GMAO Product Collections and Variables

1.1 tavg1_2d_slv_Nx: Two–Dimensional, Hourly, Time-averaged Assimilation and Forecast Fields – Single Level Diagnostics Collection

Sea level pressure	Northward wind at 2 m above displacement height
Time-averaged surface pressure	Northward wind at 50 m above surface
Eastward wind at 850 hPa, 500 hPa, 250 hPa	Temperature at 10 m above displacement height
Northward wind at 850 hPa, 500 hPa, 250 hPa	Temperature at 2 m above displacement height
Temperature at 850 hPa, 500 hPa, 250 hPa	Specific humidity at 10 m above displacement height
Specific humidity at 850 hPa, 500 hPa, 250 hPa	Specific humidity at 2 m above displacement height
Height at 1000 hPa, 850 hPa, 500 hPa, 250 hPa	Radiative skin temperature
Vertical pressure velocity at 500 hPa	Displacement height
Eastward wind at 10 m above displacement height	Tropopause pressure
Eastward wind at 2 m above displacement height	Tropopause specific humidity
Eastward wind at 50 m above surface	Tropopause temperature
Northward wind at 10 m above displacement height	Cloud-top pressure
Northward wind at 2 m above displacement height	Cloud-top temperature

1.2 tavg1_2d_flx_Nx: Two–Dimensional, Hourly, Time-averaged Assimilation and Forecast Fields – Turbulence Collection

Latent heat flux	Eastward wind of lowest model layer
Surface evaporation	Northward wind of lowest model layer
Sensible heat flux	Surface air density
Eastward surface wind stress	Effective surface wind speed
Northward surface wind stress	Surface exchange coefficient for heat
Eastward gravity wave surface stress	Surface exchange coefficient for moisture
Northward gravity wave surface stress	Surface exchange coefficient for momentum
Planetary boundary layer height	Surface neutral drag coefficient
Surface buoyancy scale	Effective turbulence skin temperature
Surface velocity scale	Effective turbulence skin humidity
Surface temperature scale	Sea-ice fraction
Surface humidity scale	Surface precipitation flux from anvils
Surface Richardson number	Surface precipitation flux from convection
Roughness length, sensible heat	Surface precipitation flux from large-scale
Roughness length, momentum	Surface snowfall flux
Height of center of lowest model layer	Total surface precipitation flux
Temperature of lowest model layer	Total generation of precipitation
Specific humidity of lowest model layer	Total re-evaporation of precipitation

1.3 tavg1_2d_rad_Nx: Two–Dimensional, Hourly, Time-averaged Assimilation and Forecast Fields – Radiation Collection

Surface skin temperature	Absorbed longwave at the surface with no clouds
Surface albedo	Absorbed longwave at the surface with no clouds or aerosols
Diffuse beam NIR surface albedo	Net downward longwave flux at the surface
Direct beam NIR surface albedo	Net downward longwave flux at the surface for cloud-free sky
Diffuse beam VIS-UV surface albedo	Net downward longwave flux at the surface for clear sky

Direct beam VIS-UV surface albedos	Upward longwave flux at top of atmosphere
Emitted longwave at the surface	Upward longwave flux at TOA assuming clear sky
Absorbed longwave at the surface	Upward LW flux at TOA assuming clear clean sky
TOA incident shortwave flux	TOA outgoing shortwave flux assuming clear clean sky
Surface incident shortwave flux	Optical thickness of high clouds
Surface incident shortwave flux assuming clear sky	Optical thickness of low clouds
Surface net downward shortwave flux	Optical thickness of mid-level clouds
Surface net downward shortwave flux assuming clear sky	Optical thickness of all clouds
Surface net downward shortwave flux assuming clean sky	High-level (above 400 hPa) cloud fraction
Surface net downward shortwave flux assuming clear clean sky	Low-level (1000-700 hPa) cloud fraction
TOA outgoing shortwave flux	Mid-level (700-400 hPa) cloud fraction
TOA outgoing shortwave flux assuming clear sky	Total cloud fraction
TOA outgoing shortwave flux assuming clean sky	

