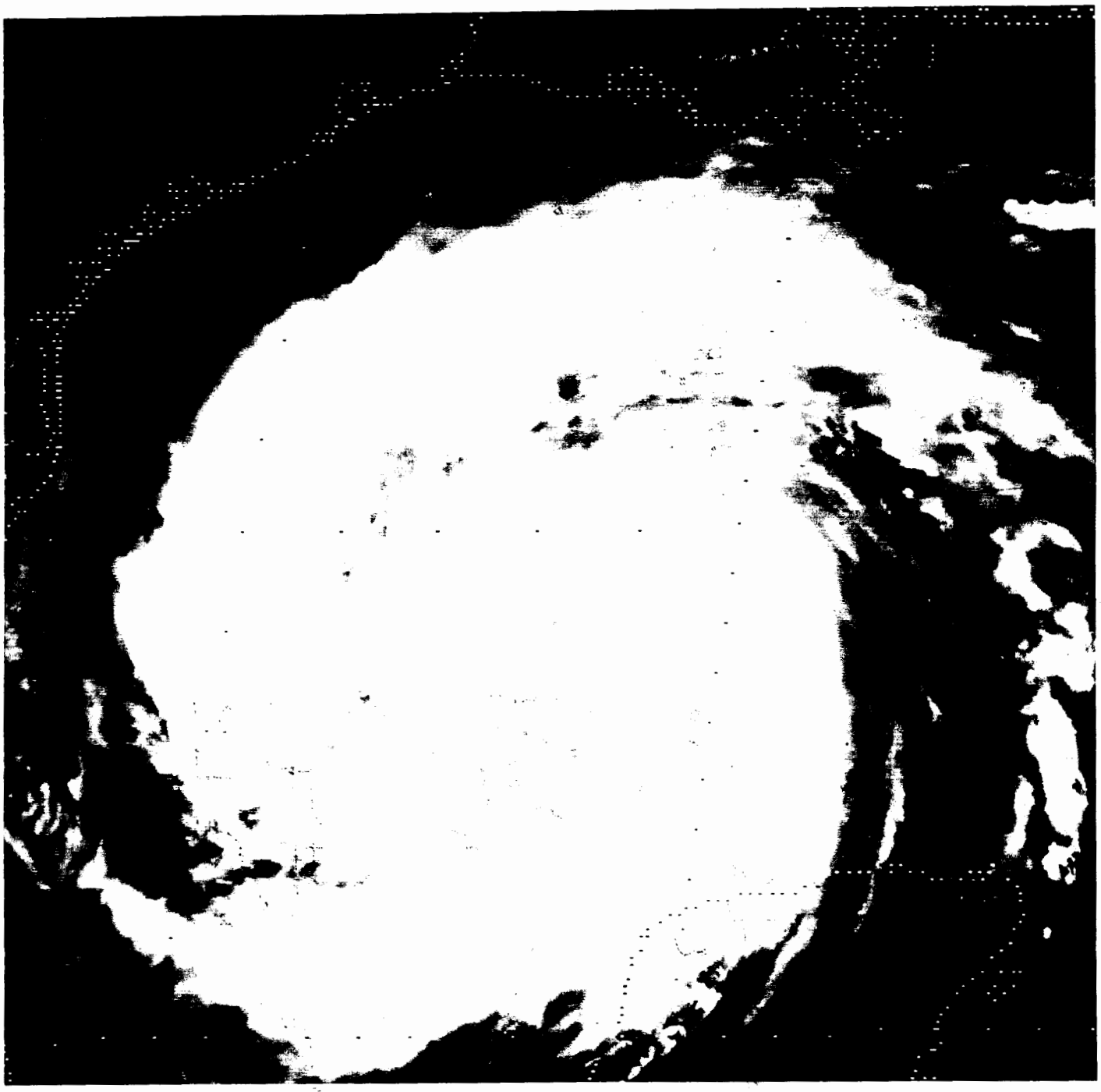
The GOES User's Guide



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National Environmental Satellite, Data, and Information Service

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The GOES User's Guide

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Washington, D.C.

June 1983

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National Environmental Satellite, Data, and Information Service
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FOREWORD

The GOES USER'S GUIDE provides current and potential data users with background information on the Geostationary Operational Environmental Satellite (GOES) System. General details of the spacecraft and instrumentation carried on board are given, as well as an explanation of the collection and distribution of data to users. Types of images and data available are presented and detailed instructions for obtaining such data are outlined.

This 1983 edition is an updated version of the original User's Guide published in 1976. The reader will note that some portions of this publication have been taken directly from three other excellent documents containing necessary material for this GOES USER'S GUIDE. These are: (1) GOES D, E, F Data Book, jointly published by NOAA, NASA, and the Hughes Aircraft Company, and (2) NAVY TACTICAL APPLICATIONS GUIDE, Vol 2, Environmental Phenomena and Effects, published by the Department of Defense, and (3) The WEFAX User's Guide, published by NOAA.

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List of Acronyms

APT	-	Automatic Picture Taking
ATS	-	Applications Technology Satellite
AVHRR	-	Advanced Very High Resolution Radiometer
CDA	-	Command and Data Acquisition
CDDF	-	Central Data Distribution Facility
CDDS	-	Central Data Distribution System
CPHC	-	Central Pacific Hurricane Center (NWS)
DCP	-	Data Collection Platform
DCS	-	Data Collection System
DOD	-	Department of Defense
EPHC	-	Eastern Pacific Hurricane Center (NWS)
ERL	-	Environmental Research Laboratories (NOAA)
FGGE	-	First GARP Global Experiment
FOV	-	Field of View
GARP	-	Global Atmospheric Research Program
GMS	-	Geostationary Meteorological Satellite
GOES	-	Geostationay Operational Environmental Satellite
GSFC	-	Goddard Space Flight Center
GTS	-	Global Telecommunications System
HRD	-	Hurricane Research Days
IGFOV	-	Instantaneous Geometric Field of View
IR	-	Infrared
METEOSAT	-	European Geostationary Meteorological Satellite
MOA	-	Memorandum of Agreement
MSI	-	Multispectral Imaging
NASA	-	National Aeronautics and Space Administration
NCC	-	National Climatic Center (NOAA)

NESDIS	-	National Environmental Satellite, Data, and Information Service (NOAA)
NMC	-	National Meteorological Center (NWS)
NOAA	-	National Oceanic and Atmospheric Administration
NSSDC	-	National Space Science Data Center
NSSFC	-	National Severe Storms Forecast Center
NWS	-	National Weather Service
QPE	-	Quantitative Precipitation Estimate
RISOP	-	Rapid Interval Scan Operations
RRSD	-	Research Rapid Scan Days
SAB	-	Synoptic Analysis Branch
S/DB	-	Snychronizer/Data Buffer
SEM	-	Space Environmental Monitor (Subsystem)
SFSS	-	Satellite Field Services Station
TBUS	-	APT Predict Message
TTC	-	Telemetry, Tracking and Command (Subsystem)
VAS	-	Visible infrared spin scan radiometer Atmospheric Sounder
VIRGS	-	VISSR Image Registration and Gridding System
VIS	-	Visible
VISSR	-	Visible and Infrared Spin Scan Radiometer
WEFAX	-	Weather Facsimile
WMO	-	World Meteorological Organization
WSFO	-	Weather Service Forecast Office

Section 1

BACKGROUND AND INTRODUCTION

In September of 1961 the United States Congress passed a law establishing a meteorological satellite system. Geostationary Operational Environmental Satellites (GOES) operated by the National Oceanic and Atmospheric Administration (NOAA) are a major component of that system. Thus far there have been seven launches of geostationary satellites.

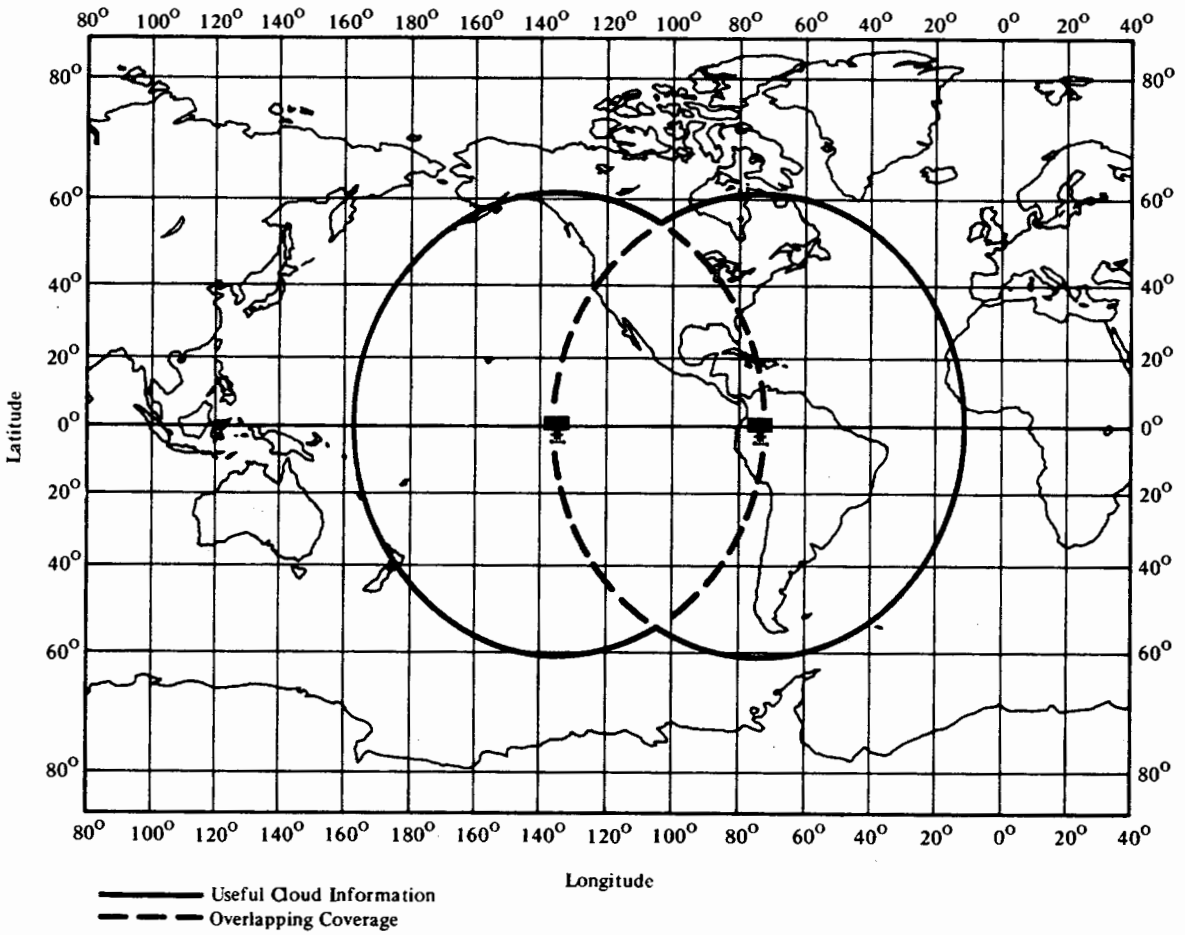
Satellite	Launch Date
SMS-1	May 5, 1974
SMS-2	February 6, 1975
GOES-1	October 16, 1975
GOES-2	June 6, 1977
GOES-3	June 16, 1978
GOES-4	September 9, 1980
GOES-5	May 22, 1981
GOES-6	Scheduled for April 83

The first five of these spacecraft were built by Aeronutronics Ford and the last three by Hughes Aircraft Company.

The current NOAA system consists of two operational GOES satellites (fig. 1-1). GOES-East is located at 75° W and GOES-West is positioned at 135° W. A third satellite, GOES-Central, is located at 107° W and is used for weather facsimile broadcasts.

GOES satellites provide frequent Visible (VIS) and Infrared (IR) images to monitor routine as well as cataclysmic weather events such as hurricanes and other severe storms, relay meteorological observation data from surface collection points to a processing center, and broadcast processed graphic and image weather data (WEFAX) to field stations. Data from GOES are also proving to be of increasing value for other environmental applications such as snow mapping and ocean surface temperature mappings. The satellites also monitor the conditions of the magnetic field, measure the energetic particle flux in the vicinity of the spacecraft, and observe X-ray emissions from the sun, transmitting these observations to a central processing point. These latter measurements are made through instruments collectively called the Space Environmental Monitor (SEM).

