APPENDIX C

INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)

DESCRIPTION OF MONTHLY MEAN CLOUD DATA (STAGE C2)

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1. INTRODUCTION

The International Satellite Cloud Climatology Project (ISCCP) collects satellite measurements of spectral radiances from the imaging radiometers on the operational weather satellites and analyzes them, together with correlative datasets, to obtain a climatology of cloud properties. Data collection began in July 1983. The data products produced are the Stage B3 Reduced Resolution Radiance Dataset (Rossow et al. 1987) and the Stage C Cloud Data Products (Rossow and Schiffer 1991). Stage B3 data are the original radiance data, sampled to 30 km and 3 hour spacing, with navigation and calibration information appended, that have been placed into a uniform data tape format. The normalization of all radiances to a standard calibration makes these data a globally uniform set of measurements that can be used for detailed cloud process studies.

The Stage C Cloud Data Products are produced by analysis of the visible (VIS = 0.6 μm) and thermal infrared (IR = 11 μm) radiances from all of the satellites, (see Section 2 in the main document;), merged into a single global product, and reduced in volume by summarizing cloud variations at a 280 km resolution (equivalent to 2.5° latitude-longitude at the equator). Stage C1 data report global results every 3 hours (see Section 3 in the main document). Stage C2 data are monthly summaries of the Stage C1 data with the same spatial resolution and including mean diurnal variations. The analysis procedures used to produce Stage C2 data from Stage C1 data and the contents of Stage C2 data are described in this appendix to the full Stage C Data Products document.

2. ANALYSIS PROCEDURES

2.1. Averaging

The basic objective of the analysis is to summarize the cloud analysis results (Stage C1 data) on a monthly time scale. To preserve information about diurnal variability, the results are first averaged over the calendar month, separately for 00, 03, 06, 09 12, 15, 18 and 21 GMT. These eight datasets are referred to as the hour-monthly means. The number of days of observations contributing to the average values is recorded as the sixth parameter in each map grid cell. Then, the hour-monthly mean values are averaged to obtain the monthly mean values. Hour-monthly mean values which consist of less than 3 daily observations are excluded from the monthly mean. Before averaging over the eight hour-monthly mean datasets, a number of adjustments are made.

Averaging of quantities from stage C1 data can be done in two ways, depending on the purpose. Some quantities, such as cloud optical thickness or top temperature, are related to the effect of clouds on radiation in a non-linear way. Thus, an average value meant to indicate the average radiative effect of clouds must give equal weight to these values proportional to their effect. Since these quantities were retrieved from radiation measurements, this weighting is also related to the variation of relative measurement precision over the range of the parameters. All quantities in Stage C2 data are averaged in this way, except for Parameter 20, called PATH. For most parameters, this weighting procedure produces an average value that is not much different than given by a simple linear average. This is not the case for cloud optical thickness, where a simple linear average produces a global monthly mean value that is about 60% larger than that produced by an energy-weighted average. Parameter 17, TAU, gives the value which represents the average radiative effect of the clouds. Since cloud optical thickness is proportional to cloud water content, Parameter 20, PATH, records the result of a simple linear average of optical thickness values. For a constant cloud particle size distribution (as assumed in the retrieval of optical thicknesses), cloud water path, WP, is given by

WP = (40/3) ("r bar" x PATH)/Q kg/m^2

$$WP = \left(\frac{40}{3}\right) \frac{\bar{r} \times PATH}{Q} \quad kg/m^2$$

where "r bar" is the average particle radius, in cm, and Q is the normalized Mie extinction efficiency at 0.6 μm wavelength. For the cloud particle size distribution used, with "r bar" is approximately 10^{-3} cm,

$$WP = 6.292\ PATH \quad g/m^2.$$

2.2. Adjustments

2.2.1. VIS adjustments

2.2.1.1. *VIS adjustments during daytime*

In the Stage C1 data, two different versions of cloud amount and cloud top temperature/pressure are reported for daytime conditions. One version of cloud amount is obtained from the IR radiances, alone, as must be done for nighttime conditions; the other version combines cloud detections from both the VIS and IR radiances. Because IR radiances are insensitive to low-level clouds, especially broken ones, the VIS radiance analysis detects more low-level cloudiness than the IR analysis. Thus, the combined VIS/IR analysis is superior to the IR-only analysis. Likewise, one version of the cloud top temperature/pressure is obtained directly from the IR radiances as is done for nighttime conditions and the other version adjusts the values consistent with the value of cloud optical thickness retrieved from the VIS radiances. This adjustment is significant only for optically thin clouds, which transmit IR radiation from below the cloud and, consequently, appear to have a higher temperature/pressure than they actually do. Thus, the VIS/IR version is superior to the IR-only version. Stage C3 data contains the VIS/IR versions of cloud amount, cloud top temperature and cloud top pressure.

2.2.1.2. *VIS adjustments during nighttime*

The mean differences between the VIS/IR and IR-only results during daytime conditions are used to adjust the nighttime results in hour-monthly mean data. Daytime differences between VIS/IR and IR-only values of total cloud amount, mean cloud top pressure and cloud top temperature are linearly interpolated over the nighttime periods between the dusk and dawn values. This interpolated difference is then added to the IR-only value during this time period. In addition, values of the cloud optical thickness (both TAU and PATH) are interpolated over the nighttime period between the dusk and dawn values. The magnitude of these corrections is generally small as illustrated in Figure 2.1. The smaller (≤ 5%) cloud amount adjustments are distributed nearly uniformly over the globe with values slightly higher over ocean than over land. The larger adjustments occur in near coastal regions, land and ocean, in low latitudes, primarily associated with tropical rain forests and

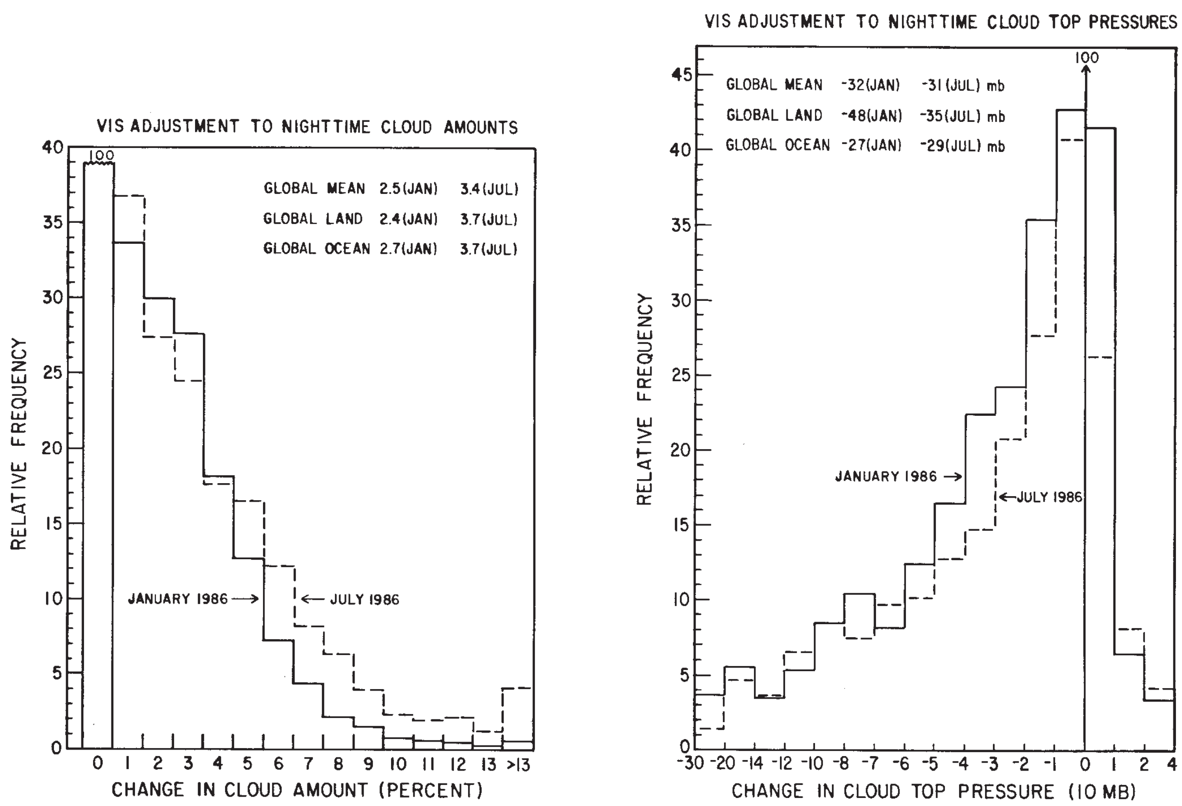

Figure 2.1. VIS adjustments to nighttime clouds (a) amount and (b) top pressures.

marine stratus regimes. The unadjusted cloud amount is reported as the last parameter in each map grid cell. The cloud top pressure correction is positive where low clouds predominate, primarily in marine stratus regimes over oceans, and negative where high, thin clouds predominate, primarily over land, especially in desert areas.

