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INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)

CATALOG OF DATA AND PRODUCTS

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International Satellite Cloud Climatology Project (ISCCP)

Central Archive

Catalog of Data and Products

May 1987

Compiled by: Jannie Gibson

National Oceanic And Atmospheric Administration

National Environmental Satellite Data And Information Service

National Climatic Data Center

Satellite Data Services Division (SDSD)

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National Oceanic and Atmospheric Administration
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LIST OF ACRONYMS

AES - Atmospheric Environment Service

ASCII - American Standard Coded Information Interchange

AVHRR - Advanced Very High Resolution Radiometer

BPI - Bits Per Inch

CCT - Computer Compatible Tape

CDA - Command and Data Acquisition

CSU - Colorado State University

EBCDIC- Extended Binary Coded Decimal Interchange Code

ESA - European Space Agency

FTS - Federal Telecommunciations Service

GAC - Global Area Coverage

GARP - Global Atmospheric Research Program

GISS - Goddard Space Flight Center Institute for Space Studies

GMS - Geostationary Meteorological Satellite

GMT - Greenwich Mean Time

GOES - Geostationary Operational Environmental Satellite

GPC - Global Processing Center

HIRS/2- High Resolution Infrared Radiation Sounder/2

ICA - ISCCP Central Archive

ICSU - International Council of Scientific Unions

IMD - Indian Meteorological Department

IR - Infrared

ISCCP - International Satellite Cloud Climatology Project

JMA - Japan Meteorological Agency

km - Kilometer

MSU - Microwave Sounding Unit

NASA - National Aeronautics and Space Administration

NCDC - National Climatic Data Center

NESDIS - National Environmental Satellite, Data, and Information Service

NOA or NOAA - National Oceanic and Atmospheric Administration

SAPC - Special Area Processing Center

SCC - Satellite Calibration Center

SDSD - Satellite Data Services Division

SPC - Sector Processing Center

SSU - Stratospheric Sounding Unit

TBM - Terabit Memory

TOVS - TIROS Operational Vertical Sounder

UWS - University of Wisconsin-Madison

VIS - Visible

WMO - World Meteorological Organization

WV - Water Vapour

1.0 Introduction

This catalog describes the data, products and supporting information that are available to users from the ISCCP Central Archive (ICA) and procedures for ordering data and products. Updates to this catalog will be issued on a quarterly basis.

Data and products available from the ICA, which is the Satellite Data Services Division of NOAA/NESDIS, include B1 data (nominally 10 km resolution visible (VIS) and infrared (IR) data at 3 hour intervals for geostationary satellites, and global 4 km resolution data for polar orbiting satellites), B3 data (nominally 30 km resolution data with supporting information) and C Cloud Climatology Products. Supporting information, such as inter-calibration and satellite history information, is also available from the ICA.

All data tapes provided by the ICA will be accompanied by detailed documentation describing the contents and formats of the data tapes.

1.1 History and Objectives of the ISCCP

1.1.1 History

The International Satellite Cloud Climatology Project (ISCCP) has been designed to provide for the production of a five year global cloud climatology by taking advantage of the global coverage provided by the planned international array of geostationary and polar orbiting meteorological satellites. The specifications for such a climatology were established originally in Oxford, England in 1978, by the World Meteorological Organization International Council of Scientific Unions (WMO/ICSU) Joint Organizing Committee for the Global Atmospheric Research Programme (GARP) Study Conference on Parameterization of Extended Cloudiness and Radiation for Climate Models. Refinements in the specifications were made at subsequent meetings held in Balatonalmadi, Hungary in June 1980 (Meeting on Real-Time Satellite Derived Cloud Climatology) and Hamburg, Federal Republic of Germany in August-September 1981 (Workshop in Support of the ISCCP on Development of Algorithms). Details about the project are contained in the Preliminary Implementation Plan (WCP 35, November 1982).

1.1.2 Objectives

The scientific objectives of the ISCCP are:

1. To produce a global, reduced resolution, infrared and visible, calibrated and normalized radiance data set containing basic information on the radiative properties of the atmosphere, from which cloud parameters can be derived.

2. To stimulate and coordinate basic research on techniques for inferring the physical properties of clouds from the condensed radiance data set and to apply the resulting algorithms to derive and validate a global cloud climatology for improving the parameterization of clouds in climate models.

3. To promote research using ISCCP data in contributing to an improved understanding of the earth's radiation budget (top of the atmosphere and surface) and of the hydrological cycle.

1.2 ISCCP Data Stages

Three data stages have been defined to differentiate between raw image radiance data as received from the satellites, reduced volume radiance data and derived cloud parameters. These are described below, along with further subdivisions within each data stage.

1.2.1 Stage A - Full Resolution Digital Satellite Image Data

Stage A data are full resolution narrow band radiometer image data (taken every 3 hours for the geostationary satellites and all orbits for the polar satellites). Included in this category are certain satellite orbital navigation (earth location) and calibration (digital counts to radiometric units) parameters.

Within this data category, there are two sub-categories of data which are required for satellite intercalibration and for the development of local climatologies.

(1) AC-Data - Data for satellite intercalibration
These are full resolution visible and infrared image data, with navigation and calibration parameters appended, for geographical areas of about 2000 km x 2000 km. Data for about 60 of these areas are required each year for each satellite, for the purposes of periodically calculating intersatellite normalization parameters (BC-data).

(2) AS-Data - Special full resolution data sets
These are full resolution image data, with navigation and calibration parameters appended, for about 20 pre-defined geographical areas of about 250 km x 250 km for every 3 hours. These data are expected to be used by research groups in the development of local climatologies.

1.2.2 Stage B - Reduced Volume Digital Satellite Image Data

Stage B data are radiometric image data, which have been reduced in volume through a process of averaging and sampling. The data volume reduction is essential to reducing the amount of data to a manageable size.