Onboard the Hughes GOES spacecraft (fig. 1-2), the environmental sensor is a Visible and Infrared Spin Scan Radiometer (VISSR) Atmospheric Sounder (VAS). In its operational mode, VAS scans the earth and gathers data in the reflected visible light and the thermal IR portions of the spectrum. VAS can also gather IR radiation in any of several spectral bands and produce images



AREA COVERAGE OF GOES SATELLITES

fig. 1-1 GOES EAST AND GOES WEST COVERAGE AREAS

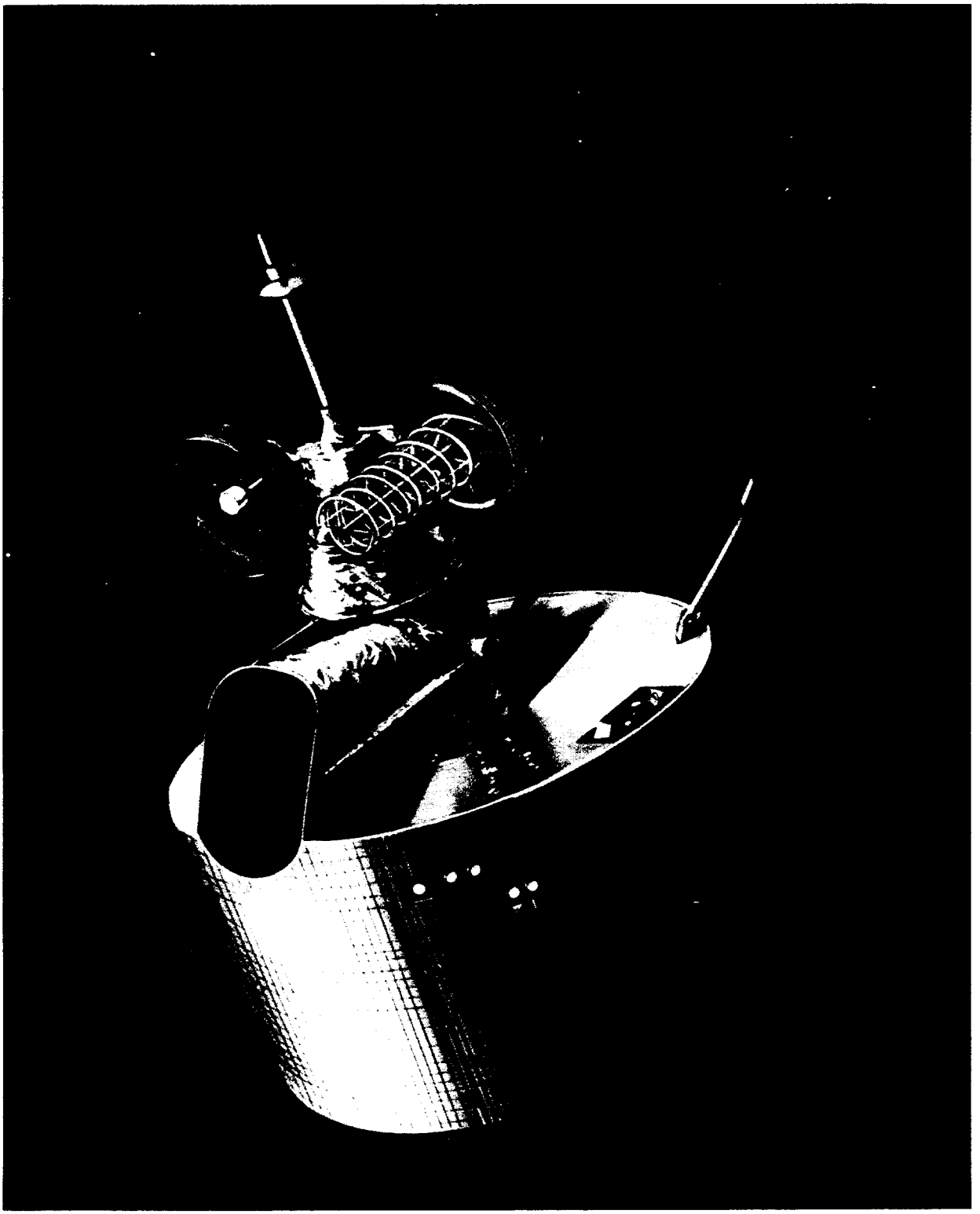


fig. 1-2 GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE (GOES)

in multiple IR spectral bands. This mode is called multispectral imaging (MSI). VAS also has an atmospheric temperature sounding capability for gathering IR radiation data. This can be used, with other known atmospheric properties, to calculate atmospheric temperature profiles over a selected geographic area.

GOES supports a service oriented, operational environmental mission. The mission is to continuously make measurements of the earth's atmosphere and surface, determine the solar X-ray and the near-earth space environment, collect in situ data from instruments located on or near the earth's surface, and disseminate both data and analyzed environmental information to operational users (fig. 1-3). The data and information dissemination process is performed in real time and near real time, to accommodate a daily, but varying, range of operational deadlines imposed by users whose operations depend on timely arrival of data.

An important, but secondary, aspect of the GOES mission is to provide data that are used by research-oriented environmental scientists for developing and testing new and/or enhanced applications. In some cases the data are used experimentally to test, develop, or validate theories.

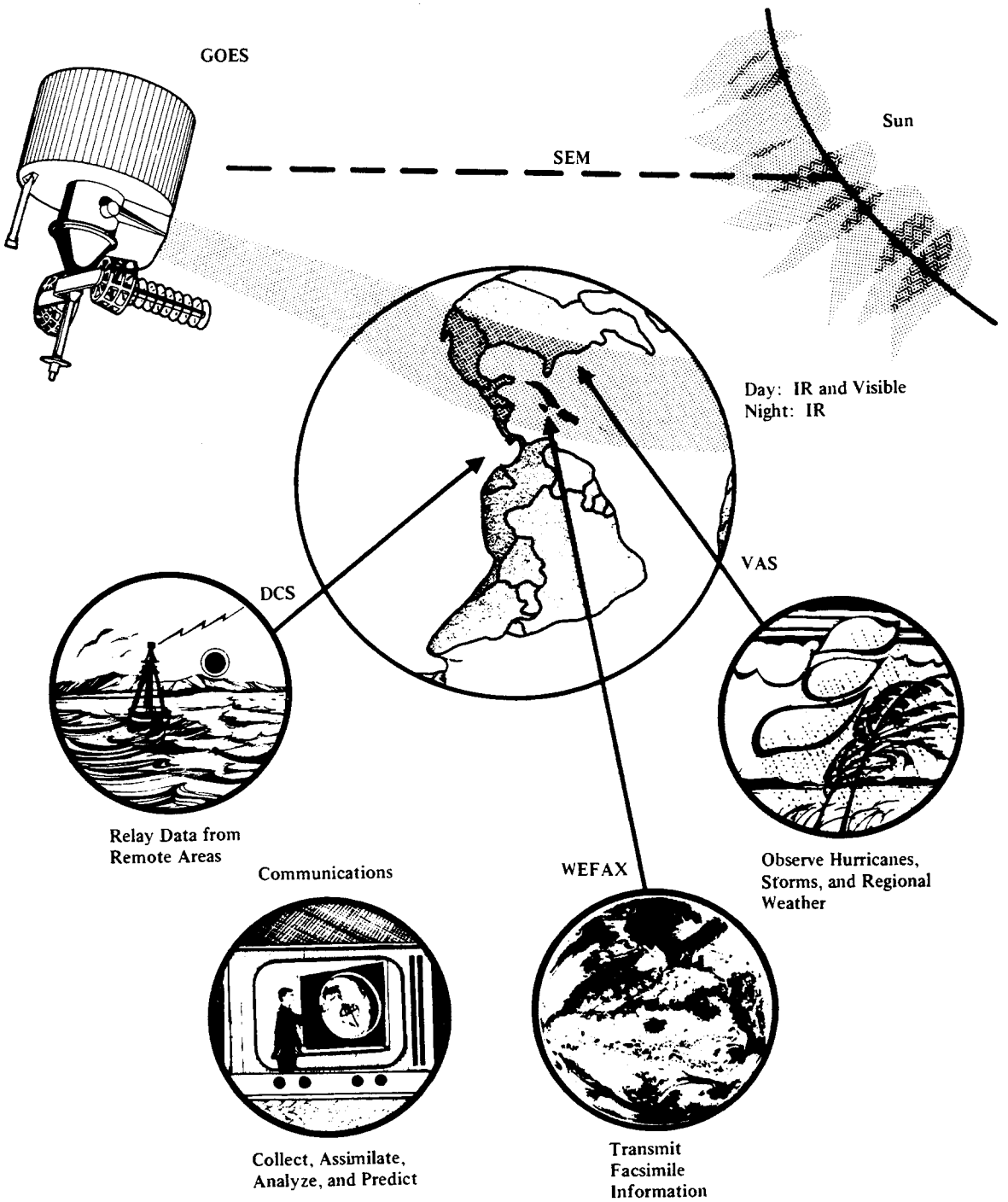


fig. 1-3 THE GOES MISSION

Section 2

SPACECRAFT DESCRIPTION AND COVERAGE

The GOES satellites are maintained at Earth synchronous altitude, 35,800 km (19,312 nm) above the Earth's surface. These spacecraft orbit in the Earth's equatorial plane. At this altitude their west to east motion equals that of the Earth beneath, therefore remaining stationary at a desired longitude.

Each spacecraft is controlled for proper Earth imaging by an attitude control subsystem which maintains the spin rate at approximately 100 rpm and aligns the spacecraft spin axis perpendicular to the Earth's equatorial plane.

Cloud and temperature imaging in both visible and infrared (IR) spectra is accomplished through VAS. By means of the VAS optical reflecting telescope, radiation from a very small area on Earth is focused on detectors that convert radiation energy to electrical signals. The spacecraft data transmission link relays these signals to Earth, where they are processed into various useful forms.

Imaging is achieved by scanning the optically focused spot over the Earth scene. Radiation enters the telescope at right angles to its optical axis via the optically flat scan mirror, which is equipped with an angular positioned stepping mechanism to facilitate scanning of the terrestrial scene. The scanned pattern, as processed for use, resembles a conventional television image. West-to-East scan lines are formed by rotation of the spinning spacecraft. The lines are moved by the stepped mirror to scan North-to-South. Synchronizing signals are also sent through the spacecraft so that imaging signals will be properly assembled on receipt by terrestrial stations.

Visible spectrum (0.55 μm to 0.75 μm) data consist of sunlight reflected from the Earth and its various cloud formations. The data are detected and converted to electrical signals by an array of eight photomultiplier tubes. Each tube views an eighth of the scan line width, so that eight lines are scanned on each spin of the spacecraft. These data, available only when terrestrial reflecting surfaces are in daylight, can be used to image clouds and the Earth's surface.

Infrared (IR) spectrum (10-12.5 μm) data which consist of emitted radiation in the "atmospheric window" from the Earth and clouds is available both day and night, permitting continuous environmental monitoring. Temperatures of clouds, land, or oceans can be determined from these IR data. Solid-state detectors,

cooled to 94° K by a radiative cooler, convert the IR energy to electrical signals.

There are two types of detector elements sensitive to different parts of the IR spectrum. Two large and two small detectors are made of a mercury and cadmium telluride composition (HgCdTd) while the two other large detectors are made of indium selenide (InSb). All detectors are square shaped. The large detectors are the same size and are separated in the North-South scan direction by a space exactly equal to the dimension of a side. The small detectors are one-half the size of the large detectors, exactly one scan line on a side. The arrangement of detectors facilitates the several imaging modes of VAS.

In the operational VISSR mode, data from the visible spectrum detectors and small thermal IR detectors are transmitted on every scan line. Filter wheel position and frame size are controlled by time-synchronized command link.

For multispectral scan imaging, VAS is programmed to transmit visible spectrum data on every scan line. It is also programmed to transmit IR detector signals in pairs: two small HgCdTe, two large HgCdTe, or two InSb. By the selective use of filters in combination with detectors, and by interweaving scans of large and small detectors as facilitated by North-South spacing of detectors, a full frame of scans can image the Earth in as many as three IR spectral channels.

The field of coverage for the operational sensing mode is 20° E-W by 20° N-S as seen from synchronous altitude. It takes about 20 min. to image the field. Two full earth disc images are provided each hour. The VAS instrument is programmed to start a new image at 30-min. intervals. The remaining 10 min. interval between images is used for WEFAX transmission or ranging.

During periods set aside for obtaining special data for experimental purposes, the VAS instrument can be programmed for a limited coverage mode. Selected latitudinal bands of varying North-South dimensions can be imaged to obtain information for calculating a vertical profile of atmospheric temperature and moisture. More frequent repeat coverage of a particular area can be obtained when VAS is programmed in this limited area coverage mode.

