2.18 Daily Flux By Cloud Type (FluxByCldTyp-Day)

The Daily Flux By Cloud Type (FluxByCldTyp) archival data product contains hourly (GMT based) daily 1° gridded regional daytime mean cloud properties and derived fluxes as a function of 42 cloud types, where the fluxes and cloud properties are stratified by pressure and optical depth. The total fluxes and cloud property for each region are also included. The FluxByCldTyp relies on the Terra and Aqua MODIS daytime cloud properties. The binned fluxes are obtained by converting the narrowband MODIS radiances stratified into three possible sub-footprint components: two cloud layers and a clear portion to broadband radiances and then using the CERES ADMs to convert them to fluxes. The fluxes and cloud properties are not temporally interpolated. Each FluxByCldTyp covers a single month. The science data are Scientific Data Sets (SDSs) with multiple records. Each record contains spatially averaged data for an individual region.

The major categories of data output on the FluxByCldTyp netCDF4 file is as follows:

- Regional Identification Parameters
- Cloud Types and Fluxes for daily

A complete listing of metadata and gridded science parameters for this data product can be found in Table 1 through Table 8.

Level: 3
Frequency: 1/Day
Portion of Atmosphere Covered: Clouds

Time Interval Covered:
File: 1 Month
Record: 1 Day

Portion of Globe Covered:
File: Entire Global
Record: 1-Deg Regions

Product Version:
TRMM: N/A
Terra/Aqua: Edition4A

FluxByCldTyp Metadata

The FluxByCldTyp metadata are summarized in Table 1. These metadata contain information which need only be recorded once per product. The CERES metadata are listed in Appendix C. Table C-1 lists the CERES Baseline Header Metadata.

Table 1. CldTypHist Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table C-1	1	46

All of the science data are organized into the HDF Grid data type and are contained in one FluxByCldTyp file, which are shown in Table 4 to Table 8. Each table contains a list of the parameters, including SDS Name, long name, data type, units, range, and number of elements within each field.

Table 2. List of Vgroup contained in FluxByCldTyp

Vgroup Number	Vgroup Name	Daily Averages
1	FluxByCldTyp_Total_TOA_Fluxes	See Table 4
2	FluxByCldTyp_Total_Cloud_Properties	See Table 5
3	Fluxes_for_42_Cloud_Types	See Table 6
4	Cloud_Properties_for_42_Cloud_Types	See Table 7
5	Regional_Information	See Table 8

Daily Regional Science Data

The Scientific Data Sets (SDS) are divided into tables which map to Vgroups of the same name. All of the daily regional science data are organized into the netCDF Grid data type, which is shown in Table 3(a). All parameter (a) tables contain a list of the gridded parameters, which includes the field name, the long name, the data type, the units, the range, and the number of elements within each field for Regional data. The No. of Elements or Dimensions are defined in the first set of tables. The first 2 dimensions noted, Nlat and Nlon, correspond to the CERES region index; for zonal, Nlat corresponds to the 1° latitudinal zone. For the Fluxes for 42 Cloud Types and Cloud Properties for 42 Cloud Types, have the Npress for pressure bins, and Nod for optical depth bins. This ordering is used by the C programming language and most HDF viewers, such as IDL. In FORTRAN, the dimensions are reversed such that the number of regions becomes the last dimension and the first dimension is the number of parameters in the SDS.

Table 3(a). Nlat, Nlon dimensions that define the CERES equal-angle 1° latitude by 1° longitude grid and Nhour dimension that defines the time

Dimension	Number of indices	Definition
Nlat	180	Index #1 is defined at 89.5°N and #180 is at 89.5°S
Nlon	360	Index #1 is defined at 179.5°W and #360 is at 179.5°E
Nday	31	Index #1 is day 1 and #31 is day 31

Table 3(b). Npres dimension that define the pressure layers

Pressure Layer Index Npres	Bottom Pressure (hPa)	Top Pressure (hPa)
1	1000	800
2	800	680
3	680	560
4	560	440
5	440	310
6	310	180
7	180	10

Table 3(c). Nod dimension that define the optical depth layers

Pressure Layer Index Npres	Optical Depth Lower Threshold	Optical Depth Upper Threshold
1	0.020	1.27
2	1.27	3.55
3	3.55	9.38
4	9.38	22.63
5	22.63	60.36
6	60.36	378.65

