b) diag2d_sfcflux 8.8 MB/day
c) diag2d_topcloud 7.1 MB/day
d) diag2d_lsm 10.1 MB/day
d) diag2d_misc 5.5 MB/day

6.3.2 Prognostic Files

Below are the variables that are output in each prognostic file.

prog2d (nominally 4 times per day)

These are instantaneous fields (no time averaging)

1449112544 = 5.2 MB/day

PHIS	Surface Geopotential Heights (m/sec)**2
ALBEDO	Surface Albedo (0-1)
PS	Surface Pressure (mb)
SLP	Sea Level Pressure (mb)
LWI	Surface Types from Land/Surface Model
UBAR	Vertically Averaged U-Wind *(m/see)*
VBAR	Vertically Averaged V-Wind (m/see)
TBAR	Vertically Averaged Temperature (K)
QBAR	Vertically Integrated Moisture (g/cm**2)
SMSHAL	Soil Moisture in Shallow (5 mm) soil layer, percent -- percent of field capacity
SMROOT	Soil Moisture in Root Zone, percent -- the thickness depends on vegetation type
SMDEEP	Soil Moisture in Deep Layer, percent
CAPAC	Canopy Interception Reservoir, mm -- amount of water suspended on the leaves
SNOW	Snow Depth (mm water equivalent)
TC	Canopy temperature, deg K -- skin temperature of the canopy/soil (SST over water)
TD	Deep soil temperature, deg K -- tied to a climatological annual cycle
QA	Canopy air humidity, g/kg -- this is the humidity in between the vegetation elements
T2M	T AT 2 METERS (DEG)
T10M	T AT 10 METERS (DEG)
Q2M	Q AT 2 METERS (KG/KG)
Q10M	Q AT 10 METERS (KG/KG)
U2M	U AT 2 METERS (M/SEC)
V2M	V AT 2 METERs (M/SEC)
U10M	U AT 10 METERS (M/SEC)
V10M	V AT 10 METERS (M/SEC)

prog3d (nominally 4 times per day)

These are instantaneous fields (no time averaging)

1449170944= 132 MB/day (sigma)
1449136844 = 68 MB/day (pressure)

UWND	U-WIND (M/S)
VWND	V-WIND (M/S)

HGHT	GEOPOTENTIAL HEIGHT (VIRTUAL) (M)
TMPU	TEMPERATURE (K)
SPHU	SPECIFIC HUMIDITY (G/KG)
QQ	TURBULENT KINETIC ENERGY (m/sec)**2
LZ	Total cloud water mixing ratio [g/kg]
RH	RELATIVE HUMIDITY (PERCENT)
oMEGA	VERTICAL VELOCITY (MB/DAY)

6.3.3. Diagnostic Files

Below are the variables that are output in each diagnostic file.

diag3d (nominally 4 times per day)

a) diag3d_mom1

1449170844 = 117.4 MB/day (sigma)
1449136844 = 60.4 MB/day (pressure)

TURBU	U-MOMENTUM CHNGS DUE TO TURB (M/S/DAY)
TURBV	V-MOMENTUM CHNGS DUE TO TURB (M/S/DAY)
GWDU	U-Wind Gravity Wave Drag (m/see/day)
GWDV	V-Wind Gravity Wave Drag (m/see/day)
RFU	U-Wind Rayleigh Friction (m/see/day)
RFV	V-Wind Rayleigh Friction (m/see/day)
MOISTU	CTEI induced change in U [m/s/day]
MOISTV	CTEI induced change in V [m/s/day]

b) diag3d_mom2

1449170444 = 58.7 MB/day (sigma)
1449136444 = 30.2 MB/day (pressure)

ANALU	ANALYSIS INCREMENT OF U-WIND (M/S/SEC)
ANALV	ANALYSIS INCREMENT OF V-WIND (M/S/SEC)
DUDT	Total U-wind tendency (m/see/day)
DVDT	Total V-wind tendency (m/see/day)

c) diag3d_temp

1449170944 = 132.1 MB/day (sigma)
1449136944 = 67.9 MB/day (pressure)

TURBT	TEMPERATURE CHNGS DUE TO TURB (DEG/DAY)
MOISTT	TEMPERATURE CHNGS DUE TO MOIST (DEG/DAY)
RNEVPT	TEMPERATURE CHANGES DUE TO LARGE SCALE RAIN & RAIN EVAP
RADLW	TEMPERATURE CHNGS DUE TO LW RAD DEG/DAY
RADSW	TEMPERATURE CHNGS DUE TO SW RAD DEG/DAY
ANALT	ANALYSIS INCREMENT OF THETA (PI*TH/SEC)
DTDT	Total temperature tendency (deg/day)
LWCLR	CLEAR SKY LW HEATING RATES (DEG/DAY)
SWCLR	CLEAR SKY SW HEATING RATES (DEG/DAY)

d) diag3d_moist

1449170744 = 102.7 MB/day (sigma)
1449136744 = 52.8 MB/day (pressure)

