Modern Era Restrospective-analysis for Research and Applications (MERRA) Data and Services at the GES DISC

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Visit http://disc.gsfc.nasa.gov/mdisc

Overview of MERRA Data

The Modern Era Retrospective-analysis for Research and Applications (**MERRA**) dataset is a **NASA** satellite era, 30 year (1979 - present), reanalysis using the Goddard Earth Observing System Data Assimilation System, Version 5 (GEOS-5). The project, run out of NASA's **Global Modeling and Assimilation Office** at Goddard Space Flight Center, provides the science and application communities with a state-of-the-art global analysis with emphasis on **improved estimates of the hydrological cycle over a broad range of weather and climate time scales.** MERRA products are generated as a long-term synthesis that places the NASA EOS suite of observations in a climate context. The MERRA analysis is performed at a **horizontal resolution of 2/3° longitude x 1/2° latitude** (540x361 global gridpoints) with observational analyses every 6 hours. The MERRA output data will include 3 dimensional state fields for every 6 hourly analysis cycle on 42 pressure levels (or 72 terrain following model coordinate levels) from the surface through the stratosphere. Several data products are specifically designed to support **chemistry and stratosphere transport modeling.** The 2 dimensional surface and atmospheric diagnostics (numbering 259) are being stored on the native grid at 1 hourly intervals. These include radiation and vertical integrals of the atmosphere for water and energy budget studies and also surface diagnostics where the diurnal cycle is important. The one hourly surface and near surface data product will also facilitate research on the integrated analysis of Earth system observations in the land, ocean and cryosphere.

The MERRA products are archived and distributed by the Goddard Earth Sciences Data and Information Services Center (GES DISC) through its Modeling DISC Web (MDISC) portal. Multiple data access methods and services are available for MERRA data through MDISC: (1) **Mirador** offers a quick, comprehensive search of MERRA and all GES DISC archived data holdings, allowing searches on keywords, location names or latitude/longitude box, and date/time, with responses within a few seconds. (2) **Giovanni** is a GES DISC developed Web application that provides **data visualization and analysis online**. Giovanni features popular visualizations such as **latitude-longitude maps, animations, cross sections, profiles, time series,** etc. and some basic statistical analysis functions such as scatter plots and correlation coefficient maps. Users are able to download results in several different formats, including **Google Earth**. (3) On-the-fly parameter **subsetting** of data within a spatial/temporal window is provided through a simple "select and click" Web page. (4) MERRA data are also available via **OPeNDAP**, **GrADS Data Server** (GDS) and can be converted to **netCDF** "on the fly".
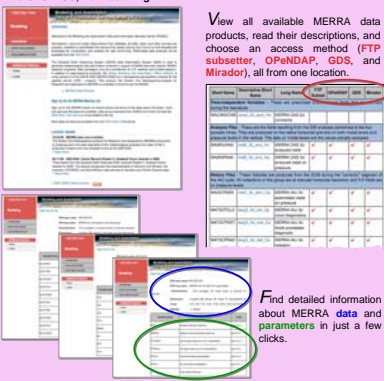
Detailed MERRA data access information is available at the MDISC portal: **http://disc.gsfc.nasa.gov/mdisc**

Detailed information on MERRA data processing is available at: **http://gmao.gsfc.nasa.gov/merra**

Data Access and Data Services at the GES DISC

MERRA Data Portal

The Modeling and Assimilation Data and Information Services Center (MDISC) portal is your one-stop location for all model data and services at the GES DISC, now featuring MERRA.

View all available MERRA data products, read their descriptions, and choose an access method (**FTP** subsetter, OPeNDAP, GDS, and Mirador), all from one location.

Find detailed information about MERRA **data** and **parameters** in just a few clicks.

Search and download data using **Mirador**

Mirador is a search and order Web tool developed by the GES DISC for data users. It has a drastically simplified, clean interface and employs the Google mini appliance for metadata keyword searches. Other features include quick response, data file hit estimator, Gazetteer (geographic search by feature name), and an interactive shopping cart. *Semantic Web Mirador coming soon!*

Mirador supports **keyword**, **time span**, and **location** searches. Keywords can be parameter names; science discipline areas (such as *oceans*); instrument, sensor, or model names; or data product short names such as *inst3_3d_asm_Cp*. Time spans can be specified in any unambiguous way (e.g. *Sep 1, 2005* or *9/1/05*). Location can be specified by area name (e.g. *Chesapeake, China*) or by geographic coordinates. Mirador is supported by a rich geographic Gazetteer.