2.2.2. Calibration adjustment

Although procedures are applied to normalize the radiances measured by various satellites to the reference polar orbiter (afternoon) measurements (Rossow et al. 1987), the precision of the normalization procedures leaves small residual differences which can be amplified by the process to retrieve physical quantities. The collection of monthly comparison statistics provides more statistical weight with which to estimate these residuals.

2.2.2.1. *Standard adjustment*

To produce Stage C1 data, results from several satellites are merged into a single global dataset. In regions where more than one satellite provides results, the merger process selects the preferred satellite according to a specified hierarchy that favors data continuity and observations made closer to nadir view. Frequency histograms of the differences in the overlapping measurements between all pairs of satellites are collected and the modal value estimated from the average of the mode value and the three nearest values above and below the mode value. These estimated differences for each satellite when compared to the reference polar orbiter are applied to adjust for small residual radiance calibration differences. The quantities in the hour-monthly mean that are corrected are: cloud top and surface temperature, cloud optical thickness and water path, and surface reflectance. Magnitudes of these corrections are illustrated in Table 2.1. Actual calibration adjustments for each month are reported in the record prefixes for each parameter for each satellite (see Section 3.7.2.).

Table 2.1. Magnitude of calibration adjustments applied to Stage C2 data to .99 remove small residual calibration differences shown as the standard deviation and range of all corrections applied to each satellite over the period July 1983 - February 1987.

Parameter	Std Dev	Range
Cloud Top Temperature	0.74 K	± 2.5 K
Surface Temperature	1.10 K	± 3.0 K
Cloud Optical Thickness and Water Path	0.02	± 0.08
Surface Visible Reflectance	2%	± 8%

2.2.2.2. *Special METEOSAT adjustment*

The spectral response of the METEOSAT "visible" channel is wider than that of the other radiometers used in the ISCCP analysis; normalization of METEOSAT radiances is done using spectrally uniform targets (clouds and clear ocean areas). The spectral response difference means that surface reflectances determined for vegetated land areas are larger for METEOSAT than for the other satellites. This difference in surface reflectances is removed in the hour-monthly mean dataset by using regression relations that are obtained by comparing METEOSAT and NOAA measurements as a function of vegetation type and season. A single relationship that varies with season was found to represent differences as a function of vegetation type. Adjustment factors are applied for each season and are given in Table 2.2. Unadjusted values can be recovered from Stage C2 values by multiplying by the slopes given in Table 2.2 and adding the intercept values.

Table 2.2. Adjustment factors applied to METEOSAT land surface reflectances to reduce them to values measured at an approximate wavelength of 0.6 ± 0.1 μm. Seasons are the standard three-month periods for the northern hemisphere.

Adjustment: Adjusted Value = (Original Value - Intercept) / Slope

		Slope	Intercept
Season:	Winter	0.893	0.1154
	Spring	0.786	0.1135
	Summer	0.752	0.1290
	Fall	0.820	0.1362

2.2.3. Diurnal adjustment

Before the hour-monthly means are combined into a monthly mean, small corrections are made to account for incomplete sampling of the diurnal variations of cloud and surface properties. An incomplete sample is less than 4 hour-monthly observations in the polar regions and less than 8 hour-monthly observations at low and middle latitudes. These adjustments are determined using the zonally averaged variations of the quantities in local time at all locations with eight hour-monthly mean values available. The diurnal average is calculated for the number of samples actually available and compared with the average of eight samples to determine the effect of sub-sampling on the diurnal average. The calculations are performed within each latitude interval, separately for land and water areas. The quantities that are adjusted are the total cloud amount, cloud top temperature and pressure, cloud optical thickness and water path, and the surface temperature. These adjustments affect only the monthly mean values and are not applied to the individual hour-monthly means.

2.3. Cloud Types

In addition to mean cloud properties, the frequency of occurrence and average properties of ten cloud types are reported; none of the adjustments discussed above are applied to these results. The cloud types are defined by ranges of cloud top pressures and optical thicknesses as illustrated in Figure 2.2. The three types, low, middle and high, are defined only by cloud top pressures determined solely from IR radiances and are reported for both daytime and nighttime conditions. The remaining seven types are defined by combinations of cloud top pressure and optical thickness and are reported only for daytime conditions. The names given to these seven types are meant to suggest relationships with the classical morphological cloud types that seem qualitatively correct, but should not be interpreted to be quantitatively correct in every instance.

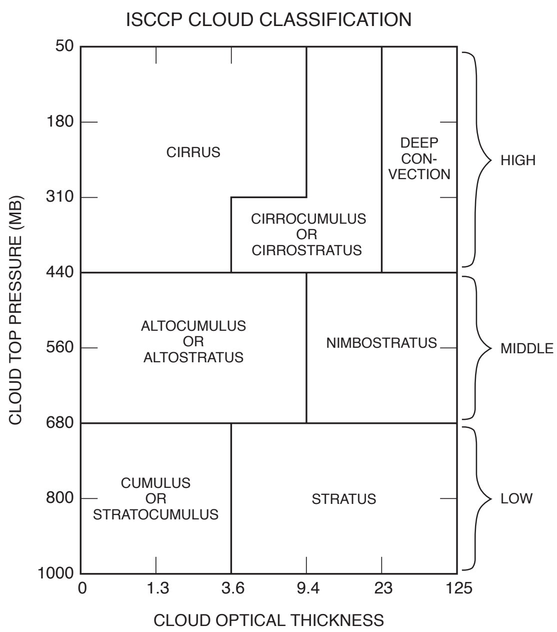

Figure 2.2. Schematic defining ten cloud types by their cloud top pressures and optical thicknesses.

2.4. Definition of Reported Parameters

Table 2 lists all of the parameters reported for each map grid cell for both the eight hour-monthly mean datasets and the monthly dataset. Variables labeled with "D" are present only during local daytime. The annotations that follow indicate which adjustments have been applied: Adj1 = VIS-adjusted values used, Adj2 = VIS adjustment at night, Adj3 = Value interpolated to nighttime, Adj4 = Calibration adjustment, Adj5 = Special METEOSAT adjustment, and Adj6 = Diurnal sampling adjustment. The upper/lower longitude indices indicate the range of longitudes in the 2.5° map grid into which the particular cell will be replicated; the range of values for both longitude indices is 1 to 144. The land/water/coast code value indicates surface type; codes 1, 2, and 3 indicate water, land, and coast.

Abbreviations are TAU = cloud optical thickness, PATH = cloud water path, PC = cloud top pressure, TC = cloud top temperature, TS = surface temperature, RS = surface reflectance, and SIGMA = standard deviation over spatial or time domains. GMT 00-21 indicates hour-monthly mean datasets and GMT ALL indicates monthly mean datasets.

Table 2.3. Contents of each map grid cell in Stage C2 datasets.