1.4 tavg1_2d_lnd_Nx: Two–Dimensional, Hourly, Time-averaged Assimilation and Forecast Fields – Land Surface Collection

Vegetation greenness fraction	Fractional unsaturated area
Leaf area index	Fractional saturated area
Root zone soil wetness	Fractional snow-covered area
Top soil layer wetness	Fractional wilting area
Top snow layer temperature	Surface downward PAR diffuse flux
Surface temperature of unsaturated zone	Surface downward PAR beam flux
Surface temperature of saturated zone	Sensible heat flux from land
Surface temperature of wilted zone	Latent heat flux from land
Surface snowfall	Evaporation from land
Total surface precipitation	Net downward longwave flux over land
Snow mass	Net downward shortwave flux over land
Snow depth	Downward heat flux at base of top soil layer
Bare soil evaporation	Total water store in land reservoirs
Transpiration	Energy store in all land reservoirs
Interception Loss	Total land water change per unit time
Sublimation	Total land energy change pre unit time
Overland runoff	Spurious land energy source
Baseflow	Spurious land water source
Snowmelt	Spurious snow source

1.5 tavg1_2d_ocn_Nx: Two–Dimensional, Hourly, Time-averaged Assimilation and Forecast Fields – Ocean Surface Collection

Specific humidity at 10 m above the surface	Net downward shortwave flux over sea-ice
Sensible heat flux from the ocean	Surface snowfall over ocean and sea-ice
Sensible heat flux from sea-ice	Surface precipitation over ocean and sea-ice
Latent heat flux from the ocean	Eastward surface wind stress over ocean
Latent heat flux from sea-ice	Northward surface wind stress over ocean
Net downward longwave flux over ocean	Eastward surface wind stress over sea-ice
Net downward longwave flux over sea-ice	Northward surface wind stress over sea-ice
Net downward shortwave flux over ocean	Fraction of sea-ice

1.6 inst3_3d_asm_Np; inst3_3d_asd_Np; inst3_3d_asq_np: Three–Dimensional, 3-Hourly, Instantaneous Pressure-Level Assimilation and Forecast Fields (3 Collections)

inst3_3d_asm_Np
Sea-level pressure (2D)
Temperature
Eastward wind component
Northward wind component
Vertical pressure velocity
inst3_3d_asd_Np
Surface pressure (2D)
Surface geopotential (2D)
Geopotential height
Ozone mass mixing ratio
Ertel potential vorticity
inst3_3d_asq_Np
Relative humidity
Specific humidity
Cloud liquid water mixing ratio
Cloud ice mixing ratio

1.7 tavg3_3d_cld_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Cloud Diagnostics Collection

Relative humidity
Cloud liquid water mixing ratio – large scale
Cloud ice mixing ratio – large scale
Cloud liquid water mixing ratio – anvils
Cloud ice mixing ratio – anvils
Cloud condensate mixing ratio – convective updraft
3D cloud fraction – large scale
3D cloud fraction – anvils
3D cloud fraction – convective

1.8 tavg3_3d_mst_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Moist Processes Diagnostics Collection

Upward moist convective mass flux
Precipitation production rate – convective
Precipitation production rate – large-scale + anvil
Downward flux of liquid precipitation - convective
Downward flux of ice precipitation - convective
Downward flux of liquid precipitation – large-scale + anvil
Downward flux of ice precipitation – large-scale + anvil
Evaporation of precipitating convective condensate
Evaporation of precipitating large-scale + anvil condensate

1.9 tavg3_3d_rad_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Radiation Diagnostics Collection

3D cloud fraction
Temperature tendency from terrestrial radiation
Temperature tendency from terrestrial radiation (clear sky)
Temperature tendency from solar radiation
Temperature tendency from solar radiation (clear sky)

1.10 tavg3_3d_trb_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Turbulence Diagnostics Collection