Communication paths between each GOES and the Earth are line of sight. Both satellites are within line of sight of the Wallops Island Command and Data Acquisition (CDA) station, which commands and receives data from each GOES satellite simultaneously. Ground terminal locations within the coverage area of each GOES can receive sensor data signals and WEFAX. Ground based sensors from fixed or mobile locations, that are attached to suitable platforms in the coverage area of GOES, can transmit their data to GOES, using the Data Collection System (DCS).

Section 3

DESCRIPTION OF SPACECRAFT SUBSYSTEMS

VAS Subsystem

The Visible infrared spin-scan radiometer Atmospheric Sounder (VAS) operates as an integral part of the Geostationary Operational Environmental Satellite (GOES) system. The VAS will provide both day and night two-dimensional cloud and Earth mapping capability with a satellite subpoint resolution of approximately 0.9 km (0.5 nm) for visible imagery and approximately 6.9 km (3.7 nm) for IR imagery. Additionally, VAS will obtain radiometric data in the Earth's atmospheric water vapor and carbon monoxide (CO) absorption bands providing the capability to determine the three-dimensional structure of atmospheric temperature and atmospheric water vapor distribution.

The VAS arrangement as used in the spin-stabilized geostationary satellite is shown in figure 3-1. As indicated by this figure, the mapping raster is formed by the combination of the satellite spin motion (spin-scan) and step action of the scanning optics. One raster line in the Earth's West-East (W-E) direction is formed for each revolution of the spinning satellite at each North-South (N-S) angular scan step position of the VAS scan mirror. Each 0.192-milliradian (mr) N-S axis scan step corresponds to the total field of view (FOV) of the eight visible channel detectors. The 0.9 km resolution in the visible spectrum is obtained by using a linear array of eight detectors aligned so that they sweep out the complete scan line path. The instantaneous geometric field of view (IGFOV) of each of the visible channels is 0.025 mr (W-E) x 0.021 mr (N-S), allowing 20 percent underlap between field stops for fabrication considerations. The Earth is covered in the N-S direction with 1821 successive latitude steps.

The VAS, as indicated in figure 3-1, has six infrared detectors. Two have a subpoint resolution of 6.9 km (IGFOV of 0.192 x 0.192 mr) and are used primarily for imaging. Four have a resolution of 13.8 km (IGFOV of 0.384 x 0.384 mr) and are used for sounding information.

SEM

The Space Environmental Monitor (SEM) Subsystem includes a magnetometer, a solar X-ray telescope, an energetic particle monitor, and a high energy Particle Detector. These were designed to provide direct quantitative measurements of important effects of solar activity for use in real-time solar forecasting and subsequent research. Unusual solar flares with high levels

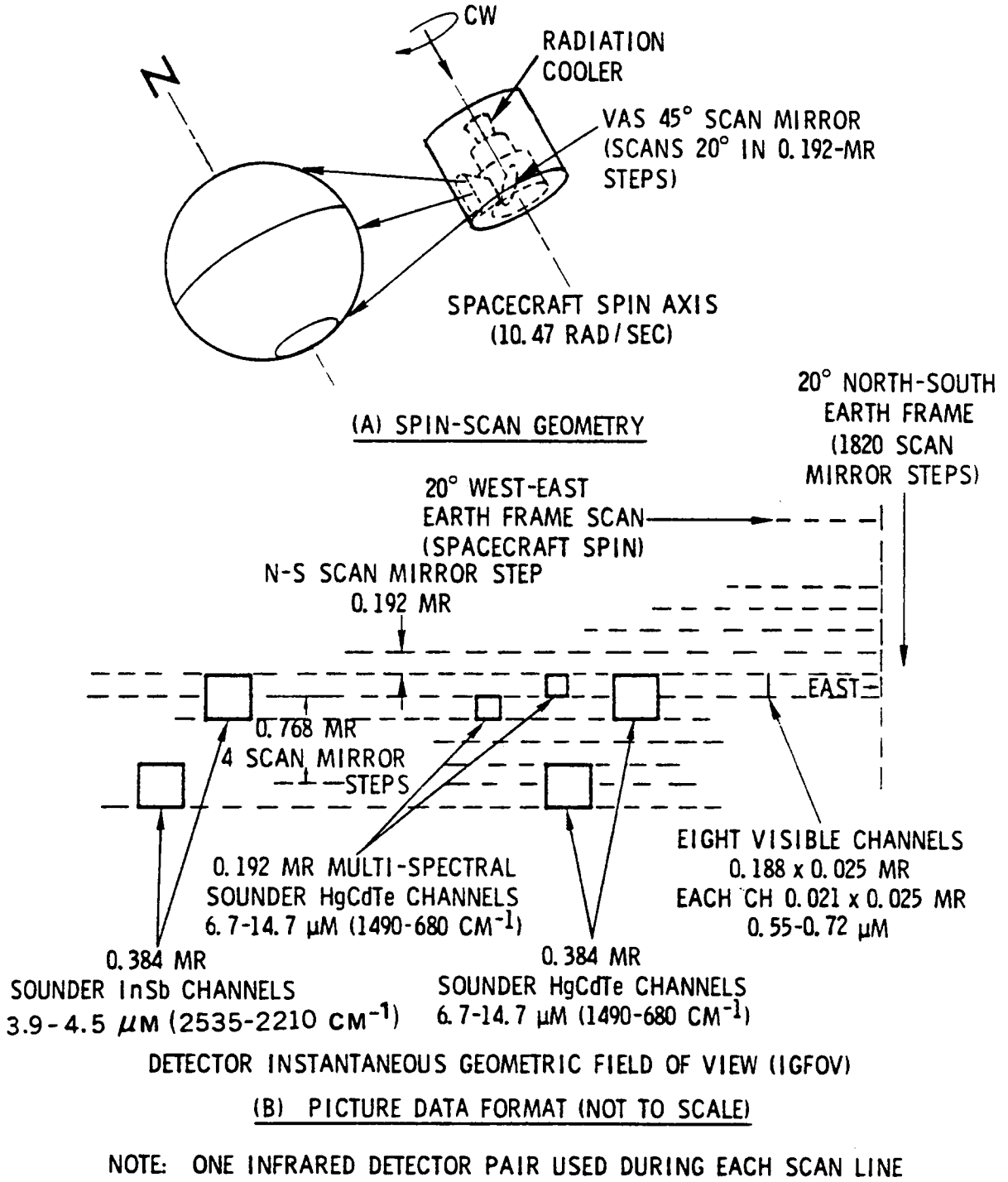


fig. 3-1 THE VAS ARRANGEMENT AS USED IN THE SPIN-STABILIZED GEOSTATIONARY SATELLITE

of radiation are detected, and the intensity of the solar wind as well as the strength and direction of the Earth's magnetic field are measured.

- The SEM subsystem provides data via the spacecraft telemetry system which are received at the NOAA Environmental Research Laboratories (ERL) at Boulder, Colorado. ERL then processes the data and produces bulletins for space disturbance forecasting to support ionospheric communications activity, the manned space program, and supersonic transport flights.

- As this Guide is intended primarily for users of meteorological data, there will be no further discussion of the SEM subsystem in the pages to follow. Readers who require further information are referred to:

  Environmental Research Laboratories
  National Oceanic & Atmospheric Administration
  Boulder, Colorado 80302

Section 4

Data Acquisition and Distribution System

The GOES operational system is planned and managed by the National Oceanic and Atmospheric Administration (NOAA). The National Environmental Satellite, Data, and Information Service (NESDIS), a major element of NOAA, operates the system. During planning stages, NOAA assembles environmental measurement requirements and determines the need for timely distribution of data. To accomplish this mission NESDIS has implemented a Central Data Distribution System (CDDS) to receive, process, and distribute VAS image data to users throughout the United States, in near real-time.

Operational Concept

Remotely sensed measurements made by the VAS from GOES East and GOES West are transmitted at high data rates to the National Oceanic and Atmospheric Administration (NOAA) Command and Data Acquisition (CDA) station at Wallops Island, Virginia (fig. 4-1). SEM data are acquired simultaneously by the Environmental Research Laboratory (ERL) at Boulder, Colorado. Visible and IR data of the full earth disc are reformatted, calibrated, and gridded at the CDA station and immediately retransmitted to the GOES satellites at reduced data rates. These retransmitted data, called "stretched VISSR," are available to any user with an appropriate ground terminal. The lower resolution 7 km IR data are also formatted in special computers at the Wallops Island CDA station for analog transmission directly to Satellite Field Services Stations (SFSS).

Operationally, the stretched VISSR mode signal is acquired by NESDIS at the Suitland, Maryland, facility. As the digital data are recorded for subsequent application processing they are also retransmitted over a microwave link to the Central Data Distribution Facility (CDDF) in the World Weather Building in Camp Springs, Maryland. These data are formatted and "sectorized" into analog form for transmission over high quality telephone lines to Satellite Field Services Stations (SFSSs) throughout the country.

The "sectorizer" in the CDDF extracts, from the total high resolution visible imagery "full disc" data, sections of specified geographical areas with approximate resolutions of 1, 2, or 4 km (1/2, 1, 2nm). A total of seven 1 km resolution sectors and/or a total of four 2 km resolution sectors cover the contiguous 48 states. Also, two standard 4 km resolution sectors cover the U.S., Atlantic, and Pacific from 50° W to about 170° W. These sectors are available every 30 min. An additional 1, 2, or 4 km resolution

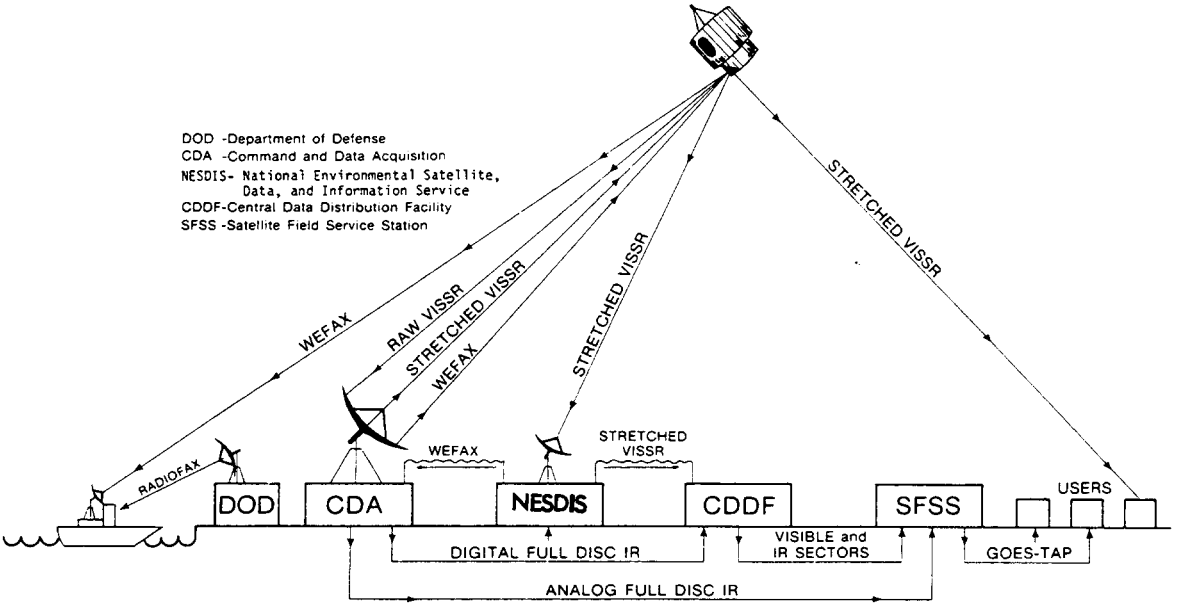


fig. 4-1 GOES CENTRAL DATA DISTRIBUTION SYSTEM

sector is transmitted to the Weather Service Forecast Office (WSFO) in Puerto Rico every 30 min. Similar resolution sectors are also available for the Alaskan and Hawaiian areas. All standard sectors have automatically implanted grids.

The sectorizer operates in a serial fashion (i.e., it does not have the capability to receive and transmit data simultaneously), which causes data transmission from the CDDF to be on a near real-time basis. The sectorizer uses about 9 min. to receive these data and about 17 more minutes for handling and transmission of selected sectors, which is completed well within the normally scheduled 30-min spacecraft imaging interval. Also, partial disc picture operation and limited scanning for short interval viewing is utilized to monitor severe weather. This is called Rapid Interval Scan Operations (RISOP). Numerous sectorizers are located within the CDDF to produce sectors required by users. Sectorizers are controlled by a central console and automated scheduler.

IR data are provided in the form of full disc imagery and disseminated over high quality phone lines and satellite communications links direct to SFSSs from the CDA station at Wallops. In addition, 7 km IR data can be sectorized at the CDDF to provide IR imagery with the same geographical coverage as visible sectors; these are called equivalent IR sectors. The CDDF and Wallops have the capability of temperature enhancement for emphasis of specified features in the IR imagery. These are available to all users through the normal distribution system.