Within this category, there are five sub-categories of data. Two of these are simply intermediate stages toward the preparation of a global reduced radiance data set.

(1) B1-Data - Nominal 10 km spacing
These are compressed versions of the Stage A data, produced first by averaging the visible radiances to the resolution of the infrared radiances and then sampling the matched resolution radiance pixels to a nominal 10 km spacing (if necessary).

(2) B2-Data - Nominal 30 km spacing
These are further compressed versions of the Stage A data, produced by further sampling of the matched resolution B1-data radiance pixels to a nominal 30 km spacing.

(3) B3-Data - Globally merged calibrated radiances
These are B2-data which have been normalized to the polar orbiter radiometer responses. These radiance data are retained in satellite coordinates, but placed in a standard format with navigation and calibration information appended.

(4) BC-Data - Normalization coefficients

These are coefficients calculated from the AC-data. The BC-data will be used to convert individual satellite-based radiometric data (counts) into SI units of radiance.

(5) BS-Data - Special reduced volume data sets

These are B1-data for a small number of special geographical regions of about 2000 km x 2000 km. These data will be obtained every 3 hours over periods of approximately 4 days each month, and are expected to be used in research on cloudiness development on a synoptic scale and in algorithm development for cloud field structure retrievals.

1.2.3 Stage C - Correlative and Cloud Data

Stage C data are cloud parameters obtained from B3-data and correlative data using an experimental algorithm. The correlative data (CD-data) are used to specify the radiative properties of the surface and atmosphere in the cloud analysis. The cloud parameters will be computed for a standard equal area grid with approximately 250 km resolution.

1.3 Participating ISCCP Data Centers

1.3.1 Sector Processing Centers (SPC)

The SPC's obtain satellite orbital information and calibration data from their respective satellite operators. They acquire the full resolution satellite digital data (A-data) for their respective satellite image areas in real time, and provide samples (AC-data) to the Satellite Calibration Center (SCC) for intercalibration purposes. The coordinates for these sample areas are supplied by the SCC. The SPC's produce condensed radiance data sets with navigation and calibration parameters appended. These condensed data sets are delivered to the Global Processing Center.

1.3.1.1 List of Sector Processing Centers

CSU	SPC-GOES-WEST	CIRA, Colorado State University Ft. Collins, CO 80523, USA
ESA	SPC-METEOSAT	ESOC/MDMD Robert-Bosch Strasse 5 6100 Darmstadt, FRG
JMA	SPC-GMS	Meteorological Satellite Center Japan Meteorological Agency 3-235 Nakakiyoto, Kiyose Tokyo 204 Japan
UWS	SPC-GOES-EAST (7/1/83 - 8/1/84)	Univ. of Wisconsin SSEC 1225 W. Dayton St. Madison, WI 53706, USA

NOA	SPC-NOAA	NOAA/NESDIS/NCDC Satellite Data Services Division World Weather Building, Rm 100 Washington, D.C. 20233, USA

(Due to become operational when the next GOES-EAST becomes operational)

AES	SPC-GOES-EAST	Atmospheric Environment Service 4905 Dufferin St, Downsview, Ontario Canada M3H5T4

1.3.1.2 Participating Spacecraft

The following spacecraft participated in the ISCCP during the periods indicated:

GOES-5 (EAST)	7/1/83 - 7/29/84
GOES-6 (WEST)	7/1/83 - Present
GMS-1	1/21/84 - 6/30/84
GMS-2	7/1/83 - 1/20/84
	7/1/84 - 9/27/84
GMS-3	9/27/84 - Present
METEOSAT-2	7/1/83 - Present
NOAA-7	7/1/83 - 2/8/85
NOAA-8	9/20/83 - 6/24/84
NOAA-9	2/8/85 - Present

1.3.2 Satellite Calibration Center (SCC)

The SCC, using information and data obtained from the SPC's and satellite operators, calculates intersatellite normalization parameters (BC-data) and delivers this information to the GPC and SPC's. The SCC archives the calibration data set during the length of the project, and provides the ICA with calibration histories for each satellite.

The address for the SCC is as follows:

FRENCH WEATHER SERVICE
Centre de Meteorologie Spatiale
B.P. 147
22032 Lannion, Cedex France

1.3.3 Global Processing Center (GCP)

The GPC plays the central role in the ISCCP data flow in producing global radiance data and cloud data sets. The GPC obtains B1 or B2 data tapes and monitors the quality of the data, and obtains intersatellite normalization parameters from the SCC as well as correlative atmospheric data. The GPC then produces the B3-data set, and further derives the 3 hourly global cloud properties and monthly means of each property, before delivering these products to the ISCCP Central Archive.

The GPC can be contacted at the following address:

NASA/GISS
2880 Broadway
New York, NY 10025, USA

1.3.4 ISCCP Central Archive (ICA)

The ICA, the Satellite Data Services Division, is the repository of all final radiance and cloud data products generated by the International Satellite Cloud Climatology Project and acts as the channel through which all user requests will be met.

Inquiries should be sent to the address below:

NOAA/NESDIS/NCDC
Satellite Data Services Division
FOB-3, Rm G233
Suitland, MD 20233, USA

2.0 Ordering ISCCP Data and Products - Procedures and Prices

2.1 How to Order ISCCP Products and Data from SDSD

Users requesting ISCCP satellite data from the Satellite Data Services Division (SDSD) should make every effort to supply as much information as possible concerning their needs. The data listings will contain the tape number, date range, and the times of the first and last images on the tape; all missing data will be indicated. Requesters should specify the ICA Catalog tape numbers of the tapes to be copied or from which files are to be extracted, as well as date, time, satellite, etc. Presently, the smallest amount of geostationary data that can be extracted is a file containing one time frame. Specified time or area can be extracted from selected orbits of the polar orbiter data.

