near surface (usually, 10 meters) eastward component of wind		uas
1	Northward Near Surface Wind	ms s ⁻¹	near surface (usually, 10 meters) northward component of wind		vas

Over 300 Variables in
(monthly) CMIP5 Database
 ~120 ocean
 ~60 land
 ~90 atmos
 ~50 cryosphere

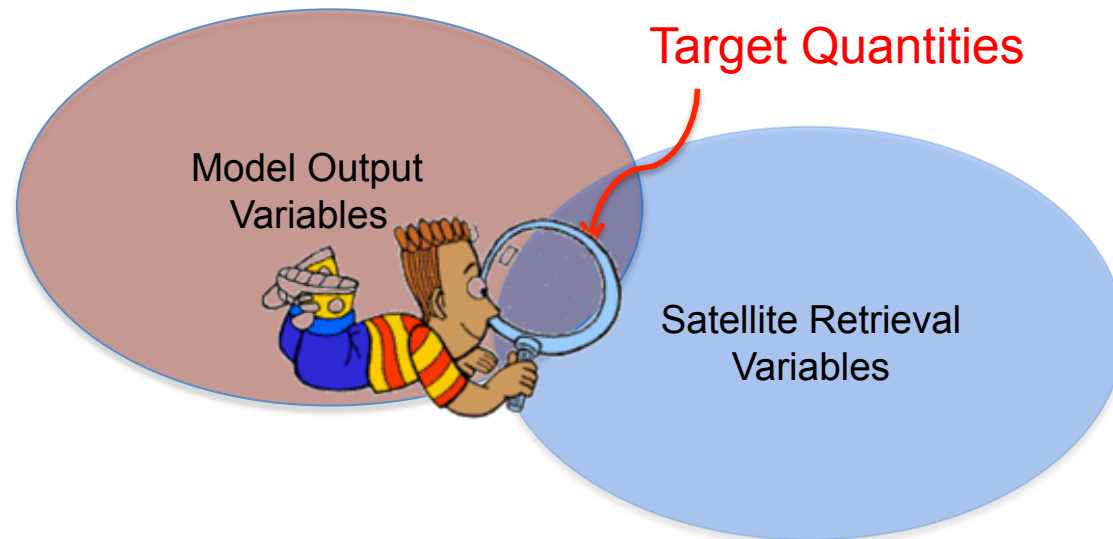


Example: NASA – Current Missions ~14
 Total Missions Flown ~ 60
 Many with multiple instruments
 Most with multiple products (e.g. 10-100s)
 Many cases with the same products



Over 1000 satellite-
derived quantities

Some Basic Tenets of this Activity



Oct 2010 : Workshop I at PCMDI

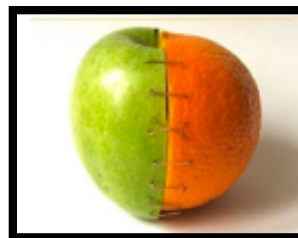
Nov 2010 : Workshop II at GSFC

About 15 variables identified as being “safely”
comparable in the first phase.

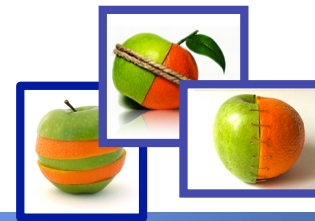
Significant IT work with ESG and data delivery/
formatting by missions teams followed.

Some Basic Tenets of this Activity

1. Use the **CMIP5 simulation protocol** (Taylor et al. 2009) as guideline for deciding which observations to stage in parallel to model simulations.
Target: monthly avg (e.g. OMON, AMON, LMON) products on 1°x1° grid
2. Convert Satellite Observations to be **formatted exactly** the same as CMIP Model output
CMOR output, NetCDF files, CF Convention Metadata
3. Includes a 6-8 page **Technical Note** describing strengths/weaknesses, uncertainties, dos/don'ts regarding interpretations comparisons with models. **(at graduate student level)**
4. Hosted **side by side** on the ESG with CMIP5
5. Advertise availability of observations for use in CMIP5 analysis.



