2.4. CONVERSION TABLES FOR PHYSICAL VALUES

Physical values for most of the variables in all cloud products are reported as one-byte code values representing COUNTS from 0 to 254; the value 255 is reserved to represent missing data. Counts are converted to physical units (Table 2.5.4) in the READ programs using look-up tables. Note that VIS radiances are reported in the same units as reflectances, but that a reflectance is not a radiance. Users may wish to use the count values directly for image display purposes.

Since most of the parameters are obtained from measurements of satellite radiances, the precision of such measurements, though roughly constant over the response range of the radiometer, is not constant over the range of some of the parameters derived from the radiances. For example, a radiometer measurement of IR radiances with constant precision does not provide temperature values with constant precision: colder temperatures are not measured with as much precision as warmer temperatures. Hence, the look-up tables used to convert count values to physical values are not always linear because they represent the proper proportionality between the derived parameter and the original radiance measurement. The two instances of non-linear relations are for temperatures and cloud optical thicknesses: the linear variation of count values parallels the linear variation of the amount of energy measured by the radiometer. Because averaging of such non-linear relationships can change the relationship, two versions of cloud top temperature and optical thickness are provided in D1 and D2 datasets. The two **radiative** parameters, top temperature and optical thickness, are averaged so as to preserve the average radiative effect of clouds, whereas the two **physical** parameters, top pressure and water path, are averaged linearly.

Input data errors and analysis model errors can result in derived values that are non-physical, especially near zero, or are much smaller/larger than anticipated. To limit the count values to a one byte representation required establishing limits for all quantities. If these limits are violated, then either underflow or overflow occurs. In the look-up tables, special count values have been reserved to indicate underflow/overflow: count = 0 represents underflow and count = 254 represents overflow. Count 255 is reserved to mean NO DATA, exclusively. For physical quantities, count = 0 is converted to -100.0, count = 254 is converted to -200.0, and count = 255 is converted to -1000.0.

2.5. CODE DEFINITION TABLES

Table 2.5.1. Satellite Identification (ID) Codes and ID Names. See Table 2.5.2 for position codes.

IDCODE	IDNAME	POSITION	SATELLITE	SATELLITE PROCESSING CENTER	OPERATIONAL DATES
11	NOA7	6	NOAA-7	NOAA	Jul83 - Jan85
12	NOA9	6	NOAA-9	NOAA	Feb85 - Oct88
13	NOAB	6	NOAA-11	NOAA	Nov88 - Sep94
14	NOAE	6	NOAA-14	NOAA	Feb95 - present
21	GOE6	3	GOES-6	CSU	Jul83 - Jan89
31	GOE5	4	GOES-5	UWS	Jul83 - Jul84
32	GOE7	3	GOES-7	AES	Apr87 - Apr92
		4			May92 - present
33	GOE8	4	GOES-8	CSU	Mar95 - present
41	MET2	2	METEOSAT-2	ESA	Jul83 - Jul88
42	MET3	2	METEOSAT-3	ESA	Aug88 - Jun89
		2			Feb90 - Apr90
		4			May92 - Apr95
43	MET4	2	METEOSAT-4	ESA	Jul89 - Jan90
		2			May90 - Jan94
44	MET5	2	METEOSAT-5	ESA	Feb94 - present
51	GMS1	1	GMS-1	JMA	Feb84 - May84
52	GMS2	1	GMS-2	JMA	Jul83 - Jan84
		1			Jul84 - Sep84
53	GMS3	1	GMS-3	JMA	Oct84 - Nov89
54	GMS4	1	GMS-4	JMA	Dec89 - May95
55	GMS5	1	GMS-5	JMA	Jun95 - present
61	NOA8	7	NOAA-8	NOAA	Oct83 - Jun84
62	NOAA	7	NOAA-10	NOAA	Dec86 - Aug91
63	NOAC	7	NOAA-12	NOAA	Sep91 - present
71	INS1	5	INSAT-1	IMD	Apr88 - Mar89

Table 2.5.2. Satellite Position Codes.

