



Global Modeling and Assimilation Office

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File Specification for M2AMIP Products

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File Specification for M2AMIP Products

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1. Introduction

The Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2) is an atmospheric reanalysis computed with the Goddard Earth Observing System, Version 5.12.4 (GEOS) data assimilation system (Gelaro et al., 2017). To supplement the reanalysis, the GEOS General Circulation Model (GCM) used in MERRA-2 has been used to generate a 10-member ensemble of simulations, configured following the convention of the Atmospheric Model Intercomparison Project (AMIP; Gates et al., 1992). Each ensemble member was initialized using meteorological fields from a different date in November 1979. The AMIP simulations used the sea-surface temperature (SST) and sea-ice boundary conditions that were used in MERRA-2 (Bosilovich et al., 2016). This 10-member ensemble of AMIP simulations, denoted M2AMIP, is available for download in a group of self-describing files, which are documented in this office note.

All data collections are provided on the same horizontal grid as MERRA-2. This grid has 576 points in the longitudinal direction and 361 points in the latitudinal direction, corresponding to a resolution of $0.625^\circ \times 0.5^\circ$. Although data collections are available at this grid, all fields are computed on a cubed-sphere grid with an approximate resolution of 50 km x 50 km and are then spatially interpolated to the latitude-longitude grid. There are no changes in the vertical grids used: variables are provided on either the native vertical grid of 72 model layers, or interpolated to 42 standard pressure levels. Unlike MERRA, no data collections are available at the vertical layer edges. More details on the grid are provided in Section 4.

MERRA-2 introduced observation-based precipitation forcing for the land surface parameterization and the corresponding variable *PRECTOTCORR* in the MERRA-2 FLX and LFO collections (see Section 6; Reichle et al., 2017). While this variable is still available for M2AMIP, there was no observation-based forcing, making the value identical to the model derived precipitation, *PRECTOT*. Similarly, without data assimilation, the values for the analysis increments, *D*DTANA*, in the tendency and vertically integrated file collections are zero.

The M2AMIP data are available for download online through the NASA Center for Climate Simulation (NCCS) DataPortal (https://portal.nccs.nasa.gov/datashare/gmao_m2amip/). Data are arranged in subdirectories based on ensemble member, followed by year and month. Control files that are compatible with the Grid Analysis and Display System (GrADS) are available in the *ctl_daily* and *ctl_monthly* directories for the hourly, three hourly, and monthly mean data. Control files for the monthly mean diurnal cycle can be found in the *ctl_diurnal* subdirectory within the directory for each individual ensemble member.

2. Format and File Organization

M2AMIP data files are provided in netCDF-4 format, rather than the HDF-5/HDF-EOS format used for MERRA. Since netCDF-4 files are actually HDF-5 files that are structured in a special way, netCDF-4 files can also be read by HDF-5 tools. The data files adhere to the netCDF “classic” data model, which will allow source code used to read older netCDF formats to still work when compiled with the netCDF-4 and HDF-5 libraries. The data products will adhere to the older COARDS metadata conventions and many of the CF metadata conventions, although the files are not fully CF-compliant. The conventions for identifying dimension information are followed, which should allow M2AMIP files to be used by many tools that are CF-compliant.

Due to the size of the M2AMIP archive, most product collections are compressed with a GRIB-like method that is invisible to the user. This method does degrade the precision of the data, but every effort has been made to ensure that differences between the product and the original, non-degraded data are not scientifically meaningful. Once the precision has been degraded, the files are written using the standard (internal) Lempel-Ziv deflation available in netCDF-4.

M2AMIP is run on a cube-sphere grid, but these native data are not distributed. Rather, in post-processing the data, it has been interpolated to the regular latitude-longitude grid discussed in this document. The interpolation includes two options, a conservative remapping (simply a binning routine) and a non-conservative bilinear interpolation. Most variable collections were transformed using the bilinear interpolation. The conservatively remapped file collections are the vertical integrals and aerosol diagnostics, specifically:

tavgM_2d_int_Nx
tavgM_2d_aer_Nx

In some collections, there are duplicate or component variables. For example, net surface longwave radiation is in the time averaged vertical integral collection, while the components are in the 2-D radiation collection. Computing the net surface longwave radiation from the tavgM_2d_rad_Nx files will not precisely equal the net longwave radiation in tavgM_2d_int_Nx, because of the difference in remapping. As a rule of thumb, only the data that have been conservatively remapped will balance to the highest precision.

2.1 Dimensions

Every M2AMIP collection will contain variables that define the dimensions of longitude, latitude, and time. Product collections that contain three-dimensional data will also have a vertical dimension that defines either pressure levels or the index associated with the model level (see section 4.2). Dimension variables have an attribute named “units,” set to an appropriate string defined by the CF and COARDS conventions that can be used by applications to identify the dimension.

Table 2.1-1. Dimension Variables Contained in GMAO NetCDF Files

Name	Description	Type	<i>units</i> attribute
-------------	--------------------	-------------	-------------------------------

lon	Longitude	double	degrees_east
lat	Latitude	double	degrees_north
lev	pressure or layer index	double	hPa or layer
time	minutes since first time in file	int	minutes

2.2 Variables

Variables are stored as HDF-5 dataset objects, which are analogous to the HDF-4 SDS arrays used for MERRA. M2AMIP uses the “classic” netCDF data model and does not use and of the extensions supported by netCDF-4 and the underlying HDF-5 format. This allows applications written to read netCDF files to easily read variables without having to modify code. Variable names are listed in Section 6 along with the number and sizes of dimensions. One can quickly list the variables in the file by using common utilities such as *ncdump*, which is distributed with the netCDF-4 library. With the ‘-h’ flag, this utility will display all information about the file and its contents, including metadata associated with each variable. The variable name is analogous to the *short_name* in the M2AMIP HDF-EOS files. A short description of the variable is provided in the *long_name* and *standard_name* metadata parameters.

Each variable has several useful metadata attributes. Many of these attributes are required by the [CF](#) and [COARDS](#) conventions, while others are specific for GMAO products. The following table lists required attributes. Other attributes may be included for internal GMAO use and can be ignored.

Table 2.2-1 Metadata attributes associated with each SDS.

Name	Type	Description
_FillValue	32-bit float	Floating-point value used to identify missing data. Normally set to 1e15. Required by CF.
missing_value	32-bit float	Same as _FillValue. Required for COARDS backwards compatibility.
valid_range	32-bit float, array(2)	This attribute defines the valid range of the variable. The first element is the smallest valid value and the second element is the largest valid value. Required by CF. In MERRA files these are set to -/+ _FillValue.
long_name	String	A brief description of the variable contents taken from the <i>Description</i> column of the tables in Appendix D.
standard_name	Char String	An ad hoc description of the variable as required by COARDS . It approximates the standard names as defined in an early version of CF conventions, but is not strictly CF-compliant. (Eaton et al., 2011; NOAA, 2015).

Name	Type	Description
units	Char String	The units of the variable. Must be a string that can be recognized by UNIDATA's Uunits package.
scale_factor	32-bit float	If variable is packed as 16-bit integers, this is the scale_factor for expanding to floating-point. Currently data are not packed, thus value is 1.0.
add_offset	32-bit float	If variable is packed as 16-bit integers, this is the offset for expanding to floating-point. Currently, data are not packed, thus value is 0.0.

2.3 Global Attributes

In addition to HDF-5 dataset variables and dimension scales, global metadata is also stored in GMAO netCDF-4 files. Some metadata are required by the CF/COARDS conventions, some are present to meet ECS requirements, and others as a convenience to users of GMAO products. A summary of global attributes present in all M2AMIP files is shown in Table 2.3-1. All global metadata parameters are of type character

Table 2.3-1 Global metadata attributes associated with each SDS.

Name	Description
History	Production/creation date of this file.
Comment	Internal/original GMAO filename (for provenance).
Filename	Filename of this granule.
Conventions	Identification of the file convention used, currently “CF-1.0”
Institution	“NASA Global Modeling and Assimilation Office”
References	“ http://gmao.gsfc.nasa.gov ”
Format	“NetCDF-4/HDF-5”
SpatialCoverage	Global
VersionID	The GEOS version used for M2AMIP, “5.12.4”.
Temporal Range	The beginning and ending dates of M2AMIP. The ending date is assumed but may change.

Name	Description
identifier_product_doi_authority	“http://dx.doi.org”
Shortname	Product short name used by G-DISC
RangeBeginningDate	Date corresponding to the first timestep in this file.
RangeBeginningTime	Time corresponding to the first timestep in this file.
RangeEndingDate	Date corresponding to the last timestep in this file.
RangeEndingTime	Time corresponding to the last timestep in this file.
GranuleID	Filename for this product.
ProductionDateTime	Production date & time of this granule.
LongName	Description of product type.
Title	Description of product type.
SouthernmostLatitude	“-90.0”
NorthernmostLatitude	“90.0”
WesternmostLongitude	“-180.0”
EasternmostLongitude	“179.375”
LatitudeResolution	“0.5”
LongitudeResolution	“0.625”
DataResolution	Horizontal and vertical resolution of granule.
identifier_product_doi	Unique Digital Object Identifier
Source	CVS tag associated with GEOS version.
Contact	“http://gmao.gsfc.nasa.gov”

3. Instantaneous vs Time-averaged Products

Each file collection listed in [Section 6](#) contains either instantaneous or time-averaged products, but not both.

All instantaneous collections contain fields at *synoptic times* (00 GMT, 06 GMT, 12 GMT, and 18 GMT). In addition, three-hourly instantaneous collections also include snapshots at *mid-synoptic times* (03 GMT, 09 GMT, 15 GMT, and 21 GMT). 1-hourly instantaneous diagnostics of some states fields and other weather diagnostics are also provided. Monthly means of instantaneous diagnostics have also been computed.