OPERATIONAL GOES DATA USERS

The Satellite Field Services Station (SFSS)

These stations are the heart of the operational system and serve as primary distribution points for GOES data to WSFO's, Department of Defense (DOD) units, universities, TV stations, news media, and other users.

To meet the needs of the entire user community most efficiently, the contiguous U.S. is divided into five areas, each containing a communications hub and first-line user interface, that is, an SFSS. Also, the Honolulu SFSS serves as the interface for the central and southwestern Pacific and the Anchorage SFSS for Alaska. The SFSSs currently in operation are co-located with National Weather Service (NWS) offices.

Current SFSSs in Operation

SFSS	Co-located NWS Units
New Orleans, Louisiana	New Orleans, WSFO
Washington, D.C.	Washington, D.C. WSFO
Miami, Florida	Miami WSFO and National Hurricane Center (NHC), Miami
Kansas City, Missouri	Nat'l Severe Storms Forecast Center (NSSFC) Kansas City, Missouri
San Francisco, California	San Francisco WSFO and Eastern Pacific Hurricane Center (EPHC)
Honolulu, Hawaii	Honolulu WSFO and Central Pacific Hurricane Center (CPHC)
Anchorage, Alaska	Anchorage WSFO, Alaska

The SFSSs receive sectorized data from the CDDF and full disc IR data from the CDA over dedicated communications circuits. Since only one sector at a time can be transmitted over a single line, several lines to each SFSS are required for simultaneous transmission of several sectors.

When visible data are not available (night time), equivalent 7 km resolution IR data are available for the standard 2 and 4 km sectors. During daylight hours, both visible and equivalent IR data are available on request or as scheduled. Standard times are established (adjusted seasonally) for transition from visible to IR at each SFSS. As noted, full disc IR is available 24 hr each day. Equivalent IR imagery is also enhanced (on a scheduled/request basis) to emphasize specified features, that is convective areas, freezing level, fog, stratus, sea surface temperatures, etc.

"Floating Sectors" (non-standard) of 1, 2, and 4 km resolution are available at most SFSSs. In some instances, these sectors are ungridded and are used by the SFSS to meet specific requirements. The real-time user is notified of the location and resolutions of these floaters. Requests for floater products can be made by the user through the appropriate SFSS. However, specific resolution and sector location will be provided by the SFSSs only if priorities and scheduling permit.

An SFSS has the capability to display sectors for regional WSFOs and other users and to provide satellite data interpretation assistance. Using these sectors, meteorologists on each end can view the same high quality image simultaneously, while discussing interpretation. The SFSSs include a complement of satellite meteorologists, oceanographers, and hydrologists who provide, in most instances, a capability for 24 hr per day operation.

Synoptic Analysis Branch

The Synoptic Analysis Branch (SAB) is responsible for the operational interface with the NWS National Meteorological Center (NMC) on a global basis in near real-time. The Branch is also responsible, in coordination with SFSS's, to produce and disseminate Quantitative Precipitation Estimates (QPE) in support of the NOAA Flash Flood Program. SAB is co-located with NMC in the World Weather Building.

GOES data are routinely made available on a continuing basis to the SAB in hard copy and television format from the CDDF Photographic Laboratory. In addition, the SAB has automatic recorders to receive selected sectors as they are being transmitted to appropriate SFSSs. GOES data are used operationally in current global meteorological, oceanographic, and hydrologic activities of the Forecast Division of NMC.

SAB and SFSSs work together and coordinate their expertise and input for many critical environmental phenomena affecting NMC and NWS field office forecasts.

Atmospheric wind fields are determined by NESDIS utilizing the digital satellite data resident in the IBM 360/195 computer. A series of images taken at 30-min intervals are registered in digital form for machine processing. Cloud locations appearing in successive picture pairs are identified, and a correlation process is used to compute cloud motions or vectors during each interval. The resulting cloud vectors and corresponding cloud-top temperatures determined from the IR data are examined by a meteorologist and quality controlled. Heights of cloud tracers are assigned by comparing satellite derived cloud temperatures with current NMC vertical temperature profiles. Areas containing suitable cloud tracers not picked up by the automatic correlation process are filled in by the meteorologist using the VISSR Image Registration and Gridding System (VIRGS) program called WINDCO. WINDCO allows the meteorologist to display a series of registered full disc images, to identify and track successive cloud tracers, and to compute cloud motions or vectors. Vector heights are determined by referencing IR cloud temperatures to the heights of corresponding temperatures extracted from NMC vertical temperature profiles.

These wind fields are then returned from the VIRGS facility to the 360/195 computer where they can be: (1) used as input to NMC numerical weather prediction models; (2) distributed to world-wide users via teletype bulletin, and (3) copied to magnetic tape as archive for future user requests.

The extraction of wind field information from GOES data makes possible the determination of this important atmospheric parameter over large areas such as oceans, where conventional wind measurements are sparse or nonexistent.

WEFAX (Weather Facsimile)

The term WEFAX (Weather Facsimile) identifies both a communications subsystem and a service provided by and through the GOES. WEFAX was first introduced as a communications relay experiment on Applications Technology Satellite ATS-1, later included on ATS-3, and subsequently refined for incorporation on the GOES spacecraft. It involves acquisition and processing of satellite data on the ground, and retransmission of these data back through the geostationary spacecraft to relatively low-cost receiving units within receiving range of the spacecraft. The original data source of WEFAX products may or may not be the same spacecraft from which the WEFAX transmissions are received.

GOES WEFAX transmissions are made on S-band frequencies (1691.0 MHz). Automatic Picture Transmission (APT) ground stations, the most common recipients of ATS WEFAX data, required modifications in order to be able to receive GOES S-band WEFAX broadcasts. These modifications were primarily in the nature of conversion systems for receiving and converting the 1691.0 MHz signal from GOES to the 137 MHz frequency used by the ATS satellites. This enabled existing receiving and facsimile recorder equipment to be used to the maximum possible extent.

In 1979 NESDIS established a dedicated WEFAX experimental service from a satellite located at 107° W. This service, referred to as GOES Central, uses an earlier GOES spacecraft no longer suitable for imaging.

Geostationary environmental satellites originally launched by other nations as part of the First GARP Global Experiment (FGGE) also provide WEFAX services. Compatibility among the WEFAX communications subsystems on all of these spacecraft does exist and permits transient vessels or fixed ground stations the option of selecting WEFAX broadcasts from whichever spacecraft best meets their existing data requirements. Commonality in ground receiving equipment also exists; schedules and products, however, vary. Following is a brief description of the capabilities and constraints affecting GOES WEFAX products and schedules:

Transmission Schedules (GOES-East and GOES-West)

With certain exceptions, WEFAX data are transmitted in 10-min time slots, at half-hourly intervals, 24 hr per day. These ordinarily follow the 20-min VISSR image acquisition periods. Broadcasts are staggered between GOES-East and GOES-West, that is, both satellites are not broadcasting WEFAX data at the same time.

In theory, there are 48 10-min time slots (2 per hr) available on each spacecraft for WEFAX broadcasts. In practice, however, six 10-min time slots are reserved for operation of the trilateration ranging system. In addition, a block of time is reserved for the twice yearly spacecraft eclipse periods centered on spacecraft midnight. Consequently, only about 35 10-min time blocks are available for WEFAX broadcasts. These are not distributed evenly throughout a 24-hr period because of the constraints noted above.

Transmission Schedule (GOES-Central)

Since there is no VISSR operation on the GOES-Central, WEFAX broadcasts can be made anytime during the hour. Daily exceptions to this schedule occur during a block of time reserved for ground station preventive maintenance and the twice yearly spacecraft eclipse periods. WEFAX broadcast schedules are contained in operational messages transmitted once each day via each of the three spacecraft. In addition, they are often listed in W-series APT Information Notes distributed by the NOAA Coordinator for Weather Facsimile Services. Notes containing these schedules (and other operational and planning information) are distributed whenever there are long-term schedule changes or other important activities affecting transmission or reception of WEFAX broadcasts. Predictable long-term changes result from changes in operating procedures, product changes, satellite ground system component failures, and for other reasons.

VISSR Imagery

The majority of products transmitted on WEFAX are derived from VISSR instruments on board the GOES-East and GOES-West spacecrafts. All of these imagery products are transmitted as pairs of related data sectors, that is, each broadcast consists of two sector images related by time or geography.

The primary WEFAX product is sectorized full disc VISSR visible and infrared 7 km resolution imagery transmitted as quadrant pairs. A full disc view, either visible or IR, is recorded on tape and formatted for transmission as a WEFAX image. The equipment which formats the VISSR image for transmission as a WEFAX product begins its horizontal line search (scanning) at the northern extremity of the image. Therefore, a northern quadrant (NW or NE) is transmitted first. Northern quadrants cover an area from the Equator to 60° N, and 60° east or west of the subsatellite point, and show the curvature of the earth. The second sector transmitted is a southern (SW or SE) quadrant. Southern quadrants also cover an area 60° south of the Equator and approximately 60° east and west of the subsatellite point. These two images constitute an east or west hemispheric data pair. Approximately one-half hour later, the opposite quadrants are transmitted. When assembled, the 4 sectors depict the full disc earth view.

In addition to quadrant pairs, sectors covering tropical areas are also transmitted as related data pairs. These are referred to as Tropical East and Tropical West sectors. Both cover an area between 25° N and 15° S. The Tropical-East sector extends eastward approximately 60° from the subsatellite point, while the Tropical-West sector extends an equal distance west of the subpoint. The resolution is 7 km, the same as quadrant data.

Although VISSR images are received every half-hour, only those visible and IR images received at or near synoptic times (00Z, 03Z, etc.) are transmitted on WEFAX.

Polar Imagery

Approximately one-third of the imagery transmitted on GOES WEFAX are derived from low resolution visible and IR observations recorded on-board NOAA's polar orbiting spacecraft. These are processed mapped and reformatted for WEFAX transmission. Polar stereographic mapped quadrants, from the Northern and Southern Hemispheres, together with mercator projection mapped data are used.

Both products present 7 to 14 km resolution data. Imagery contained in these broadcasts are compiled from observations acquired on several orbits and are not synoptic data. However, such observations afford global views of cloud features, including areas of the Arctic and Antarctic, which cannot be observed from geostationary satellites.

National Meteorological Center (NMC) Charts

NMC charts which are broadcast via WEFAX are computer generated meteorological charts. These charts were first introduced on the GOES-Central as a test program which proved to be very satisfactory. After the charts are generated in the 360/195 computer they are stored on disc. When scheduled for transmission they are routed through the NMC communications computer to the NESDIS WEFAX operations area. These charts are manually patched through distribution panels direct to Wallops.

TBUS Bulletins

The APT Predict (TBUS) bulletins are a U.S. National Practice Code form defined in the World Meteorological Organization (WMO) Manual on Codes, Volume II. These bulletins are broadcast daily for each of the TIROS-N Series polar-orbiting satellites. Each bulletin contains ephemeris data for orbital predictions. Like the NMC charts, the TBUS bulletins are generated daily in the NOAA 360/195 computer and are manually patched through distribution panels direct to Wallops.

Simultaneous VISSR/WEFAX Operations

Simultaneous VISSR/WEFAX operations are conducted on both Goes-West and GOES-East. These are scheduled as part of the normal operation in order to transmit more information. Also, during designated storm days which are initiated by the Kansas City Satellite Field Services Station in support of the Severe Local Storms Unit, simultaneous VISSR/WEFAX are conducted on GOES-East on a continuous basis except for one 30 min. period every 3 hours that is used to ingest a full disc image. Storm days require Rapid Interval Scan Operations (RISOP), or partial disc imagery, every 15 min. There is no change in the WEFAX broadcast schedule but there is a reduction in power by 6 dBm on the WEFAX uplink signal to the spacecraft. This in turn reduces the power of the WEFAX signal emanating from the spacecraft by 12 dBm resulting in degraded signal reception for many WEFAX receivers. There are other rapid interval scanning operations such as Research Rapid Scan Days (RRSD) and Hurricane Research Days (HRD) which follow the same full disc VISSR image ingest schedule every 3 hours to support the WEFAX schedule.

Obtaining Additional Information

Requests for information on ground equipment requirements, data reception, and WEFAX schedules and products may be addressed to:

Coordinator, Weather Facsimile Services
National Enviromental Satellite, Data, and
Information Service
National Oceanic and Atmospheric Administration
E/SP21, WWB, Room 806
Washington, D.C. 20233

For more detailed information users should refer to the NESDIS WEFAX User's Guide.