Table 3(d). List of the 18 Cloud Types used in Table 7

Cloud Type	Name	Phase	(Pressure Level, Optical Depth Level)
1	Cumulus	Liquid	(Low, Thin)
2	Stratocumulus	Liquid	(Low, Mid-thick)
3	Stratus	Liquid	(Low, Thick)
4	Cumulus	Ice	(Low, Thin)
5	Stratocumulus	Ice	(Low, Mid-thick)
6	Stratus	Ice	(Low, Thick)
7	Altocumulus	Liquid	(Mid, Thin)
8	Altostratus	Liquid	(Mid, Mid-thick)
9	Nimbostratus	Liquid	(Mid, Thick)
10	Altocumulus	Ice	(Mid, Thin)
11	Altostratus	Ice	(Mid, Mid-thick)
12	Nimbostratus	Ice	(Mid, Thick)
13	Cirrus	Liquid	(High, Thin)
14	Cirrostratus	Liquid	(High, Mid-thick)
15	Deep Convection	Liquid	(High, Thick)
16	Cirrus	Ice	(High, Thin)
17	Cirrostratus	Ice	(High, Mid-thick)
18	Deep Convection	Ice	(High, Thick)

Table 4. FluxByCldTyp Total TOA Fluxes

SDS Name	Long Name	DataType	Units	Range	No. Of Elements Regional
clr_toa_sw	Clear-Sky TOA SW Flux from FLuxByCldTyp	32-bit real	W m^{-2}	0 .. 1450	Nlon*Nlat *Nday
clr_toa_lw	Clear-Sky TOA LW Flux from FLuxByCldTyp	32-bit real	W m^{-2}	0 .. 600	Nlon*Nlat *Nday
clr_toa_alb	Clear-Sky TOA Albedo from FLuxByCldTyp	32-bit real	N/A	0.0 .. 1.0	Nlon*Nlat *Nday
all_toa_sw	All-Sky TOA SW Flux from FLuxByCldTyp	32-bit real	W m^{-2}	0 .. 1450	Nlon*Nlat *Nday
all_toa_lw	All-Sky TOA LW Flux from FLuxByCldTyp	32-bit real	W m^{-2}	0 .. 600	Nlon*Nlat *Nday
all_toa_alb	All-Sky TOA Albedo from FLuxByCldTyp	32-bit real	N/A	0.0 .. 1.0	Nlon*Nlat *Nday
toa_sw_insol	TOA SW Insolation	32-bit real	W m^{-2}	0 .. 1450	Nlon*Nlat *Nday

Table 5. FluxByCldTyp Total Cloud Properties

SDS Name	Long Name	DataType	Units	Range	No. Of Elements Regional
cldtot_amount	Total Cloud Amount from FluxByCldTyp	32-bit real	%	0.0 .. 100.0	Nlon*Nlat *Nday
cldtot_eff_temp	Total Cloud Effective Temperature from FluxByCldTyp	32-bit real	K	100.0 .. 350.0	Nlon*Nlat *Nday
cldtot_eff_press	Total Cloud Effective Pressure from FluxByCldTyp	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat *Nday
C ldtot_ir_emiss	Total Cloud Infrared Emissivity from FluxByCldTyp	32-bit real	N/A	0.0 .. 2.0	Nlon*Nlat *Nday
cldtot_od	Total Cloud Visible Optical Depth (from 3.7 mm particle size retrieval) from FluxByCldTyp	32-bit real	N/A	0.0 .. 400.0	Nlon*Nlat *Nday
cldtot_lwp	Total Cloud Liquid Water Path (from 3.7 mm particle size retrieval) from FluxByCldTyp	32-bit real	g m^{-2}	0.0 .. 10000.0	Nlon*Nlat *Nday
cldtot_iwp	Total Cloud Ice Water Path (from 3.7 mm particle size retrieval) from FluxByCldTyp	32-bit real	g m^{-2}	0.0 .. 10000.0	Nlon*Nlat *Nday
cldtot_liq_radius	Total Cloud Liquid Particle Radius (from 3.7 mm particle size retrieval) from FluxByCldTyp	32-bit real	micron	0.0 .. 40.0	Nlon*Nlat *Nday
cldtot_ice_radius	Total Cloud Ice Particle Radius (from 3.7 mm particle size retrieval) from FluxByCldTyp	32-bit real	micron	0.0 .. 300.0	Nlon*Nlat *Nday
cldtot_amount_liq	Total Cloud Amount – Liquid - from FluxByCldTyp	32-bit real	%	0.0 .. 100.0	Nlon*Nlat *Nday
cldtot_amount_ice	Total Cloud Amount -Ice - from FluxByCldTyp	32-bit real	%	0.0 .. 100.0	Nlon*Nlat *Nday