TURBQ	MOISTURE CHANGES DUE TO TURB (G/KG/DAY)
MOISTQ	MOISTURE CHANGES DUE TO TOTAL MOISTURE PROCESSES
RNEVPQ	MOISTURE CHANGES DUE TO LARGE SCALE RAIN AND RAIN EVAP
ANALQ	ANALYSIS INCREMENT OF SPHU (PI*SH/SEC)
QFILL	Filling of negative specific humidity
DQDT	Total specific humidity tendency (g/kg/day)
dLls	Stratiform clouds induced changes in L [g/kg/day]

e) diag3d_cloud

1449170744 = 102.7 MB/day (sigma)
1449136744 = 52.8 MB/day (pressure)

TAUCLD	Cloud Optical Depth (non-dimensional)
CLDTOT	Tot Cloud Fraction (RAS+LrgScl+Slng/Rit)
CLDRAS	Convective Cloud Fraction (RAS)
CLDSR	Slingo/Ritter (no-precip) cloud fraction
CSIZE	Effective cloud droplet size [10^-6 m]
LZAVE	Time averaged total cloud water mixing ratio [g/kg]
LZICE	Time averaged cloud ice [g/kg]

f) diag3d_transp

1449170444 = 58.7 MB/day (sigma)
1449136444 = 30.2 MB/day (pressure)

ET	Eddy diffusivity coef. for a passive tracer(Kh)
EU	Eddy diffusivity coef. for momentum (Km)
CLDMAS	Cloud Mass Flux
DTRAIN	Detainment Cloud Mass Flux

diag2d (nominally 8 times per day)

These are time-averaged fields. For the case of 8 times/day output they would typically be 3 hour up-stream time-averages. For example, 6Z output would be a 3Z-6Z time average. This is consistent with the 4 times/day centered average for the 3D diagnostics.

a) diag2d_stress

1449111584 = 6.3 MB/day

PSAVE	Surface Pressure (mb)
UFLUX	U-MOMENTUM SURFACE STRESS (N/M**2)
VFLUX	V-MOMENTUM SURFACE STRESS (N/M**2)
GWDUS	U-Wind Gravity Wave Surf Stress (N/m**2)
GWDVS	V-Wind Gravity Wave Surf Stress (N/m**2)
GWDUT	U-Wind Gravity Wave PTOP Stress (N/m**2)
GWDVT	V-Wind Gravity Wave PTOP Stress (N/m**2)
CU	SURFACE DRAG COEF. FOR U AND V (M/S)
USTAR	USTAR (M/SEC)
Z0	SURFACE ROUGHNESS 20 (M)
PBL	PBL DEPTH (MB)
U2MAVE	U AT 2 METERS (M/SEC)

V2MAVE	V AT 2 METERS (M/SEC)
U10MAVE	U AT 10 METERS (M/SEC)
V10MAVE	V AT 10 METERS (M/SEC)
ANALP	ANALYSIS INCREMENT OF PSURF (MB/SEC)

b) diag2d_sfcflux

1449112184 = 8.8 MB/day

PREACC	TOTAL PRECIPITATION (MM/DAY)
PRECON	CONVECTIVE PRECIPITATION (MM/DAY)
EVAP	SURFACE EVAPORATION (MM/DAY)
HFLUX	SURFACE FLX OF SENSIBLE HEAT (W/M**2)
QICE	Heat conduction through sea ice. (W/m**2)
CT	SURFACE DRAG COEF. FOR T AND Q (M/S)
TCAVE	Canopy temperature, deg K -- skin temperature of the canopy/soil (SST over water)
T2MAVE	T AT 2 METERS (DEG)
T10MAVE	T AT 10 METERS (DEG)
Q2MAVE	Q AT 2 METERS (KG/KG)
Q10MAVE	Q AT 10 METERS (KG/KG)
RADLWG	NET UPWARD LW RAD. AT GRND (W/M**2)
ST4	Upward lw radiation at the ground (W/M**2)
RADSWG	NET DOWNWARD SW RAD. AT GRND (W/M**2)
ALBEDO	Surface Albedo (0-1)
ALBVISDR	Direct Beam VIS Surface Albedo (0-1)
ALBVISDF	Diffuse Beam VIS Surface Albedo (0-1)
ALBNIRDR	Direct Beam NIR Surface Albedo (0-1)
ALBNIRDF	Diffuse Beam NIR Surface Albedo (0-1)
LWGCLR	SURFACE LONGWAVE FLUX CLEAR SKY (W/M**2)
SWGCLR	SURF. SHORTWAVE FLUX CLEAR SKY (W/M**2)

c) diag2d_topcloud

144911484 = 7.1 MB/day

OLR	OUTGOING LONGWAVE RADIATION (W/M**2)
OLRCLR	OUTGOING LONGWAVE RAD CLEAR SKY (W/M**2)
RADSWT	INCIDENT SW RAD AT TOP OF ATM. (W/M**2)
OSR	OUTGOING SHORTWAVE RADIATION (W/M**2)
OSRCLR	OUTGOING SHORTWAVE RAD CLEAR (W/M**2)
CLDFRC	2-DIMENSIONAL TOTAL CLOUD FRACTION (0-1)
TAULOW	Low-Level (1000-700 mb) Optical Depth
TAUMID	Mid-Level (700-400 mb) Optical Depth
TAUHI	High-Level (above 400 mb) Optical Depth
CLDLOW	Low-Level (700-400 mb) Cloud Fraction
CLDMID	Mid-Level (700-400 mb) cloud Fraction
CLDHI	High-Level (above 400 mb) Cloud Fraction
CLDTMP	Cloud Top Temperature (when cloudy) (DEG K)
CLDPRS	Cloud Top Pressure (when cloudy) (mb)
CTEI	Cloud-top-entrainment-instability fractional cloud cover
LWP	Vertically integrated mass of liquid cloud water [kg/m^2 1
IWP	Vertically integrated mass of frozen cloud water [kg/m^2 1