	Variable Number		Description
	VAR	1	LATITUDE INDEX (EQUAL-AREA)
	VAR	2	LONGITUDE INDEX (EQUAL-AREA)
	VAR	3	LOWER LONGITUDE INDEX (2.5-SQ)
	VAR	4	UPPER LONGITUDE INDEX (2.5-SQ)
	VAR	5	LAND/WATER/COAST CODE
	VAR	6	GMT 00-21: TOTAL NUMBER OF DAYS IN AVERAGE (Day+night) GMT ALL: TOTAL NUMBER OF GMTS IN AVERAGE (Day+night)
	VAR	7	GMT 00-21: TOTAL NUMBER OF DAYS IN AVERAGE (Day) GMT ALL: TOTAL NUMBER OF GMTS IN AVERAGE (Day)
	VAR	8	MEAN FREQUENCY OF CLOUDY PIXELS (Adj2, Adj6)
	VAR	9	GMT 00-21: NUMBER OF DAYS WITH CLOUDY PIXELS > 0 GMT ALL: MEAN FREQ OF CLOUDY DAYS
	VAR	10	MARGINAL VIS/IR CLOUD AMOUNT
	VAR	11	MEAN PC FOR CLOUDY PIXELS (Adj1, Adj2, Adj6)
	VAR	12	TIME-SIGMA PC FOR IR-CLOUDY PIXELS
	VAR	13	MEAN SPACE-SIGMA PC FOR IR-CLOUDY PIXELS
	VAR	14	MEAN TC FOR CLOUDY PIXELS (Adj1, Adj2, Adj4, Adj6)
	VAR	15	TIME-SIGMA TC FOR IR-CLOUDY PIXELS
	VAR	16	MEAN SPACE-SIGMA TC FOR IR-CLOUDY PIXELS
	VAR	17	MEAN TAU FOR VIS/IR-CLOUDY PIXELS (Adj3, Adj4, Adj6)
D	VAR	18	TIME-SIGMA TAU FOR VIS/IR-CLOUDY PIXELS
D	VAR	19	MEAN SPACE-SIGMA TAU FOR VIS/IR-CLOUDY PIXELS
	VAR	20	MEAN PATH FOR VIS/IR-CLOUDY PIXELS
D	VAR	21	TIME-SIGMA PATH FOR VIS/IR-CLOUDY PIXELS
D	VAR	22	MEAN SPACE-SIGMA PATH FOR VIS/IR-CLOUDY PIXELS
	VAR	23	AVG FREQ OF LOW LEVEL CLOUDINESS
	VAR	24	AVG PC OF LOW LEVEL CLOUDINESS
	VAR	25	AVG TC OF LOW LEVEL CLOUDINESS
	VAR	26	AVG FREQ OF MIDDLE LEVEL CLOUDINESS
	VAR	27	AVG PC OF MIDDLE LEVEL CLOUDINESS
	VAR	28	AVG TC OF MIDDLE LEVEL CLOUDINESS
	VAR	29	AVG FREQ OF HIGH LEVEL CLOUDINESS
	VAR	30	AVG PC OF HIGH LEVEL CLOUDINESS
	VAR	31	AVG TC OF HIGH LEVEL CLOUDINESS
D	VAR	32	AVG FREQ OF CUMULUS CLOUDINESS
D	VAR	33	AVG PC OF CUMULUS CLOUDINESS
D	VAR	34	AVG TC OF CUMULUS CLOUDINESS
D	VAR	35	AVG TAU OF CUMULUS CLOUDINESS
D	VAR	36	AVG FREQ OF STRATUS CLOUDINESS
D	VAR	37	AVG PC OF STRATUS CLOUDINESS
D	VAR	38	AVG TC OF STRATUS CLOUDINESS
D	VAR	39	AVG TAU OF STRATUS CLOUDINESS
D	VAR	40	AVG FREQ OF ALTOCUMULUS CLOUDINESS
D	VAR	41	AVG PC OF ALTOCUMULUS CLOUDINESS
D	VAR	42	AVG TC OF ALTOCUMULUS CLOUDINESS
D	VAR	43	AVG TAU OF ALTOCUMULUS CLOUDINESS
D	VAR	44	AVG FREQ OF NIMBOSTRATUS CLOUDINESS
D	VAR	45	AVG PC OF NIMBOSTRATUS CLOUDINESS
D	VAR	46	AVG TC OF NIMBOSTRATUS CLOUDINESS
D	VAR	47	AVG TAU OF NIMBOSTRATUS CLOUDINESS

Table 2.3. (continued).

	Variable Number		Description
D	VAR	48	AVG FREQ OF CIRRUS CLOUDINESS
D	VAR	49	AVG PC OF CIRRUS CLOUDINESS
D	VAR	50	AVG TC OF CIRRUS CLOUDINESS
D	VAR	51	AVG TAU OF CIRRUS CLOUDINESS
D	VAR	52	AVG FREQ OF CIRROSTRATUS CLOUDINESS
D	VAR	53	AVG PC OF CIRROSTRATUS CLOUDINESS
D	VAR	54	AVG TC OF CIRROSTRATUS CLOUDINESS
D	VAR	55	AVG TAU OF CIRROSTRATUS CLOUDINESS
D	VAR	56	AVG FREQ OF DEEP CONVECTIVE CLOUDINESS
D	VAR	57	AVG PC OF DEEP CONVECTIVE CLOUDINESS
D	VAR	58	AVG TC OF DEEP CONVECTIVE CLOUDINESS
D	VAR	59	AVG TAU OF DEEP CONVECTIVE CLOUDINESS
	VAR	60	MEAN TS FROM CLEAR SKY COMPOSITE (Adj4, Adj6)
	VAR	61	TIME-SIGMA TS FROM CLEAR SKY COMPOSITE
D	VAR	62	MEAN RS FROM CLEAR SKY COMPOSITE (Adj4, Adj5)
	VAR	63	MEAN SNOW/ICE COVER
	VAR	64	SURFACE PRESSURE (TOVS)
	VAR	65	NEAR-SURFACE AIR TEMPERATURE (TOVS EXTRAPOLATED)
	VAR	66	TEMPERATURE AT 500 MB (TOVS)
	VAR	67	TROPOPAUSE PRESSURE (TOVS)
	VAR	68	TROPOPAUSE TEMPERATURE (TOVS)
	VAR	69	STRATOSPHERE TEMPERATURE AT 15 MB (TOVS)
	VAR	70	PRECIPITABLE WATER - COLUMN (TOVS)
	VAR	71	OZONE - COLUMN (TOVS)
	VAR	72	MEAN FREQ OF CLOUDY PIXELS - UNADJUSTED

3. DATA TAPE FORMAT

3.1. Tape Characteristics

3.1.1. IBM tape structure

The Stage C2 data tapes are written in "IBM Standard Label" format. In this format each actual data file is accompanied by additional, very short, "Header" and "Trailer" files that describe the contents of the actual file. Some computer systems use these files to obtain the "data set name." Users whose computer systems do not use these additional files should read the tape from the second actual file on the tape and read every third file after that. In the discussion to follow, the file numbers referred to are those of actual data files, ignoring the extra Header/Trailer files. The file numbers given at various places in the C2 data also ignore these extra files.

Each C2 data tape consists of the following files with the indicated lengths.

File Number	Data Set Name	Length (Records)	Contents
1	VOLID	3	Volume ID
2	TOC	3	Table of Contents
3	READPROG	16	READ Program
4	TABLES	3	Conversion Tables
5	ANCILARY	116	Ancillary Tables
6-118	DATA001-DATA113	67	C2 Data

All files on C2 data tapes are separated by standard end-of-file (EOF) marks. The first five files on all tapes provide an assortment of identification and ancillary information; these files are coded entirely as ASCII character data, arranged in groups of 80-character strings representing individual lines of text. The contents of these files are meant to be printed as text. The remaining files on each tape contain the C2 data coded entirely as 1-BYTE BINARY integers; the contents of these files are not meant to be printed as text.

All files are composed of records that are separated by standard inter-record gaps. All records are 7200 BYTES in length.

3.1.2. ISCCP tape number

C2 data tapes are numbered consecutively as follows:

GPC.C2.NNNN.V.YYDDD.YYDDD.ISCCP

GPC	=	Global Processing Center, producer of C2 data, NASA Goddard Space Flight Center Institute for Space Studies New York, NY USA
C2	=	type of data
NNNN	=	unique sequence number within the C2 data set
V	=	version number, original version = 0, if a new version of a tape is issued the version number is increased

YYDDD	=	year and Julian day of first data file on tape
YYDDD	=	year and Julian day of last data file on tape
ISCCP	=	International Satellite Cloud Climatology Project, first project of the World Climate Research Programme of the World Meteorological Organization and the International Council of Scientific Unions

The tape number is recorded as ASCII characters in the first 80 bytes of the first (Volume ID) file on every tape.