Data Collection System (DCS)

The GOES Data Collection System (DCS) has been established for collecting environmental data from almost any location in the Western Hemisphere. The DCS has been sized to provide approximately 10,000 messages per hour per spacecraft utilizing more than 100 separate channels on each spacecraft. The satellite serves as a communications relay device from the individual data-gathering platforms. These platforms are called Data Collection Platforms (DCPs) and are remotely located. The DCPs transmit their data through the GOES satellites to the Command and Data Acquisition (CDA) ground station, located at Wallops, Virginia. These data are relayed from the CDA by conventional communications means to the GOES DCS control center at the World Weather Building (WWB) near Washington, D.C. The user may obtain the data from the WWB by dial-in telephone at various data rates or receive the data directly from the satellite by building an appropriate ground station. In summary, major elements of the GOES DCS are two operational goestationary satellites, DCP's, CDA, and DCS control center which is located at the WWB.

The GOES DCS provides the capability to monitor environmental emergency conditions such as flash floods, seismic and tsunami events, and hurricane activity as well as more routine but significant environmental information. The GOES DCS has been specially designed to accomodate these programs by offering high reliability. This feature is made possible by providing redundancy throughout the ground system and in the satellites. In addition, GOES DCS has the capability of working with a spare satellite located midway between the west and east operational satellites in the event that a major failure occurs on one or both of the primary satellites or during eclipse periods.

Program Management

Organizations that plan to collect data utilizing GOES DCS must forward a request to NESDIS for participation. The request and approval by NESDIS would establish that organization as a user of the GOES DCS.

In general these procedures state that after NESDIS has received a request for participation in the system, NESDIS will respond by sending information on GOES DCS and a questionnaire. When the questionnaire is completed and returned to NESDIS, it will be processed internally and, if accepted, a Memorandum of Agreement (MOA) will be negotiated.

After a user has been accepted into the program, the user will require transmission times on particular frequencies or channels. In consultation with the user, NESDIS assigns these channels and transmission times along with the unique identification or address for each DCP.

Data Collection Platform

The DCP is designed to accept data from a wide variety of sensors. There are three types of DCPs; self-timed, random reporting, and interrogated. The user's data requirements determine the type of DCP.

Additional information pertaining to the GOES DCS may be obtained from NESDIS Technical Memorandum 1 or by contacting:

Chief, Data Collection and Direct Broadcast Branch
National Environmental Satellite, Data, and
Information Service
National Oceanic and Atmospheric Administration
E/SP21, WWB, Room 806
Washington, D.C. 20233

Telephone: 301-763-8325

Section 5

GOES DISTRIBUTION SYSTEM

The GOES-TAP Program

The GOES-TAP Program provides high quality satellite imagery to government and commercial users on a real-time basis. To receive satellite data, a user must acquire appropriate telephone communications, purchase or lease terminal display equipment, consummate an agreement with the government, and pay both an initial connection fee and annual service fee.

Satellite imagery is initially processed through the World Weather Building in Camp Springs, Maryland. The data are converted into an analog facsimile format and disseminated via private telephone lines to the Satellite Field Services Stations (SFSS). The SFSSs are located at Washington, D.C.; San Francisco, California; Honolulu, Hawaii; Kansas City, Missouri; Anchorage, Alaska; Miami, Florida; and New Orleans, Louisiana. These sites were selected due to their proximity to key National Weather Service (NWS) facilities and serve as major distribution points for NWS and GOES-TAP users.

WSFO-TAP PROGRAM

Another method of receiving satellite imagery is to make a connection to a National Weather Service (NWS) dedicated telephone line. This method is termed WSFO-TAP (Weather Service Forecast Office Tap) and requires a written agreement with the NWS. There is no charge by the government for this service. Also, due to usually shorter telephone lines, the line cost is less. The user should note: WSFO-TAP customers do not have the capability to select sectors and will receive only data selected by the WSFO. Requests for information concerning a WSFO-TAP should be addressed to: NOAA/NWS, Communications Divison (W53), Gramax Building, Room 1316, Silver Spring, Maryland 20910. The user may also contact the local WSFO for additional information.

Additional Satellite Imagery Available on The GOES-TAP System:

AVHRR

Advanced Very High Resolution Radiometer (AVHRR) imagery from NOAA's polar-orbiting satellites is available to most GOES-TAP customers. These data, although spatially and temporally

limited, have resolutions of 1 km in all wavelength channels. AVHRR data have proven to be a very useful diagnostic tool in the fields of meteorology, oceanography, and hydrology. For further information concerning AVHRR data availability contact the nearest SFSS.

Geostationary Meteorological Satellite (GMS)

Japan operates one geostationary satellite, GMS, which has a satellite subpoint at 140° E. This position gives GMS an areal coverage from the South Pacific to Siberia, and from Hawaii to India. Limited amounts of GMS data are available to GOES-TAP customers. GMS data is transmitted in WEFAX format (240 LPM). For further information concerning availability of GMS data contact the nearest SFSS.

European Geostationary Meteorological Satellite (METEOSAT)

The European Space Agency operates a geostationary satellite, METEOSAT, which has a subpoint at 0° longitude. This position gives METEOSAT an areal coverage from the South Atlantic to Greenland and from Saudi Arabia to Brazil. This satellite offers visible, infrared, and moisture channel data. Limited amounts of METEOSAT data, also in WEFAX format, are available to GOES-TAP customers. For further information concerning availability of METEOSAT data please contact the nearest SFSS.

Telephone Lines

NESDIS requires that GOES-TAP users install a full duplex, private voiceband data circuit of at least C-2 quality (C-2 is a Bell System specification). Full duplex (which means the ability to transmit simultaneously in both directions) is required to provide the user with the means to make data selections at the SFSS by using a touchtone transmitter and to allow loopback circuit testing by the carrier.

GOES-TAP users must order, pay for, and maintain their own data circuit, display, and touchtone transmitter. The SFSS will provide basic data circuit testing services upon request. This consists of inserting test signals to the user and evaluating touchtone signals transmitted by the user to the SFSS. The user will initiate trouble calls to their carrier.

The Bell System is the most widely available and frequently used carrier for these data circuit services. AT&T provides an interexchange service, and the Bell operating companies provide local circuits between the SFSS and the nearest AT&T exchange

and between the user's location and the nearest AT&T exchange. These three interconnected segments provide an end-to-end service. Other interstate carriers exist that may provide better performance and/or lower cost. These other carriers may subcontract the local circuit segments, but will serve as prime contractor or single point responsibility for end to end service. Costs and circuit performances of carriers other than AT&T depend largely upon circuit availability and the type of equipment used between the end points involved in each unique circuit routing.

These analog facsimile transmissions are especially vulnerable to degradations of signal to noise ratio, gain variations, impulse noise, and tone interferences. NESDIS's experience to date has been that circuit routing by satellite has provided better performance than land line circuits. Also, circuit facilities that utilize Time Division Multiplexing facilities (analog to digital conversion, interstate transmission, then digital to analog conversion) provide better performance than analog transmission.

Circuits can be ordered from the Bell System by contacting your local Bell Company business office. The description of desired service (below) may not be adequate at all local offices. The following AT&T contact is familiar with NESDIS services and should be referenced when ordering services: NESDIS Account Executive: 202:457-3655.

RCA American Communications is known to have facilities available on certain routes and is familiar with NESDIS requirements. Contact: Charles Haught: 609:734-4008. Other carriers may exist that offer applicable services. NESDIS does not endorse the aforementioned companies in any way.

The following format should be used when ordering a GOES-TAP circuit:

- Voiceband private line data circuit
- C-2 conditioning
- Full period
- Full duplex
- Standard 0 dbm transmit
- Non-standard receive level of 0 dbm*
- Organization, address, contact, and phone number at each end of the circuit. This information for the SFSS end is included in this section.

For WSFO TAP connections, customers should obtain the circuit number from the WSFO and then contact the AT&T Extension Services Group at 800-424-2939 or 202-457-2847 (Ella Sperovich). The following format should be used when ordering a WSFO-TAP circuit:

- o Voiceband private line data circuit
- o C-2 conditioning
- o Full period
- o Simplex - receive only
- o Standard receive level of -16 dBm
- o To be connected to circuit number _____ at the nearest available location.
- o Organization, address, contact, and phone number at the customer's location.

*NOTE: Since the beginning of the GOES data distribution program, GOES-TAP users have been instructed to order "0 dBm receive levels" (as opposed to the industry standard of -16 dBm), and provide a customer activated loop-back switch. NESDIS is now aware of compatability problems between the 0 dBm receive level and carrier terminal equipment. The purpose in 0 dBm receive was to facilitate circuit loopback testing services by the SFSS personnel. Since touchtone equipment has been installed at the SFSSs, the purpose has diminished because the user's touchtone transmitter can now also serve as a test signal source.

NESDIS is ordering modifications to its touchtone equipment at the SFSSs. Installation is not expected to be completed until the last half of 1983. Circuits ordered before then must be 0 dbm receive at the SFSS. The user's receive level can be ordered at -16 dBm; but the user must insure compatiability with display recorder receive level.

User Interface Equipment

Introduction

GOES-TAP customers of the Washington, D.C., Miami, Fla., Kansas City, Mo., and Redwood City, Calif., Satellite Field Services Stations can select their data products by using a touchtone transmitter. The transmitter is used to make product selection switches at the SFSS. This section provides a description of that system from the user's viewpoint and provides a recommended equipment configuration for the user's terminal.

The user terminal consists of a display recorder and a touchtone transmitter. A speaker is needed for monitoring incoming signaling tones from the SFSS touchtone equipment. Most display devices contain a speaker for monitoring the facsimile

signal and can also be used for monitoring the signaling tones. A list of known display recorders vendors is included in this section.

Touchtone Operating Procedures

The GOES-TAP user depresses the "service request" key (#). This alerts the SFSS switching system that a change is being requested. When the system is ready to accept the request, a dial tone is returned to the GOES-TAP user. The time required to access the system depends upon the number of users who simultaneously make requests. The user then dials a two digit code which corresponds to a desired product on the data menu, as shown in Section 8. This code is acted upon immediately by the switching system, and 900 hz tone is transmitted to the GOES-TAP user to signify that the data change is completed.

NOTE: After a customer has accessed the system by receiving the dial tone, the two digit code must be dialed within 10 seconds or the switching system will drop the system access condition and dial tone and will service the next user in line. The first user must again depress the "service request" key in order to get back in line.

Touchtone Transmitter

Touchtone transmitters can be obtained from several sources. The following list is known to be available or in use by GOES-TAP customers; NESDIS does not endorse these components in any way.

1. A completely assembled touchtone system can be purchased from United Press International for about $275. This system consists of a standard handset type touchtone telephone and an AC powered voltage supply. Contact: Ian Smith at 201-273-3261.

2. A battery powered portable unit is manufactured by Interface Technology, Inc. The unit is the Model 728 "port-a-tone" 12 key, without "talk-thru." The unit must be modified by installing an isolation transformer between the output and the phone line. A TRW/UTC DOT-41 will fit inside the case of the 728. The printed circuit must be altered slightly to install the transformer at the output miniature phone jack. The 728 is delivered with an acoustic coupler on a patch cord. The patch cord, with the coupler removed, can be used to connect with the phone line. The unit sells for about $75, plus about $15 for the transformer. Contact: Karen Zienta at 1-800-325-1558 or 314-426-6880.

3. Radio Shack now markets a touchtone pad for do-it-yourselfers. This unit does not produce 0 dBm output (an amplifier is required), is not packaged, and does not contain battery or transformer. These tasks must be done by the GOES-TAP customer. The basic pad sells for about $20, including crystal.

Terminal Display Equipment

Terminal display equipment may be of any type so long as it is compatible with the signal characteristics listed later in this section. Cost of such equipment varies with system capability; a cost of $11-28K should be expected.

A list of known commercial vendors of display devices is included later in this section. This does not necessarily represent a complete list of commercial manufacturers capable of providing appropriate display devices, nor does it imply in any way government approval of these, nor rejection of equivalent devices.

AGREEMENT, EXECUTION, AND PROCESSING

Permission to connect onto the GOES Central Data Distribution System (CDDS) will be granted only upon proper execution of the Agreement between the Government and the User. This Agreement defines the Government's responsibilities in providing this service. The effective date of the Agreement will be the date the user's communication line is connected into the appropriate SFSS. The connection cannot be made until the signed Agreement and the connection fee are received. Advance notice of at least 30 days should be provided so appropriate arrangements can be made. Agreements should be completed and forwarded to:

NOAA/NESDIS, Satellite Services Division
E/SP2, World Weather Building, Room 607
Washington, D.C. 20233
Attention: GOES-TAP
Telephone: 301-763-8051

Upon completion of the connection, a copy of Agreement, signed by the designated government representative, will be returned to the user.