Momentum diffusivity
Momentum diffusivity from Louis
Momentum diffusivity from Lock
Heat (scalar) diffusivity
Heat (scalar) diffusivity from Louis
Heat (scalar) diffusivity from Lock
Heat (scalar) diffusivity from Lock, radiative contribution
Heat (scalar) diffusivity from Lock, surface contribution
Richardson number

1.11 tavg3_3d_tdt_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Temperature Tendencies Collection

Temperature tendency from radiation
Temperature tendency from moist physics
Temperature tendency from turbulence
Temperature tendency from frictional heating
Temperature tendency from gravity wave drag
Temperature tendency from physics
Temperature tendency from dynamics
Temperature tendency from analysis

1.12 tavg3_3d_udt_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Wind Tendencies Collection

U-wind tendency from moist physics	V-wind tendency from moist physics
U-wind tendency from turbulence	V-wind tendency from turbulence
U-wind tendency from gravity wave drag	V-wind tendency from gravity wave drag
U-wind tendency from dynamics	V-wind tendency from dynamics
U-wind tendency from analysis	V-wind tendency from analysis

1.13 tavg3_3d_qdt_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Moisture Tendencies Collection

Water vapor tendency from moist physics	Ice tendency from turbulence
Water vapor tendency from turbulence	Ice tendency from dynamics
Water vapor tendency from chemistry	Liquid water tendency from moist physics
Water vapor tendency from dynamics	Liquid water tendency from turbulence
Water vapor tendency from analysis	Liquid water tendency from dynamics
Ice tendency from moist physics	

1.14 tavg3_3d_odt_Np: Three–Dimensional, 3-Hourly, Time-averaged Pressure-Level Assimilation and Forecast Fields – 3D Ozone Tendencies Collection

Ozone tendency from moist physics
Ozone tendency from turbulence
Ozone tendency from chemistry
Ozone tendency from dynamics
Ozone tendency from analysis

1.15 inst6_3d_ana_Nv: 6-Hourly, Instantaneous, Model-Level Analysis Collection

Surface pressure
Layer pressure thickness
Air temperature
Eastward wind component
Northward wind component
Specific humidity
Ozone mixing ratio

1.16 inst6_3d_ana_Np: 6-Hourly, Instantaneous, Pressure-Level Analysis Collection

Sea-level pressure
Surface pressure
Geopotential height
Air temperature
Eastward wind component
Northward wind component
Specific humidity
Ozone mixing ratio

1.17 const_2d_asm_Nx: Invariants Collection

Surface geopotential
Standard deviation of topography for gravity wave drag
Fraction of lake type in grid box
Fraction of land type in grid box
Fraction of land ice type in grid box
Fraction of ocean in grid box
Area of grid box

Notes

- Details of the specific collections, including definitions and units, can be found in the MERRA product file specification document, available at:

  http://gmao.gsfc.nasa.gov/research/merra/MERRA_FileSpec_DRAFT_09_02_2008.pdf .

  More details are also available at each collection's **info** link, under the OpenDap tab, at the web site.

- All data are at the model's native resolution (1/4° × 1/3°), except time-averaged 3D diagnostics produced during the forecast; these are at a reduced resolution (1/2° × 1/2°).

- The native grid has the first point in longitude centered on the dateline; in latitude the first point is at the south pole and the last at the north pole. Thus, fields are 1080 x 361.

- Reduced resolution data are on (1/2° × 1/2°) boxes with the first box having its western edge at the dateline and its southern edge at the South Pole.

- All data are in NETCDF-4/HDF5 format.

- The 6-Hourly, Instantaneous, Model-Level Analysis Collection is provided on the 72 model levels.

- Collections on model levels include the 3D pressure thickness of the layers. Edge pressures can be computed using 1 Pa as the top pressure of the top layer. Layers are numbered from top to bottom.

- 3D pressure-level data are provided on 37 Pressure Levels*:*

1000	975	950	925	900	875	850	825	800	775	750
725	700	650	600	550	500	450	400	350	300	250
200	150	100	70	50	40	30	20	10	7	5
4	3	2	1							