Existing Data Sets and Ongoing Efforts



Jet Propulsion Laboratory
California Institute of Technology

CMIP Protocol Variables	Data Source	Time Period	Comments
ta, hus - Atm Temp, Specific Humidity	AIRS (≥ 300 hPa)	9/02 – 5/11	AIRS +MLS needed to cover all required pressure levels
ta, hus - Atm Temp, Specific Humidity	MLS (< 300 hPa)	8/04 - 12/10	AIRS +MLS needed to cover all required pressure levels
tos - Sea Surface Temperature	AMSR-E	6/02 - 12/10	
rlut, rlutcs, rsdt, rsut, rsutcs - TOA outgoing LW & SW Radiation, Incident SW Radiation	CERES	3/00 - 6/11	
rlds, rldscs, rlus, rsds, rsdscs, rsus, rsuscs - Surface down- and upwelling LW & SW Radiation	CERES	3/00 - 2/10	
clt – Total Cloud Fraction	MODIS	2/00 - 9/11	
zos - Sea Surface Height Above Geoid	TOPEX/JASON series	10/92 - 12/10	AVISO Product
pr - Precip flux	TRMM	1/98 - 6/11	Monthly Ave + 3 hourly products
pr - Precip flux	GPCP	1Jan96 - 30Jun11	Daily ave
pr - Precip flux	GPCP	1/79 - 6/11	Monthly Ave
sfcWind, uas, vas - near surface winds	QuikSCAT	8/99 –10/09	Oceans only, excluding sea ice regions. No land products.
fpar - Fract Abs Photo Active Radiation	MODIS	2/00 - 12/09	
lai - Leaf Area Index	MODIS	2/00 - 12/09	
tro3 – Mole Fract of Ozone	TES	7/05 - 12/09	
tos - Sea Surface Tem	ARC SST (ATSR, AATSR)	1/97 - 12/11	
od550aer - AOD 550 nm	MISR	3/00 - 12/12	Land only
od550aer - AOD 550 nm	MODIS	2/00 - 12/09	Ocean only
cliscep ; albiscep ; cltiscep ; cttiscep ; pctiscep	ISCCP/IPSL	1983 - 2008	
cfad2Lidarsr532 ; cfad2Lidarsr532 ; cfadLidarsr532 ; clrcalipso ; uncalipso ; clcalipso ; clccalipso ; clhcalipso ; clcalipso ; clmcalipso ; cltcalipso	CALIPSO	2006 - 2010	Monthly Ave & Day/Night
parasolRefl ; parasolRefl ; sza	PARASOL	2005 - 2008	Monthly & Daily
overpasses ; missingdatafraction ; cfadDbze94 ; cltcloudsat	CloudSat	2006 - 2010	

ESG Gateway : Side by Side Archive with CMIP



Jet Propulsion Laboratory
California Institute of Technology

The image displays a side-by-side comparison of the ESGF Portal interface. The left window shows the search results for 'obs4MIPS', with a red box highlighting the 'obs4MIPS Project' and a red arrow pointing to the 'Institute' field. The right window shows the 'NASA obs4MIPS' dataset page, with a red arrow pointing to the 'CERES TOA Outgoing Shortwave Radiation' dataset.

ESGF Portal
Earth System Grid Federation

Home Search Tools Login Help

Current Selections

- [remove all](#)
- [\(x\) product:observations](#)
- [\(x\) project:obs4MIPS](#)
- [\(x\) query:obs4MIPS](#)

Search Categories

Project

obs4MIPS (24)

Institute

Model

SubModel

Instrument

Experiment Family

Experiment

SubExperiment

Time Frequency

Product

Realm

Variable

Search: obs4MIPS

Examples: temperature, "surface temperature", climate

To download data: add datasets to your Data Cart

☒ Search All Sites ☐ Show All Replicas

displaying 1 to 10 of 24 search results

Display 10 datasets per page

[Add All Displayed to Datacart](#) [Remove](#)

Results Data Cart

obs4MIPS.NASA-GSFC.TRMM.atmos.mon

Data Node: esgdata1.nccs.nasa.gov

Version: 20130204

No description available.

Further options: [Add To Cart](#) [Visualize and Analyze](#)

obs4MIPS.IPSL.CALIOF.day

Data Node: vesg.ipsl.polytechnique.fr

Version: 1

No description available.

Further options: [Add To Cart](#) [Visualize and Analyze](#)

ESGF Portal
Jet Propulsion Laboratory
California Institute of Technology

TECHNOLOGY
BRING THE UNIVERSE TO YOU: JPL Email News | RSS | Mobile | Video

Home Search Tools Login Help

Welcome to this ESGF P2P Node

ESGF
Earth System Grid Federation

- [ANL Node](#)
- [BADC Node](#)
- [BNL Node](#)
- [CMCC Node](#)
- [DKRZ Node](#)
- [DKRZ CMIP5 Node](#)
- [NOAA-GFDL Node](#)
- [IPSL Node](#)
- [NASA-GSFC Node](#)
- [NASA-JPL Node](#)
- [NCAR Node](#)
- [NERSC Node](#)
- [ORNL Node](#)
- [PCMDI Node](#)

NASA obs4MIPS

These NASA datasets are provided as part of an experimental activity to increase the usability of NASA satellite observational data for the model and model analysis communities. These are not standard NASA satellite instrument products. They may have been reprocessed, reformatted, or created solely for comparisons with the CMIP5 model. Community feedback to improve and validate the datasets for modeling usage is appreciated.