CODE	POSITION	SSP LONGITUDE
1	GMS (West Pacific/Japan/Australia)	140.0°
2	METEOSAT (Atlantic/Europe/Africa)	0.0°
3	GOES-WEST (East Pacific)	225.0° - 262.0°
4	GOES-EAST (North/South America)	248.0° - 310.0°
5	INSAT (Asia/India/Indian Ocean)	74.5°
6	NOAA-Afternoon (global)	Not Applicable
7	NOAA-Morning (global)	Not Applicable

Note: *Geostationary satellites (codes 1-5) are nominally positioned on the equator at particular sub-satellite point (SSP) longitudes and cover an area roughly ± 60 ° from the SSP. Sun-synchronous polar orbiting satellites (codes 6-7) cover different areas of the earth at different times of day in swaths, attaining global coverage over a period of 12 hours.*

Table 2.5.3. Vegetation Type Codes (based on Matthews 1983).

CODE	VEGETATION TYPE
0	Water
1	Rain forest
2	Deciduous forest
3	Evergreen forest
4	Grassland
5	Tundra
6	Shrubland
7	Desert
8	Ice

Table 2.5.4. Variable Abbreviations and Physical Units.

ABBREVIATION	DESCRIPTION
UTC	Universal Time Convention (HH = hour)
	MEASURED RADIANCES
IR VIS NIR	infrared (≈ 11 μm wavelength) brightness temperature (165-345 K) visible (≈ 0.6 μm wavelength) scaled radiance (0-1.108) near-infrared (≈ 3.7 μm wavelength) brightness temperature (165-345 K)
	VIEWING GEOMETRY
MUE MU0 PHI	Cosine of satellite zenith angle (0-1) Cosine of solar zenith angle (0-1) Relative azimuth angle (degrees) (0-180 degrees)
	RETRIEVED CLOUD PROPERTIES
CA PC TC TAU WP	Cloud amount (0-100%) Cloud top pressure (5-1000 millibars) Cloud top temperature (165-345 K) Cloud visible optical thickness (0.02-378.65) Cloud water path (g/m^2)
	RETRIEVED SURFACE PROPERTIES
TS RS	Surface skin temperature (165-345 K) Surface visible reflectance (0-1.108)
	ATMOSPHERIC PROPERTIES
PS PT T PW O3	Surface pressure (5-1000 millibars) Tropopause pressure (5-1000 millibars) Layer mean temperatures (165-345 K) Layer total water abundance (0-8 centimeters) Total column ozone abundance (0-515 Dobson)

Table 2.5.5. Cloud Detection Threshold Codes and Threshold Categories.

WAVELENGTH	CODE	DESCRIPTION (Threshold intervals given in Table 3.2.4)
IR	1	greater than IR Clear Sky by more than threshold interval
IR	2	greater than IR Clear Sky by less than threshold interval
IR	3	less than IR Clear Sky by less than threshold interval
IR	4	less than IR Clear Sky by more than threshold interval
IR	5	less than IR Clear Sky by more than 2 × threshold interval
VIS	0	no visible data
VIS	1	less than VIS Clear Sky by more than threshold interval
VIS	2	less than VIS Clear Sky by less than threshold interval
VIS	3	greater than VIS Clear Sky by less than threshold interval
VIS	4	greater than VIS Clear Sky by more than threshold interval
VIS	5	greater than VIS Clear Sky by more than 2 × threshold interval
NIR	1	less than NIR Clear Sky by more than threshold (daytime)
NIR	2	less than lower limit (daytime)
NIR	3	less than lower limit (nighttime)
NIR	4	greater than upper limit (nighttime)
NIR	6	greater than 3 × threshold (nighttime)
NIR	7	greater than NIR Clear Sky by less than threshold (daytime) or greater than zero by less than threshold (nighttime)
NIR	8	less than NIR Clear Sky by less than threshold (daytime) or greater than zero by less than threshold (nighttime)
NIR	9	greater than NIR Clear Sky by more than threshold (daytime) or greater than zero by more than threshold (nighttime)
NIR	10	less than zero by more than threshold (nighttime)
NIR	11	greater than NIR Clear Sky by more than 2 × threshold (daytime) or greater than zero by more than 2 × threshold (nighttime)
NIR	12	less than zero by more than 2 × threshold (nighttime)
NIR	13	greater than NIR Clear Sky by more than 3 × threshold (daytime)