COST FOR GOES-TAP

For Permanent Connection: A non-refundable one-time charge of $1,000.00 to cover expenses involved in initial connection will be charged each user. In addition, a minimum annual recurring cost currently established at $100.00 will be charged for the SFSS services provided.

For Temporary Connection: A one-time non-refundable fee of $250.00 for a 3-mo. period, $500.00 for a 6-mo. period, and $750.00 for a 9-mo. period to cover expenses of establishing the connection will be charged. In addition, a minimum service fee, currently established at $25.00 for 3-mos., $50.00 for 6-mos., and $75.00 for 9-mos. will be charged for SFSS services provided during the temporary period. A temporary connection cannot be renewed. If continuation of service is desired, the cost will revert to the normal one-time non-refundable fee of $1,000.00 and annual recurring service charge of $100.00. In order for a user to continue service beyond a specific temporary period, additional funds necessary to bring the connection and service charge up to the required fee for a permanent connection must be submitted.

PAYMENT PROCEDURE

A copy of the payment form (last page of Agreement) and signed Agreement should be properly executed and forwarded with payment at least 30 days prior to the established date with the telephone company for installation of the communications line. Checks should be made payable to: Department of Commerce/NOAA. Please include on the check the notation: "For GOES-TAP." The cancelled check will serve as a receipt. If payment is to be made by government purchase order or MIPR (Military Interagency Procurement Request), these should be forwarded to the same address with a copy of the enclosed payment form, completely filled out along with the signed Agreement. The purchase order or MIPR should clearly indicate that it is for a GOES-TAP at the appropriate SFSS (Miami, Washington, Kansas City, San Francisco, New Orleans, Honolulu, or Anchorage) to cover connection charges and recurring service fee. Correct billing addresses must be included. The requesting agency will be billed accordingly at a later date.

ADDITIONAL INFORMATION

If any additional information is needed, correspondence should be directed to the address or telephone number on the previous page.

Known Display Device Vendors

Alden Electronic & Impulse Recording Equipment Company
1 Washington Street
Westborough, Massachusetts 01581
Telephone: (617) 336-8851

Arvin-Diamond
4490 Old Columbus Road, NW
Carroll, Ohio 43112
Telephone: (614) 756-9211

Datalog Division, Litton Industries
1770 Walt Whitman Road
Melville, Long Island, New York 11747
Telephone: (516) 694-8300

Harris Corporation, Satellite Communications Division
P.O. Box 1700
Melbourne, Florida 32901
ATTN: Bill O'Connor
Telephone: (305) 724-3000

EMR Telemetry
P.O. Box 3041
Sarasota, Florida 33578
ATTN: Weather Data System, Steve Carper
Telephone: (813) 371-0811

Muirhead Instruments, Inc.
1101 Bristol Road
Mountainside, New Jersey 07092
Telephone: (201) 223-6010

IPS
70 Glenn Way
Belmont, California 94002
Telephone: (415) 592-1742

SYNSAT Communications/Northern Videographics
5202 Grandview Lane
Minneapolis, Minnesota 55436
ATTN: John Uldrich
Telephone: (612) 927-0641

United Press International
220 East 42nd Street
New York, New York 10017
ATTN: Ian Smith
Telephone: (212) 850-8685 or (201) 273-3261

NOTE: The above does not necessarily represent a complete list of compatible display device manufacturers. It is provided only as an aid for potential GOES-TAP users to obtain information regarding display devices compatible with the GOES system. No U.S. Government endorsement is implied.

Known Touchtone Vendors for the GOES-TAP Customer Controlled Switching System

United Press International
220 East 42nd Street
New York, New York 10017
ATTN: Ian Smith
Telephone: (201) 850-8685 or (201) 273-3261

Interface Technology Inc.
10500 Kahlmeyer Drive
St. Louis, Missouri 63132
ATTN: Karen Zienta
Telephone: (314) 426-6880 or 1-800-325-1558

NOTE: The above does not necessarily represent a complete list of compatible touchtone vendors. It is provided only as an aid for potential GOES-TAP users to obtain information regarding touchtone vendors compatible with the GOES system. No U.S. Government endorsement is implied.

SATELLITE SERVICES DIVISION (SSD)
SATELLITE FIELD SERVICES STATIONS (SFSS)

Gary Hufford, Manager, E/SP2A
Satellite Field Services Station
Box 45, 701 C Street
Anchorage, Alaska 99513
Telephone: FTS (907) 271-3473
COM (907) 271-3473

Robert Pyle, Manager, E/SP2H
Satellite Field Services Station
Honolulu International Airport
Tower Building, Room 514
Honolulu, Hawaii 96819
Telephone: FTS (808) 836-2776
COM (808) 836-2776

Ronald Gird, Manager, E/SP2K
Satellite Field Services Station
601 E 12th Street Room 1724D
Kansas City, Missouri 64106
Telephone: FTS 758-5410
COM (816) 374-5410

Donald Gaby, Manager, E/SP2M
Satellite Field Services Station
1320 S Dixie Highway, Room 619
Coral Gables, Florida 33146
Telephone: FTS 350-4310
COM (305) 350-4310

Billie Aldridge, Manager, E/SP2F
Satellite Field Services Station
660 Price Avenue
Redwood City, California 94063
Telephone: FTS 470-9122
COM (415) 364-2422

Harold Headlee, Manager, E/SP2W
Satellite Field Services Station
World Weather Building
Washington, D.C. 20233
Telephone: FTS 763-8239
COM (301) 763-8239

Richard Clark, Manager, E/SP2S
Satellite Field Services Station
1120 Old Spanish Trail
Slidell, Louisiana 70458
Telephone: FTS 682-2807
COM (504) 649-5130

FOR FEDERAL GOVERNMENT AGENCIES

INTERAGENCY AGREEMENT

BETWEEN

NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

AND

_____

_____

(USER)

AGREEMENT FOR ACCESS TO METEOROLOGICAL
SATELLITE IMAGERY DATA

THIS AGREEMENT is entered into pursuant to the Economy Act, 31 U.S.C. 686, between the National Environmental Satellite, Data, and Information Service (NESDIS), National Oceanic and Atmospheric Administration (NOAA) and _____(Hereinafter referred to as the User.) In order to provide for the use of meteorological satellite data, the parties hereby mutually agree:

RESPONSIBILITIES

A. NESDIS agrees -

(1) To authorize User to connect appropriate telephone communications, provided by User, to Meteorological Satellite imagery data at the Satellite Field Services Station located at _____.

(2) To furnish User a connection at the Satellite Field Services Station specified in subparagraph (1) above, upon payment by User of an initial attachment fee to cover the expense thereof.

(3) To service and maintain the connection at the specified Satellite Field Services Station, upon payment by User of an annual service fee.

(4) To provide an automatic product switching system service at the Miami, Washington, San Francisco, and Kansas City SFSSs. Limited manual switching service is available at the New Orleans, Hawaii, and Anchorage SFSSs.

B. User agrees -

(1) To pay all NESDIS costs and expenses resulting from this agreement, both direct and indirect. These costs shall be payable as follows:

a. A one-time connection fee of one thousand dollars ($1,000) to cover the expense of establishing a connection at the specified Satellite Field Services Station.

b. An annual service fee of one hundred dollars ($100) per year (fiscal year basis).

(2) To obtain a Touchtone Interface System for SFSS connections requiring touchtone sector selection.

(3) The frequency of User requests for changes in area of data coverage may be limited by NESDIS and no request for retransmission of data will be entertained. NESDIS does not guarantee the frequency or continuity of data, its form, or area of coverage.

(4) If User should remote the electronic signal, in its original form, to any other point, User will so notify NESDIS immediately. In such case the NESDIS will not insure the quality of the signal received by User or those who have remotes off the User. NESDIS will not provide diagnostic testing of the communications line between the SFSS and the User facility. The SFSS will provide sector change service and imagery interpretation to User only.

(5) NESDIS will not be responsible for maintenance service of User terminal equipment or for coordination with the telephone company regarding communications problems associated with facilities leased by User. Where lower grade lines than C-2 are used, NESDIS will not offer line check evaluation service. NESDIS insists on a 0 dBm normal insertion level at the SFSS regardless of the type of line used.

(6) Automatic notifications of satellite imagery schedules cannot be provided by NESDIS. It will be the responsibility of the User to contact the Satellite Field Services Station for information if imagery is not received. In addition, meteorological interpretation services will be provided to the User on a noninterference basis only. Operational support to NESDIS users will remain as first priority.

EFFECTIVE DATE

THIS AGREEMENT is effective as of _____ (date of connection) and shall be renewed annually (fiscal year basis) unless terminated by either party. Request for renewal should be forwarded with the annual service fee, to NOAA/NESDIS, Satellite Services Division, E/SP2, Room 607, World Weather Building, Stop I, Washington, D.C., 20233, 30 days prior to expiration date.

TERMINATION

Either party may terminate this AGREEMENT by providing 30 days written notice to the other party. User will not be refunded any of the payments provided for under this AGREEMENT.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the date first written.

USER

National Oceanic & Atmoshperic Admin.
National Environmental Satellite,
Data, and Information Service

BY: _____
(signature)

BY: _____

Chief, Satellite Services Division
National Environmental Satellite,
Data, and Information Service

TITLE: _____

Date:

Subject: GOES-TAP Payment

To: NOAA/NESDIS, Satellite Services Division
E/SP2, Room 607, WWB, Stop I
Washington, D.C. 20233
Attn: GOES-TAP

Enclosed is a (check) (purchase order) (MIPR) for $ _____ payable to Department of Commerce/NOAA for a GOES-TAP on the SFSS at (Washington) (Kansas City) (Miami) (San Francisco) (Honolulu) (Anchorage) (New Orleans) which will be terminated at _____. The enclosed payment
(Location Address of Display Equipment)

covers the connection charge of $_____ and the recurring service charge of $ _____ for the period _____ to _____. My official
day/month/year day/month/year

address is:

_____
(Name of Government Agency)

_____
(Address of Government Agency)

_____
(Phone No. of Personal Contact)

DO NOT WRITE BELOW THIS LINE

1. Payment of $_____ received _____. _____
(amount) (date) (SSD initials)

2. (MIPR) (Purchase Order): _____. Bill forwarded _____.
(date received) (date)

Check received _____.
(date)

3. Task Code: _____. 4. User Agreement Received: _____.
(date)

4. Signed Agreement Returned _____. 6. Connection made,
(date)

Agreement effective _____. 7. Remarks:
(date)

AGREEMENT

Between

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

AND

_____

_____

(USER)

UNITED STATES DEPARTMENT OF COMMERCE

WASHINGTON, D. C.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

AGREEMENT FOR ACCESS TO METEOROLOGICAL SATELLITE IMAGERY DATA

THIS AGREEMENT is entered into on this _____ day of _____ 19 , between the United States of America, Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, hereinafter referred to as the Government, and _____ hereinafter referred to as the User. In order to provide for the use of meteorological satellite data the parties hereby mutually agree:

RESPONSIBILITIES.

A. Government agrees -

(1) To authorize the User to connect appropriate telephone communications, provided by the user, to Meteorological Satellite imagery data at the Satellite Field Services Station located at _____.

(2) To furnish the User a connection at the Satellite Field Services Station specified in subparagraph (1) above, upon payment by User of an initial attachment fee to cover the expenses thereof.

(3) To service and maintain the connection at the specified Satellite Field Services Station, upon payment by User of an annual service fee.

(4) To provide an automatic product switching system service at the Miami, Washington, San Francisco, and Kansas City SFSSs. Limited manual switching service is available at the New Orleans, Hawaii, and Anchorage SFSSs.

B. User agrees -

(1) To pay all costs and expenses resulting from this agreement:

a. A one-time non-refundable connection fee of one thousand dollars ($1,000) to cover the expense of establishing a connection at the specified Satellite Field Service Station and

b. An annual service fee of one hundred dollars ($100) per year to cover the Government's expense in maintaining the service provided herein.

(2) To obtain a Touchtone Interface System for SFSS connections requiring touchtone sector selections.

(3) For telecasting or other release of meteorological satellite derived information to the general public:

a. No visual commercial message shall be superimposed on the picture of the Government image at any time; there shall be nothing in the announcements associated with these telecasts to indicate or imply that the Government endorses any commercial product advertised.

b. To give full credit and identification of the imagery received and to take due care to avoid the implication that interpretations by others are those of the Government.

(4) To assume full responsibility for the use made of any information telecasted or otherwise disseminated, and to hold the Government and its employees harmless for any damage whatsoever which may arise from the use thereof.

(5) To obtain any necessary permits and to abide by all applicable rules, regulations, or laws pertaining to agreements with the Government.