- [AIRS Air Temperature](#)
- [AIRS Specific Humidity](#)
- [AMSR-E Sea Surface Temperature](#)
- [AVISO Sea Surface Height](#)
- [CERES TOA Outgoing Clear-Sky Longwave Radiation](#)
- [CERES TOA Outgoing Longwave Radiation](#)
- [CERES TOA Incident Shortwave Radiation](#)
- [CERES TOA Outgoing Clear-Sky Shortwave Radiation](#)
- [CERES TOA Outgoing Shortwave Radiation](#)
- [MLS Specific Humidity](#)
- [MLS Air Temperature](#)
- [MODIS Cloud Fraction](#)
- [TES Ozone](#)
- [TRMM Precipitation 3-Hourly](#)
- [TRMM Precipitation Monthly](#)
- [QuikSCAT Wind Speed](#)
- [QuikSCAT Eastward Near-Surface Wind](#)
- [QuikSCAT Northward Near-Surface Wind](#)

Quick Links

- [Create Account](#)
- [MyProxyLogin](#)
- [Expert Search \(XML\)](#)
- [Web Script Generator](#)
- [ESGF aggregated RSS feed](#)
- [Contact ESGF](#)

Instructions

- [ESGF Full User Guide](#)
- [Search Help](#)
- [Search Controlled Vocabulary](#)
- [Web Scripts FAQ](#)
- [Web Scripting](#)
- [Tutorial: Download Strategies](#)
- [Using Globus Online](#)
- [Subscribing to RSS Notification](#)

Efforts underway to make obs4MIPs a WCRP activity



Jet Propulsion Laboratory
California Institute of Technology

- WDAC has reviewed the pilot phase of obs4MIPs
 - Embraces concept as a viable mechanism to improve model-data connectedness
 - Currently putting together a task team to help guide advancement. Until this is achieved, project is being guided by original team and a NASA obs4MIPs working group
- Governance is needed – some examples
 - Solidify a mechanism for reviewing potential datasets
 - Addressing issues such as minimum quality and redundancy (how many SST products?)
 - Improving the technical specifications to enable data providers to more easily prepare data themselves (note obs4MIPs is using CMOR)
 - With improved support the project could be broadened beyond satellite data (limited reanalysis is already being included)

A possible obs4MIPs 4CMIP6 workshop



Jet Propulsion Laboratory
California Institute of Technology

goal is to ensure that relevant satellite data sets currently (or potentially) available can be fully utilized for CMIP6 research

- Review obs4MIPs inventory and key aspects of model evaluation that rely on satellite observations
- Identify currently under-utilized and potentially valuable satellite observations for model evaluation and process understanding
- Examine the mismatch between CMIP model output and satellite-based products, with intent of recommending changes for CMIP6 standard output
- Discuss the utility and expansion of satellite simulators for model evaluation, striving to identify key areas where such developments could yield high impact advancements in model evaluation and improvement
- Prioritize recommendations for future missions, targeting critical voids in model evaluation capabilities, including important phenomena, sub-grid scale features, composition, carbon cycle, hydrology, etc.

A possible obs4MIPs 4CMIP6 workshop



Jet Propulsion Laboratory
California Institute of Technology

- The sooner the better for CMIP6 planning. Possible dates: **April 15-16 or 22-23 2014**
- NASA offering to host at headquarters in Washington DC
- Capacity = 100
- Getting the right mix of people (data experts and modelers) will be especially important; *invite-only* invite-only format required to ensure we get the right mix.
- Seeking feedback and endorsement from WGCM, WCRP
- Recommendations for ideally suited attendees and organization are welcome!

Very Rough sketch of workshop

Potential for additions to obs4MIPs and expansion of CMIP standard output

- Satellite Atmosphere Physics
- Satellite Land and Hydrology
- Satellite Carbon Cycle & Ecosystems
- Satellite Ocean & Cryosphere
- Satellite Atmospheric Composition

- **Where else might satellite simulators be useful?**

- **Model needs and directions**

- **Priorities for new measurements (model evaluation/development perspective)**