

2.18 Monthly Cloud Type Histogram (CldTypHist)

The Monthly Cloud Type Histogram (CldTypHist) archival data product contains hourly (GMT based) monthly 1° gridded regional daytime; nighttime; and total (day and night) mean cloud properties as a function of 18 cloud types, similar to the [ISCCP D2](#) product, where the cloud properties are stratified by pressure, optical depth, and phase. The CldTypHist relies on the Terra and Aqua MODIS cloud properties supplemented by 5-satellite, hourly GMT, 8km nominal resolution, geostationary cloud properties limited to 60°N to 60°S. The GEO cloud properties are from the same source as the SYN1deg products, however they are not temporally interpolated. Each CldTypHist 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 CldTypHist product replaces the earlier ISCCP-D2like-Mrg product.

The major categories of data output on the CldTypHist HDF file is as follows:

- Regional Identification Parameters
- Cloud Types for monthly-1-hourly/monthly

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/Month

Portion of Atmosphere Covered: Clouds

Time Interval Covered:

File: 1 Month

Record: 1 Month

Portion of Globe Covered:

File: Entire Global

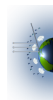
Record: 1-Deg Regions

Product Version:

TRMM: N/A

Terra/Aqua/GEO Merged: Edition4A

CldTypHist-1



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CldTypHist Metadata

The CldTypHist 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 B](#). [Table B-1](#) lists the CERES Baseline Header Metadata and [Table B-2](#) lists the CERES _metadata Vdata.

Table 1. CldTypHist Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES _metadata Science Data	Table B-2	1	14

All of the science data are organized into the HDF Grid data type and are contained in one CldTypHist file, which are shown in [Table 5](#) to [Table 8](#). Each table contains a list of the parameters, including SDS index, SDS Name, data type, units, range, and number of elements within each field.

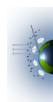
All SDS names ending with _mh refer to monthly-hourly; ending with _md refer to daytime monthly mean; ending with _mn refers to nighttime monthly; ending with mt refer to total (day and night) monthly mean.

Table 2. List of the Vgroups for different temporal periods

Vgroup Number	Vgroup Name	Monthly 1-Hourly Averages/ Monthly Averages	SDS Name Ending	Long Name Ending
1	Monthly Hourly Averages	See Table 3	_mh	- Monthly Hourly
2	Monthly Day Averages	See Table 3	_md	- Monthly Day
3	Monthly Night Averages	See Table 3	_mn	- Monthly Night
4	Monthly Total Averages	See Table 3	_mt	- Monthly Total

Table 3. List of Vgroup contained in each temporal period Vgroups

Vgroup Number	Vgroup Name	Monthly Hourly Averages/ Monthly Averages
1	Regional Information	See Table 5
2	Meteorological Variables	See Table 6
3	Total Cloud Properties	See Table 7
4	Cloud Properties for 9 Cloud Types	See Table 8



Monthly Regional Science Data

The Scientific Data Sets (SDS) are divided into tables which map to Vgroups of the same name. All of the Monthly regional science data are organized into the HDF-EOS Grid data type, which is shown in Table 4(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. All parameter (b) tables contain the list of SDS indices, which are grouped into monthly hourly averages, monthly day averages, monthly night averages, and monthly total averages. The SDS name ending with *_mh* refer to monthly-hourly; ending with *_md* refer to daytime monthly mean; ending with *_mn* refers to nighttime monthly; ending with *mt* refer to total (day and night) monthly mean variable. Likewise, the long name ends with either – Monthly Hourly, Monthly Day, Monthly Night, or Monthly Total. The first 2 dimensions noted, Nlat and Nlon, correspond to the CERES region index; for zonal, Nlat corresponds to the 1° latitudinal zone. The third dimension for the monthly hourly is the GMT hour. For the Cloud Properties for 9 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 4(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
Nhour	24	Index #1 is hour 0 and #24 is hour 23 GMT

Table 4(b). Npres dimension that define the pressure layers

Pressure Layer Index Npres	Bottom Pressure (hPa)	Top Pressure (hPa)
1	1000	680
2	680	440
3	440	10

Table 4(c). Nod dimension that define the optical depth layers

Pressure Layer Index Npres	Optical Depth Lower Threshold	Optical Depth Upper Threshold
1	0.020	3.55
2	3.55	22.63
3	22.63	387.65



Table 4(d). List of the 18 Cloud Types used in [Table 8](#)

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	Alto cumulus	Liquid	(Mid, Thin)
8	Altostratus	Liquid	(Mid, Mid-thick)
9	Nimbostratus	Liquid	(Mid, Thick)
10	Alto cumulus	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)

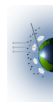


Table 5(a). Regional Information

SDS Name	Long Name	Data Type	Units	Range	No. Of Elements Regional
ocean_coverage	Ocean Percent Coverage	32-bit real	%	0 .. 100	Nlon*Nlat
snow_ice_coverage	Snow/Ice Percent Coverage	32-bit real	%	0 .. 100	Nlon*Nlat
cos_sza	Cosifn of Solar Zenith Angle	32-bit real	N/A	-1.0 .. 1.0	Nlon*Nlat
num_obs_modis	Number of Observations with CERES-MODIS Clouds	32-bit real	day	0 .. 744	Nlon*Nlat
num_obs_geo	Number of Observations with GEO Clouds	32-bit real	day	0 .. 744	Nlon*Nlat