CATEGORY	DESCRIPTION
cloudy	cloudy by IR or VIS or NIR thresholds
VIS/IR-cloudy	cloudy by IR or VIS thresholds
IR-cloudy	cloudy by IR threshold
IR-only-cloudy	IR cloudy but VIS clear
NIR-cloudy	cloudy by NIR threshold
NIR-only-cloudy	NIR cloudy but IR clear and VIS clear
VIS-only-cloudy	VIS cloudy but IR clear
IR-marginally-cloudy	marginally cloudy by IR threshold
VIS/IR-marginally-cloudy	marginally cloudy by IR or VIS threshold
NIR-marginally-cloudy	marginally cloudy by NIR threshold
NIR-only-marginally-cloudy	NIR marginally cloudy but IR clear and clear
clear	clear by IR and VIS and NIR thresholds
IR-clear	clear by IR threshold
VIS/IR-clear	clear by IR and VIS thresholds

Table 2.5.6. Land/Water/Coast Codes (based on Masaki 1972). ***Note:*** *This code is also used as a day/night code in D1 where day ≤ 100, night > 100.*

	WATER (Land fraction ≤ 35%)	LAND (Land fraction ≥ 65%)	COAST
Stage D2	1	2	3
Stage D1 -- Day	1	2	3
Stage D1 -- Night	101	102	103

Table 2.5.7. Cloud Types (see Figure 2.5).

NAME	PC RANGE (mb)	TAU RANGE	TYPE CODE
LOW			
Cumulus	> 680	≤ 3.55	1 (liquid), 4 (ice)
Stratocumulus	> 680	3.55 - 22.63	2 (liquid), 5 (ice)
Stratus	> 680	> 22.63	3 (liquid), 6 (ice)
MIDDLE			
Altocumulus	440 - 680	≤ 3.55	7 (liquid), 10 (ice)
Altostratus	440 - 680	3.55 - 22.63	8 (liquid), 11 (ice)
Nimbostratus	440 - 680	> 22.64	9 (liquid), 12 (ice)
HIGH			
Cirrus	≤ 440	≤ 3.5	13 (ice)
Cirrostratus	≤ 440	3.5 - 22.63	14 (ice)
Deep Convective	≤ 440	> 22.63	15 (ice)