Frequently, orders contain incomplete or ambiguous information, which results in delays or improper filling of orders. Proper identification of desired data on magnetic tapes is important because of the high data densities frequently encountered and large tape volumes. The following information should be furnished in preparing orders for data to ensure timely and correct completion:

- Catalog Tape Number
- Date(s) of Interest
- Time(s) in GMT
- Geographic Area and Coordinates
- Type of Data Products: B1, B3, C, CD
- Satellite (if known and applicable)
- Orbit Number (if known and applicable)
- Channel Type or Numbers (if channel select option is desired; applicable to polar orbiter B1-Data only)
- Density (9-track/6250 bpi, etc.)

2.2 General Ordering Procedures, Shipping, and Payments

The Satellite Data Services Division (SDSD) of the NOAA/NESDIS National Climatic Data Center is the ICA. SDSD representatives will take telephone orders and inquiries from approximately 0730 to 1630 Eastern Time, Monday through Friday (except USA Holidays) at 301-763-8111 or FTS-763-8111. International inquiries, where time is critical, can be sent via International Telex specifying delivery to: "SATELLITE DATA SERVICES DIVISION, ROOM 100, WORLD WEATHER BUILDING." The cable address is "NOAA, WASHINGTON, D.C."; the International Telex Numbers are RCA 248376 OBSWUR or TRT 197683 KWBCUT.

2.3 Pre-payment Policy

Payment is to be made in U.S. funds only in the form of a check or money order made out to "Commerce/NOAA/NCDC", via VISA or MASTERCARD. Repeat users are urged to set up an account with the SDSD (minimum deposit of $100) to draw upon.

Orders not accompanied by pre-payment will not be processed until full payment is received. U.S. Federal Government Agencies must supply a Purchase Order or MIPR (USA Dept. of Defense contract) with each request.

NOAA organizations must furnish a valid organization code and task Number to be billed.

Completed orders are sent via regular mail to domestic customers and via Air Mail to overseas customers; orders valued at more than $250 (U.S.) are sent Registered or Certified Mail. We also have the capability to deliver orders to most areas of the United States, some Canadian locations, and major cities in most Foreign countries, by several different express delivery Companies (overnight or 2-3 days). If any of these express delivery services are requested by the data user, the customer will assume all delivery charges. Delivery to foreign nations can also be made through each nation's Scientific Attache located at their Embassy in Washington, D.C. Such formal arrangements must be requested by the user directly through their Scientific Attache.

For additional information, price quotation, or order placement, contact:

NOAA/NESDIS/NCDC
SATELLITE DATA SERVICES DIVISION
WORLD WEATHER BUILDING, ROOM 100
WASHINGTON, D.C. 20233
(301) 763-8111 Commercial or FTS 763-8111

2.4 Digital Tape Products Price List (FY87)

DESCRIPTION	UNIT PRICE
9-track, 1600 BPI	$ 20.00 per input tape plus $80.00 per output tape
9-track, 6250 BPI	$ 20.00 per input tape plus $100.00 per output tape

PLEASE NOTE:

1. The above prices are subject to change. Written price quotations by SDSD are valid for 60 days.

2. All data sales are final. SDSD will guarantee readability of all tapes and quality of photographic products if returned prepaid within 60 days in original condition.

3. An additional fee of $10 will be charged for each tape order processed. For delivery outside of the U.S., another fee of $10 will be charged for completing customs forms.

3.0 B1 Data Archive Descriptions

The B1 data archive presently consist of the following data sets:

METEOSAT	7/1/83	- 4/30/87
GMS	7/1/83	- 4/30/87
GOES-E	7/1/83	- 7/29/84
GOES-W	7/1/83	- 4/30/87
NOAA-7/9	7/1/83	- 4/30/87
NOAA-8	10/1/83	- 6/24/84

3.1 METEOSAT

The European geostationary satellite, METEOSAT-2, operated by the European Space Agency (ESA), provides data which are used to produce one of the many B1 formatted products for the ISCCP.

A-level data, currently received from METEOSAT-2, consist of data from three spectral channels: visible (0.4-1.1 microns), water vapour (5.7-7.1 microns) and infrared (10.5-12.5 microns). The visible channel has either 2.5 km x 5 km pixels or 2.5 km x 2.5 km pixels at the sub-satellite point. The infrared and water vapour channels have 5 km x 5 km pixels at the sub-satellite point. One full disk image in all three channels is recorded every half hour. The visible and water vapour pixel data are represented by six bits (0-63) and the infrared by eight bits (0-255).

The raw data, received directly from the satellite, are received in multiplexed form, so initially, these data have to be demultiplexed into separate line-by-line visible, infrared and water vapour image scan lines. At the same time, the radiances are reformatted so that the original six-bit radiances of the visible and water vapour channels are expanded to eight bits, to match those of the infrared channel. A quality control check for missing scan lines is also performed, and the data are archived onto tape.

The next stage of the processing consists of computing the deformation parameters by determining the position of the centre of the earth's disk in image space using horizon detection techniques. The images are then resampled into rectified image format so that data from all three channels are co-located and lines and pixels always related to the same latitude/longitude on the earth. The rectified images are used as input to the ISCCP data processing algorithms as pixel navigation is much easier. No calibration factors are applied to the infrared or water vapour data during the processing.

The visible pixels are first averaged linearly to a 5 km x 5 km resolution, to match the infrared and water vapour pixels. Then, every other pixel along every other scan line is sampled to produce a B1-data image. Various header data are then appended to the data at this stage.