Time-averaged collections contain hourly, three-hourly, monthly, or monthly diurnal means, but not mixtures of these. Each time-averaged collection consists of a continuous sequence of data averaged over the indicated interval and time stamped with the central time of the interval. For hourly data, for example, these times are 00:30 GMT, 01:30 GMT, 02:30 GMT, etc. Only products consisting exclusively of two-dimensional (horizontal) fields are produced hourly. Three-hourly time-averaged files contain averages over time intervals centered and time stamped at 01:30 GMT, 04:30 GMT, 07:30 GMT, and so on. Due to the large amount of disk storage required for the ten ensemble members, sub-monthly files are only available for ensemble member 02. Monthly files represent averages for the calendar months, accounting for leap years. For monthly means, each file contains a single month.

In M2AMIP, a collection is included for certain daily statistics computed from the model time step integration. Daily maximum and minimum temperatures are saved from the time step in which they occur and saved as a daily value, alongside the daily mean temperature (all at 2m above the surface) and daily precipitation.

Each hourly or three-hourly collection, whether instantaneous or time-averaged, consist of a set of daily files, with the date as part of the filename. For collections of monthly or seasonal means each month or season is in a separate file, and file names also include a date in the file name. Monthly means also include certain quadratic information (such as the variance and covariance of certain variables).

4. Grid Structure

4.1 Horizontal Structure

In M2AMIP, all fields will be produced on the same $5/8$ longitude by $1/2$ latitude grid. The GEOS M2AMIP *native grid* is a cubed sphere. The gridded output is on a global horizontal grid, consisting of **IMn=576** points in the longitudinal direction and **JMn=361** points in the latitudinal direction. The horizontal native grid origin, associated with variables indexed ($i=1, j=1$) represents a grid point located at ($180^\circ\text{W}, 90^\circ\text{S}$). Latitude (φ) and longitude (λ) of grid points as a function of their indices (i, j) can be determined by:

$$\lambda_i = -180 + (\Delta\lambda)_n(i-1), \quad i = 1, \text{IMn}$$

$$\varphi_j = -90 + (\Delta\varphi)_n(j-1), \quad j = 1, \text{JMn}$$

Where $(\Delta\lambda)_n = 5/8^\circ$ and $(\Delta\varphi)_n = 1/2^\circ$. For example, ($i = 289, j = 181$) corresponds to a grid point at ($\lambda = 0, \varphi = 0$).

4.2 Vertical Structure

Gridded products use four different vertical configurations: Horizontal-only (can be vertical averages, single level, or surface values), pressure-level, model-level, or model-edge. Horizontal-only data for a given variable appear as 3-dimensional fields (x, y, time), while pressure-level, model-level, or model-edge data appear as 4-dimensional fields (x, y, z, time). In all cases the time dimension spans multiple files with one time in each file. Pressure-level data is output on the **LMp=42** pressure levels shown in Table 4.1. The GEOS model layers used for M2AMIP products are on a terrain-following hybrid sigma-p coordinate. Model-level data will be output on the **LM=72** layers shown in the second table of Table 4.2. The model-edge products contain fields with **LMe = LM + 1** levels representing the layer edges. The pressure at the model top is a fixed constant, **PTOP=0.01 hPa**. As with MERRA and MERRA-2, pressures at model edges should be computed by summing the DELP starting at P_{TOP}. A representative pressure for the layer can then be obtained from these. In the GEOS-4 *eta* files, one could compute the pressure on the edges by using the “ak” and “bk” values and the surface pressure. In GEOS, the full 3-dimensional pressure variables are explicitly provided through ([DELP;ij](#)) and P_{TOP}. For the M2AMIP products documented here, all model-level fields are on a hybrid-sigma coordinate, and their vertical location could be obtained from the “ak-bk” relationship as well. But this may change in future GMAO systems. We thus recommend that users rely on the reported 3D pressure distribution, and not use ones computed from the “ak” and “bk”.

Note that the indexing for the GEOS vertical coordinate system in the vertical is top to bottom, i.e., layer 1 is the top layer of the atmosphere, while layer LM is adjacent to the earth’s surface. The same is true for edge variables, with level 1 being the top of the model’s atmosphere (P_{TOP}), and level LM+1 being the surface. In early versions of certain post processing routines, such as the GES DISC Subsetter, may alter meta data and the direction of the vertical grid. While this has likely been addressed in the M2AMIP interface to the data, it is prudent to verify the

meta data of downloaded or post processed data.

Table 4.1 Pressure-level data is output on the following 42 pressure levels:

Level	P(hPa)	Level	P(hPa)	Level	P(hPa)	Level	P(hPa)	Level	P(hPa)	Level	P(hPa)
1	1000	8	825	15	600	22	250	29	30	36	2
2	975	9	800	16	550	23	200	30	20	37	1
3	950	10	775	17	500	24	150	31	10	38	0.7
4	925	11	750	18	450	25	100	32	7	39	0.5
5	900	12	725	19	400	26	70	33	5	40	0.4
6	875	13	700	20	350	27	50	34	4	41	0.3
7	850	14	650	21	300	28	40	35	3	42	0.1

Table 4.2 Products on the native vertical grid are output on the following levels. Pressures are nominal for a 1000 hPa surface pressure and refer to the top edge of the layer. Note that the bottom layer has a nominal thickness of 15 hPa.

Lev	P(hPa)	Lev	P(hPa)	Lev	P(hPa)	Lev	P(hPa)	Lev	P(hPa)	Lev	P(hPa)
1	0.0100	13	0.6168	25	9.2929	37	78.5123	49	450.000	61	820.000
2	0.0200	14	0.7951	26	11.2769	38	92.3657	50	487.500	62	835.000
3	0.0327	15	1.0194	27	13.6434	39	108.663	51	525.000	63	850.000
4	0.0476	16	1.3005	28	16.4571	40	127.837	52	562.500	64	865.000
5	0.0660	17	1.6508	29	19.7916	41	150.393	53	600.000	65	880.000
6	0.0893	18	2.0850	30	23.7304	42	176.930	54	637.500	66	895.000
7	0.1197	19	2.6202	31	28.3678	43	208.152	55	675.000	67	910.000
8	0.1595	20	3.2764	32	33.8100	44	244.875	56	700.000	68	925.000
9	0.2113	21	4.0766	33	40.1754	45	288.083	57	725.000	69	940.000
10	0.2785	22	5.0468	34	47.6439	46	337.500	58	750.000	70	955.000
11	0.3650	23	6.2168	35	56.3879	47	375.000	59	775.000	71	970.000
12	0.4758	24	7.6198	36	66.6034	48	412.500	60	800.000	72	985.000

5. File Naming Conventions

The filename of each GEOS product will be stored in the metadata parameter GranuleID. Each product also has a 9-character “Shortname” which is specified in the metadata and is often called an Earth Science Data Type (ESDT). In M2AMIP each file collection has a unique ESDT index. The ESDT index convention is described in section 5.2.

5.1 File Names

The standard full name for the assimilated GEOS M2AMIP products will consist of three dot-delimited nodes:

runid.collection.timestamp

The node fields, which vary from file to file, are defined as follows:

runid

All M2AMIP *Mainstream* ensemble members runs will be identified by **m2amipEE**, where the numeric qualifier EE denotes the ensemble member, or “_ens” for the ensemble mean.

collection:

All M2AMIP data are organized into file *collections* that contain fields with common characteristics. These collections are used to make the data more accessible for specific purposes. Fields may appear in more than one collection. Collection names are of the form *freq_dims_group_HV*, where the four attributes are:

freq: time-independent (**cnst**), instantaneous (**inst F**), statistics (**stat F**) or time-average (**tavg F**), where F indicates the frequency or averaging interval and can be any of the following:

1 = Hourly

3 = 3-Hourly

M = Monthly mean

D = Daily Value (mean or other statistic, only used for **stat**)

U = Monthly-Diurnal mean

0 = Not Applicable

A *freq* designation of **M** or **U** can apply to either an **inst** or a **tavg** file depending on whether it is a monthly mean of instantaneous or time-averaged data. As of M2AMIP, the only **D** is **stat**, and vice versa. This was added to incorporate daily statistics to the MERRA-2 output collections.

dims: **2d** for collections with only 2-dimensional fields or **3d** for collections with a mix of 2- and 3-dimensional fields.

group: A three-letter mnemonic for the type of fields in the collection. It is a lowercase version of the group designation used in the ESDT name, as [listed in the next section](#).

HV: Horizontal and Vertical grid.

H can be:

N: Native (5/8 x 1/2) horizontal resolution

V can be:

x: horizontal-only data (surface, single level, etc.) ; *dims* must be **2D**

p: pressure-level data (see [Appendix D](#) for levels) ; *dims* must be **3D**

v: model layer centers (see Appendix D) *dims* must be **3D**

timestamp:

This node defines the date and time associated with the data in the file. It has the form *yyyymmdd* for either instantaneous or time-averaged daily files, *yyyymm* for monthly-mean files.

yyyy - year string (e.g. , "2002")

mm - month string (e.g., "09" for September)

dd - day of the month string (optional)

EXAMPLE:

m2amip02.tavgM_3d_tdt_Np.200209.nc4

This is an example of a M2AMIP filename from the second ensemble member ("m2amip02"). The data are monthly time-averages ("tavgM"), three-dimensional ("3d"), temperature tendency products ("tdt"), at native horizontal resolution and interpolated to pressure levels ("Np"). The file contains 8 the monthly average for September 2002 and is in "nc4" format.