Monthly Hourly variables are dimensioned Nlon*Nlat*NHour

Table 5(b). SDS Index of Regional Information

SDS Name	Monthly Hourly Averages	Monthly Day Averages	Monthly Night Averages	Monthly Total Averages
ocean_coverage	0	45	90	135
snow_ice_coverage	1	46	91	136
cos_sza	2	47	92	137
num_obs_modis	3	48	93	138
num_obs_geo	4	49	94	139

Table 6(a). Meteorological Variables

SDS Name	Long Name	Data Type	Units	Range	No. Of Elements Regional
sfc_skin_temp	Surface Skin Temperature	32-bit real	K	175.0 .. 375.0	Nlon*Nlat
sfc_press	Surface Pressure	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat
pw	Precipitable Water	32-bit real	cm	0.0 .. 10.0	Nlon*Nlat
sfc_wind_speed	Surface Wind Speed	32-bit real	ms ⁻¹	0.0 .. 100.0	Nlon*Nlat
estim_inversion_strength	Estimated Inversion Strength	32-bit real	K	-200.0 .. 200.0	Nlon*Nlat

Monthly Hourly variables are dimensioned Nlon*Nlat*NHour

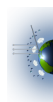


Table 6(b). SDS Index of Meteorological Variables

SDS Name	Monthly Hourly Averages	Monthly Day Averages	Monthly Night Averages	Monthly Total Averages
sfc_skin_temp	5	50	95	140
sfc_press	6	51	96	141
pw	7	52	97	142
sfc_wind_speed	8	53	98	143
estim_inversion_strength	9	54	99	144

Table 7(a). Total Cloud Properties

SDS Name	Long Name	Data Type	Units	Range	No. Of Elements Regional
cldtot_amount	Total Cloud Amount	32-bit real	%	0.0 .. 100.0	Nlon*Nlat
cldtot_eff_press	Total Cloud Effective Pressure	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat
cldtot_eff_temp	Total Cloud Effective Temperature	32-bit real	K	100.0 .. 350.0	Nlon*Nlat
cldtot_eff_hgt	Total Cloud Effective Height	32-bit real	km	0.0 .. 20.0	Nlon*Nlat
cldtot_top_press	Total Cloud Top Pressure	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat
cldtot_top_temp	Total Cloud Top Temperature	32-bit real	K	100.0 .. 350.0	Nlon*Nlat
cldtot_top_hgt	Total Cloud Top Height	32-bit real	km	0.0 .. 20.0	Nlon*Nlat
cldtot_od	Total Cloud Visible Optical Depth (from 3.7 mm particle size retrieval)	32-bit real	N/A	0.0 .. 400.0	Nlon*Nlat
cldtot_lwp	Total Cloud Liquid Water Path (from 3.7 mm particle size retrieval)	32-bit real	g m ⁻²	0.0 .. 10000.0	Nlon*Nlat
cldtot_iwp	Total Cloud Ice Water Path (from 3.7 mm particle size retrieval)	32-bit real	g m ⁻²	0.0 .. 10000.0	Nlon*Nlat
cldtot_liq_radius	Total Cloud Liquid Particle Radius (from 3.7 mm particle size retrieval)	32-bit real	micron	0.0 .. 40.0	Nlon*Nlat
cldtot_ice_radius	Total Cloud Ice Particle Radius (from 3.7 mm particle size retrieval)	32-bit real	micron	0.0 .. 300.0	Nlon*Nlat
cldtot_ir_emiss	Total Cloud Infrared Emissivity	32-bit real	N/A	0.0 .. 2.0	Nlon*Nlat

Monthly Hourly variables are dimensioned Nlon*Nlat*NHour



Table 7(b). SDS Index of Total Cloud Properties

SDS Name	Monthly Hourly Averages	Monthly Day Averages	Monthly Night Averages	Monthly Total Averages
cldtot_amount	10	55	100	145
cldtot_eff_press	11	56	101	146
cldtot_eff_temp	12	57	102	147
cldtot_eff_hgt	13	58	103	148
cldtot_top_press	14	59	104	149
cldtot_top_temp	15	60	105	150
cldtot_top_hgt	16	61	106	151
cldtot_od	17	62	107	152
cldtot_lwp	18	63	108	153
cldtot_iwp	19	64	109	154
cldtot_liq_radius	20	65	110	155
cldtot_ice_radius	21	66	111	156
cldtot_ir_emiss	22	67	112	157