All three channel data are processed to B1 format at three-hourly intervals (nominally 0000, 0300, 0600, 0900, 1200, 1500, 1800, 2100 GMT), although the 2100, 0000 and 0300 GMT images do not contain any visible image data. The B1-data are archived on 6250 bpi tapes, each containing four days of data. If no data were available for one of the scheduled times, data collected an hour later are substituted.

3.2 GMS

The Meteorological Satellite Center of the Japan Meteorological Agency provides B1-data processed from raw data (A-level) received from the GMS spacecraft. These data are provided to the ICA, via the GPC, on 6250 BPI magnetic tapes.

A-level data consist of data from two spectral channels: visible (0.5-0.75 microns) and infrared (10.5-12.5 microns). The infrared channel data and visible channel data are transmitted quantized in 256 levels (8 bits) and 64 levels (6 bits) respectively. The data sets have a spatial resolution at sub-satellite point of 1.25 km for the VIS data and 5 km for the IR data.

The infrared data undergoes inflight calibration to enable the conversion of sensor output voltage to count values, and the conversion of the sensor output voltages to physical quantities (radiance, temperature). The former uses a 0 - 5 volts staircase response inserted in the infrared channel signal path. The latter utilizes two targets (space and the calibration shutter) for the IR sensor.

A normalization procedure is performed on the visible data to reduce "stripes" which occur due to differences between the sensitivities of the different detectors. In this procedure, a reference channel, to which the other channels are normalized, is chosen. The reference channel look-up table is fixed.

GMS takes VISSR images of the earth disk eight times a day. These images are processed at the Data Processing Center (DPC) to reformat the original image into full earth disk.

For B1-data processing, the image window is defined by 1,100 pixels along 1,100 scan lines, centered at the sub-satellite point. One infrared pixel out of every six pixels along a scan line is extracted from every other scan line (6x2) of the original image data. The corresponding 24 visible pixels (6 pixels by 4 scan lines) covering the same location of the infrared pixel element are averaged and is converted into 8-bit data. One line of sampled infrared data followed by one line of averaged visible data are repeatedly stored on magnetic tape as B1-data. The B1 data set has a 10 km resolution.

The B1 data sets, archived on 9 track, 6250 bpi tapes consist of data for every three hours, nominally 0000, 0300, 0600, 0900, 1200, 1500 or 1600, 1800, and 2100 GMT. Each tape contains approximately 8 days of data.

3.3 GOES-EAST

The task of processing GOES-EAST B1 data sets was performed by the Space Science and Engineering Center (SSEC) at the University of Wisconsin-Madison until the demise of GOES-5 July 29, 1984. The Atmospheric Environment Service of the Canadian Climate Center will be the SPC for GOES-EAST, once the next GOES-East becomes operational.

The raw data are transmitted from the U.S. geostationary satellites to the NOAA/NESDIS Command and Data Acquisition Ground Station at Wallops Island, Virginia. These data are then processed into stretched VISSR (Visible and Infrared Spin Scan Radiometer) and VAS (Visible Infrared Spin Scan Radiometer Atmospheric Sounder) data before being retransmitted back to the satellite for relay to SSEC and NESDIS ground systems. The processing includes the calibration of the IR data to correspond to predetermined data value versus temperature tables which are computed and maintained by NESDIS. A set of predicted navigation parameters is also appended to the data.

The A-level VISSR data frame consist of data transmitted from 8 visible detectors (sensitive to 0.54-0.70 microns band) and 1 of 2 IR detectors, or an average of 2 of the IR detectors (sensitive to the 10.5-12.6 microns band). The basic full resolution VISSR data frame, which is transmitted every three hours contains data collected during nominally 1821 scans of the earth by the VISSR instrument. The visible data are quantized as 6 bits, and the IR data as 8 bits.

The full resolution image data are first reduced to 4 km resolution by averaging and sampling the visible data and expanding and duplicating the IR data; it is then reduced to 8 km resolution.

Linear averaging of every four visible pixels along a scan line is performed by the hardware system during data ingestion. The system software then samples every fourth scan line so that 1 km A-level visible data have now been degraded to 4 km resolution. B1 data are now obtained by linearly averaging four adjacent pixels to obtain 8 km resolution data. Thus, out of an original 8 x 8 pixels array, only 16 pixels have been averaged to produce a single B1 visible pixel. During data ingest, 4 km infrared data are produced by expanding the oversampled pixel data along the scan line (east-west direction) and duplicating the pixel data for each scan line. B1 data are now obtained by sampling every other pixel along every other scan line.

The B1 data sets are available at three-hour intervals, nominally 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 GMT. These data are archived on 9 track, 6250 bpi tapes with 2 days of data per tape.

3.4 GOES-WEST

The GOES-WEST B1 data sets are produced by the Cooperative Institute for Research in the Atmosphere (CIRA) at the Colorado State University (CSU). The data sets are produced from full disk calibrated GOES-WEST data.

As stated in Section 3.3, the raw data from the GOES satellites are received by the ground station at Wallops Island, Virginia and are processed (See Section 3.3 for more details) into stretched VISSR and VAS data frames before being retransmitted back to the satellite. The stretched data are then directed to various ground stations.

The VISSR data represent the A-level data used for processing the B1 data. These data frames consist of IR data transmitted from one of two IR detectors (10.5-12.6 microns band) or an average of the two IR detectors and visible data from eight visible detectors (0.54-0.70 microns band). A basic VISSR data frame has a resolution of nominally 8 km near nadir. The visible pixels data are 6 bits and the IR pixels data are 8 bits.

The raw A-level data are received from the satellite every 3 hours, sectorized, and then stored on a temporary disk. In reading the data back from the disk file, navigation parameters are extracted and the conversion to B1 data is then made. In this step, the visible pixel data are energy-averaged over areas approximately the size of the individual infrared pixels and the visible-infrared pair is sampled along the scan line to remove redundant information.