5.2 Earth Science Data Types (ESDT) Name

To accommodate EOSDIS toolkit requirements, all M2AMIP files are associated with a nine-character ESDT. The ESDT is a short (and rather cryptic) handle for users to access sets of files. In M2AMIP the ESDT will be used to identify the *Mainstream collections* and consists of a compressed version of the collection name of the form:

MTFHVGGG

where

T: Time Description:

I = Instantaneous

T = Time-averaged

C = Time-independent

S = Statistics

F: Frequency

1 = Hourly

3 = 3-Hourly

M = Monthly mean

D = Daily statistics

U = Monthly-Diurnal mean

0 = Not Applicable

H: Horizontal Resolution

N = [Native](#)

V: Vertical Location

X = Two-dimensional

P = Pressure

V = model layer center

GGG: Group

ASM = assimilated state variables

INT = vertical integrals

LFO = land surface forcing output

SLV = single level

CSP = COSP satellite simulator

FLX = surface turbulent fluxes and related quantities

LND = land surface variables

OCN = ocean

RAD = radiation

AER = aerosol mixing ratio

TDT = tendencies of temperature

UDT = tendencies of eastward and northward wind components

QDT = tendencies of specific humidity

ODT = tendencies of ozone

GLC = Land Ice Surface

MST = moist processes

CLD = clouds

TRB = turbulence

6: M2AMIP data collections

This section lists the variables in each data collection. More details on the variable definitions may be found in the GEOS Variable Definition Glossary, available on the GMAO web page at https://gmao.gsfc.nasa.gov/products/documents/GEOS-5_Filespec_Glossary.pdf. In the tables, variable names refer to HDF names, which are uppercase.

Constants

const_2d_asm_Nx (M2C0NXASM): Constant Model Parameters

Frequency: *constant from 03:00 UTC (time-invariant)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~1.2 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
AREA	tyx	grid cell area	
FRLAKE	tyx	fraction of lake*	1
FRLAND	tyx	fraction of land	1
FRLANDICE	tyx	fraction of land ice	1
FROCEAN	tyx	fraction of ocean	1
PHIS	tyx	surface geopotential height	m ² s ⁻²
SGH	tyx	isotropic stdv of GWD topography	m

Instantaneous Two-Dimensional Collections

instM_2d_asm_Nx (M2I1NXASM): Single-Level Diagnostics

Frequency: *Monthly from 00:00 UTC (instantaneous)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~32 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
DISPH	tyx	zero plane displacement height	m
PS	tyx	surface pressure	Pa
QV10M	tyx	10-meter specific humidity	kg kg ⁻¹
QV2M	tyx	2-meter specific humidity	kg kg ⁻¹
SLP	tyx	sea level pressure	Pa
T10M	tyx	10-meter air temperature	K
T2M	tyx	2-meter air temperature	K
TO3	tyx	total column ozone	Dobsons
TOX	tyx	total column odd oxygen	kg m ⁻²
TQI	tyx	total precipitable ice water	kg m ⁻²
TQL	tyx	total precipitable liquid water	kg m ⁻²
TQV	tyx	total precipitable water vapor	kg m ⁻²
TROPPB	tyx	tropopause pressure based on blended estimate	Pa
TROPPT	tyx	tropopause pressure based on thermal estimate	Pa
TROPPV	tyx	tropopause pressure based on EPV estimate	Pa
TROPQ	tyx	tropopause specific humidity using blended TROPP estimate	kg kg ⁻¹
TROPT	tyx	tropopause temperature using blended TROPP estimate	K
TS	tyx	surface skin temperature	K
U10M	tyx	10-meter eastward wind	m s ⁻¹
U2M	tyx	2-meter eastward wind	m s ⁻¹
U50M	tyx	eastward wind at 50 meters	m s ⁻¹
V10M	tyx	10-meter northward wind	m s ⁻¹
V2M	tyx	2-meter northward wind	m s ⁻¹
V50M	tyx	northward wind at 50 meters	m s ⁻¹

instM_2d_int_Nx (M2I1NXINT): Vertically Integrated Diagnostics

Frequency: *Monthly from 00:00 UTC (instantaneous)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~11 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
CPT	tyx	vertically integrated enthalpy	J m ⁻²
KE	tyx	vertically integrated kinetic energy	J m ⁻²
MASS	tyx	atmospheric mass	kg m ⁻²
THV	tyx	vertically integrated virtual potential temperature	K
TOX	tyx	total column odd oxygen	kg m ⁻²
TQI	tyx	total precipitable ice water	kg m ⁻²
TQL	tyx	total precipitable liquid water	kg m ⁻²
TQV	tyx	total precipitable water vapor	kg m ⁻²

instM_2d_lfo_Nx (M2I1NXLFO): Land Surface Forcings

Frequency: *Monthly from 00:00 UTC (instantaneous)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~6.8 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
HLML	tyx	surface layer height	m
PS	tyx	surface pressure	Pa
QLML	tyx	surface specific humidity	1
SPEEDLML	tyx	surface wind speed	m s ⁻¹
TLML	tyx	surface air temperature	K

Instantaneous Three-Dimensional Collections

instM_3d_asm_Np (M2I3NPASM): Assimilated Meteorological Fields

Frequency: *Monthly from 00:00 UTC (instantaneous)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~1.3 GB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
EPV	tzyx	ertels potential vorticity	K m ² kg ⁻¹ s ⁻¹
H	tzyx	edge heights	m
O3	tzyx	ozone mass mixing ratio	kg kg ⁻¹
OMEGA	tzyx	vertical pressure velocity	Pa s ⁻¹
PHIS	tyx	surface geopotential height	m ² s ⁻²
PS	tyx	surface pressure	Pa
QI	tzyx	mass fraction of cloud ice water	kg kg ⁻¹
QL	tzyx	mass fraction of cloud liquid water	kg kg ⁻¹
QV	tzyx	specific humidity	kg kg ⁻¹
RH	tzyx	relative humidity after moist	1
SLP	tyx	sea level pressure	Pa
T	tzyx	air temperature	K
U	tzyx	eastward wind	m s ⁻¹
V	tzyx	northward wind	m s ⁻¹

instM_3d_asm_Nv (M2I3NVASM): Assimilated Meteorological Fields

Frequency: *Monthly from 00:00 UTC (instantaneous)*

Spatial Grid: *3D, model-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=72, time=8*

Granule Size: *~2.2 GB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
EPV	tzyx	ertels potential vorticity	K m ² kg ⁻¹ s ⁻¹
H	tzyx	mid layer heights	m
O3	tzyx	ozone mass mixing ratio	kg kg ⁻¹
OMEGA	tzyx	vertical pressure velocity	Pa s ⁻¹
PHIS	tyx	surface geopotential height	m ² s ⁻²
PS	tyx	surface pressure	Pa
QI	tzyx	mass fraction of cloud ice water	kg kg ⁻¹
QL	tzyx	mass fraction of cloud liquid water	kg kg ⁻¹
QV	tzyx	specific humidity	kg kg ⁻¹
RH	tzyx	relative humidity after moist	1
SLP	tyx	sea level pressure	Pa
T	tzyx	air temperature	K
U	tzyx	eastward wind	m s ⁻¹
V	tzyx	northward wind	m s ⁻¹

Time Averaged Two-Dimensional Collections

statM_2d_slv_Nx (M2SDNXSLV): Single-Level Diagnostics

Frequency: *daily from 00:30 UTC (aggregated statistics)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~6.3 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
HOURNORAIN	tyx	time-during an hour with no precipitation	s
T2MMAX	tyx	2-meter air temperature	K
T2MMEAN	tyx	2-meter air temperature	K

T2MMIN	tyx	2-meter air temperature	K
TPRECMEAN	tyx	total precipitation	kg m ⁻² s ⁻¹

tavgM_2d_csp_Nx (M2T1NXCSP): COSP Satellite Simulator

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~19 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
ISCCPALB	tyx	isccp cloud albedo	1
ISCCPCLDFRC	tyx	isccp total cloud area fraction	1
MDSCLDFRCH2O	tyx	modis cloud fraction water mean	1
MDSCLDFRCHI	tyx	modis cloud fraction high mean	1
MDSCLDFRCICE	tyx	modis cloud fraction ice mean	1
MDSCLDFRCLO	tyx	modis cloud fraction low mean	1
MDSCLDFRCMID	tyx	modis cloud fraction mid mean	1
MDSCLDFRCTTL	tyx	modis cloud fraction total mean	1
MDSCLDSZH2O	tyx	modis cloud particle size water mean	m
MDSCLDSZICE	tyx	modis cloud particle size ice mean	m
MDSCLDTOPPS	tyx	modis cloud top pressure total mean	Pa
MDSH2OPATH	tyx	modis liquid water path mean	Kg m ⁻²
MDSICEPATH	tyx	modis ice water path mean	Kg m ⁻²
MDSOPTHCKH2O	tyx	modis optical thickness water mean	1
MDSOPTHCKH2OLG	tyx	modis optical thickness water logmean	1
MDSOPTHCKICE	tyx	modis optical thickness ice mean	1
MDSOPTHCKICELG	tyx	modis optical thickness ice logmean	1
MDSOPTHCKTTL	tyx	modis optical thickness total mean	1

MDSOPHCKTTLLG	tyx	modis optical thickness total logmean	1
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tavgM_2d_flux_Nx (M2T1NXFLX): Surface Flux Diagnostics

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~61 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
BSTAR	tyx	surface bouyancy scale	m s ⁻²
CDH	tyx	surface exchange coefficient for heat	kg m ⁻² s ⁻¹
CDM	tyx	surface exchange coefficient for momentum	kg m ⁻² s ⁻¹
CDQ	tyx	surface exchange coefficient for moisture	kg m ⁻² s ⁻¹
CN	tyx	surface neutral drag coefficient	1
DISPH	tyx	zero plane displacement height	m
EFLUX	tyx	total latent energy flux	W m ⁻²
EVAP	tyx	evaporation from turbulence	kg m ⁻² s ⁻¹
FRCAN	tyx	areal fraction of anvil showers	1
FRCCN	tyx	areal fraction of convective showers	1
FRCLS	tyx	areal fraction of nonanvil large scale showers	1
FRSEAICE	tyx	ice covered fraction of tile	1
GHTSKIN	tyx	Ground heating for skin temp	W m ⁻²
HFLUX	tyx	sensible heat flux from turbulence	W m ⁻²
HLML	tyx	surface layer height	m
NIRDF	tyx	surface downwelling nearinfrared diffuse flux	W m ⁻²
NIRDR	tyx	surface downwelling nearinfrared beam flux	W m ⁻²
PBLH	tyx	planetary boundary layer height	m
PGENTOT	tyx	Total column production of precipitation	kg m ⁻² s ⁻¹