3.2. Volume ID File

The VOLUME ID (File 1) is coded entirely as ASCII characters, arranged into 80-character groups representing individual lines of text, and meant to be printed as text. This file provides a complete description of the tape structure and data format, as well as identification of the sources of data. The contents are listed below (each item ends in a blank line).

Line Number	Contents
1 - 2	Tape number
3 - 6	Data type and project name
7 - 9	Date and time of first and last data files on tape
10 - 15	Address of originating center
16 - 17	Tape creation date
18 - 23	Address of archives for data
24 - 32	Satellites contributing data to the particular tape (unused lines left blank)
33 - 40	Definition of satellite types
41 - 54	ISCCP tape numbers of input data used
55 - 59	Sources and types of correlative data used
60 - 66	Description of file order and record characteristics
67 - 71	Description of tape files and contents
72 - 83	Description of conversion tables used
84 - 97	Description of ancillary data file
98 - 104	Description of data organization
105 - 130	Description of data record structure
131 - 171	Description of map grids and geographic information
172 - 176	Definition of land/water/coast surface types
177 - 270	Variable definitions

3.3. Table of Contents File

The TABLE OF CONTENTS (File 2) provides a file-by-file listing for each data file and is coded entirely as ASCII characters. The first two lines (80-characters each or 160 BYTES) are the headings for the table of numerical values to follow. Each one line summary lists the file number, the year, month, and GMT of the data, percent of the map cells with data, and the code numbers of the specific satellites contributing data to that file.

3.4. Read Program file

The READ PROGRAM (File 3) file provides the C2READ subroutine which can be used to read, decode, and re-map the C2 data files. The file is coded entirely as ASCII characters, meant to be printed as text. This subroutine retrieves the data from one record at a time. To illustrate the use of the C2READ program, a SAMPLE MAIN program is provided that prints all the quantities from one particular longitude for all latitudes. A schematic of the program is shown in Fig. 2; documentation contained in the software listing explains the functions of each component of the program.

3.4.1. Program structure

(i) For the initial call to the subroutine C2READ, the subroutine "EQUARE" calculates quantities needed to re-map the data from the EQUAL-AREA map grid to the 2.5° EQUAL-ANGLE (latitude/longitude) map grid. The first data record is read, using the subroutine C2REC.

(ii) In C2REC the C2 data record is read and translated from CHARACTER*1 to INTEGER*4 by the subroutine UNPACK. Note that this subroutine calls the function ICHAR. The data record prefix is decoded in the subroutine PREFIX.

(iii) Output variable arrays are initialized so that missing data will be reported as a real value of -1000.0.

(iv) The data records are searched until the first latitude specified by the user is found. If the desired cell is not in the "current" record, the next data record is read and decoded by subroutines C2REC, UNPACK and PREFIX.

(v) If the desired cell is present, the count values, which have been converted from CHARACTER*1 form to INTEGER*4 form, are converted to physical units in the subroutine CONVRT. The conversion tables are initialized in a BLOCK DATA subprogram that defines the arrays in COMMON BLOCK CNTTAB. These tables are used as lookup arrays by CONVRT. Note the use of EQUIVALENCE declarations in this subprogram.

(vi) The data are returned to the calling MAIN program through the COMMON C2DATA.

3.4.2. Notes to non-IBM or NON-standard FORTRAN 77 users

Most computer systems cannot perform arithmetic operations with individual BYTES; hence, some form of decoding is necessary to use the information contained in the C2 data files, which are coded exclusively in this form (CHARACTER*1). In C2READ, the subroutine UNPACK performs the conversion from CHARACTER*1 to INTEGER*4 and the subroutine CONVRT translates the code integers to physical quantities in REAL*4.

The conversion of the BYTE values to INTEGER*4 values is performed using the FORTRAN function called ICHAR; this function is declared to be INTRINSIC in the subroutine, UNPACK, so that if the particular computer does not support this procedure, an error message will be generated at LINK time.

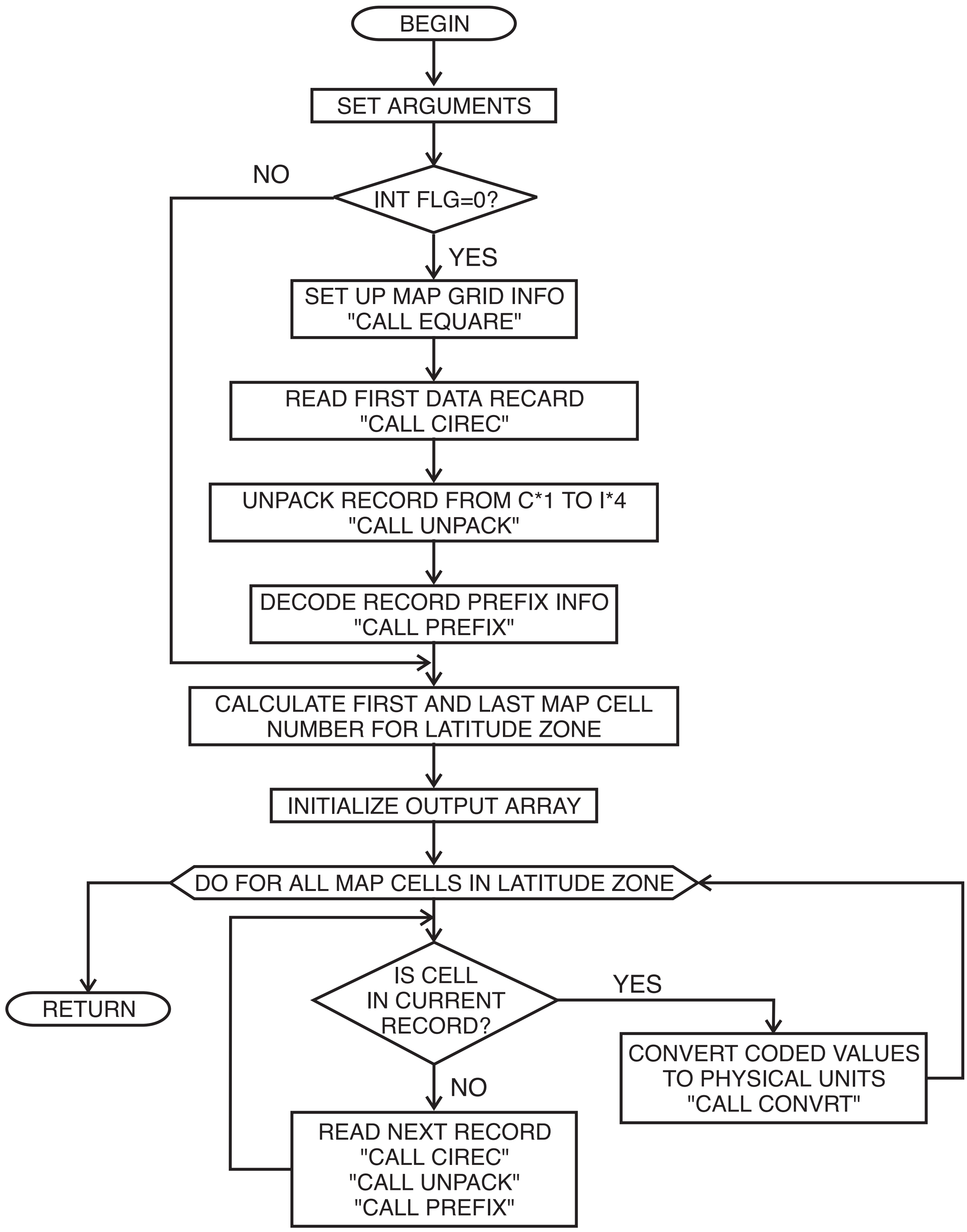

Figure 2.2. Program schematic for SUBROUTINE C2READ.