The B1 data from GOES-West represent spots with an approximate size of 12 km x 8 km. This is a result of the sampling and averaging procedures used at CSU. Because of the large size of the GOES IR pixels, they are sampled so that there is very little overlap between adjacent fields of view, which are retained in the B1 data set. Thus, one out of three IR pixels in the East-West direction is selected for the B1-data set. The VIS data are averaged to correspond to this resolution. Only 32 of 64 pixels from an 8 x 8 array are averaged to produce a single VIS value to correspond to a single IR value. (The use of one-half of the data was tested and the effect was less than 1 count.) Also, some VIS pixels in the East-West direction are not utilized because of the wide intervals between IR pixel centres.

The procedure for sampling the matched-pair data is straightforward in that every third pair along a scan line is retained. Since the IR pixels overlap, the resulting resolution of the sampled data pairs is 12 km x 8 km.

B1-data of three-hour intervals (nominally 0000, 0300, 0600, 0900, 1200, 1500, 1800, 2100 GMT) are archived on 6250 bpi magnetic tapes with 5 days worth of data per tape.

In the case of missing scan lines of data, the following procedure is used. All IR scan lines are recorded on the B1 output tape. If an IR scan line was not received and the corresponding VIS data are available, the latter are not included on the output tape to preserve the alternating sequence of IR, VIS, IR, VIS, etc. files throughout the daylight hours. Some of the data that was not processed by CSU was provided by UWS, these data are in the same format as the UWS GOES-EAST data and not the CSU GOES-WEST format.

3.5 NOAA AVHRR

The USA NOAA series polar orbiting satellite, which is operated by NOAA, provides polar orbiter GAC (Global Area Coverage) data as B1-data.

The real-time raw data, as received from the satellite, consists of data from 4 or 5 channels (depending on satellite) with a sub-nadir resolution of 1 km. The data sets consist of 10-bit precision data from two visible channels (0.58-1.10 micron) and three infrared channels (3.55-12.5 micron). Approximately fourteen data sets per day (with some area overlap) are collected. The data reduction process takes four out of every five pixels along every third scan line to compute one average value. As a result, the spatial resolution of GAC data near the subpoint is actually 4.0 x 3.3 km, although it is generally treated as 4 km resolution. All of the GAC data computed during a complete pass (approximately 110 minutes) are recorded on the satellite for transmission to Command and Data Acquisition (CDA) stations. These data are processed into Level 1b format (which includes appended Earth location and calibration information) by NOAA/NESDIS satellite operations and ground processing system, and then archived by SDSD. The AVHRR GAC data sets in its archived format are used as B1-data.

The B1 data sets for 7/1/83 - 4/11/85 are stored on Terabit Memory (TBM) volumes, and for 4/11/85 - present on 6250 BPI computer compatible tapes (CCTs), and are provided to users on 9-track, 1600 or 6250 BPI CCTs. The tape numbers indicated in the logs (following pages) are standard ISCCP tape numbers plus the corresponding SDSD archive tape numbers. Approximately 95 minutes (slightly less than 1 complete orbit) of B1-data (all channels) can be written to a 9-track 1600 BPI tape, and 3 complete orbits (all channels) to a 9-track 6250 BPI CCT.

4.0 B3-Data Description and Listing

The B3-data set represents the final stage of processing before the conversion from satellite radiances to cloud parameters is made. The Global Processing Center (GPC), which is NASA/Goddard Space Flight Center Institute for Space Studies (GISS), produces the B3-data sets.

The GPC receives operational satellite radiance data (B1 or B2), plus navigation and calibration information from the designated SPCs and radiance calibration/normalization coefficients (BC) from the SCC. The GPC navigates, calibrates and applies normalization coefficients (BC) to the satellite radiance data (B2) to produce the B3-data product.

B3-data are the normalized satellite visible and infrared radiances with a nominal resolution of 30 km every 3 hours. The data for each satellite are recorded in image array formats in the original satellite coordinates, but each radiance pixel pair (more spectral channels are included if available) is labelled by its latitude, longitude, solar and satellite zenith angles, and the azimuth angle difference between the sun and satellite position vectors.

The B3 radiance data set produced by the GPC and shipped to the ICA consist of one or two (6250 bpi) tapes per geostationary satellite and 4 tapes per polar orbiter satellite per month. The images are arranged in chronological order from 0000 GMT on the first day of the month through 2100 GMT on the last day of the month.

4.1 NOAA AVHRR

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0001.2.83182.NOAA-7	7/1/83 - 7/8/83
GPC.B3.0002.2.83190.NOAA-7	7/9/83 - 7/16/83
GPC.B3.0003.2.83198.NOAA-7	7/17/83 - 7/24/83
GPC.B3.0004.2.83206.NOAA-7	7/25/83 - 7/31/83
GPC.B3.0015.0.83213.NOAA-7	8/1/83 - 8/8/83
GPC.B3.0016.0.83221.NOAA-7	8/9/83 - 8/16/83
GPC.B3.0017.0.83229.NOAA-7	8/17/83 - 8/24/83
GPC.B3.0018.0.83237.NOAA-7	8/25/83 - 8/31/83
GPC.B3.0019.0.83244.NOAA-7	9/1/83 - 9/8/83
GPC.B3.0020.0.83252.NOAA-7	9/9/83 - 9/16/83
GPC.B3.0021.0.83260.NOAA-7	9/17/83 - 9/24/83
GPC.B3.0022.0.83268.NOAA-7	9/25/83 - 9/30/83
GPC.B3.0023.0.83274.NOAA-7	10/1/83 - 10/8/83
GPC.B3.0024.0.83282.NOAA-7	10/9/83 - 10/16/83
GPC.B3.0025.0.83290.NOAA-7	10/17/83 - 10/24/83
GPC.B3.0026.0.83298.NOAA-7	10/25/83 - 10/31/83
GPC.B3.0033.0.83305.NOAA-7	11/1/83 - 11/8/83
GPC.B3.0034.0.83313.NOAA-7	11/9/83 - 11/16/83
GPC.B3.0035.0.83321.NOAA-7	11/16/83 - 11/24/83
GPC.B3.0036.0.83329.NOAA-7	11/25/83 - 11/30/83
GPC.B3.0037.0.83335.NOAA-7	12/1/83 - 12/8/83
GPC.B3.0038.0.83343.NOAA-7	12/9/83 - 12/16/83
GPC.B3.0039.0.83351.NOAA-7	12/17/83 - 12/24/83
GPC.B3.0040.0.83359.NOAA-7	12/25/83 - 12/31/83