The **event search** allows a user to search by event names including **hurricanes,** named **storms, cyclones,** and **typhoons;** as well as **volcanoes,** and **air pollution events** (e.g. aerosols, ozone).

A full-featured **shopping cart** allows users to manage all GES DISC data and have access to related services, such as **subsetting, OPeNDAP,** and **netCDF.**
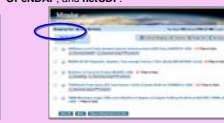
Subset MERRA Data Using **FTP Subsetter**

The online MERRA FTP Subsetter is a special service for MERRA data users. Select data product, a spatial area, time range, and one or more parameters.

The subsetted MERRA data are available in native HDF4 or (soon!) in **netCDF**. **Batch download** is available for bulk downloads. This service is also available through Mirador search.

Access MERRA Data Via OPeNDAP and GrADS Data Server

The MERRA data are also available via the OPeNDAP and the GrADS Data Server (GDS) protocols.

Giovanni Online Visualization and Analysis Services at the GES DISC

What is Giovanni?

Giovanni is a Web-based application developed by the GES DISC that provides a simple and easy way to visualize, analyze, and access vast amounts of Earth science remote sensing and model data.

Only a Web browser is needed. There is no need to learn data formats, programming, or download large amounts of data.

Visualizations for MERRA data include latitude-longitude maps, **time series diagrams,** latitude-time and longitude-time Hovmöller diagrams, and animations. New visualizations will be introduced over time.

Giovanni is Easy to Use

Simply select **spatial area**, **parameters**, and **time range**. For 3D parameters, select **vertical levels**. Then select a **visualization**.

The MERRA data are but the newest additions to Giovanni. Giovanni already provides access to many **atmospheric, hydrological, environmental, oceans,** and other datasets from multiple satellites, *in situ* observations, and models with well over **1000 parameters.**
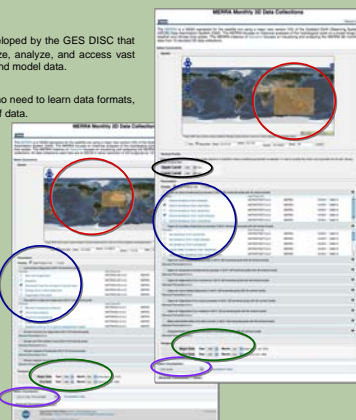
Visualize and analyze large volumes of data …

… with only a few mouse clicks.

Try Giovanni at: http://giovanni.gsfc.nasa.gov
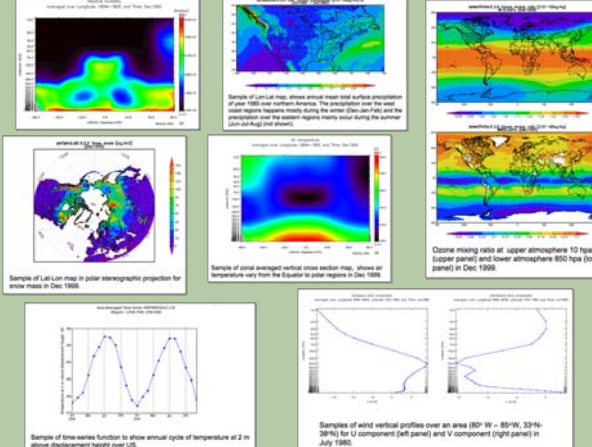
MERRA Standard Data Products

Shown below are the standard MERRA daily products. Monthly mean products (averaged over all time steps produced in a month) and monthly diurnal mean products (averaged over individual time steps produced in a month) are also available.

Time-independent Variables

MERRA DAS 2d Constants (MAC0NXCNS)
const_2d_asm_Nx

-Constants at native resolution
-Dimensions: lon: 540, lat: 361
-Times: N/A

3-D Analysis Products

MERRA DAS 3d Analyzed State (MAI6NVANA)
inst6_3d_ana_Nv

-Instantaneous, on model levels, at native resolution
-Dimensions: lon: 540, lat: 361, levels: 72
-Times: 00, 06, 12, 18 GMT

MERRA DAS 3d Analyzed State on Pressure (MAI6NPANA)
inst6_3d_ana_Np

-Instantaneous, on pressure levels, at native resolution
-Dimensions: lon: 540, lat: 361, pressure levels: 42
-Times: 00, 06, 12, 18 GMT; monthly, seasonal