If a computer system cannot use this approach or has incompatible definitions of numerical values, the C2 data should be directly decoded, using a local procedure to transform each set of 8 bits in a record into the local representation of positive integers. This local decoding process should replace the subroutine UNPACK, which is clearly labeled in the software listing. Each data record can then be identified as an integer array, called C2INTS (NBYTES, NUMBOX) in the UNPACK subroutine. NBYTES is the number of variables reported for each map cell (= 72 in C2 data) and NUMBOX is the number of map cells plus one that is reported in one record (= 99 + 1 in C2 data). Once this has been done, the rest of the C2READ program should run successfully on all computers.

Another feature of the C2READ program that may cause difficulties is the use of EQUIVALENCE declarations for arrays in BLOCK DATA. Since there are limits on the length of data statements, these declarations are used to assemble the complete conversion tables in COMMON BLOCK CNTTAB from several smaller arrays, which are defined in this subprogram. Users with systems that do not support this process will need to alter BLOCK DATA to initialize COMMON BLOCK CNTTAB. Another way to initialize the table values in COMMON BLOCK CNTTAB is to read the fourth file on each data tape that contains the same conversion tables, represented as ASCII text.

3.5. Conversion Tables File

The CONVERSION TABLES (File 4), used to convert the integer count values to physical quantities, are provided in this file. The file is written in ASCII characters that are meant to be printed as text. The first three lines of text (80-characters each or 240 BYTES) are headings for the table of numerical values to follow. Each subsequent 80-character string represents one line of the tables listing the COUNT value and the corresponding temperatures in Kelvins, pressures in millibars, reflectances and VIS radiances as dimensionless fractions, optical thickness (and water path) as a dimensionless number, humidity in precipitable centimeters, and ozone abundance in Dobson units.

3.6. Ancillary Data File

The ANCILLARY DATA (File 5) provides geographic and map grid information for each cell in the 2.5° map grid as a one line summary. The information is recorded as ASCII characters that are meant to be printed as text. The first two lines (80-characters each or 160 BYTES) are headings for the table of numerical values to follow. Listed on each line are the latitude index (same for both map grids, 1-72), the longitude index for the 2.5° map grid, latitude and longitude at the center of the 2.5° map cell, longitude at the center of the EQUAL-AREA map cell, the EQUAL-AREA cell number that is mapped to that EQUAL-ANGLE cell, the record number where that cell is found in ALL data files, the number of the first byte in the record that contains data for that cell, the EQUAL-AREA cell area in km^2, the land fraction in percent, the topographic altitude of the surface (meters), and the preferred satellite for that cell

3.6.1. Map grids

Two related map grids are used for ISCCP C data sets, an EQUAL-AREA grid and an EQUAL-ANGLE grid. These grids are identical at the equator. The collection of statistics from the satellite analysis, which produces global information at about 30 km resolution, is conducted using an EQUAL-AREA map to maintain a nearly constant statistical weight for results at all locations (see Rossow and Garder 1984). For economy of data storage on the data tapes, the results are also recorded in the same EQUAL-AREA grid. However, since data manipulation on computers and in image displays are more convenient using rectangular arrays, the C2READ program provided with the data will automatically put the data into an EQUAL-ANGLE map grid of 2.5° resolution. The data are transformed to the EQUAL-ANGLE grid by replication, which preserves all of the original statistics (Rossow and Garder 1984), since the grid cells of the EQUAL-ANGLE grid at higher latitudes represent higher resolution (in the longitudinal direction) than in the original data set. If a user wishes to re-map the data to some other projection, the EQUAL-AREA form of the data is most convenient, since the area-weights are all equal.

All data arrays are listed in order from the south pole to the north pole. All longitudes for each latitude zone are listed in order from Greenwich meridian, eastward (longitudes are given in the range 0-360°), before listing the next latitude zone.

3.6.1.1. *EQUAL-AREA grid for data storage*

The EQUAL-AREA map (Fig. 2.3a) is defined by the area of a 2.5° × 2.5° cell at the equator; the intersection of the Greenwich meridian and the equator is a cell corner. There are 6596 cells in this map grid.

All map cells are determined by a constant 2.5° increment in latitude and a variable longitude increment. The longitude increment is selected to provide an integer number of cells in a latitude zone and to give a cell area

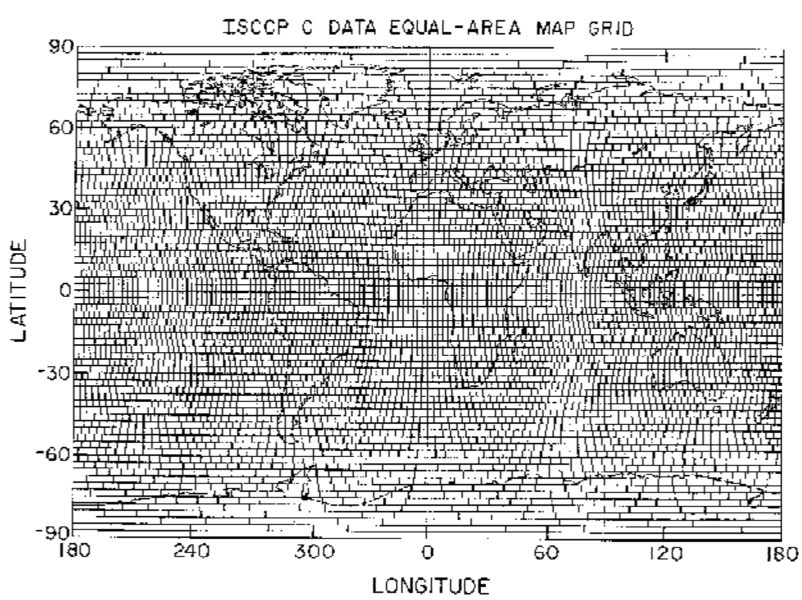

Figure 2.3a. Equal-area map grid used for ISCCP data.

as close to that of the equatorial cell as possible. The number of longitude increments for each latitude (first number of each pair is latitude index from 1 to 72) is given below.

1 - 3	19 - 104	37 - 144	55 - 100
2 - 9	20 - 108	38 - 144	56 - 95
3 - 16	21 - 112	39 - 143	57 - 90
4 - 22	22 - 116	40 - 142	58 - 85
5 - 28	23 - 120	41 - 141	59 - 80
6 - 34	24 - 123	42 - 140	60 - 75
7 - 40	25 - 126	43 - 138	61 - 69
8 - 46	26 - 129	44 - 136	62 - 64
9 - 52	27 - 132	45 - 134	63 - 58
10 - 58	28 - 134	46 - 132	64 - 52
11 - 64	29 - 136	47 - 129	65 - 46
12 - 69	30 - 138	48 - 126	66 - 40
13 - 75	31 - 140	49 - 123	67 - 34
14 - 80	32 - 141	50 - 120	68 - 28
15 - 85	33 - 142	51 - 116	69 - 22
16 - 90	34 - 143	52 - 112	70 - 16
17 - 95	35 - 144	53 - 108	71 - 9
18 - 100	36 - 144	54 - 104	72 - 3

3.6.1.2. *EQUAL-ANGLE grid for data output*

The C2READ program, provided to read the data files, will automatically replicate the data from the 6596 EQUAL-AREA cells to an EQUAL-ANGLE map grid (Fig. 2.3b). This map grid has equal 2.5° increments in latitude and longitude; there are 10368 cells in this grid (72 latitude zones and 144 longitude intervals). The intersection of the Greenwich meridian and equator is a cell corner; coordinates are given as latitudes from -90° to 90° and longitudes from 0° to 360° (positive eastward).