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0041.0.84001.NOAA-7	1/1/84 - 1/8/84
GPC.B3.0042.0.84009.NOAA-7	1/9/84 - 1/16/84
GPC.B3.0043.0.84017.NOAA-7	1/17/84 - 1/24/84
GPC.B3.0044.0.84025.NOAA-7	1/25/84 - 1/31/84
GPC.B3.0055.0.84032.84039.NOAA-7	2/1/84 - 2/8/84
GPC.B3.0056.0.84040.84047.NOAA-7	2/9/84 - 2/16/84
GPC.B3.0057.0.84048.84055.NOAA-7	2/17/84 - 2/24/84
GPC.B3.0058.0.84056.84060.NOAA-7	2/25/84 - 2/29/84
GPC.B3.0059.0.84061.84068.NOAA-7	3/1/84 - 3/8/84
GPC.B3.0060.0.84069.84076.NOAA-7	3/9/84 - 3/16/84
GPC.B3.0061.0.84077.84084.NOAA-7	3/17/84 - 3/24/84
GPC.B3.0062.0.84085.84091.NOAA-7	3/25/84 - 3/31/84
GPC.B3.0063.0.84092.84099.NOAA-7	4/1/84 - 4/8/84
GPC.B3.0064.0.84100.84107.NOAA-7	4/9/84 - 4/16/84
GPC.B3.0065.0.84108.84115.NOAA-7	4/17/84 - 4/24/84
GPC.B3.0066.0.84116.84121.NOAA-7	4/25/84 - 4/31/84
GPC.B3.0067.0.84122.84129.NOAA-7	5/1/84 - 5/8/84
GPC.B3.0068.0.84130.84137.NOAA-7	5/9/84 - 5/16/84
GPC.B3.0069.0.84138.84145.NOAA-7	5/17/84 - 5/24/84
GPC.B3.0070.0.84146.84152.NOAA-7	5/25/84 - 5/31/84
GPC.B3.0071.0.84153.84160.NOAA-7	6/1/84 - 6/8/84
GPC.B3.0072.0.84161.84168.NOAA-7	6/9/84 - 6/16/84
GPC.B3.0073.0.84169.84176.NOAA-7	6/17/84 - 6/24/84
GPC.B3.0074.0.84177.84182.NOAA-7	6/25/84 - 6/30/84

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0027.0.84183.84190.NOAA-7	7/1/84 - 7/8/84
GPC.B3.0028.0.84191.84198.NOAA-7	7/9/84 - 7/16/84
GPC.B3.0029.0.84199.84206.NOAA-7	7/17/84 - 7/24/84
GPC.B3.0030.0.84207.84213.NOAA-7	7/25/84 - 7/31/84
GPC.B3.0101.0.84214.84221.NOAA-7	8/1/84 - 8/8/84
GPC.B3.0102.0.84222.84229.NOAA-7	8/9/84 - 8/16/84
GPC.B3.0103.0.84230.84237.NOAA-7	8/17/84 - 8/24/84
GPC.B3.0104.0.84238.84244.NOAA-7	8/25/84 - 8/31/84
GPC.B3.0105.0.84245.84252.NOAA-7	9/1/84 - 9/8/84
GPC.B3.0106.0.84253.84260.NOAA-7	9/9/84 - 9/16/84
GPC.B3.0107.0.84261.84268.NOAA-7	9/17/84 - 9/24/84
GPC.B3.0108.0.84269.84274.NOAA-7	9/25/84 - 9/30/84
GPC.B3.0109.0.84275.84282.NOAA-7	10/1/84 - 10/8/84
GPC.B3.0110.0.84283.84290.NOAA-7	10/9/84 - 10/16/84
GPC.B3.0111.0.84291.84298.NOAA-7	10/17/84 - 10/24/84
GPC.B3.0112.0.84299.84305.NOAA-7	10/25/84 - 10/31/84
GPC.B3.0113.0.84306.84313.NOAA-7	11/1/84 - 11/8/84
GPC.B3.0114.0.84314.84321.NOAA-7	11/9/84 - 11/16/84
GPC.B3.0115.0.84322.84329.NOAA-7	11/17/84 - 11/24/84
GPC.B3.0116.0.84330.84335.NOAA-7	11/25/84 - 11/30/84
GPC.B3.0117.0.84336.84343.NOAA-7	12/1/84 - 12/8/84
GPC.B3.0118.0.84344.84351.NOAA-7	12/9/84 - 12/16/84
GPC.B3.0119.0.84352.84359.NOAA-7	12/17/84 - 12/24/84
GPC.B3.0120.0.84360.84366.NOAA-7	12/25/84 - 12/31/84