History Products

MERRA IAU 3d Assimilated State on Pressure (MAI3CPASM)
inst3_3d_asm_Cp

-Instantaneous, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 00, 03, 06, 09, 12, 15, 18, 21 GMT

MERRA IAU 3d Cloud Diagnostics (MAT3CPCLD)
tavg3_3d_cld_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Moist Processes Diagnostics (MAT3CPMST)
tavg3_3d_mst_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Radiation Diagnostics (MAT3CPRAD)
tavg3_3d_rad_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Turbulence Diagnostics (MAT3CPTRB)
tavg3_3d_trb_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Temperature Tendencies (MAT3CPTDT)
tavg3_3d_tdt_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Eastward Wind Tendencies (MAT3CPUDT)
tavg3_3d_udt_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Moisture Tendencies (MAT3CPQDT)
tavg3_3d_qdt_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Ozone Tendencies (MAT3CPODT)
tavg3_3d_odt_Cp

-Time averaged, on pressure levels, at reduced resolution
-Dimensions: lon: 288, lat: 144, pressure levels: 42
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 2d Atmospheric Single-Level Diagnostics (MAT1NXSLV)
tavg3_2d_slv_Nx

-Time averaged, single-level, at native resolution
-Dimensions: lon: 540, lat: 361
-Times: 0:30, 1:30, 2:30, 3:30, 4:30, … GMT

MERRA IAU 2d Surface Turbulent Flux Diagnostics (MAT1NXFLX)
tavg1_2d_flx_Nx

-Time averaged, single-level, at native resolution
-Dimensions: lon: 540, lat: 361
-Times: 0:30, 1:30, 2:30, 3:30, 4:30, … GMT

MERRA IAU 2d Surface and TOA Radiation Fluxes (MAT1NXRAD)
tavg1_2d_rad_Nx

-Time averaged, single-level, at native resolution
-Dimensions: lon: 540, lat: 361
-Times: 0:30, 1:30, 2:30, 3:30, 4:30, … GMT

MERRA IAU 2d Land Surface Diagnostics (MAT1NXLND)
tavg1_2d_lnd_Nx

-Time averaged, single-level, at native resolution
-Dimensions: lon: 540, lat: 361
-Times: 0:30, 1:30, 2:30, 3:30, 4:30, … GMT

MERRA IAU 2d Vertical Integrals (MAT1NXINT)
tavg1_2d_int_Nx

-Time averaged, single-level, at native resolution
-Dimensions: lon: 540, lat: 361
-Times: 0:30, 1:30, 2:30, 3:30, 4:30, … GMT

MERRA IAU 2d Vertical Integrals (MAI1NXINT)
inst1_2d_int_Nx

-Instantaneous, single-level, at native resolution
-Dimensions: lon: 540, lat: 361
-Times: 0, 1, 2, 3, 4, … 23 GMT

Chemistry Forcing Products

MERRA CHM 2d Constants (MAC0FXCNS)
const_2d_chm_Fx

-Constants at reduced FV resolution
-Dimensions: lon: 288, lat: 181
-Times: N/A

MERRA IAU 3d Chem On Layers (MAT3FVCHM)
tavg3_3d_chm_Fv

-Time averaged, 3D model levels, at reduced FV resolution
-Dimensions: lon: 288, lat: 181, levels: 72
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Chem On Layer Edges (MAT3FECHM)
tavg3_3d_chm_Fe

-Time averaged, 3D model levels, at reduced FV resolution
-Dimensions: lon: 288, lat: 181, levels: 73
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 2d Chem (MAT3FXCHM)
tavg3_2d_chm_Fx

-Time averaged, single-level, at reduced FV resolution
-Dimensions: lon: 288, lat: 181
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Chem On Layers (MAT3NVCHM)
tavg3_3d_chm_Nv

-Time averaged, 3D model levels, at native resolution
-Dimensions: lon: 540, lat: 361, levels: 72
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Chem On Layer Edges (MAT3NECHM)
tavg3_3d_chm_Ne

-Time averaged, 3D model levels, at native resolution
-Dimensions: lon: 540, lat: 361, levels: 73
-Times: 1:30, 4:30, 7:30, 10:30, 13:30, 16:30, 19:30, 22:30 GMT

MERRA IAU 3d Chem On Layer Edges (MAI3NECHM)
inst3_3d_chm_Ne

-Instantaneous, 3D model levels, at native resolution
-Dimensions: lon: 540, lat: 361, levels: 73
-Times: 0, 3, 6, 9, 12, 15, 18, 21 GMT