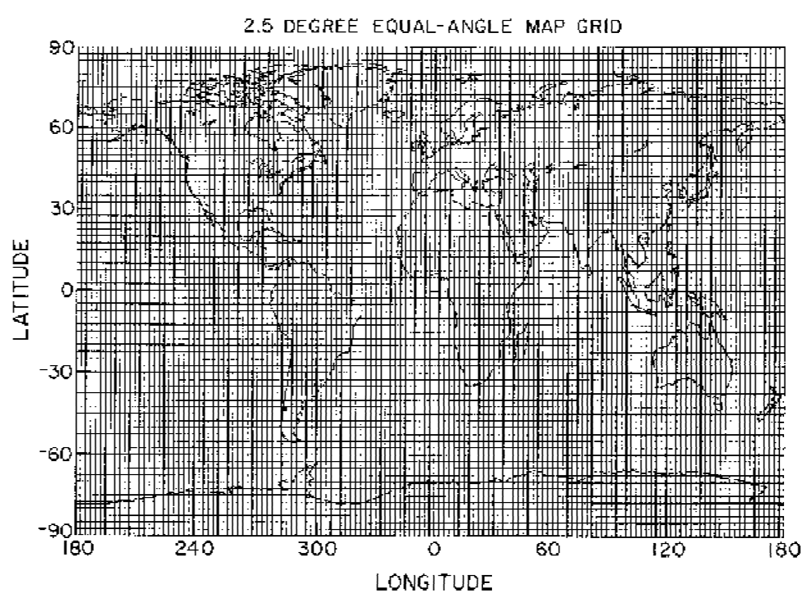

Figure 2.3b. Equal-angle map grid used for ISCCP data.

3.6.2. Geographic information

Geographic information is reported for each EQUAL-ANGLE map cell, about the EQUAL-AREA map grid, about the land cover fraction and topography of the surface, and the satellite hierarchy. The map grid information consists of the latitude and longitude indices of the EQUAL-ANGLE map cell, the latitude and longitude of the EQUAL-ANGLE map cell center, the center-longitude of the EQUAL-AREA map cell replicated to that particular EQUAL-ANGLE cell, the EQUAL-AREA cell number (1 to 6596), the location of the cell in all data files (record number within the file and byte number within the record), and the actual area (in km^2) of the original EQUAL-AREA cell. The land cover fraction (0 to 100%) and the mean topographic altitude above mean sea level in meters are also reported. The preferred satellite for that cell is given by satellite type code.

Geographic information, such as the land/water/coast classification, topographic altitude, and map cell areas, is defined for the EQUAL-AREA map grid, but reported for each EQUAL-ANGLE map grid cell. Thus, for example, the average topography, when reported in the EQUAL-ANGLE map grid does not represent information with 2.5° longitude resolution at high latitudes.

3.7. Data Files

All C2 data files are coded entirely as 1-BYTE BINARY values; these values are not meant to be printed as text. The first data file on C2 data tapes is always File 6.

Each data file is composed of 67 data records for C2, each 7200 BYTES in length. Each C2 data record begins with a 72 BYTE prefix that identifies the contents of that record. The prefix is followed by 99 map cells of data, each represented by 72 BYTES.

3.7.1. Data organization

C2 data provide a monthly mean summary of the C1 data in the form of eight separate monthly averages for each 3 hour time period (the hour-monthly means), followed by the average over all diurnal phases (the monthly mean). Thus, there are nine C2 data sets per month. Each C2 data tape contains one year of C2 data, arranged by month.

Each C2 data file represents a complete global distribution of results. The same number of values is always reported in each data file, even if some data are missing for some locations. Missing data values are always represented by count values of 255; this value is not used for any other purpose. The nominal resolution of the map grid is 250 km: each map cell represents an area equal to that of a 2.5° × 2.5° latitude/longitude cell at the equator (actually the dimensions of this cell at the equator are about 278 km, square). The latitude increment in the map grid is 2.5°; the longitude increment in the EQUAL-AREA map grid is variable to preserve a constant cell area (see description of map grids above).

Data within a single C2 data file are organized to provide all quantities at each map location. (If no data are available for a particular location, all quantities will be coded as 255.) In C2 data files 72 quantities are reported for each map cell (see Table 2.3 above). The sequence of values within a data file gives the 72 quantities for the first map cell (latitude 88.75° S, longitude 1.25° E), then the next cell (latitude 88.75° S, longitude 3.75° E), and so on. The map cells progress in longitude increasing eastward and latitude increasing northward. Each latitude zone is completed before moving to the next latitude zone.

3.7.2. Record prefix

The record prefix for C2 data records contains the following:

Byte 1:	Record number within file (1-67)
Byte 2:	File number on tape (6-118)
Byte 3:	Year of data set (83-95)
Byte 4:	Month (1-12)
Byte 5:	255
Byte 6:	GMT (0,3,6...21, 255)
Byte 7:	Latitude index of first cell in record
Byte 8:	Equal-area longitude index of first cell in record
Byte 9:	Latitude index of last cell in record
Byte 10:	Equal-area longitude index of last cell in record
Byte 11-66:	Calibration correction factors in byte pairs. First byte is 0 for positive correction, or 1 for negative correction. Second byte is scaled correction magnitude. Four byte-pairs are recorded for each satellite type, corresponding to TC, TS, Tau, and RS with scale factors of 10, 10, 100, and 1000, respectively.
Byte 67-72:	255

3.7.3. Coding of parameter values

All quantities in the C2 data set are reported in the form of positive integer code values, called COUNT values and represented in the data files as one BYTE (8-bit) BINARY values. The C2READ program automatically converts the count values to physical units (R*4). Users may wish to retrieve the count values directly for image display purposes, however.

The reported physical parameters are defined in Table 2.3; temperatures are given in Kelvins, pressures in millibars, reflectances as a fraction from 0.0 to 1.12, cloud optical thickness and water path as values from 0.02 to 119.59, precipitable water amounts in centimeters, and ozone abundances in Dobson units.

Since most of the parameters derived in the analysis 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 parameters. 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 relation between the code values and physical values is not always linear and represents the proper proportionality between the derived parameter and the original radiance measurement. The two instances of a non-linear relations are temperatures and cloud optical thicknesses: the linear variation of count values parallels the linear variation of the amount of energy measured by the radiometer.

Averaging of quantities from C2 data can be done in two ways, depending on what is appropriate. For most quantities with a linear relation between count values and physical values, these two approaches produce identical results. For temperatures and optical thicknesses, however, averaging before conversion to physical units will produce a different result than averaging after conversion.

Input data errors and 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 1-BYTE representation required establishing limits for all quantities. If these limits are violated, then either underflow or overflow occurs. Special count values have been reserved for the physical quantities to indicate these possibilities: 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. (Overflow occurs at lower counts for pressures and cloud optical thicknesses.)

The fourth file on every C2 data tape contains the conversion tables used to translate the COUNT values to physical values; the C2READ program contains the same table and automatically converts all data to physical units.

3.8. Sample Volume ID File

```
GPC.C2.0001.2.83182.83365.ISCCP

                         CLOUD CLIMATOLOGY PRODUCT
              International Satellite Cloud Climatology Project
                        World Climate Research Program

1983  7   00    (year  month  day)
1983  12  ALL   (year  month  day)

Tape Produced at:
    NASA Goddard Space Flight Center
    Institute for Space Studies
    2880 Broadway
    New York, N.Y. 10025
    USA

Tape archived at:
    Satellite Data Services Division
    National Environmental Satellite Data and Information Service
    National Oceanic and Atmospheric Administration
    Washington, DC 20233
    USA

1991 01 08    (year month day)      date of tape creation

Contributing Satellites:      Processing Center:
  Sat-ID-Code  11 Type 6 NOAA-7       National Oceanic & Atmospheric Admin.
  Sat-ID-Code  21 Type 3 GOES-6       Colorado State University
  Sat-ID-Code  31 Type 4 GOES-5       University of Wisconsin
```

Sat-ID-Code 41	Type 2	METEOSAT-2	European Space Agency
Sat-ID-Code 52	Type 1	GMS-2	Japan Meteorological Agency
Sat-ID-Code 61	Type 7	NOAA-8	National Oceanic & Atmospheric Admin.