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0121.0.85001.85008.NOAA-7	1/1/85 - 1/8/85
GPC.B3.0122.0.85009.85016.NOAA-7	1/9/85 - 1/16/85
GPC.B3.0123.0.85017.85024.NOAA-7	1/17/85 - 1/24/85
GPC.B3.0124.0.85025.85031.NOAA-7	1/25/85 - 1/31/85

4.2 METEOSAT

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0007.2.83182.METEO-2	7/1/83 - 7/16/83
GPC.B3.0008.2.83198.METEO-2	7/17/83 - 7/31/83
GPC.B3.0009.0.83213.METEO-2	8/1/83 - 8/16/83
GPC.B3.0010.0.83229.METEO-2	8/17/83 - 8/31/83
GPC.B3.0011.0.83244.METEO-2	9/1/83 - 9/16/83
GPC.B3.0012.0.83260.METEO-2	9/17/83 - 9/30/83
GPC.B3.0013.0.83274.METEO-2	10/1/83 - 10/16/83
GPC.B3.0014.0.83290.METEO-2	10/17/83 - 10/31/83
GPC.B3.0045.0.83305.METEO-2	11/1/83 - 11/16/83
GPC.B3.0046.0.83321.METEO-2	11/17/83 - 11/30/83
GPC.B3.0047.0.83335.METEO-2	12/1/83 - 12/16/83
GPC.B3.0048.0.83351.METEO-2	12/17/83 - 12/31/83
GPC.B3.0031.0.84001.METEO-2	1/1/84 - 1/16/84
GPC.B3.0032.0.84017.METEO-2	1/17/84 - 1/31/84
GPC.B3.0075.0.84032.84047.METEO-2	2/1/84 - 2/16/84
GPC.B3.0076.0.84048.84060.METEO-2	2/17/84 - 2/29/84
GPC.B3.0077.0.84061.84076.METEO-2	3/1/84 - 3/16/84
GPC.B3.0078.0.84077.84091.METEO-2	3/17/84 - 3/31/84
GPC.B3.0079.0.84092.84107.METEO-2	4/1/84 - 4/16/84
GPC.B3.0080.0.84108.84121.METEO-2	4/17/84 - 4/30/84
GPC.B3.0081.0.84122.84137.METEO-2	5/1/84 - 5/16/84
GPC.B3.0082.0.84138.84152.METEO-2	5/17/84 - 5/31/84
GPC.B3.0083.0.84153.84168.METEO-2	6/1/84 - 6/16/84
GPC.B3.0084.0.84169.84182.METEO-2	6/17/84 - 6/30/84

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0085.0.84183.84198.METEO-2	7/1/84 - 7/16/84
GPC.B3.0086.0.84199.84213.METEO-2	7/17/84 - 7/31/84
GPC.B3.0087.0.84214.84229.METEO-2	8/1/84 - 8/16/84
GPC.B3.0088.0.84230.84244.METEO-2	8/17/84 - 8/31/84
GPC.B3.0089.0.84245.84260.METEO-2	9/1/84 - 9/16/84
GPC.B3.0090.0.84261.84274.METEO-2	9/17/84 - 9/30/84
GPC.B3.0091.0.84275.84290.METEO-2	10/1/84 - 10/16/84
GPC.B3.0092.0.84291.84305.METEO-2	10/16/84 - 10/31/84
GPC.B3.0093.0.84306.84321.METEO-2	11/1/84 - 11/16/84
GPC.B3.0094.0.84322.84335.METEO-2	11/17/84 - 11/30/84
GPC.B3.0095.0.84336.84351.METEO-2	12/1/84 - 12/16/84
GPC.B3.0096.0.84352.84366.METEO-2	12/17/84 - 12/31/84
GPC.B3.0097.0.85001.85016.METEO-2	1/1/85 - 1/16/85
GPC.B3.0098.0.85017.85031.METEO-2	1/17/85 - 1/31/85

4.3 GOES-EAST

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0099.0.83182.83197.GOES-EAST	7/1/83 - 7/16/83
GPC.B3.0100.0.83198.83212.GOES-EAST	7/17/83 - 7/31/83
GPC.B3.0130.0.83213.83228.GOES-EAST	8/1/83 - 8/16/83
GPC.B3.0131.0.83229.83243.GOES-EAST	8/17/83 - 8/31/83
GPC.B3.0132.0.83244.83259.GOES-EAST	9/1/83 - 9/16/83
GPC.B3.0133.0.83260.83273.GOES-EAST	9/17/83 - 9/30/83
GPC.B3.0134.0.83274.83289.GOES-EAST	10/1/83 - 10/16/83
GPC.B3.0135.0.83290.83304.GOES-EAST	10/17/83 - 10/31/83
GPC.B3.0136.0.83305.83320.GOES-EAST	11/1/83 - 11/16/83
GPC.B3.0137.0.83321.83334.GOES-EAST	11/17/83 - 11/31/83
GPC.B3.0138.0.83335.83350.GOES-EAST	12/1/83 - 12/16/83
GPC.B3.0139.0.83351.83365.GOES-EAST	12/17/83 - 12/31/83
GPC.B3.0140.0.84001.84016.GOES-EAST	1/1/84 - 1/16/84
GPC.B3.0141.0.84017.84031.GOES-EAST	1/17/84 - 1/31/84
GPC.B3.0142.0.84032.84047.GOES-EAST	2/1/84 - 2/16/84
GPC.B3.0143.0.84048.84060.GOES-EAST	2/17/84 - 2/29/84
GPC.B3.0144.0.84061.84076.GOES-EAST	3/1/84 - 3/16/84
GPC.B3.0145.0.84077.84091.GOES-EAST	3/17/84 - 3/31/84
GPC.B3.0146.0.84092.84107.GOES-EAST	4/1/84 - 4/16/84
GPC.B3.0147.0.84108.84121.GOES-EAST	4/17/84 - 4/30/84
GPC.B3.0148.0.84122.84137.GOES-EAST	5/1/84 - 5/16/84
GPC.B3.0149.0.84138.84152.GOES-EAST	5/17/84 - 5/31/84
GPC.B3.0150.0.84153.84168.GOES-EAST	6/1/84 - 6/16/84
GPC.B3.0151.0.84169.84182.GOES-EAST	6/17/84 - 6/30/84