PRECANV	tyx	anvil precipitation	$\text{kg m}^{-2} \text{ s}^{-1}$
PRECCON	tyx	convective precipitation	$\text{kg m}^{-2} \text{ s}^{-1}$
PRECLSC	tyx	nonanvil large scale precipitation	$\text{kg m}^{-2} \text{ s}^{-1}$
PRECSNO	tyx	snowfall	$\text{kg m}^{-2} \text{ s}^{-1}$
PRECTOT	tyx	total precipitation	$\text{kg m}^{-2} \text{ s}^{-1}$
PRECTOTCORR	tyx	total precipitation	$\text{kg m}^{-2} \text{ s}^{-1}$
PREVTOT	tyx	Total column re-evap/subl of precipitation	$\text{kg m}^{-2} \text{ s}^{-1}$
QLML	tyx	surface specific humidity	1
QSH	tyx	effective surface specific humidity	kg kg^{-1}
QSTAR	tyx	surface moisture scale	kg kg^{-1}
RHOA	tyx	air density at surface	kg m^{-3}
RISFC	tyx	surface bulk richardson number	1
SPEED	tyx	surface wind speed	m s^{-1}
SPEEDMAX	tyx	surface wind speed	m s^{-1}
TAUGWX	tyx	surface eastward gravity wave stress	N m^{-2}
TAUGWY	tyx	surface northward gravity wave stress	N m^{-2}
TAUX	tyx	eastward surface stress	N m^{-2}
TAUY	tyx	northward surface stress	N m^{-2}
TCZPBL	tyx	transcom planetary boundary layer height	m
TLML	tyx	surface air temperature	K
TSH	tyx	effective surface skin temperature	K
TSTAR	tyx	surface temperature scale	K
ULML	tyx	surface eastward wind	m s^{-1}
USTAR	tyx	surface velocity scale	m s^{-1}
VLML	tyx	surface northward wind	m s^{-1}
Z0H	tyx	surface roughness for heat	m
Z0M	tyx	surface roughness	m

tavgM_2d_int_Nx (M2T1NXINT): Vertically Integrated Diagnostics

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~110 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
AUTCNVRN	tyx	autoconversion loss of cloud water	kg m ⁻² s ⁻¹
BKGERR	tyx	vertically integrated kinetic energy residual for BKG energy conservation	W m ⁻²
COLCNVRN	tyx	accretion loss of cloud water to rain	kg m ⁻² s ⁻¹
COLCNVSN	tyx	accretion loss of cloud water to snow	kg m ⁻² s ⁻¹
CUCNVC I	tyx	convective source of cloud ice	kg m ⁻² s ⁻¹
CUCNVCL	tyx	convective source of cloud water	kg m ⁻² s ⁻¹
CUCNVRN	tyx	convective production of rain water	kg m ⁻² s ⁻¹
DHDT_ANA	tyx	total potential energy tendency due to analysis	W m ⁻²
DHDT_BKG	tyx	vertically integrated potential energy tendency due to gravity wave background	W m ⁻²
DHDT_CUF	tyx	vertically integrated potential energy tendency due to cumulus friction	W m ⁻²
DHDT_DYN	tyx	vertically integrated potential energy tendency due to dynamics	W m ⁻²
DHDT_FRI	tyx	vertically integrated potential energy tendency due to friction	W m ⁻²
DHDT_GWD	tyx	vertically integrated potential energy tendency across gwd	W m ⁻²
DHDT_MST	tyx	vertically integrated potential energy tendency across moist	W m ⁻²
DHDT_ORO	tyx	vertically integrated potential energy tendency due to orographic gravity waves	W m ⁻²
DHDT_PHY	tyx	total potential energy tendency due to physics	W m ⁻²

DHDT_RAD	tyx	vertically integrated potential energy tendency across radiation	W m ⁻²
DHDT_RAY	tyx	vertically integrated potential energy tendency due to Rayleigh friction	W m ⁻²
DHDT_RES	tyx	vertically integrated cpt tendency residual	W m ⁻²
DHDT_TRB	tyx	vertically integrated potential energy tendency across turbulence	W m ⁻²
DKDT_ANA	tyx	total kinetic energy tendency due to analysis	W m ⁻²
DKDT_BKG	tyx	vertically integrated kinetic energy dissipation due to gravity wave background	W m ⁻²
DKDT_DYN	tyx	vertically integrated kinetic energy tendency due to dynamics	W m ⁻²
DKDT_GWD	tyx	vertically integrated kinetic energy tendency across gwd	W m ⁻²
DKDT_GWDRES	tyx	vertically integrated kinetic energy residual for total energy conservation	W m ⁻²
DKDT_INT	tyx	vertically integrated kinetic energy dissipation due to diffusion	W m ⁻²
DKDT_MST	tyx	vertically integrated kinetic energy tendency across moist	W m ⁻²
DKDT_ORO	tyx	vertically integrated kinetic energy dissipation due to orographic gravity waves	W m ⁻²
DKDT_PHY	tyx	vertically integrated kinetic energy tendency due to physics	W m ⁻²
DKDT_PHYPHY	tyx	vertically integrated kinetic energy tendency across physics	W m ⁻²
DKDT_RAY	tyx	vertically integrated kinetic energy dissipation due to Rayleigh friction	W m ⁻²
DKDT_SRF	tyx	vertically integrated kinetic energy dissipation due to surface friction	W m ⁻²
DKDT_TOP	tyx	vertically integrated kinetic energy dissipation due to topographic friction	W m ⁻²
DKDT_TRB	tyx	vertically integrated kinetic energy tendency across turbulence	W m ⁻²

DMDT_ANA	tyx	vertically integrated mass tendency due to analysis	kg m ⁻² s ⁻¹
DMDT_DYN	tyx	vertically integrated mass tendency due to dynamics	kg m ⁻² s ⁻¹
DMDT_PHY	tyx	vertically integrated mass tendency due to physics	kg m ⁻² s ⁻¹
DOXDT_ANA	tyx	vertically integrated ozone tendency due to analysis	kg m ⁻² s ⁻¹
DOXDT_CHM	tyx	vertically integrated odd oxygen tendency due to chemistry	kg m ⁻² s ⁻¹
DOXDT_DYN	tyx	vertically integrated ozone tendency due to dynamics	kg m ⁻² s ⁻¹
DOXDT_FIL	tyx	vertically integrated ox adjustment from filling	kg m ⁻² s ⁻¹
DOXDT_PHY	tyx	vertically integrated odd oxygen tendency due to physics	kg m ⁻² s ⁻¹
DPDT_ANA	tyx	mountain work tendency due to analysis	W m ⁻²
DPDT_DYN	tyx	mountain work tendency due to dynamics	W m ⁻²
DPDT_PHY	tyx	mountain work tendency due to physics	W m ⁻²
DQIDT_ANA	tyx	vertically integrated ice water tendency due to analysis	kg m ⁻² s ⁻¹
DQIDT_DYN	tyx	vertically integrated ice water tendency due to dynamics	kg m ⁻² s ⁻¹
DQIDT_FIL	tyx	vertically integrated qi adjustment from filling	kg m ⁻² s ⁻¹
DQIDT_MST	tyx	vertically integrated ice tendency due to moist processes	kg m ⁻² s ⁻¹
DQIDT_PHY	tyx	vertically integrated ice tendency due to physics	kg m ⁻² s ⁻¹
DQLDT_ANA	tyx	vertically integrated liquid water tendency due to analysis	kg m ⁻² s ⁻¹
DQLDT_DYN	tyx	vertically integrated liquid water tendency due to dynamics	kg m ⁻² s ⁻¹
DQLDT_FIL	tyx	vertically integrated ql adjustment from filling	kg m ⁻² s ⁻¹
DQLDT_MST	tyx	vertically integrated liquid water tendency due to moist processes	kg m ⁻² s ⁻¹
DQLDT_PHY	tyx	vertically integrated liquid water tendency due to physics	kg m ⁻² s ⁻¹

DQVDT_ANA	tyx	vertically integrated water vapor tendency due to analysis	$\text{kg m}^{-2} \text{s}^{-1}$
DQVDT_CHM	tyx	vertically integrated water vapor tendency due to chemistry	$\text{kg m}^{-2} \text{s}^{-1}$
DQVDT_DYN	tyx	vertically integrated water vapor tendency due to dynamics	$\text{kg m}^{-2} \text{s}^{-1}$
DQVDT_FIL	tyx	vertically integrated qv adjustment from filling	$\text{kg m}^{-2} \text{s}^{-1}$
DQVDT_MST	tyx	vertically integrated water vapor tendency due to moist processes	$\text{kg m}^{-2} \text{s}^{-1}$
DQVDT_PHY	tyx	vertically integrated water vapor tendency due to physics	$\text{kg m}^{-2} \text{s}^{-1}$
DQVDT_TRB	tyx	vertically integrated water vapor tendency due to turbulence	$\text{kg m}^{-2} \text{s}^{-1}$
DTHDT_ANA	tyx	vertically integrated THV tendency due to analysis	$\text{K kg m}^{-2} \text{s}^{-1}$
DTHDT_DYN	tyx	vertically integrated THV tendency due to dynamics	$\text{K kg m}^{-2} \text{s}^{-1}$
DTHDT_PHY	tyx	vertically integrated THV tendency due to physics	$\text{K kg m}^{-2} \text{s}^{-1}$
EVAP	tyx	evaporation from turbulence	$\text{kg m}^{-2} \text{s}^{-1}$
EVPCCL	tyx	evaporation loss of cloud water	$\text{kg m}^{-2} \text{s}^{-1}$
EVPRN	tyx	evaporation loss of precip water	$\text{kg m}^{-2} \text{s}^{-1}$
FRZCL	tyx	net freezing of cloud condensate	$\text{kg m}^{-2} \text{s}^{-1}$
FRZRN	tyx	net freezing of precip condensate	$\text{kg m}^{-2} \text{s}^{-1}$
HFLUX	tyx	sensible heat flux from turbulence	W m^{-2}
LSCNVC1	tyx	statistical source of cloud ice	$\text{kg m}^{-2} \text{s}^{-1}$
LSCNVCL	tyx	statistical source of cloud water	$\text{kg m}^{-2} \text{s}^{-1}$
LSCNVRN	tyx	spurious rain from RH cleanup	$\text{kg m}^{-2} \text{s}^{-1}$
LWGNET	tyx	surface net downward longwave flux	W m^{-2}
LWTNET	tyx	upwelling longwave flux at toa	W m^{-2}
PRECCU	tyx	convective rainfall	$\text{kg m}^{-2} \text{s}^{-1}$
PRECLS	tyx	large scale rainfall	$\text{kg m}^{-2} \text{s}^{-1}$
PRECSN	tyx	snowfall	$\text{kg m}^{-2} \text{s}^{-1}$