d) diag2d_lsm

1449112484 = 10.1 MB/day

RAINCONV	Convective rainfall, mm/day -- liquid convective precip
SNOWFALL	Total snowfall, mm/day -- Solid (ice) precipitation
RAINLSP	Large Scale rainfall, mm/day -- liquid large scale precip (note: RAINLSP = PREACC - SNOWFALL - RAINCONV)
LWDOWN	Downward LW radiation at surface, w/m**2
PARDF	Diffuse-beam photosynthetically-active-radiation, w/m**2
PARDR	Direct-beam photoshynthetically-active-radiation, w/m**2
LAI	Leaf Area Index, percent
GREEN	Greenness Index, percent
DHWLTC	Derivative of LW radiation with respect to Tc, w/m**2 deg K
DHSDTC	Derivative of Sensible Heat Flux with respect to Tc, w/m**2 deg K
DEDTC	Derivative of Latent Heat Flux with respect to Tc, w/m**2 deg K
DTDEEPS	Change of Canopy Temperature due to Flux of heat to deep soil, deg K/see
DTHEAT	Change of Canopy Temperature due to Net heating, deg K/sec
DTVAPOR	Change of Canopy Temperature due to change of canopy air humidity, deg K/sec
DTC	Total change of Tc, deg K/sec
RUNOFF	water from precipitation not infiltrated into soil, mm/see
FWSOIL	infiltration of rainwater into top soil layer, mm/ sec
GDRAIN	Diffusion of moisture across bottom of root zone, mm/sec -- (diffusion from swetroot into swetdeep)
SMELT	rate of snow melt, mm/sec
E I N T	Interception loss, w/m**2 -- evap from interception reservoir
ESOI	Bare soil evaporation, w/m**2
EVEG	Transpiration, w/m**2 -- evaporation from vegetation surface
ESNO	Evaporation from snow pack, w/m**2
SNOWAVE	Snow Depth (mm water equivalent)

e) diag2d_misc

1449111384 = 5.5 MB/day

TROPP	Tropopause Pressure (mb)
TROPT	Tropopause Temperature (deg K)
VINTUQ	VERTICALLY INTEGRATED U*Q (M/SEC G/KG)
VINTVQ	VERTICALLY INTEGRATED V*Q (M/SEC G/KG)
VINTUT	VERTICALLY INTEGRATED U*T (M/SEC DEG)
VINTVT	VERTICALLY INTEGRATED V*T (M/SEC DEG)
QINT	PRECIPITABLE WATER (GM/CM**2)
VINTQANA	VERTICALLY INTEGRATED DQANAL (mm/day)

VINTQFIL	VERTICALLY INTEGRATED QFILL (mm/day)
VDTMOIST	Vertical integral of the moist heating (DEG/DAY)
VDTTURB	Vertical integral of the turbulent heating (DEG/DAY)
VDTSWRAD	Vertical integral of the sw heating (DEG/DAY)
VDTLWRAD	Vertical integral of the lw heating (DEG/DAY)

7. Metadata

GEOS-3 gridded output files will contain two types of metadata. Depending on the utility you use to access the file, one set of metadata will be read and the other ignored.

7.1 EOSDIS Metadata

If you are using the EOSDIS toolkit you will only see the EODIS metadata. EOSDIS identifies two major types of metadata, collection and granule.

Collection metadata are stored in a separate index file. This file is like a library card catalog. Each ESDT has a "card" that contains its unique collection attributes. Appendix C describes the ESDT collection metadata.

Granule metadata is the "table of contents" information stored on the data file itself. The EOSDIS granule metadata include:

- file name (local granule ID)
- grid structure
  number of times per day fields are stored in this file
  number of vertical levels for each variable in this file
  names of variables in this file
  variable format (32-bit floating point, 16-bit integer, etc.)
  variable storage dimensions
    2-d fields will have 3 storage dimensions, time, x and y
    3-d fields will have 4 storage dimensions, time, x, y, and z
  'missing" value for each variable
  unpacking scale factor for each packed variable (see section 8)
  unpacking off-set value for each packed variable (see section 8)

7.2 COARDS Metadata

If you use GRADS *or* FERRET to view the GEOS DAS gridded data sets you will only see the COARDS metadata. These metadata will comply with the COARDS convention and include the following information:

- space-time grid information (coordinate variables)
  variable names
  variable units
  "missing" value for each variable
  unpacking scale factor for each packed variable (see section 8)
  unpacking off-set value for each packed variable (see section 8)