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0152.0.84183.84198.GOES-EAST	7/1/84 - 7/16/84
GPC.B3.0153.0.84199.84210.GOES-EAST	7/17/84 - 7/29/84

4.4 GOES-WEST

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0154.0.83182.83197.GOES-WEST	7/1/83 - 7/16/83
GPC.B3.0155.0.83198.83212.GOES-WEST	7/17/83 - 7/31/83

4.5 GMS

B3-DATA HOLDINGS

Tape #	Date Range (MON/DAY/YR)
GPC.B3.0005.0.83181.GMS-2	6/30/83 - 7/16/83
GPC.B3.0006.0.83197.GMS-2	7/16/83 - 7/31/83

5.0 Cloud Climatology Product (C) Data Sets

Stage C data are cloud parameters obtained from an analysis of B3 radiance data using an experimental algorithm. This analysis uses other correlative data sets which are appended to C data and called CD-data. The cloud parameters are reported for standard geographical areas every 3 hours (0000, 0300,0600, 0900, 1200, 1500, 1800, 2100 GMT). These C1 data have a spatial resolution of approximately 250 km and can be read from the tape in either an equal-area grid or an equal latitude-longitude increment grid with 2.5 degrees resolution. Variables reported include fractional cloud cover and error estimate, as well as the spatial mean and variances of cloud optical thickness, top temperature and top pressure for six cloud types (total, low, middle, high, cirrus and deep convective). Each of these types is defined by a cloud top pressure and/or optical thickness range. Also reported are the mean and variance of total and clear sky radiances (for all available radiance channels), surface temperature, humidity, and solar reflectivity, surface type and topography, atmospheric temperature and humidity profiles, and ozone column abundance. The original surface and atmospheric quantities contained in correlative data are also reported in mapped form on the CD-data tapes. C2-data are monthly summaries of C1-data, containing monthly mean and mean diurnal descriptions of all reported variables. On a larger regional scale, other space and time distribution diagnostics are reported.

6.0 Supporting Information Available from ICA

6.1 Correlative Data

6.1.1 TOVS Sounding Product

The TOVS Sounding Product information is derived from the three TOVS instruments. These instruments consist of the HIRS/2, MSU, and SSU sensors (described in Polar Orbiter User Guide), which measure the intensity of the upwelling radiation in the various spectral intervals that correspond to broad layers at various depths in the atmosphere. These radiance measurements are processed into Earth-located, calibrated radiance values, "clear" radiance (radiances corrected for cloud effects and angle of view), estimates of water vapor in three atmospheric layers (converted to precipitable water in these layers), mean temperatures for selected atmospheric layers, tropopause height and temperature estimates, and geopotential thickness of selected atmospheric layers.

6.1.2 GOES Orbit and Attitude Information

The ICA is archiving orbit and attitude data for both GOES-West and GOES-East satellites. These data are generated at 0000Z and 1200Z for each day and stored as separate files for the two satellites. The data are stored as stacked files on 9 track, 1600 bpi computer compatible tapes.

This navigation information is used by the GPC in producing the B3 version of GOES data. Orbit and Attitude data, usually accompanying GOES data obtained from NOAA, represent predicted data produced 12 hours before the image. The data referred to here represent the actual orbit and attitude determined after the image was taken.

6.2 Data Handling Software

This section will describe supporting information available, generally source code listings describing software that has been implemented at the ICA or other ISCCP Data Centers for reading ISCCP data tapes and listing the contents, producing extracts, etc. The software is offered to users to aid in the implementation of similar software on their own computer systems.

6.2.1 GPC B3 Software

FORTRAN 77 source modules designated for reading, decoding, and/or copying B3 images from tape onto other media are included in the Volume Identification (written in both ASCII and EBCDIC) file on all B3 data tapes.

6.2.2 GOES Data Calibration Routines

The GOES calibration routines include software for converting IR count values to temperature then, by use of the Planck Function, to radiance data and software for the conversion of the visible count values to radiance values.

6.2.3 METEOSAT Navigation Routine

The latitude/longitude of a given point (pixel) in a full resolution 2500 x 2500 METEOSAT rectified image can be obtained by supplying the navigation routine with the column/line coordinates of the point. The column and line numbers for B1 data sets must be converted to correspond to the full resolution data before they can be used as input to this routine. Formulae are provided for these conversions. The reverse operation, latitude/longitude -to-column/line, can also be performed with this routine.

Appendix A: Correlative Data

Data Type	Data Source	Reason Required
Vertical profiles of temperature and humidity	TOVS soundings from NOAA/NESDIS	Specification in radiative transfer analysis of atmospheric effects on infrared radiances and location of clouds in altitude
Ozone column concentrations	TOVS soundings from NOAA/NESDIS	Specification of atmospheric effects on visible radiances in radiative transfer analysis
Weekly snow cover analysis	Digitized values from NOAA/NESDIS	Specification of variations of surface visible reflectance to discriminate between snow covered land and clouds
Weekly sea ice cover analysis	Maps from U.S. Navy/NOAA Joint Ice Center (digitized values from May 1984)	Specification of time variation of ocean surface visible reflectance to discriminate between sea ice and clouds
Three-hourly global collection of surface reports	NMC data tapes, provided by NOAA/ NESDIS	Specification of time diurnal and synoptic time variations of land surface temperature to improve discrimination of low clouds and land surface, especially at night

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