Satellite types:

1	Western Pacific	Geostationary
2	European	Geostationary
3	Eastern Pacific	Geostationary
4	American	Geostationary
5	Asian	Geostationary
6	Afternoon	Polar Orbiter
7	Morning	Polar Orbiter

ISCCP tape designators (Input):

GPC.C1.0001.2.83182.83197.ISCCP	GPC.C1.0002.2.83198.83212.ISCCP
GPC.C1.0019.1.83213.83228.ISCCP	GPC.C1.0020.1.83229.83243.ISCCP
GPC.C1.0021.1.83244.83259.ISCCP	GPC.C1.0022.1.83260.83273.ISCCP
GPC.C1.0023.1.83274.83289.ISCCP	GPC.C1.0024.1.83290.83304.ISCCP
GPC.C1.0025.1.83305.83320.ISCCP	GPC.C1.0026.1.83321.83334.ISCCP
GPC.C1.0029.1.83335.83350.ISCCP	GPC.C1.0030.1.83351.83365.ISCCP

Correlative Data:

TOVS	NOAA / NESDIS
Snow cover	NOAA / NESDIS
Sea ice	US Navy / NOAA
Topography	National Center for Atmospheric Research

Tape Format:

File 1 - Volume ID	(3 records)
File 2 - Table of Contents	(2 record)
File 3 - READ program	(16 records)
File 4 - Variable Conversion Table	(3 records)
File 5 - Ancillary Data Table	(116 records)
File 6 through 240 - CLOUD DATA	(67 records/file)

Files 1 through 5 are written in ASCII and are meant to be printed as text. They should be separated into logical records of 80 characters representing lines of text. The remaining data files are written as binary data, not meant to be printed.

Conversion Tables: (File 4 - ASCII)

The seven tables convert the 8-bit counts in the data files to the appropriate physical units as given below. The count values represent positive integers from 0 to 254 (inclusive) with 255 always indicating no data.

Temperature	in Kelvin
Temperature variance	in Kelvin
Pressure	in Millibars
Reflectance/Albedo	Fraction of Solar Constant
Optical Depth (Tau)	dimensionless
Humidity	in precipitable centimeters
Ozone Abundance	in Dobson Units

Ancillary Data: (File 5 - ASCII)

Tabular format, for each Equal-Angle cell:

- Latitude Index of cell
- Longitude Index of cell
- Latitude of cell
- Longitude of cell
- Longitude of Equal-Area box mapped to this cell
- Cell number of Equal-Area box mapped to this cell

Cell locator: Record number
Cell locator: Byte number within record
Area of Equal-Area box mapped to this cell
Land Fraction of Equal-Area box mapped to this cell
Topographic Altitude of Equal-Area box mapped to this cell
Satellite Hierarchy: Primary Satellite Code

Data: (Binary) Monthly mean global data every three hours with spatial resolution of 250 km (nominal). There are nine files for each month. The first eight files contain the monthly means at a single GMT (00,03,06,09,12,15,18,21) and the ninth file for the month contains the monthly means over all eight GMT's.

Record Structure: Each record has a 72-byte prefix followed by 99 cells of 72 bytes each (adding up to 7200 bytes). The prefix contains the following, as 8-bit positive integers:

Byte 1:	Record number in file	(1 - 67)
Byte 2:	File number on tape	(6 - 240)
Byte 3:	Year of dataset	(83 - 95)
Byte 4:	Month	(1 - 12)
Byte 5:	Unused	(255)
Byte 6:	GMT	(0,3,6,...,21)
Byte 7:	First Latitude Equal Area index in record	
Byte 8:	First Longitude Equal Area index in record	
Byte 9:	Last Latitude Equal Area index in record	
Byte 10:	Last Longitude Equal Area index in record	
Bytes 11-66:	Calibration Correction factors in two-byte pairs. First byte is 0 for positive correction, or 1 for negative correction. Second byte is scaled correction magnitude. Four byte-pairs are recorded for each satellite type (types 1-7 above) corresponding to TC, TS, Tau, and RS with scale factors of 10, 10, 100, and 1000 respectively. For example, bytes 11-18 are the TC, TS, Tau, and RS corrections applied to GOES-WEST boxes.	
Bytes 67-72:	Unused	(255)

Mapping: Data are stored on tape in Equal-Area Grid format 6596 Grid Boxes in Equal Area Map; (0,0) is a box corner. The sequential box numbering system assigns a number between 1 and 6596 to each Equal-Area box, starting from the South Pole at the Greenwich Meridian. Within each latitude belt the numbers then increase eastward from the zero degree meridian. Box numbers increase northward in latitude. In each hemisphere there are 3298 boxes.

Output from READ program is in Equal-Angle Grid format 10368 Grid Cells in Equal Latitude/Longitude Map. Latitude begins at -90 degrees (South Pole) moving to +90 (North Pole). Longitude begins at 0 degrees and moves to 360 positive eastward.

Equal-Area Map: Index, #Cells

Lat Index	#Cells	Lat Index	#Cells	Lat Index	#Cells
1	3	25	126	49	123
2	9	26	129	50	120
3	16	27	132	51	116
4	22	28	134	52	112
5	28	29	136	53	108
6	34	30	138	54	104
7	40	31	140	55	100
8	46	32	141	56	95
9	52	33	142	57	90
10	58	34	143	58	85
11	64	35	144	59	80
12	69	36	144	60	75
13	75	37	144	61	69
14	80	38	144	62	64
15	85	39	143	63	58
16	90	40	142	64	52
17	95	41	141	65	46
18	100	42	140	66	40
19	104	43	138	67	34
20	108	44	136	68	28
21	112	45	134	69	22
22	116	46	132	70	16
23	120	47	129	71	9
24	123	48	126	72	3

Land/Water/Coast classification of Equal-Area Cells:
- Land cell has land fraction 65 - 100%
- Coast cell has land fraction 36 - 64%
- Water cell has land fraction 0 - 35%

Variable Definitions for each cell:
- Variables labeled with 'D' are present only during local daytime.
- Frequencies are reported to nearest .5 percent.
- Variable abbreviations:

Abbreviation		Definition
SIGMA	=	Variance of quantity
PC	=	Cloud Top Pressure
PS	=	Surface Pressure
PT	=	Tropopause Pressure
TC	=	Cloud Top Temperature
TS	=	Surface Temperature
TT	=	Tropopause Temperature
T	=	Atmospheric Temperature
TAU	=	Cloud Optical Thickness
PATH	=	Cloud Water Path
RS	=	Surface Reflectance
PW	=	Precipitable Water

Adj1:	VIS adjusted values used	Adj4:	Calibration adjustment
Adj2:	VIS adjustment at night	Adj5:	Meteosat reflectance adjustment
Adj3:	Interpolated fill at night	Adj6:	Diurnal adjustment