QTFILL	tyx	vertically integrated total water adjustment from filling	kg m ⁻² s ⁻¹
SDMCI	tyx	sedimentation loss of cloud ice	kg m ⁻² s ⁻¹
SUBCI	tyx	sublimation loss of cloud ice	kg m ⁻² s ⁻¹
SUBSN	tyx	sublimation loss of precip ice	kg m ⁻² s ⁻¹
SWNETSRF	tyx	surface net downward shortwave flux	W m ⁻²
SWNETTOA	tyx	toa net downward shortwave flux	W m ⁻²
UFLXCPT	tyx	eastward flux of atmospheric enthalpy	J m ⁻¹ s ⁻¹
UFLXKE	tyx	eastward flux of atmospheric kinetic energy	J m ⁻¹ s ⁻¹
UFLXPHI	tyx	eastward flux of atmospheric potential energy	J m ⁻¹ s ⁻¹
UFLXQI	tyx	eastward flux of atmospheric ice	kg m ⁻¹ s ⁻¹
UFLXQL	tyx	eastward flux of atmospheric liquid water	kg m ⁻¹ s ⁻¹
UFLXQV	tyx	eastward flux of atmospheric water vapor	kg m ⁻¹ s ⁻¹
VFLXCPT	tyx	northward flux of atmospheric enthalpy	J m ⁻¹ s ⁻¹
VFLXKE	tyx	northward flux of atmospheric kinetic energy	J m ⁻¹ s ⁻¹
VFLXPHI	tyx	northward flux of atmospheric potential energy	J m ⁻¹ s ⁻¹
VFLXQI	tyx	northward flux of atmospheric ice	kg m ⁻¹ s ⁻¹
VFLXQL	tyx	northward flux of atmospheric liquid water	kg m ⁻¹ s ⁻¹
VFLXQV	tyx	northward flux of atmospheric water vapor	kg m ⁻¹ s ⁻¹

tavgM_2d_lfo_Nx (M2T1NXLFO): Land Surface Forcings

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~7.5 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
LWGAB	tyx	surface absorbed longwave radiation	W m ⁻²

PARDF	tyx	surface downwelling par diffuse flux	W m ⁻²
PARDR	tyx	surface downwelling par beam flux	W m ⁻²
PRECCUCORR	tyx	liquid water convective precipitation	kg m ⁻² s ⁻¹
PRECLSCORR	tyx	liquid water large scale precipitation	kg m ⁻² s ⁻¹
PRECSNOCORR	tyx	snowfall	kg m ⁻² s ⁻¹
SWGDN	tyx	Incident shortwave land	W m ⁻²
SWLAND	tyx	Net shortwave land	W m ⁻²

tavgM_2d_Ind_Nx (M2T1NXLND): Land Surface Diagnostics

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~19 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
BASEFLOW	tyx	baseflow flux	kg m ⁻² s ⁻¹
ECHANGE	tyx	rate of change of total land energy	W m ⁻²
EVLAND	tyx	Evaporation land	kg m ⁻² s ⁻¹
EVPINTR	tyx	interception loss energy flux	W m ⁻²
EVPSBLN	tyx	snow ice evaporation energy flux	W m ⁻²
EVPSOIL	tyx	baresoil evap energy flux	W m ⁻²
EVPTRNS	tyx	transpiration energy flux	W m ⁻²
FRSAT	tyx	fractional area of saturated zone	1
FRSNO	tyx	fractional area of land snowcover	1
FRUNST	tyx	fractional area of unsaturated zone	1
FRWLT	tyx	fractional area of wilting zone	1
GHLAND	tyx	Ground heating land	W m ⁻²

GRN	tyx	greeness fraction	1
GWETPROF	tyx	ave prof soil moisture	1
GWETROOT	tyx	root zone soil wetness	1
GWETTOP	tyx	surface soil wetness	1
LAI	tyx	leaf area index	1
LHLAND	tyx	Latent heat flux land	W m ⁻²
LWLAND	tyx	Net longwave land	W m ⁻²
PARDFLAND	tyx	surface downwelling par diffuse flux	W m ⁻²
PARDRLAND	tyx	surface downwelling par beam flux	W m ⁻²
PRECSNOLAND	tyx	snowfall land	kg m ⁻² s ⁻¹
PRECTOTLAND	tyx	Total precipitation land	kg m ⁻² s ⁻¹
PRMC	tyx	water profile	m ⁻³ m ⁻³
QINFIL	tyx	Soil water infiltration rate	kg m ⁻² s ⁻¹
RUNOFF	tyx	overland runoff including throughflow	kg m ⁻² s ⁻¹
RZMC	tyx	water root zone	m ⁻³ m ⁻³
SFMC	tyx	water surface layer	m ⁻³ m ⁻³
SHLAND	tyx	Sensible heat flux land	W m ⁻²
SMLAND	tyx	Snowmelt flux land	kg m ⁻² s ⁻¹
SNODP	tyx	snow depth	m
SNOMAS	tyx	Total snow storage land	kg m ⁻²
SPLAND	tyx	rate of spurious land energy source	W m ⁻²
SPSNOW	tyx	rate of spurious snow energy	W m ⁻²
SPWATR	tyx	rate of spurious land water source	kg m ⁻² s ⁻¹
SWLAND	tyx	Net shortwave land	W m ⁻²
TELAND	tyx	Total energy storage land	J m ⁻²
TPSNOW	tyx	surface temperature of snow	K
TSAT	tyx	surface temperature of saturated zone	K

TSOIL1	tyx	soil temperatures layer 1	K
TSOIL2	tyx	soil temperatures layer 2	K
TSOIL3	tyx	soil temperatures layer 3	K
TSOIL4	tyx	soil temperatures layer 4	K
TSOIL5	tyx	soil temperatures layer 5	K
TSOIL6	tyx	soil temperatures layer 6	K
TSURF	tyx	surface temperature of land incl snow	K
TUNST	tyx	surface temperature of unsaturated zone	K
TWLAND	tyx	Avail water storage land	kg m ⁻²
TWLT	tyx	surface temperature of wilted zone	K
WCHANGE	tyx	rate of change of total land water	kg m ⁻² s ⁻¹

tavgM_2d_ocn_Nx (M2T1NXOCN): Ocean Surface Diagnostics

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~17 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
EFLUXICE	tyx	sea ice latent energy flux	W m ⁻²
EFLUXWTR	tyx	open water latent energy flux	W m ⁻²
FRSEAICE	tyx	ice covered fraction of tile	1
HFLUXICE	tyx	sea ice upward sensible heat flux	W m ⁻²
HFLUXWTR	tyx	open water upward sensible heat flux	W m ⁻²
LWGNTICE	tyx	sea ice net downward longwave flux	W m ⁻²
LWGNTWTR	tyx	open water net downward longwave flux	W m ⁻²
PRECSNOOCN	tyx	ocean snowfall	kg m ⁻² s ⁻¹
QV10M	tyx	10-meter specific humidity	kg kg ⁻¹

RAINOCN	tyx	ocean rainfall	kg m ⁻² s ⁻¹
SWGNTICE	tyx	sea ice net downward shortwave flux	W m ⁻²
SWGNTWTR	tyx	open water net downward shortwave flux	W m ⁻²
T10M	tyx	10-meter air temperature	K
TAUXICE	tyx	eastward stress over ice	N m ⁻²
TAUXWTR	tyx	eastward stress over water	N m ⁻²
TAUYICE	tyx	northward stress over ice	N m ⁻²
TAUYWTR	tyx	northward stress over water	N m ⁻²
TSKINICE	tyx	sea ice skin temperature	K
TSKINWTR	tyx	open water skin temperature	K
U10M	tyx	10-meter eastward wind	m s ⁻¹
V10M	tyx	10-meter northward wind	m s ⁻¹

tavgM_2d_rad_Nx (M2T1NXRAD): Radiation Diagnostics

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~45 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
ALBEDO	tyx	surface albedo	1
ALBNIRDF	tyx	surface albedo for near infrared diffuse	1
ALBNIRDR	tyx	surface albedo for near infrared beam	1
ALBVISDF	tyx	surface albedo for visible diffuse	1
ALBVISDR	tyx	surface albedo for visible beam	1
CLDHGH	tyx	cloud area fraction for high clouds	1
CLDLOW	tyx	cloud area fraction for low clouds	1
CLDMID	tyx	cloud area fraction for middle clouds	1

