

NASA Center for Climate Simulation: NASA Model and Observational Data on the Earth System Grid Federation

Overview

Climate model data contributions to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) are expected to exceed hundreds of petabytes, and this data will need to be made available to the international climate community. The Earth System Grid Federation (ESGF) is a partnership of climate modeling centers created to provide secure, web-based, distributed access to the Coupled Model Intercomparison Project Phase 5 (CMIP5) model data that is serving as the basis for IPCC AR5. The ESGF allows scientists and others to search, download, analyze, and visualize this distributed data through one common web interface.

The NASA Center for Climate Simulation (NCCS), located at NASA Goddard Space Flight Center in Greenbelt, Maryland, is contributing to the ESGF by providing access to the model data produced at the NCCS by the Global Modeling Assimilation Office (GMAO) and the Goddard Institute for Space Studies (GISS). The NCCS is also hosting CMIP5 data from the National Oceanic and Atmospheric Administration (NOAA) and the Center for Ocean-Land-Atmosphere Studies (COLA) produced with NOAA’s National Centers for Environmental Prediction (NCEP) model. In addition to climate model data, the ESGF is providing access to selected datasets from the 30-year GMAO Modern Era Retrospective-Analysis for Research and Applications (MERRA) and NASA observational data.

Data Access and Visualization

To access data, visit the NCCS ESGF Gateway:

<http://esgf.nccs.nasa.gov>

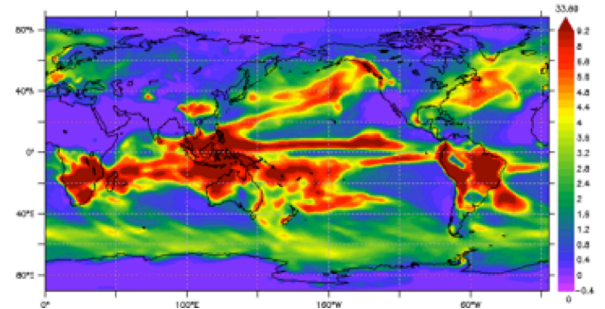
Users can search by categories such as Institute, Model, and Variable and visualize the data, as in the above figure, using Live Access Server (LAS).

Use Case: Comparing Model Output with Satellite Observations

In this example, a user 1) extracted MERRA data from the Analysis for MIPs (ana4MIPs) Project and the matching Clouds and the Earth’s Radiant Energy System (CERES) data from the Observations for MIPs (obs4MIPs) Project, 2) calculated a December-January-February average, 3) regridged the MERRA data to the CERES grid, and 4) calculated and plotted the difference between the reanalysis data and the satellite observations.

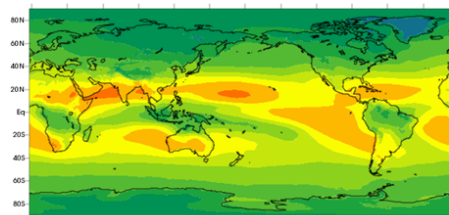
Using the Ultrascale Visualization Climate Data Analysis Tools (UV-CDAT) package—now in development—can greatly simplify this process. UV-CDAT allows the user to directly access data stored on ESGF servers. For more information about UV-CDAT:

<http://uv-cdat.llnl.gov>

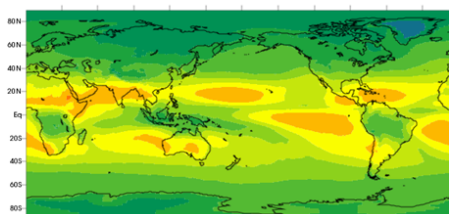


Global Modeling and Assimilation Office (GMAO) precipitation (mm/day), Feb. 2007, Y-axis: Latitude, X-axis: Longitude.

MERRA Top of the atmosphere outgoing longwave radiation

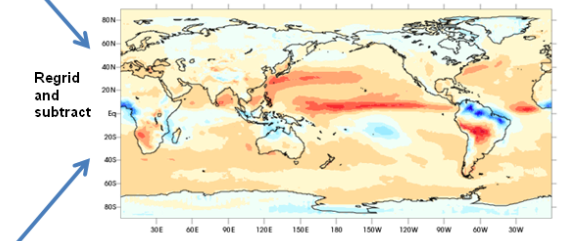


CERES Top of the atmosphere outgoing longwave radiation



Watts/meter²

MERRA - CERES TOA outgoing longwave radiation



Regrid and subtract

Watts/meter²

Model Products

GISS ModelE — NASA Goddard Institute for Space Studies, ModelE:

Search on Project > CMIP5, Institute > NASA-GISS

For more information on GISS ModelE — <http://www.giss.nasa.gov/tools/modele>

GMAO GEOS-5 — NASA Goddard Space Flight Center, Global Modeling and Assimilation Office, GEOS-5:

Search on Project > CMIP5, Institute > NASA-GMAO

For more information on GMAO GEOS-5 — <http://gmao.gsfc.nasa.gov/systems/geos5>

NCEP CFSv2-2011 — NOAA National Centers for Environmental Prediction, Climate Forecast System:

Search on Project > CMIP5, Institute > NCEP

For more information on NCEP CFSv2-2011 — <http://cfs.ncep.noaa.gov>

COLA CFS — Center for Ocean-Land-Atmosphere Studies, Climate Forecast System:

Search on Project > CMIP5, Institute > COLA-CFS

For more information on COLA CFS — <http://www.iges.org/cola.html>

Reanalysis Products

MERRA — NASA Goddard Space Flight Center, Global Modeling and Assimilation Office, Modern Era Retrospective-Analysis for Research and Applications:

Search on Project > ana4MIPs, Institute > NASA-GMAO

For more information on MERRA — <http://gmao.gsfc.nasa.gov/research/merra>

Observational Data Subsets

CERES — NASA Langley Research Center, Clouds and the Earth's Radiant Energy System:

Search on Project > obs4MIPs, Institute > NASA-LaRC

For more information on CERES — <http://ceres.larc.nasa.gov>

TRMM — NASA Goddard Space Flight Center, Tropical Rainfall Measuring Mission:

Search on Project > obs4MIPs, Institute > NASA-GSFC, Model > Obs-TRMM

For more information on TRMM — <http://trmm.gsfc.nasa.gov>

GPCP — NASA Goddard Space Flight Center, Global Precipitation Climatology Project:

Search on Project > obs4MIPs, Institute > NASA-GSFC, Model > Obs-GPCP

For more information on GPCP — <http://precip.gsfc.nasa.gov>

Planned Reanalysis Products — Early 2013

ECMWF — European Center for Medium-Range Weather Forecasts ERA-Interim

JRA-25 — Japanese 25 Year Reanalysis Project

NOAA CFSR — National Oceanic and Atmospheric Administration Climate Forecast System Reanalysis

NOAA 20CR — National Oceanic and Atmospheric Administration 20th Century Reanalysis

Planned Observational Data Subsets — Early 2013

MODIS — NASA Goddard Space Flight Center, Moderate Resolution Imaging Spectroradiometer:

Leaf Area Index (LAI)/Fractional Photosynthetically Active Radiation (FPAR)

Snow Cover

Albedo

Net Primary Production (NPP)/Gross Primary Production (GPP)

For more information about the NASA Center for Climate Simulation, visit <http://www.nccs.nasa.gov>