Table 8(a). Cloud Properties for 9 Cloud Types

SDS Name	Long Name	Data Type	Units	Range	No. Of Elements Regional
cld_amount_liq	Cloud Amount - Liquid	32-bit real	%	0.0 .. 100.0	Nlon*Nlat*Npres*Nod
cld_amount_ice	Cloud Amount - Ice	32-bit real	%	0.0 .. 100.0	Nlon*Nlat*Npres*Nod
cld_eff_press_liq	Cloud Effective Pressure - Liquid	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat*Npres*Nod
cld_eff_press_ice	Cloud Effective Pressure - Ice	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat*Npres*Nod
cld_eff_temp_liq	Cloud Effective Temperature - Liquid	32-bit real	K	100.0 .. 350.0	Nlon*Nlat*Npres*Nod
cld_eff_temp_ice	Cloud Effective Temperature - Ice	32-bit real	K	100.0 .. 350.0	Nlon*Nlat*Npres*Nod
cld_eff_hgt_liq	Cloud Effective Height - Liquid	32-bit real	km	0.0 .. 20.0	Nlon*Nlat*Npres*Nod
cld_eff_hgt_ice	Cloud Effective Height - Ice	32-bit real	km	0.0 .. 20.0	Nlon*Nlat*Npres*Nod
cld_top_press_liq	Cloud Top Pressure - Liquid	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat*Npres*Nod
cld_top_press_ice	Cloud Top Pressure - Ice	32-bit real	hPa	0.0 .. 1100.0	Nlon*Nlat*Npres*Nod



SDS Name	Long Name	Data Type	Units	Range	No. Of Elements Regional
cld_top_temp_liq	Cloud Top Temperature - Liquid	32-bit real	K	100.0 .. 350.0	Nlon*Nlat*Npres*Nod
cld_top_temp_ice	Cloud Top Temperature - Ice	32-bit real	K	100.0 .. 350.0	Nlon*Nlat*Npres*Nod
cld_top_hgt_liq	Cloud Top Height - Liquid	32-bit real	km	0.0 .. 20.0	Nlon*Nlat*Npres*Nod
cld_top_hgt_ice	Cloud Top Height - Ice	32-bit real	km	0.0 .. 20.0	Nlon*Nlat*Npres*Nod
cld_od_liq	Cloud Visible Optical Depth (from 3.7 mm particle size retrieval) - Liquid	32-bit real	N/A	0.0 .. 400.0	Nlon*Nlat*Npres*Nod
cld_od_ice	Cloud Visible Optical Depth (from 3.7 mm particle size retrieval) - Ice	32-bit real	N/A	0.0 .. 400.0	Nlon*Nlat*Npres*Nod
cld_lwp	Cloud Liquid Water Path (from 3.7 mm particle size retrieval)	32-bit real	g m ⁻²	0.0 .. 10000.0	Nlon*Nlat*Npres*Nod
cld_iwp	Cloud Ice Water Path (from 3.7 mm particle size retrieval)	32-bit real	g m ⁻²	0.0 .. 10000.0	Nlon*Nlat*Npres*Nod
cld_liq_radius	Cloud Liquid Particle Radius (from 3.7 mm particle size retrieval)	32-bit real	micron	0.0 .. 40.0	Nlon*Nlat*Npres*Nod
cld_ice_radius	Cloud Ice Particle Radius (from 3.7 mm particle size retrieval)	32-bit real	micron	0.0 .. 300.0	Nlon*Nlat*Npres*Nod
cld_ir_emiss_liq	Cloud Infrared Emissivity - Liquid	32-bit real	N/A	0.0 .. 2.0	Nlon*Nlat*Npres*Nod
cld_ir_emiss_ice	Cloud Infrared Emissivity - Ice	32-bit real	N/A	0.0 .. 2.0	Nlon*Nlat*Npres*Nod

Monthly Hourly variables are dimensioned Nlon*Nlat*NHour* Npres*Nod

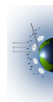
Table 8(b). SDS Index of Cloud Properties for 9 Cloud Types

SDS Name	Monthly Hourly Averages	Monthly Day Averages	Monthly Night Averages	Monthly Total Averages
cld_amount_liq	23	68	113	158
cld_amount_ice	24	69	114	159
cld_eff_press_liq	25	70	115	160
cld_eff_press_ice	26	71	116	161
cld_eff_temp_liq	27	72	117	162
cld_eff_temp_ice	28	73	118	163



SDS Name	Monthly Hourly Averages	Monthly Day Averages	Monthly Night Averages	Monthly Total Averages
cld_eff_hgt_liq	29	74	119	164
cld_eff_hgt_ice	30	75	120	165
cld_top_press_liq	31	76	121	166
cld_top_press_ice	32	77	122	167
cld_top_temp_liq	33	78	123	168
cld_top_temp_ice	34	79	124	169
cld_top_hgt_liq	35	80	125	170
cld_top_hgt_ice	36	81	126	171
cld_od_liq	37	82	127	172
cld_od_ice	38	83	128	173
cld_lwp	39	84	129	174
cld_iwp	40	85	130	175
cld_liq_radius	41	86	131	176
cld_ice_radius	42	87	132	177
cld_ir_emiss_liq	43	88	133	178
cld_ir_emiss_ice	44	89	134	179

File Size: CldTypHist 689.0 MB
Number of Regional parameters: 179
Sets of Regional Records: 64800



CldTypHist 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.

CldTypHist Revision Record

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