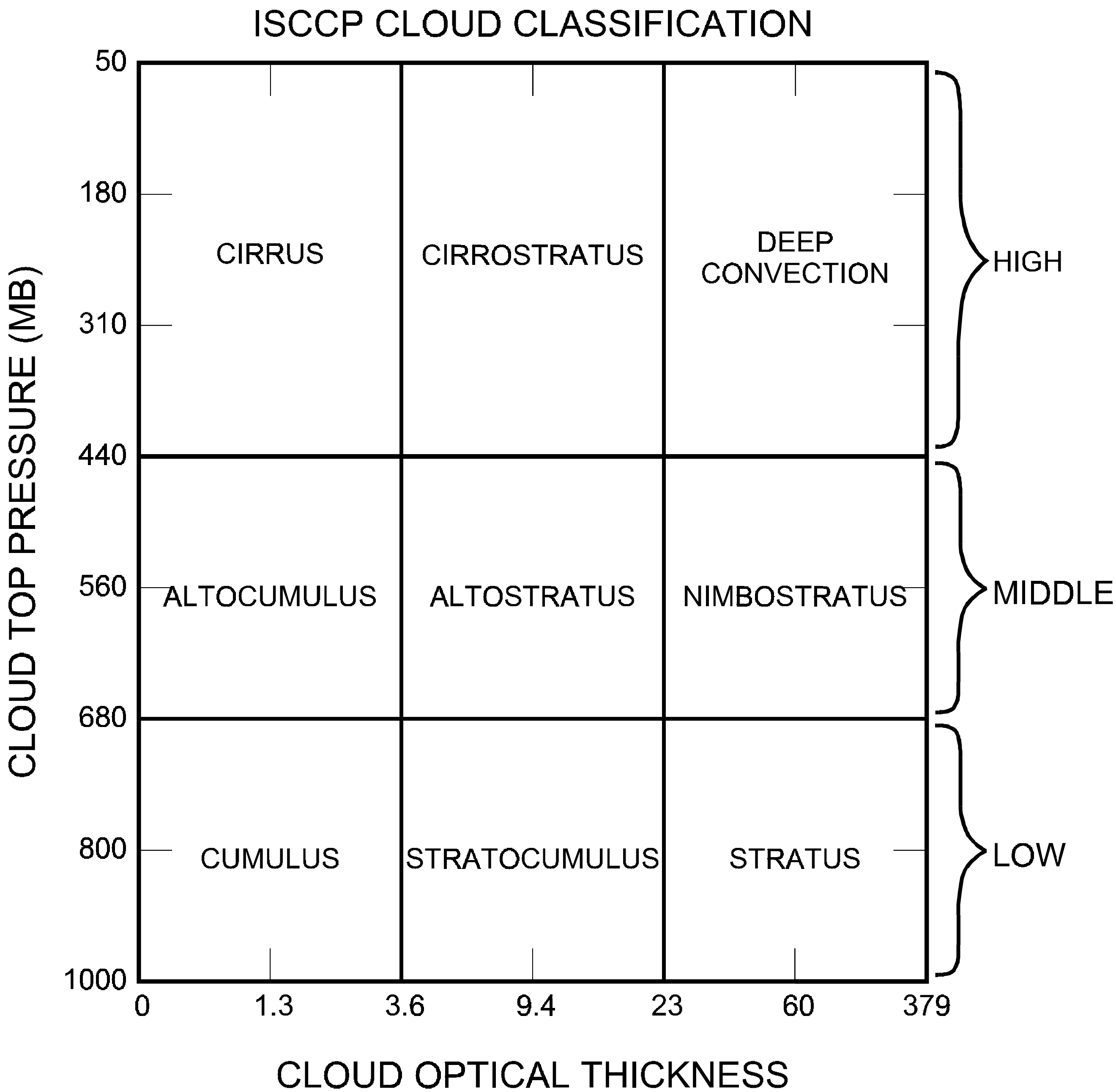

Figure 2.5. ISCCP Radiometric cloud classification.

Table 2.5.8. TOVS Atmospheric Data Origin Code.

CODE	DESCRIPTION
0	No data
1	Original TOVS observation
2	Data replicated from nearby TOVS observation
3	TOVS MONTHLY used (see Section 6.1)
4	CLIM MONTHLY used (see Section 6.1)
5	Original TOVS water vapor outside range and changed

Table 2.5.9. DX Satellite Type Codes and Geographic Sectors. Subsets are produced for the GEWEX regional experiments.