CLDTOT	tyx	total cloud area fraction	1
EMIS	tyx	surface emissivity	1
LWGAB	tyx	surface absorbed longwave radiation	W m ⁻²
LWGABCLR	tyx	surface absorbed longwave radiation assuming clear sky	W m ⁻²
LWGABCLRCLN	tyx	surface absorbed longwave radiation assuming clear sky and no aerosol	W m ⁻²
LWGEM	tyx	longwave flux emitted from surface	W m ⁻²
LWGNT	tyx	surface net downward longwave flux	W m ⁻²
LWGNTCLR	tyx	surface net downward longwave flux assuming clear sky	W m ⁻²
LWGNTCLRCLN	tyx	surface net downward longwave flux assuming clear sky and no aerosol	W m ⁻²
LWTUP	tyx	upwelling longwave flux at toa	W m ⁻²
LWTUPCLR	tyx	upwelling longwave flux at toa assuming clear sky	W m ⁻²
LWTUPCLRCLN	tyx	upwelling longwave flux at toa assuming clear sky and no aerosol	W m ⁻²
SWGDN	tyx	surface incoming shortwave flux	W m ⁻²
SWGDNCLR	tyx	surface incoming shortwave flux assuming clear sky	W m ⁻²
SWGNT	tyx	surface net downward shortwave flux	W m ⁻²
SWGNTCLN	tyx	surface net downward shortwave flux assuming no aerosol	W m ⁻²
SWGNTCLR	tyx	surface net downward shortwave flux assuming clear sky	W m ⁻²
SWGNTCLRCLN	tyx	surface net downward shortwave flux assuming clear sky and no aerosol	W m ⁻²
SWTDN	tyx	toa incoming shortwave flux	W m ⁻²
SWTNT	tyx	toa net downward shortwave flux	W m ⁻²
SWTNTCLN	tyx	toa net downward shortwave flux assuming no aerosol	W m ⁻²
SWTNTCLR	tyx	toa net downward shortwave flux assuming clear sky	W m ⁻²

SWTNTCLRCLN	tyx	toa net downward shortwave flux assuming clear sky and no aerosol	W m ⁻²
TAUHGHI	tyx	in cloud optical thickness of high clouds(EXPORT)	1
TAULOW	tyx	in cloud optical thickness of low clouds	1
TAUMID	tyx	in cloud optical thickness of middle clouds	1
TAUTOT	tyx	in cloud optical thickness of all clouds	1
TS	tyx	surface skin temperature	K

tavgM_2d_slv_Nx (M2T1NXSLV): Single-Level Diagnostics

Frequency: *Monthly from 00:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~63 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
CLDPRS	tyx	cloud top pressure	Pa
CLDTMP	tyx	cloud top temperature	K
DISPH	tyx	zero plane displacement height	m
H1000	tyx	height at 1000 mb	m
H250	tyx	height at 250 hPa	m
H500	tyx	height at 500 hPa	m
H850	tyx	height at 850 hPa	m
OMEGA500	tyx	omega at 500 hPa	Pa s ⁻¹
PBLTOP	tyx	pbltop pressure	Pa
PS	tyx	surface pressure	Pa
Q250	tyx	specific humidity at 250 hPa	kg kg ⁻¹
Q500	tyx	specific humidity at 500 hPa	kg kg ⁻¹
Q850	tyx	specific humidity at 850 hPa	kg kg ⁻¹

QV10M	tyx	10-meter specific humidity	kg kg ⁻¹
QV2M	tyx	2-meter specific humidity	kg kg ⁻¹
SLP	tyx	sea level pressure	Pa
T10M	tyx	10-meter air temperature	K
T250	tyx	air temperature at 250 hPa	K
T2M	tyx	2-meter air temperature	K
T2MDEW	tyx	dew point temperature at 2 m	K
T2MWET	tyx	wet bulb temperature at 2 m	K
T500	tyx	air temperature at 500 hPa	K
T850	tyx	air temperature at 850 hPa	K
TO3	tyx	total column ozone	Dobsons
TOX	tyx	total column odd oxygen	kg m ⁻²
TQI	tyx	total precipitable ice water	kg m ⁻²
TQL	tyx	total precipitable liquid water	kg m ⁻²
TQV	tyx	total precipitable water vapor	kg m ⁻²
TROPPB	tyx	tropopause pressure based on blended estimate	Pa
TROPPT	tyx	tropopause pressure based on thermal estimate	Pa
TROPPV	tyx	tropopause pressure based on EPV estimate	Pa
TROPQ	tyx	tropopause specific humidity using blended TROPP estimate	kg kg ⁻¹
TROPT	tyx	tropopause temperature using blended TROPP estimate	K
TS	tyx	surface skin temperature	K
U10M	tyx	10-meter eastward wind	m s ⁻¹
U250	tyx	eastward wind at 250 hPa	m s ⁻¹
U2M	tyx	2-meter eastward wind	m s ⁻¹
U500	tyx	eastward wind at 500 hPa	m s ⁻¹
U50M	tyx	eastward wind at 50 meters	m s ⁻¹
U850	tyx	eastward wind at 850 hPa	m s ⁻¹

V10M	tyx	10-meter northward wind	m s ⁻¹
V250	tyx	northward wind at 250 hPa	m s ⁻¹
V2M	tyx	2-meter northward wind	m s ⁻¹
V500	tyx	northward wind at 500 hPa	m s ⁻¹
V50M	tyx	northward wind at 50 meters	m s ⁻¹
V850	tyx	northward wind at 850 hPa	m s ⁻¹
ZLCL	tyx	lifting condensation level	m

tavgM_2d_aer_Nx (M2T3NXAER): Aerosol Diagnostics

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=1*

Granule Size: *~183 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
BCANGSTR	tyx	Black Carbon Angstrom parameter [470-870 nm]	1
BCCMASS	tyx	Black Carbon Column Mass Density	kg m ⁻²
BCDP001	tyx	Black Carbon Dry Deposition Bin 001	kg m ⁻² s ⁻¹
BCDP002	tyx	Black Carbon Dry Deposition Bin 002	kg m ⁻² s ⁻¹
BCEM001	tyx	Black Carbon Emission Bin 001	kg m ⁻² s ⁻¹
BCEM002	tyx	Black Carbon Emission Bin 002	kg m ⁻² s ⁻¹
BCEMAN	tyx	Black Carbon Anthropogenic Emissions	kg m ⁻² s ⁻¹
BCEMBB	tyx	Black Carbon Biomass Burning Emissions	kg m ⁻² s ⁻¹
BCEMBF	tyx	Black Carbon Biofuel Emissions	kg m ⁻² s ⁻¹
BCEXTTAU	tyx	Black Carbon Extinction AOT (550 nm)	1
BCFLUXU	tyx	Black Carbon column u-wind mass flux	kg m ⁻¹ s ⁻¹
BCFLUXV	tyx	Black Carbon column v-wind mass flux	kg m ⁻¹ s ⁻¹
BCHYPHIL	tyx	Black Carbon Hydrophobic to Hydrophilic	kg m ⁻² s ⁻¹

BCSCATAU	tyx	Black Carbon Scattering AOT (550 nm)	1
BCSMASS	tyx	Black Carbon Surface Mass Concentration	kg m ⁻³
BCSV001	tyx	Black Carbon Convective Scavenging Bin 001	kg m ⁻² s ⁻¹
BCSV002	tyx	Black Carbon Convective Scavenging Bin 002	kg m ⁻² s ⁻¹
BCWT001	tyx	Black Carbon Wet Deposition Bin 001	kg m ⁻² s ⁻¹
BCWT002	tyx	Black Carbon Wet Deposition Bin 002	kg m ⁻² s ⁻¹
DMSCMASS	tyx	DMS Column Mass Density	kg m ⁻²
DMSSMASS	tyx	DMS Surface Mass Concentration	kg m ⁻³
DUAERIDX	tyx	Dust TOMS UV Aerosol Index	1
DUANGSTR	tyx	Dust Angstrom parameter [470-870 nm]	1
DUCMASS	tyx	Dust Column Mass Density	kg m ⁻²
DUCMASS25	tyx	Dust Column Mass Density - PM 2.5	kg m ⁻²
DUDP001	tyx	Dust Dry Deposition Bin 001	kg m ⁻² s ⁻¹
DUDP002	tyx	Dust Dry Deposition Bin 002	kg m ⁻² s ⁻¹
DUDP003	tyx	Dust Dry Deposition Bin 003	kg m ⁻² s ⁻¹
DUDP004	tyx	Dust Dry Deposition Bin 004	kg m ⁻² s ⁻¹
DUDP005	tyx	Dust Dry Deposition Bin 005	kg m ⁻² s ⁻¹
DUEM001	tyx	Dust Emission Bin 001	kg m ⁻² s ⁻¹
DUEM002	tyx	Dust Emission Bin 002	kg m ⁻² s ⁻¹
DUEM003	tyx	Dust Emission Bin 003	kg m ⁻² s ⁻¹
DUEM004	tyx	Dust Emission Bin 004	kg m ⁻² s ⁻¹
DUEM005	tyx	Dust Emission Bin 005	kg m ⁻² s ⁻¹
DUEXTT25	tyx	Dust Extinction AOT [550 nm] - PM 2.5	1
DUEXTTAU	tyx	Dust Extinction AOT [550 nm]	1
DUEXTTFM	tyx	Dust Extinction AOT [550 nm] - PM 1.0 um	1
DUFLUXU	tyx	Dust column u-wind mass flux	kg m ⁻¹ s ⁻¹
DUFLUXV	tyx	Dust column v-wind mass flux	kg m ⁻¹ s ⁻¹
DUSCAT25	tyx	Dust Scattering AOT [550 nm] - PM 2.5	1

