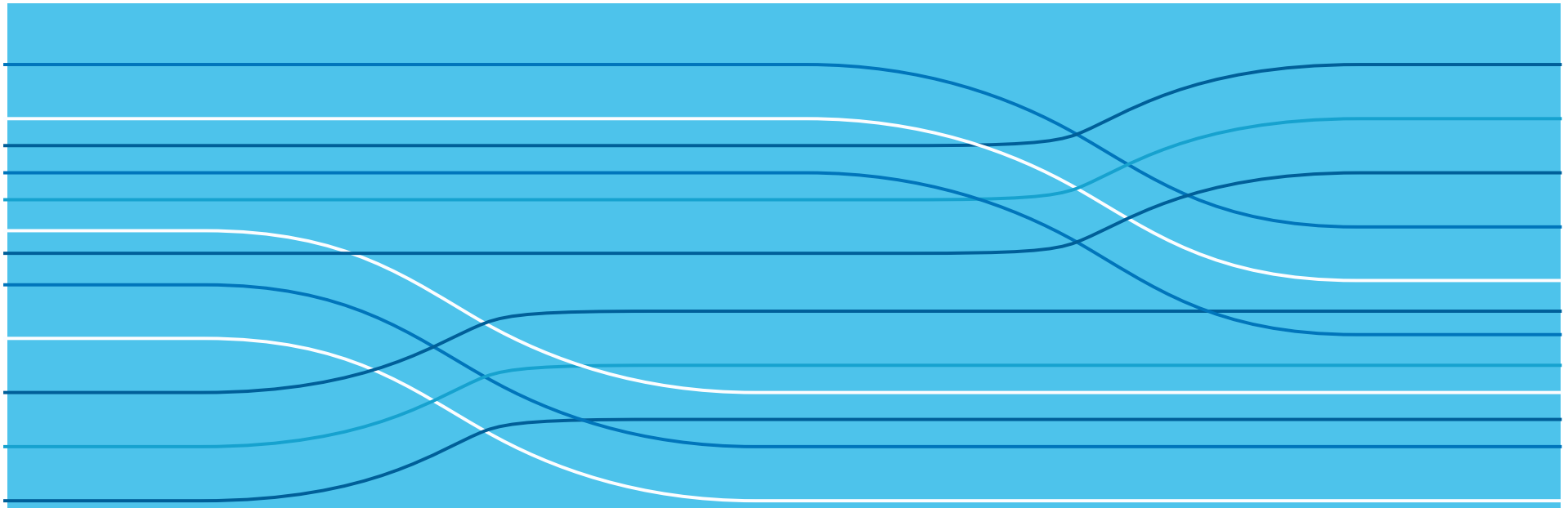


Toward community-based evaluation of climate models: Obs4MIPs, the metrics panel and evaluation tools for CMIP6