SATTYP	SATELLITE TYPE – REGION	SECTOR
-3	Polar Orbiter – Polar subset	S, N
-2	Polar Orbiter – Midlatitude subset	A-F
-1	Geostationary – Geographic subset	0
0	Geostationary – Full View centered on SSP	0
1	Polar Orbiter – South Polar Cap (Lat < -50°)	S
2	Polar Orbiter – North Polar Cap (Lat > 50°)	N
3	Polar Orbiter – Midlatitude Ascending Lon = 180°-300°	A
4	Polar Orbiter – Midlatitude Descending Lon = 180°-300°	D
5	Polar Orbiter – Midlatitude Ascending Lon = 300°-60°	B
6	Polar Orbiter – Midlatitude Ascending Lon = 60°-180°	C
7	Polar Orbiter – Midlatitude Descending Lon = 300°-60°	E
8	Polar Orbiter – Midlatitude Descending Lon = 60°-180°	F

Table 2.5.10. Ice/Snow Codes.

CODE	WATER	LAND
0	No sea ice	No snow or ice
1	Partial ice cover	Land ice
2	Full ice cover	Full snow cover
3	Ice margin	Snow or ice margin

Table 2.5.11. Equal-Area Map Grid. Latitude index goes from south to north. Longitude intervals are in degrees.

Lat. Index	Long. Interval	No. Cells	Begin Cell No.	End Cell No.	Lat. Index	Long. Interval	No. Cells	Begin Cell No.	End Cell No.
1	120.00	3	1	3	37	2.50	144	3299	3442
2	40.00	9	4	12	38	2.50	144	3443	3586
3	22.50	16	13	28	39	2.52	143	3587	3729
4	16.36	22	29	50	40	2.54	142	3730	3871
5	12.86	28	51	78	41	2.55	141	3872	4012
6	10.59	34	79	112	42	2.57	140	4013	4152
7	9.00	40	113	152	43	2.61	138	4153	4290
8	7.83	46	153	198	44	2.65	136	4291	4426
9	6.92	52	199	250	45	2.69	134	4427	4560
10	6.21	58	251	308	46	2.73	132	4561	4692
11	5.63	64	309	372	47	2.79	129	4693	4821
12	5.22	69	373	441	48	2.86	126	4822	4947
13	4.80	75	442	516	49	2.93	123	4948	5070
14	4.50	80	517	596	50	3.00	120	5071	5190
15	4.24	85	597	681	51	3.10	116	5191	5306
16	4.00	90	682	771	52	3.21	112	5307	5418
17	3.79	95	772	866	53	3.33	108	5419	5526
18	3.60	100	867	966	54	3.46	104	5527	5630
19	3.46	104	967	1070	55	3.60	100	5631	5730
20	3.33	108	1071	1178	56	3.79	95	5731	5825
21	3.21	112	1179	1290	57	4.00	90	5826	5915
22	3.10	116	1291	1406	58	4.24	85	5916	6000
23	3.00	120	1407	1526	59	4.50	80	6001	6080
24	2.93	123	1527	1649	60	4.80	75	6081	6155
25	2.86	126	1650	1775	61	5.22	69	6156	6224
26	2.79	129	1776	1904	62	5.63	64	6225	6288
27	2.73	132	1905	2036	63	6.21	58	6289	6346
28	2.69	134	2037	2170	64	6.92	52	6347	6398
29	2.65	136	2171	2306	65	7.83	46	6399	6444
30	2.61	138	2307	2444	66	9.00	40	6445	6484
31	2.57	140	2445	2584	67	10.59	34	6485	6518
32	2.55	141	2585	2725	68	12.86	28	6519	6546
33	2.54	142	2726	2867	69	16.36	22	6547	6568
34	2.52	143	2868	3010	70	22.50	16	6569	6584
35	2.50	144	3011	3154	71	40.00	9	6585	6593
36	2.50	144	3155	3298	72	120.00	3	6594	6596

Table 2.5.12. ISCCP Tape Designator: GPC.TT.NNNN.V.YYDDD.YYDDD.ISCCP

GPC	Global Processing Center, data producer
TT	Data type: D2, D1, DX, TV, IS
NNNN	Tape sequence number, starting with 0001
V	Tape version number, starting with 0
YYDDD	Year and Julian Day (1-366) of first data file
YYDDD	Year and Julian Day (1-366) of last data file
ISCCP	Project producing the data