DUSCATAU	tyx	Dust Scattering AOT [550 nm]	1
DUSCATFM	tyx	Dust Scattering AOT [550 nm] - PM 1.0 um	1
DUSD001	tyx	Dust Sedimentation Bin 001	kg m ⁻² s ⁻¹
DUSD002	tyx	Dust Sedimentation Bin 002	kg m ⁻² s ⁻¹
DUSD003	tyx	Dust Sedimentation Bin 003	kg m ⁻² s ⁻¹
DUSD004	tyx	Dust Sedimentation Bin 004	kg m ⁻² s ⁻¹
DUSD005	tyx	Dust Sedimentation Bin 005	kg m ⁻² s ⁻¹
DUSMASS	tyx	Dust Surface Mass Concentration	kg m ⁻³
DUSMASS25	tyx	Dust Surface Mass Concentration - PM 2.5	kg m ⁻³
DUSV001	tyx	Dust Convective Scavenging Bin 001	kg m ⁻² s ⁻¹
DUSV002	tyx	Dust Convective Scavenging Bin 002	kg m ⁻² s ⁻¹
DUSV003	tyx	Dust Convective Scavenging Bin 003	kg m ⁻² s ⁻¹
DUSV004	tyx	Dust Convective Scavenging Bin 004	kg m ⁻² s ⁻¹
DUSV005	tyx	Dust Convective Scavenging Bin 005	kg m ⁻² s ⁻¹
DUWT001	tyx	Dust Wet Deposition Bin 001	kg m ⁻² s ⁻¹
DUWT002	tyx	Dust Wet Deposition Bin 002	kg m ⁻² s ⁻¹
DUWT003	tyx	Dust Wet Deposition Bin 003	kg m ⁻² s ⁻¹
DUWT004	tyx	Dust Wet Deposition Bin 004	kg m ⁻² s ⁻¹
DUWT005	tyx	Dust Wet Deposition Bin 005	kg m ⁻² s ⁻¹
LWI	tyx	Land (1) / Water (0) / Ice (2) Flag	1
OCANGSTR	tyx	Organic Carbon Angstrom parameter [470-870 nm]	1
OCCMASS	tyx	Organic Carbon Column Mass Density	kg m ⁻²
OCDP001	tyx	Organic Carbon Dry Deposition Bin 001	kg m ⁻² s ⁻¹
OCDP002	tyx	Organic Carbon Dry Deposition Bin 002	kg m ⁻² s ⁻¹
OCEM001	tyx	Organic Carbon Emission Bin 001	kg m ⁻² s ⁻¹
OCEM002	tyx	Organic Carbon Emission Bin 002	kg m ⁻² s ⁻¹
OCEMAN	tyx	Organic Carbon Anthropogenic Emissions	kg m ⁻² s ⁻¹
OCEMBB	tyx	Organic Carbon Biomass Burning Emissions	kg m ⁻² s ⁻¹

OCEMBF	tyx	Organic Carbon Biofuel Emissions	kg m ⁻² s ⁻¹
OCEMBG	tyx	Organic Carbon Biogenic Emissions	kg m ⁻² s ⁻¹
OCEXTTAU	tyx	Organic Carbon Extinction AOT [550 nm]	1
OCFLUXU	tyx	Organic Carbon column u-wind mass flux	kg m ⁻¹ s ⁻¹
OCFLUXV	tyx	Organic Carbon column v-wind mass flux	kg m ⁻¹ s ⁻¹
OCHYPHIL	tyx	Organic Carbon Hydrophobic to Hydrophilic	kg m ⁻² s ⁻¹
OCSCATAU	tyx	Organic Carbon Scattering AOT [550 nm]	1
OCSMASS	tyx	Organic Carbon Surface Mass Concentration	kg m ⁻³
OCSV001	tyx	Organic Carbon Convective Scavenging Bin 001	kg m ⁻² s ⁻¹
OCSV002	tyx	Organic Carbon Convective Scavenging Bin 002	kg m ⁻² s ⁻¹
OCWT001	tyx	Organic Carbon Wet Deposition Bin 001	kg m ⁻² s ⁻¹
OCWT002	tyx	Organic Carbon Wet Deposition Bin 002	kg m ⁻² s ⁻¹
SO2CMASS	tyx	SO2 Column Mass Density	kg m ⁻²
SO2EMAN	tyx	SO2 Anthropogenic Emissions	kg m ⁻² s ⁻¹
SO2EMBB	tyx	SO2 Biomass Burning Emissions	kg m ⁻² s ⁻¹
SO2EMVE	tyx	SO2 Volcanic (explosive) Emissions	kg m ⁻² s ⁻¹
SO2EMVN	tyx	SO2 Volcanic (non-explosive) Emissions	kg m ⁻² s ⁻¹
SO2SMASS	tyx	SO2 Surface Mass Concentration	kg m ⁻³
SO4CMASS	tyx	SO4 Column Mass Density	kg m ⁻²
SO4EMAN	tyx	SO4 Anthropogenic Emissions	kg m ⁻² s ⁻¹
SO4SMASS	tyx	SO4 Surface Mass Concentration	kg m ⁻³
SSAERIDX	tyx	Sea Salt TOMS UV Aerosol Index	1
SSANGSTR	tyx	Sea Salt Angstrom parameter [470-870 nm]	1
SSCMASS	tyx	Sea Salt Column Mass Density	kg m ⁻²
SSCMASS25	tyx	Sea Salt Column Mass Density - PM 2.5	kg m ⁻²
SSDP001	tyx	Sea Salt Dry Deposition Bin 001	kg m ⁻² s ⁻¹
SSDP002	tyx	Sea Salt Dry Deposition Bin 002	kg m ⁻² s ⁻¹
SSDP003	tyx	Sea Salt Dry Deposition Bin 003	kg m ⁻² s ⁻¹

SSDP004	tyx	Sea Salt Dry Deposition Bin 004	kg m ⁻² s ⁻¹
SSDP005	tyx	Sea Salt Dry Deposition Bin 005	kg m ⁻² s ⁻¹
SSEM001	tyx	Sea Salt Emission Bin 001	kg m ⁻² s ⁻¹
SSEM002	tyx	Sea Salt Emission Bin 002	kg m ⁻² s ⁻¹
SSEM003	tyx	Sea Salt Emission Bin 003	kg m ⁻² s ⁻¹
SSEM004	tyx	Sea Salt Emission Bin 004	kg m ⁻² s ⁻¹
SSEM005	tyx	Sea Salt Emission Bin 005	kg m ⁻² s ⁻¹
SSEXTT25	tyx	Sea Salt Extinction AOT [550 nm] - PM 2.5	1
SSEXTTAU	tyx	Sea Salt Extinction AOT [550 nm]	1
SSEXTTFM	tyx	Sea Salt Extinction AOT [550 nm] - PM 1.0 um	1
SSFLUXU	tyx	Sea Salt column u-wind mass flux	kg m ⁻¹ s ⁻¹
SSFLUXV	tyx	Sea Salt column v-wind mass flux	kg m ⁻¹ s ⁻¹
SSSCAT25	tyx	Sea Salt Scattering AOT [550 nm] - PM 2.5	1
SSSCATAU	tyx	Sea Salt Scattering AOT [550 nm]	1
SSSCATFM	tyx	Sea Salt Scattering AOT [550 nm] - PM 1.0 um	1
SSSD001	tyx	Sea Salt Sedimentation Bin 001	kg m ⁻² s ⁻¹
SSSD002	tyx	Sea Salt Sedimentation Bin 002	kg m ⁻² s ⁻¹
SSSD003	tyx	Sea Salt Sedimentation Bin 003	kg m ⁻² s ⁻¹
SSSD004	tyx	Sea Salt Sedimentation Bin 004	kg m ⁻² s ⁻¹
SSSD005	tyx	Sea Salt Sedimentation Bin 005	kg m ⁻² s ⁻¹
SSSMASS	tyx	Sea Salt Surface Mass Concentration	kg m ⁻³
SSSMASS25	tyx	Sea Salt Surface Mass Concentration - PM 2.5	kg m ⁻³
SSSV001	tyx	Sea Salt Convective Scavenging Bin 001	kg m ⁻² s ⁻¹
SSSV002	tyx	Sea Salt Convective Scavenging Bin 002	kg m ⁻² s ⁻¹
SSSV003	tyx	Sea Salt Convective Scavenging Bin 003	kg m ⁻² s ⁻¹
SSSV004	tyx	Sea Salt Convective Scavenging Bin 004	kg m ⁻² s ⁻¹
SSSV005	tyx	Sea Salt Convective Scavenging Bin 005	kg m ⁻² s ⁻¹
SSWT001	tyx	Sea Salt Wet Deposition Bin 001	kg m ⁻² s ⁻¹

SSWT002	tyx	Sea Salt Wet Deposition Bin 002	kg m ⁻² s ⁻¹
SSWT003	tyx	Sea Salt Wet Deposition Bin 003	kg m ⁻² s ⁻¹
SSWT004	tyx	Sea Salt Wet Deposition Bin 004	kg m ⁻² s ⁻¹
SSWT005	tyx	Sea Salt Wet Deposition Bin 005	kg m ⁻² s ⁻¹
SUANGSTR	tyx	SO4 Angstrom parameter [470-870 nm]	1
SUDP001	tyx	Sulfate Dry Deposition Bin 001	kg m ⁻² s ⁻¹
SUDP002	tyx	Sulfate Dry Deposition Bin 002	kg m ⁻² s ⁻¹
SUDP003	tyx	Sulfate Dry Deposition Bin 003	kg m ⁻² s ⁻¹
SUDP004	tyx	Sulfate Dry Deposition Bin 004	kg m ⁻² s ⁻¹
SUEM001	tyx	Sulfate Emission Bin 001	kg m ⁻² s ⁻¹
SUEM002	tyx	Sulfate Emission Bin 002	kg m ⁻² s ⁻¹
SUEM003	tyx	Sulfate Emission Bin 003	kg m ⁻² s ⁻¹
SUEM004	tyx	Sulfate Emission Bin 004	kg m ⁻² s ⁻¹
SUEXTTAU	tyx	SO4 Extinction AOT [550 nm]	1
SUFLUXU	tyx	SO4 column u-wind mass flux	kg m ⁻¹ s ⁻¹
SUFLUXV	tyx	SO4 column v-wind mass flux	kg m ⁻¹ s ⁻¹
SUPMSA	tyx	MSA Prod from DMS Oxidation [column]	kg m ⁻² s ⁻¹
SUPSO2	tyx	SO2 Prod from DMS Oxidation [column]	kg m ⁻² s ⁻¹
SUPSO4AQ	tyx	SO4 Prod from Aqueous SO2 Oxidation [column]	kg m ⁻² s ⁻¹
SUPSO4G	tyx	SO4 Prod from Gaseous SO2 Oxidation [column]	kg m ⁻² s ⁻¹
SUPSO4WT	tyx	SO4 Prod from Aqueous SO2 Oxidation (wet dep) [column]	kg m ⁻² s ⁻¹
SUSCATAU	tyx	SO4 Scattering AOT [550 nm]	1
SUSV001	tyx	Sulfate Convective Scavenging Bin 001	kg m ⁻² s ⁻¹
SUSV002	tyx	Sulfate Convective Scavenging Bin 002	kg m ⁻² s ⁻¹
SUSV003	tyx	Sulfate Convective Scavenging Bin 003	kg m ⁻² s ⁻¹
SUSV004	tyx	Sulfate Convective Scavenging Bin 004	kg m ⁻² s ⁻¹
SUWT001	tyx	Sulfate Wet Deposition Bin 001	kg m ⁻² s ⁻¹