Table 6. Flux for 42 Cloud Types

SDS Name	Long Name	DataType	Units	Range	No. Of Elements Regional
fbct_toa_sw	FluxByCldTyp TOA SW Flux	32-bit real	W m^{-2}	0 .. 1450	Nlon*Nlat*Nday *Npres*Nod
fbct_toa_lw	FluxByCldTyp TOA LW Flux	32-bit real	W m^{-2}	0 .. 600	Nlon*Nlat*Nday *Npres*Nod
fbct_toa_alb	FluxByCldTyp TOA Albedo Flux	32-bit real	N/A	0.0 .. 1.0	Nlon*Nlat*Nday *Npres*Nod

Table 7. Cloud Properties for 42 Cloud Types

SDS Name	Long Name	DataType	Units	Range	No. Of Elements Regional
fbct_cld_amount	FluxByCldT Cloud Amount - Total	32-bit real	%	0.0 .. 100.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_amount_liq	FluxByCldT Cloud Amount – Liquid	32-bit real	%	0.0 .. 100.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_amount_ice	FluxByCldT Cloud Amount -Ice	32-bit real	%	0.0 .. 100.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_eff_temp	FluxByCldT Cloud Effective Temperature	32-bit real	K	100.0 .. 350.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_eff_press	FluxByCldT Cloud Effective Pressure	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_ir_emiss	FluxByCldT Cloud Infrared Emissivity	32-bit real	N/A	0.0 .. 2.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_od	FluxByCldT Cloud Visible Optical Depth (from 3.7 mm particle size retrieval)	32-bit real	N/A	0.0 .. 400.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_lwp	FluxByCldT Cloud Liquid Water Path (from 3.7 mm particle size retrieval)	32-bit real	g m^{-2}	0.0 .. 10000.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_iwp	FluxByCldT Cloud Ice Water Path (from 3.7 mm particle size retrieval)	32-bit real	g m^{-2}	0.0 .. 10000.0	Nlon*Nlat*Nday *Npres*Nod
fbct_cld_liq_radius	FluxByCldT Cloud Liquid Particle Radius (from 3.7 mm particle size retrieval)	32-bit real	micron	0.0 .. 40.0	Nlon*Nlat*Nday *Npres*Nod

SDS Name	Long Name	DataType	Units	Range	No. Of Elements Regional
fbct_cld_ice_radius	FluxByCldT Cloud Ice Particle Radius (from 3.7 mm particle size retrieval)	32-bit real	micron	0.0 .. 300.0	Nlon*Nlat*Nday *Npres*Nod

Table 8. Regional Information

SDS Name	Long Name	DataType	Units	Range	No. Of Elements Regional
sza	Solar Zenith Angle	32-bit real	degree	0 .. 82	Nlon*Nlat*Nday
num_daily_obs	Number of Daily Observations	32-bit real	N/A	0 .. 31	Nlon*Nlat*Nday
num_lw_obs	Number of Cloudy-Sky LW Flux Observations	32-bit real	N/A	0 .. 744	Nlon*Nlat *Nday
num_sw_obs	Number of Cloudy-Sky SW Flux Observations	32-bit real	N/A	0 .. 744	Nlon*Nlat*Nday
num_clr_lw_obs	Number of Clear-Sky LW Flux Observations	32-bit real	N/A	0 .. 744	Nlon*Nlat*Nday
num_clr_sw_obs	Number of Clear-Sky SW Flux Observations	32-bit real	N/A	0 .. 744	Nlon*Nlat*Nday

File Size: FluxByCldTyp 647.0 MB
Number of Regional parameters: 38
Sets of Regional Records: 64800

FluxByCldTyp-Day Revision Record

The product Revision Record contains information pertaining to approved document changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The document authors are listed on the cover.

FluxByCldTyp-Day Revision Record

SCCR Approval Date	Release/ Version Number	SCCR Number	Description of Revision	Section(s) Affected
03/30/2017	R1V1	1237	• Initial version.	All