(6) If the User should remote the electronic signal, in its original form, to any other point, User will so notify the Government immediately. In such case the Government will <u>not</u> insure the quality of the signal received by User or those who have remotes off the User. The Government will <u>not</u> provide diagnostic testing of the communications line between the SFSS and the User and will only insure the insertion of a 0 (zero) dBm signal into the line. In addition, the SFSS will provide sector change service and imagery interpretation to the User only.

(7) The Government will <u>not</u> be responsible for maintenance service of user terminal equipment or for coordination with the telephone company, concerning communications problems associated with facilities leased by the User. If the communications line leased by the User is of a quality lower than C-2, the Government will only be responsible for the insertion of a 0 (zero) dBm signal into the line.

(8) The frequency of User requests for changes in area of data coverage may be limited by the Government and no requests for retransmission of data will be entertained. The Government does not guarantee the frequency or continuity of data, its form, or area of coverage.

(9) Automatic notifications of satellite imagery schedules cannot be provided by the Government. It will be the responsibility of the User to contact the Satellite Field Services Station for information if the image is not received. In addition, meteorological interpretation services normally provided by the Satellite Meteorologist at the Field Services Station will be provided upon request by the User on a noninterference basis only. Operational support to NOAA users will remain as first priority.

EFFECTIVE DATE

THIS AGREEMENT is effective as of_____ (date of connection) and shall be renewed annually unless terminated by either party. Request for renewal should be forwarded, with the annual service fee, to NOAA/NESDIS Satellite Services Division, E/SP2, Room 607, World Weather Building, Stop I, Washington, D.C. 20233, 30 days prior to the expiration date.

TERMINATION

User may terminate this AGREEMENT with or without cause upon providing 30 days written notice to the Government. The Government may terminate this AGREEMENT, after 30 days written notice to User, whenever:

(1) The Assistant Administrator for Satellites, NOAA, shall determine that such termination is in the best interest of the Government; or

(2) The Assistant Administrator for Satellites, NOAA, shall determine that technological difficulties result from the connection provided for in this AGREEMENT.

The operation of the GOES-TAP system is subject to the availability of appropriated funds.

In the event of termination by either party, User will not be refunded any of the payments provided for under this AGREEMENT.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the date first written above.

USER	UNITED STATES OF AMERICA Department of Commerce National Oceanic & Atmos. Admin. National Environmental Satellite, Data, and Information Service
BY:_____ (signature)	BY:_____ (signature)
TITLE:_____	TITLE:_____

Date:

Subject: GOES-TAP Payment

To: NOAA/NESDIS, Satellite Services Division
E/SP2, Room 607, WWB, Stop I
Washington, D.C. 20233
Attn: GOES-TAP

Enclosed is a (check) (purchase order) (MIPR) for $_____ payable to Department of Commerce/NOAA for a GOES-TAP on the SFSS at (Washington) (Kansas City) (Miami) (San Francisco) (New Orleans) (Honolulu) (Anchorage) which will be terminated at _____. The enclosed payment covers the connection charge of $_____ and the recurring service charge of $_____ for the period _____ to _____. My official address is:
(Location Address of Display Equipment) day/month/year day/month/year

_____
(Name of firm)

_____
(Address of firm)

_____
(Phone No. and Personal Contact)

DO NOT WRITE BELOW THIS LINE

1. Payment of $_____ received _____. _____
(amount) (date) (SSD initials)

2. (MIPR) (Purchase Order): _____. Bill forwarded _____
(date received) (date)

Check received _____.
(date)

3. Task Code: _____. 4. User Agreement Received: _____.
(date)

5. Signed Agreement Returned _____. 6. Connection made,
(date)
Agreement effective _____. 7. Remarks:
(date)

ARCHIVAL DATA SERVICE

NOAA/NESDIS

The Satellite Data Services Division (SDSD) of the National Environmental Satellite, Data, and Information Service's National Climatic Center is the national archive for operational environmental satellite data and is responsible for the provision of all environmental satellite data to other users once the original collection purposes (i.e., current weather analysis and forecasting) have been satisfied. As such, it is the primary source from which retrospective users may obtain GOES data. SDSD is colocated with the operations center of NESDIS, expediting SDSD acquisition of data.

The SDSD archive of GOES data includes both full disc and sectorized images. Subsets of these data are available in digitical form on magnetic tape.

To meet the varied demands of its worldwide user community, SDSD offers GOES data in several standard formats which allow fixed user costs to be determined for each product type. Prices of these formats vary with the production costs and are reviewed and adjusted, if necessary, at least once annually. Cost for these data is basically that required for reproduction. GOES data can be ordered from the following address:

NOAA/NESDIS/NCC
Satellite Data Services Division (E/CC6)
World Weather Building, Room 100
Washington, D.C. 20233
Telephone: (301) 763-8111

The requester should furnish SDSD with as much of the following information as possible:

Satellite from which data are requested (GOES East or West).

Type of data needed: Visible or Infrared, sector or full disc.

Data format desired (print, transparency, etc.)

Use that will be made of the data.

Task number to be charged (Federal), or Purchase Order Number.

Address where data are to be sent, the telephone number, including area code.

Other information which might help SDSD personnel identify and locate the correct data from the archive.

Section 6

GOES IMAGERY AVAILABLE TO USERS

This Section covers the total inventory of GOES imagery available to all Satellite Field Services Stations. This inventory will be updated by amendments as required to meet new requirements and/or priorities of operations.

In general, standard Visible sectors (A, B, and C) at 1 km, 2 km, and 4 km resolutions will be produced during daylight hours. Equivalent IR sectors (A, B and C) of 1 km, 2 km, and 4 km geographical coverage (at 7 km resolution) will, in general, be produced during darkness. Certain standard sectors, as designated by NWS Regions, are produced on a "ping-pong" schedule (i.e., VIS, IR, VIS, IR) with different enhancement curves throughout existing daylight hours. Seasonal adjustments are implemented by appropriate SFSSs for changes from VIS to IR and IR to VIS. Schedules in this section will indicate specific products available from each SFSS in all 48 data periods.

SFSS Floater Capability

All SFSSs have floating sectors except Anchorage. The floater product schedule, including locations, resolution, VIS, IR, and enhancement, will be determined by each SFSS. All users can copy these floaters, if they desire, but must contact their appropriate SFSS to obtain the schedule or product availability for any given data period.

Central Data Distribution Facility Products

WB-1 (GOES-East)
WB-2 (GOES-West)
WC-1 Full Disc VIS (GOES-East)
WC-2 Full Disc VIS (GOES-West)

These products are not transmitted over the GOES communications network and are available only to the Washington complex and NESDIS Archive. Full Disc VIS GOES-East WC-1 is produced once an hour, on the hour. Full Disc VIS GOES-West WC-2 is produced once an hour at 45 min. after the hour. WB-1 is a 4 km geographical coverage sector with 2 km resolution from GOES-East. WB-2 is a 4 km geographical coverage sector with 2 km resolution from GOES-West.

Flash Flood (QPE) Support

This support requires production of 1 km equivalent IR sectors with MB enhancement curves. Whenever conditions indicate the possibility of flash flooding, the appropriate 1 km standard sector (from either the GOES-East or GOES-West) covering the threatened area will immediately be programmed to produce a 1 km equivalent IR with an MB enhancement curve.

The decision to switch to a Flash Flood sector will be made by the NESDIS Synoptic Analysis Branch supporting the Heavy Precipitation Branch (HPB) of the National Meteorological Center. Users copying the routine standard 1 km sector will then be aware of the possibility of a flash flood situation.

GOES System Status Notification Procedure

System Status Messages will be transmitted over all GOES-East communication lines (except the full disk IR line) at 0715Z and all GOES-West communication lines (except full disk IR) at 0730Z. Therefore, all users must have their display units on line at these times in order to receive system status information. Normal imagery transmitted at 0715Z and at 0730Z will not be sent.

Message transmission format is:

(EXAMPLE)

TO: ALL TERMINALS ON GOES DATA DISTRIBUTION SYSTEM
(GOES-EAST USERS ONLY) (GOES-WEST USERS ONLY)
(GOES E & W USERS)

FROM: CENTRAL DATA DISTRIBUTION FACILITY
WORLD WEATHER BUILDING, WASHINGTON.

DATE/TIME: (GOES-EAST 0715Z) (GOES-WEST 0730Z)

SUBJECT: SCHEDULE CHANGES FOR KANSAS CITY & SAN FRANCISCO USERS

ALL SFSSs ACKNOWLEDGE RECEIPT OF THIS MESSAGE VIA SS-4

(TEXT)

System status messages will cover outage information, schedule changes, and special operations plans implemented due to severe weather conditions (limited scan) or in support of special research programs. In addition, IR enhancement curves and associated example enhanced imagery will be transmitted at these designated data periods. Example enhanced imagery received should be saved by all users (to include in your Users Guide) since amendments to the guide will not include example photos for enhancement curves.

SAMPLE IMAGERY

GOES EAST

1.	Full Disc -	Infrared (7 km)	Figure 6-1
2.	UC-1	Visible (4 km)	Figure 6-2
3.	DA-1	Visible (1 km)	Figure 6-3
4.	DA-2	Visible (1 km)	Figure 6-4
5.	KA-3	Visible (1 km)	Figure 6-5
6.	KA-4	Visible (1 km)	Figure 6-6
7.	KA-5	Visible (1 km)	Figure 6-7
8.	DB-5	Visible (2 km)	Figure 6-8
9.	KB-8	Visible (2 km)	Figure 6-9

GOES WEST

1.	Full Disc -	Infrared (7 km)	Figure 6-10
2.	UC-2	Infrared (7 km)	Figure 6-11
3.	AC-1	Infrared (7 km)	Figure 6-12
4.	SA-1	Visible (1 km)	Figure 6-13
5.	SA-2	Visible (1 km)	Figure 6-14
6.	AA-1	Equivalent Infrared (1 km)	Figure 6-15
7.	SB-6	Visible (2 km)	Figure 6-16
8.	KB-7	Visible (2 km)	Figure 6-17
9.	AB-1	Equivalent Infrared (2 km)	Figure 6-18

NEW and EXPERIMENTAL PRODUCTS

1.	Water Vapor Image	Figure 6-19
2.	VIS/IR Composite Image	Figure 6-20
3.	METEOSAT Image	Figure 6-21
4.	GMS Image	Figure 6-22

NOTE: The geographical boundaries depicted by all GOES grids are not necessarily representative of official political boundaries.

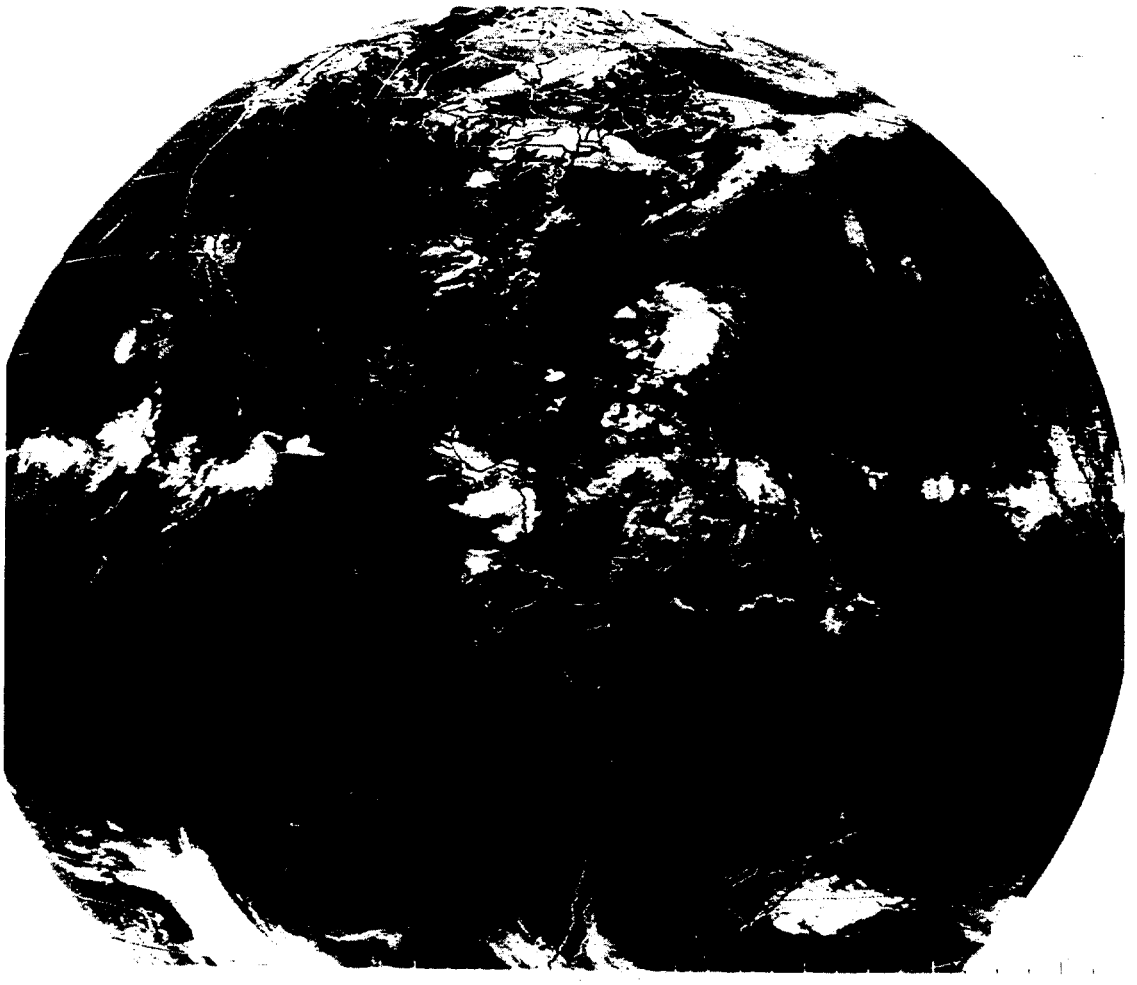


fig. 6-1 GOES EAST FULL DISC INFRARED (7 km)