Peter J. Gleckler

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

Program for Climate Model Diagnosis and Intercomparison, LLNL

PCMDI

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

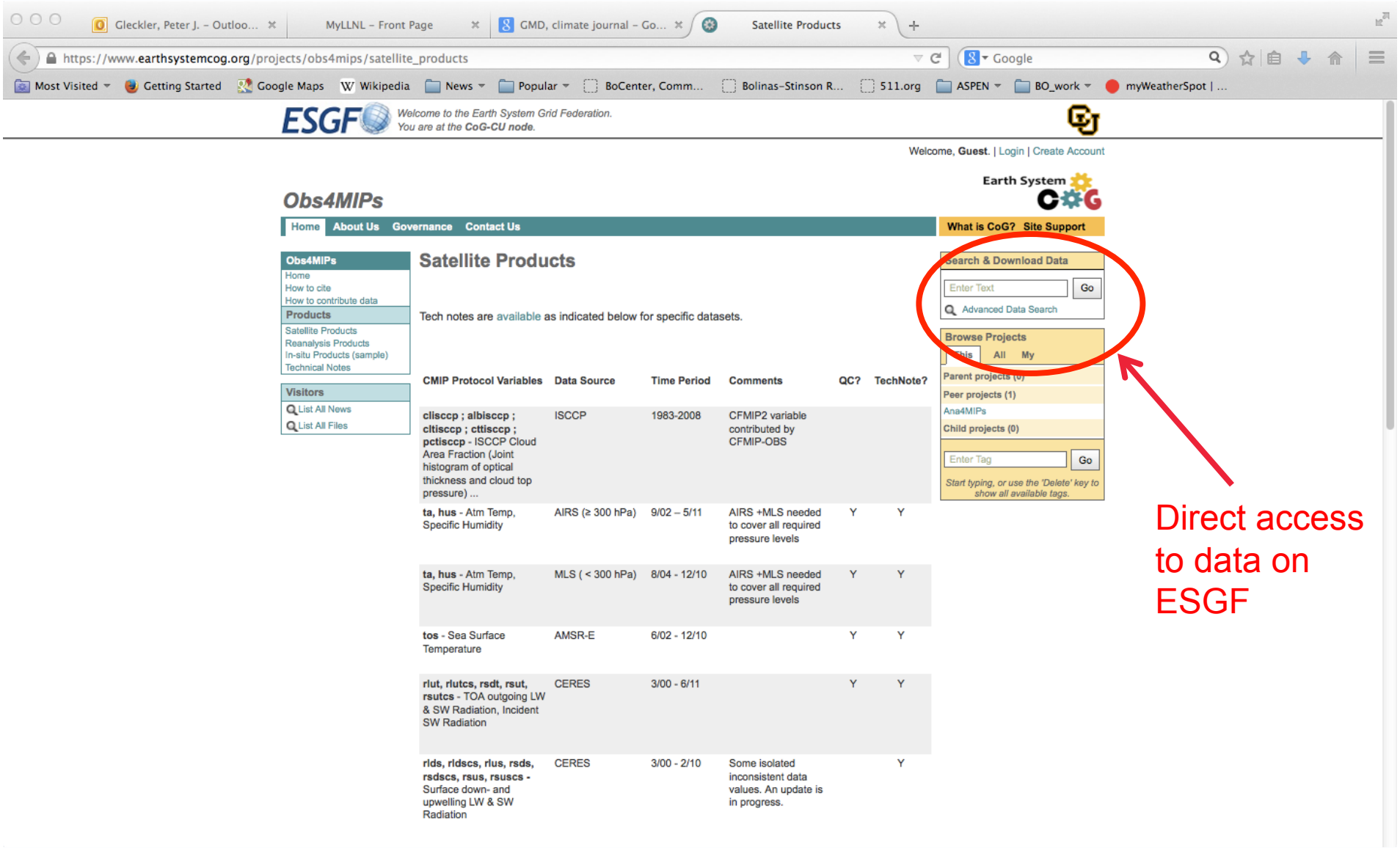
obs4MIPs update

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

<u>WDAC observations for model evaluation task team:</u>
D. Waliser and P. Gleckler (co-chairs), S. Bony, M. Bosilovich, H. Chepfer, V. Erying, R. Ferraro, R. Saunders, J. Schultz, K. Taylor, J-N Thepaut

…. and growing!



Direct access to data on ESGF

PCMDI

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 defendable error characterization/estimation of observations

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

PCMDI

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

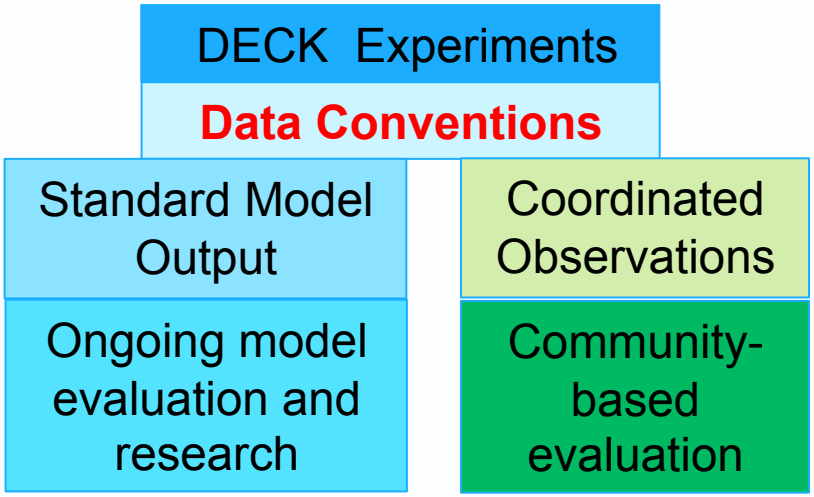
- The metrics panel working to develop a catalogue of CMIP related analysis tools and monitoring characteristics such as:
  - What software is required (e.g., CDO, R, NCL, CDAT, python, Fortran, etc)?
  - Are codes designed to work, as is, with the CMIP data structure?
  - What is the installation procedure/effort 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