SUWT002	tyx	Sulfate Wet Deposition Bin 002	kg m ⁻² s ⁻¹
SUWT003	tyx	Sulfate Wet Deposition Bin 003	kg m ⁻² s ⁻¹
SUWT004	tyx	Sulfate Wet Deposition Bin 004	kg m ⁻² s ⁻¹
TOTANGSTR	tyx	Total Aerosol Angstrom parameter [470-870 nm]	1
TOTEXTTAU	tyx	Total Aerosol Extinction AOT [550 nm]	1
TOTSCATAU	tyx	Total Aerosol Scattering AOT [550 nm]	1

tavgM_2d_glc_Nx (M2T3NXGLC): Land Ice Surface Diagnostics

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *2D, single-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, time=8*

Granule Size: *~1.2 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
ASNOW_GL	tyx	fractional area of glaciated surface snowcover	1
RUNOFF	tyx	runoff flux	kg m ⁻² s ⁻¹
SNICEALB	tyx	aggregated snow ice broadband albedo	1
SNOMAS_GL	tyx	snow mass over glaciated surface	kg m ⁻²
SNOWDP_GL	tyx	snow depth over glaciated surface	m
WESNEXT	tyx	total snow mass residual due to densification	kg m ⁻² s ⁻¹
WESNSC	tyx	top snow layer mass change due to sub con	kg m ⁻² s ⁻¹

tavgM_3d_cld_Np (M2T3NPCLD): Cloud Diagnostics

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~290 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
CFCU	tzyx	updraft areal fraction	1
CLOUD	tzyx	cloud fraction for radiation	1
DTRAIN	tzyx	detraining mass flux	kg m ⁻² s ⁻¹
INCLOUDQI	tzyx	in cloud cloud ice for radiation	kg kg ⁻¹
INCLOUDQL	tzyx	in cloud cloud liquid for radiation	kg kg ⁻¹
QI	tzyx	mass fraction of cloud ice water	kg kg ⁻¹
QL	tzyx	mass fraction of cloud liquid water	kg kg ⁻¹
RH	tzyx	relative humidity after moist	1
TAUCLI	tzyx	in cloud optical thickness for ice clouds	1
TAUCLW	tzyx	in cloud optical thickness for liquid clouds	1

tavgM_3d_mst_Np (M2T3NPMST): Moist Processes Diagnostics

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~191 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
CMFMC	tzyx	cumulative mass flux	kg m ⁻² s ⁻¹
DQRCU	tzyx	convective rainwater source	kg kg ⁻¹ s ⁻¹
DQRLSAN	tzyx	large scale rainwater source	kg kg ⁻¹ s ⁻¹
PFICU	tzyx	3D flux of ice convective precipitation	kg m ⁻² s ⁻¹
PFILSAN	tzyx	3D flux of ice nonconvective precipitation	kg m ⁻² s ⁻¹
PFLCU	tzyx	3D flux of liquid convective precipitation	kg m ⁻² s ⁻¹
PFLLSAN	tzyx	3D flux of liquid nonconvective precipitation	kg m ⁻² s ⁻¹
REEVAPCN	tzyx	evap subl of convective precipitation	kg kg ⁻¹ s ⁻¹
REEVAPLSAN	tzyx	evap subl of non convective precipitation	kg kg ⁻¹ s ⁻¹

tavgM_3d_odt_Np (M2T3NPODT): Ozone Tendencies

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~174 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
DOXDTANA	tzyx	total ozone analysis tendency	mol mol ⁻¹ s ⁻¹
DOXDTCHM	tzyx	tendency of odd oxygen mixing ratio due to chemistry	mol mol ⁻¹ s ⁻¹
DOXDTDYN	tzyx	tendency of ozone due to dynamics	kg kg ⁻¹ s ⁻¹
DOXDTMST	tzyx	tendency of odd oxygen due to moist processes	kg kg ⁻¹ s ⁻¹
DOXDTTRB	tzyx	tendency of odd oxygen due to turbulence	kg kg ⁻¹ s ⁻¹

tavgM_3d_qdt_Np (M2T3NPQDT): Moist Tendencies

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~335 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
DQIDTDYN	tzyx	tendency of ice water due to dynamics	kg kg ⁻¹ s ⁻¹
DQIDTMST	tzyx	total ice water tendency due to moist	kg kg ⁻¹ s ⁻¹
DQIDTTRB	tzyx	tendency of frozen condensate due to turbulence	kg kg ⁻¹ s ⁻¹
DQLDTDYN	tzyx	tendency of liquid water due to dynamics	kg kg ⁻¹ s ⁻¹
DQLDTMST	tzyx	total liq water tendency due to moist	kg kg ⁻¹ s ⁻¹
DQLDTTRB	tzyx	tendency of liquid condensate due to turbulence	kg kg ⁻¹ s ⁻¹
DQVDTANA	tzyx	total specific humidity analysis tendency	kg kg ⁻¹ s ⁻¹

DQVDTCHM	tzyx	tendency of water vapor mixing ratio due to chemistry	kg kg ⁻¹ s ⁻¹
DQVDTDYN	tzyx	tendency of specific humidity due to dynamics	kg kg ⁻¹ s ⁻¹
DQVDTMST	tzyx	specific humidity tendency due to moist	kg kg ⁻¹ s ⁻¹
DQVDTTRB	tzyx	tendency of specific humidity due to turbulence	kg kg ⁻¹ s ⁻¹

tavgM_3d_rad_Np (M2T3NPRAD): Radiation Diagnostics

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~236 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
CLOUD	tzyx	cloud fraction for radiation	1
DTDTLWR	tzyx	air temperature tendency due to longwave	K s ⁻¹
DTDTLWRCLR	tzyx	air temperature tendency due to longwave for clear skies	K s ⁻¹
DTDTSWR	tzyx	air temperature tendency due to shortwave	K s ⁻¹
DTDTSWRCLR	tzyx	air temperature tendency due to shortwave for clear skies	K s ⁻¹

tavgM_3d_tdt_Np (M2T3NPTDT): Temperature Tendencies

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~371 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
DTDTANA	tzyx	total temperature analysis tendency	K s ⁻¹
DTDTDYN	tzyx	tendency of air temperature due to dynamics	K s ⁻¹
DTDTFRI	tzyx	tendency of air temperature due to friction	K s ⁻¹

DTDTGWD	tzyx	air temperature tendency due to GWD	K s ⁻¹
DTDTMST	tzyx	tendency of air temperature due to moist processes	K s ⁻¹
DTDTRAD	tzyx	tendency of air temperature due to radiation	K s ⁻¹
DTDTTOT	tzyx	tendency of air temperature due to physics	K s ⁻¹
DTDTTRB	tzyx	tendency of air temperature due to turbulence	K s ⁻¹

tavgM_3d_trb_Np (M2T3NPTRB): Turbulence Diagnostics

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~353 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
KH	tzyx	total scalar diffusivity	m ² s ⁻¹
KHLK	tzyx	entrainment heat diffusivity from Lock	m ² s ⁻¹
KHLS	tzyx	scalar diffusivity from Louis	m ² s ⁻¹
KHRAD	tzyx	radiation driven scalar diffusivity from Lock scheme	m ² s ⁻¹
KHSFC	tzyx	surface driven scalar diffusivity from Lock scheme	m ² s ⁻¹
KM	tzyx	total momentum diffusivity	m ² s ⁻¹
KMLK	tzyx	entrainment momentum diffusivity from Lock	m ² s ⁻¹
KMLS	tzyx	momentum diffusivity from Louis	m ² s ⁻¹
RI	tzyx	Richardson number from Louis	1

tavgM_3d_udt_Np (M2T3NPUDT): Wind Tendencies

Frequency: *Monthly from 01:30 UTC (time-averaged)*

Spatial Grid: *3D, pressure-level, full horizontal resolution*

Dimensions: *longitude=576, latitude=361, level=42, time=8*

Granule Size: *~387 MB*

<i>Name</i>	<i>Dim</i>	<i>Description</i>	<i>Units</i>
DUDTANA	tzyx	total eastward wind analysis tendency	m s ⁻²
DUDTDYN	tzyx	tendency of eastward wind due to dynamics	m s ⁻²
DUDTGWD	tzyx	tendency of eastward wind due to GWD	m s ⁻²
DUDTMST	tzyx	zonal wind tendency due to moist	m s ⁻²
DUDTTRB	tzyx	tendency of eastward wind due to turbulence	m s ⁻²
DVDTANA	tzyx	total northward wind analysis tendency	m s ⁻²
DVDTDYN	tzyx	tendency of northward wind due to dynamics	m s ⁻²
DVDTGWD	tzyx	tendency of northward wind due to GWD	m s ⁻²
DVDTMST	tzyx	meridional wind tendency due to moist	m s ⁻²
DVDTTRB	tzyx	tendency of northward wind due to turbulence	m s ⁻²

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Web Resources

GMAO web site: <http://gmao.gsfc.nasa.gov/>

CF Standard Description: <http://cf-pcmdi.llnl.gov/>

GEOS-5 Variable Definition Glossary:

https://gmao.gsfc.nasa.gov/products/documents/GEOS-5_Filespec_Glossary.pdf