BYTE NO.	DESCRIPTION
VAR 1	LATITUDE INDEX (EQUAL-AREA)
VAR 2	LONGITUDE INDEX (EQUAL-AREA)
VAR 3	LOWER LONGITUDE INDEX (2.5-SQ)
VAR 4	UPPER LONGITUDE INDEX (2.5-SQ)
VAR 5	LAND/WATER/COAST CODE
VAR 6	GMT 00-21: TOTAL NUMBER OF DAYS IN AVERAGE (Day+night)
	GMT ALL: TOTAL NUMBER OF GMTS IN AVERAGE (Day+night)
VAR 7	GMT 00-21: TOTAL NUMBER OF DAYS IN AVERAGE (Day)
	GMT ALL: TOTAL NUMBER OF GMTS IN AVERAGE (Day)
VAR 8	AVG FREQUENCY OF CLOUDY PIXELS (Adj2, Adj6)
VAR 9	GMT 00-21: NUMBER OF DAYS WITH CLOUDY PIXELS > 0
	GMT ALL: AVG FREQ OF CLOUDY DAYS
VAR 10	MARGINAL VIS/IR CLOUD AMOUNT
VAR 11	MEAN PC FOR CLOUDY PIXELS (Adj1, Adj2, Adj6)
VAR 12	TIME-SIGMA PC FOR IR-CLOUDY PIXELS
VAR 13	MEAN SPATIAL-SIGMA PC FOR IR-CLOUDY PIXELS
VAR 14	MEAN TC FOR CLOUDY PIXELS (Adj1, Adj2, Adj4, Adj6)
VAR 15	TIME-SIGMA TC FOR IR-CLOUDY PIXELS
VAR 16	MEAN SPATIAL-SIGMA TC FOR IR-CLOUDY PIXELS
VAR 17	MEAN TAU FOR VIS/IR-CLOUDY PIXELS (Adj3, Adj4, Adj6)
D VAR 18	TIME-SIGMA TAU FOR VIS/IR-CLOUDY PIXELS
D VAR 19	MEAN SPATIAL-SIGMA TAU FOR VIS/IR-CLOUDY PIXELS
VAR 20	MEAN PATH FOR VIS/IR-CLOUDY PIXELS
D VAR 21	TIME-SIGMA PATH FOR VIS/IR-CLOUDY PIXELS
D VAR 22	MEAN SPATIAL-SIGMA PATH FOR VIS/IR-CLOUDY PIXELS
VAR 23	AVG FREQ OF LOW LEVEL CLOUDINESS
VAR 24	AVG PC OF LOW LEVEL CLOUDINESS
VAR 25	AVG TC OF LOW LEVEL CLOUDINESS
VAR 26	AVG FREQ OF MIDDLE LEVEL CLOUDINESS
VAR 27	AVG PC OF MIDDLE LEVEL CLOUDINESS
VAR 28	AVG TC OF MIDDLE LEVEL CLOUDINESS
VAR 29	AVG FREQ OF HIGH LEVEL CLOUDINESS
VAR 30	AVG PC OF HIGH LEVEL CLOUDINESS
VAR 31	AVG TC OF HIGH LEVEL CLOUDINESS
D VAR 32	AVG FREQ OF CUMULUS CLOUDINESS
D VAR 33	AVG PC OF CUMULUS CLOUDINESS
D VAR 34	AVG TC OF CUMULUS CLOUDINESS
D VAR 35	AVG TAU OF CUMULUS CLOUDINESS
D VAR 36	AVG FREQ OF STRATUS CLOUDINESS
D VAR 37	AVG PC OF STRATUS CLOUDINESS
D VAR 38	AVG TC OF STRATUS CLOUDINESS
D VAR 39	AVG TAU OF STRATUS CLOUDINESS
D VAR 40	AVG FREQ OF ALTOCUMULUS CLOUDINESS
D VAR 41	AVG PC OF ALTOCUMULUS CLOUDINESS
D VAR 42	AVG TC OF ALTOCUMULUS CLOUDINESS
D VAR 43	AVG TAU OF ALTOCUMULUS CLOUDINESS
D VAR 44	AVG FREQ OF NIMBOSTRATUS CLOUDINESS
D VAR 45	AVG PC OF NIMBOSTRATUS CLOUDINESS
D VAR 46	AVG TC OF NIMBOSTRATUS CLOUDINESS
D VAR 47	AVG TAU OF NIMBOSTRATUS CLOUDINESS
D VAR 48	AVG FREQ OF CIRRUS CLOUDINESS
D VAR 49	AVG PC OF CIRRUS CLOUDINESS
D VAR 50	AVG TC OF CIRRUS CLOUDINESS
D VAR 51	AVG TAU OF CIRRUS CLOUDINESS

BYTE NO. DESCRIPTION

D VAR 52 AVG FREQ OF CIRROSTRATUS CLOUDINESS
D VAR 53 AVG PC OF CIRROSTRATUS CLOUDINESS
D VAR 54 AVG TC OF CIRROSTRATUS CLOUDINESS
D VAR 55 AVG TAU OF CIRROSTRATUS CLOUDINESS
D VAR 56 AVG FREQ OF DEEP CONVECTIVE CLOUDINESS
D VAR 57 AVG PC OF DEEP CONVECTIVE CLOUDINESS
D VAR 58 AVG TC OF DEEP CONVECTIVE CLOUDINESS
D VAR 59 AVG TAU OF DEEP CONVECTIVE CLOUDINESS
VAR 60 MEAN TS FOR CLEAR SKY COMPOSITE (Adj4, Adj6)
VAR 61 STANDARD DEVIATION FOR TS CLEAR SKY COMPOSITE
D VAR 62 MEAN RS FOR CLEAR SKY COMPOSITE (Adj4, Adj5)
VAR 63 AVG SNOW/ICE COVER
VAR 64 SURFACE PRESSURE (TOVS)
VAR 65 SURFACE TEMPERATURE (TOVS EXTRAPOLATED)
VAR 66 TEMPERATURE AT 500 MB (TOVS)
VAR 67 TROPOPAUSE PRESSURE (TOVS)
VAR 68 TROPOPAUSE TEMPERATURE (TOVS)
VAR 69 STRATOSPHERE TEMPERATURE AT 15 MB (TOVS)
VAR 70 PRECIPITABLE WATER - COLUMN (TOVS)
VAR 71 OZONE - COLUMN (TOVS)
VAR 72 AVG FREQ OF CLOUDY PIXELS - UNADJUSTED

3.9. Sample Table of Contents File

FILE	YEAR	MONTH	GMT	DATA CELL STATS		SATELLITE TYPES IN DATA						
				%GOOD	%EMPTY	1	2	3	4	5	6	7
6	83	7	0	94	6	52	41	21	31	0	11	0
7	83	7	3	89	11	52	41	21	31	0	11	0
8	83	7	6	88	12	52	41	21	31	0	11	0
9	83	7	9	94	6	52	41	21	31	0	11	0
10	83	7	12	94	6	52	41	21	31	0	11	0
11	83	7	15	89	11	52	41	21	31	0	11	0
12	83	7	18	88	12	52	41	21	31	0	11	0
13	83	7	21	94	6	52	41	21	31	0	11	0
14	83	7	ALL	100	0	52	41	21	31	0	11	0
15	83	8	0	94	6	52	41	21	31	0	11	0
16	83	8	3	89	11	52	41	21	31	0	11	0
17	83	8	6	89	11	52	41	21	31	0	11	0
18	83	8	9	94	6	52	41	21	31	0	11	0
19	83	8	12	94	6	52	41	21	31	0	11	0
20	83	8	15	89	11	52	41	21	31	0	11	0
21	83	8	18	88	12	52	41	21	31	0	11	0
22	83	8	21	93	7	52	41	21	31	0	11	0
23	83	8	ALL	100	0	52	41	21	31	0	11	0
24	83	9	0	94	6	52	41	21	31	0	11	0
25	83	9	3	89	11	52	41	21	31	0	11	0
26	83	9	6	88	12	52	41	21	31	0	11	0
27	83	9	9	94	6	52	41	21	31	0	11	0
28	83	9	12	94	6	52	41	21	31	0	11	0
29	83	9	15	89	11	52	41	21	31	0	11	0
30	83	9	18	88	12	52	41	21	31	0	11	0
31	83	9	21	93	7	52	41	21	31	0	11	0
32	83	9	ALL	100	0	52	41	21	31	0	11	0
33	83	10	0	97	3	52	41	21	31	0	11	61
34	83	10	3	97	3	52	41	21	31	0	11	61
35	83	10	6	90	10	52	41	21	31	0	11	61

36	83	10	9	96	4	52	41	21	31	0	11	61
37	83	10	12	98	2	52	41	21	31	0	11	61
38	83	10	15	98	2	52	41	21	31	0	11	61
39	83	10	18	92	8	52	41	21	31	0	11	61
40	83	10	21	94	6	52	41	21	31	0	11	0
41	83	10	ALL	100	0	52	41	21	31	0	11	61
42	83	11	0	97	3	52	41	21	31	0	11	61
43	83	11	3	97	3	52	41	21	31	0	11	61
44	83	11	6	90	10	52	41	21	31	0	11	61
45	83	11	9	95	5	52	41	21	31	0	11	61
46	83	11	12	98	2	52	41	21	31	0	11	61
47	83	11	15	97	3	52	41	21	31	0	11	61
48	83	11	18	92	8	52	41	21	31	0	11	61
49	83	11	21	94	6	52	41	21	31	0	11	61
50	83	11	ALL	100	0	52	41	21	31	0	11	61
51	83	12	0	97	3	52	41	21	31	0	11	61
52	83	12	3	97	3	52	41	21	31	0	11	61
53	83	12	6	90	10	52	41	21	31	0	11	61
54	83	12	9	94	6	52	41	21	31	0	11	61
55	83	12	12	97	3	52	41	21	31	0	11	61
56	83	12	15	98	2	52	41	21	31	0	11	61
57	83	12	18	92	8	52	41	21	31	0	11	61
58	83	12	21	93	7	52	41	21	31	0	11	0
59	83	12	ALL	100	0	52	41	21	31	0	11	61

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