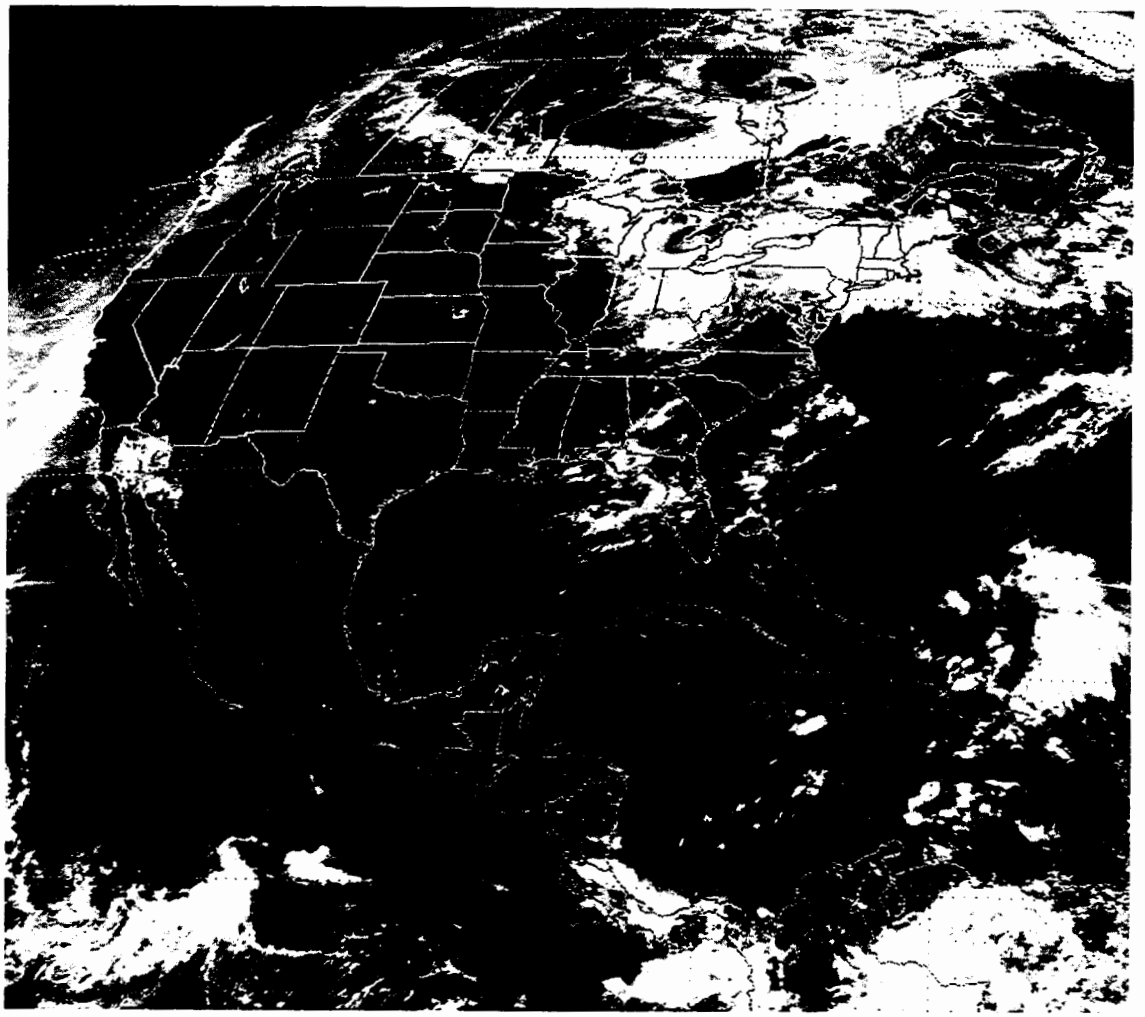


fig. 6-2 GOES EAST UC-1 VISIBLE (4 km)

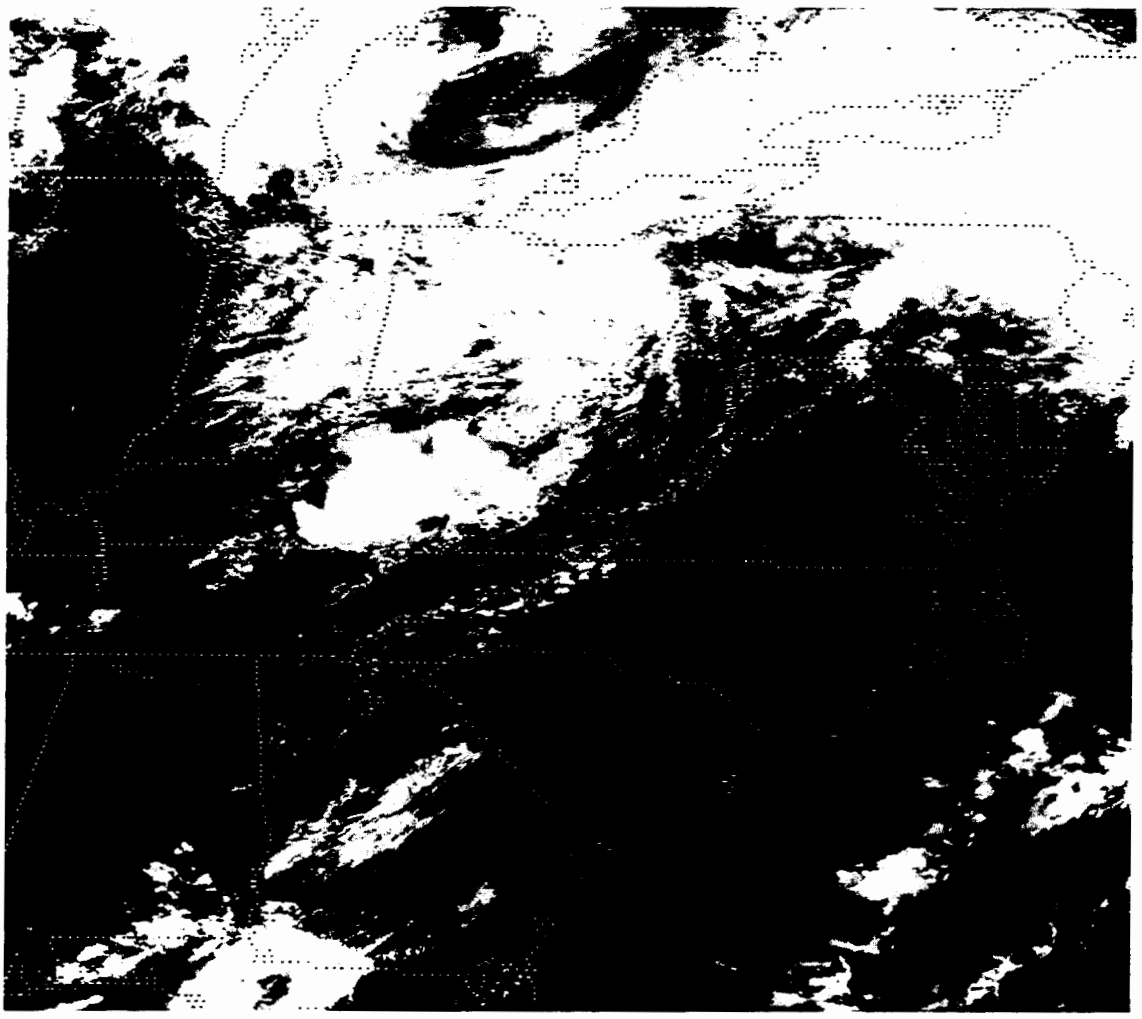


fig. 6-3 GOES EAST DA-1 VISIBLE (1 km)

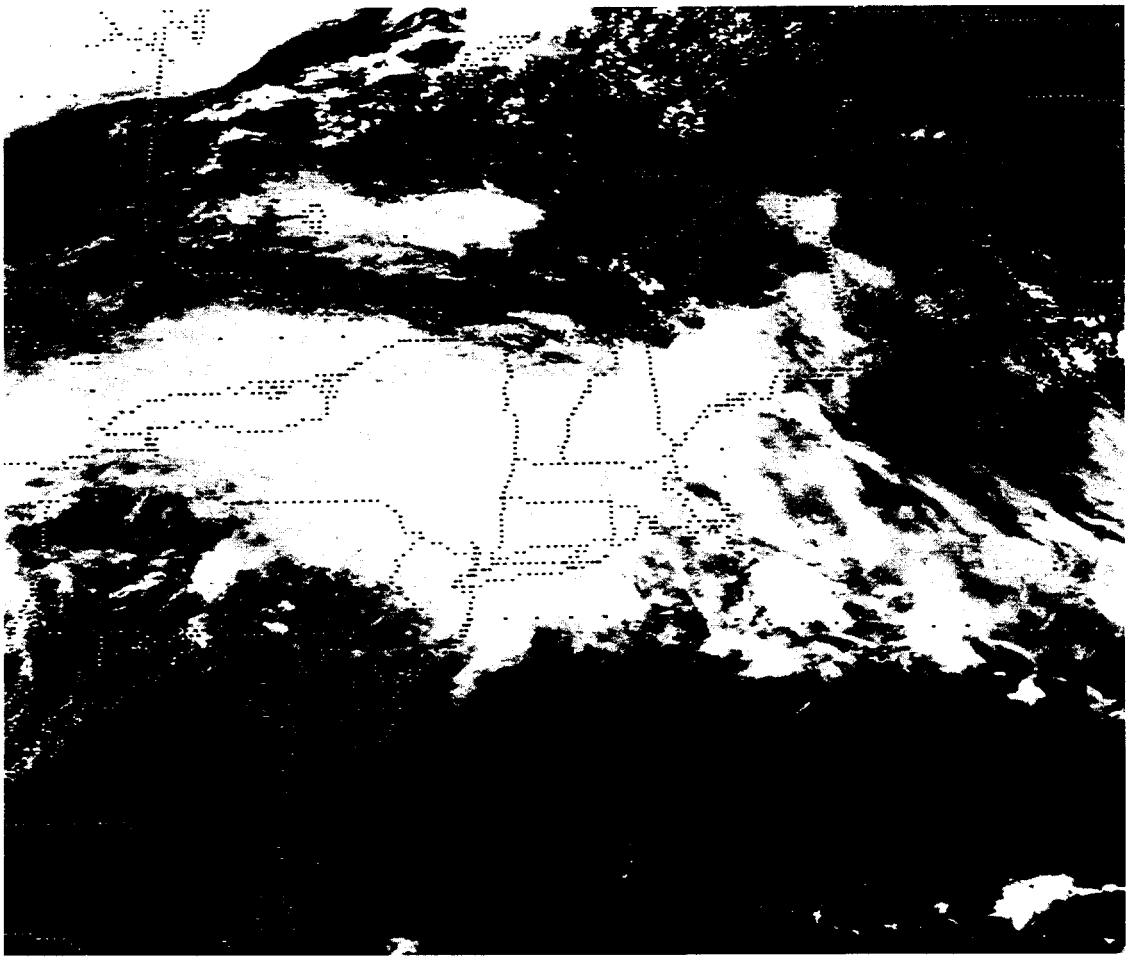


fig. 6-4 GOES EAST DA-2 VISIBLE (1 km)

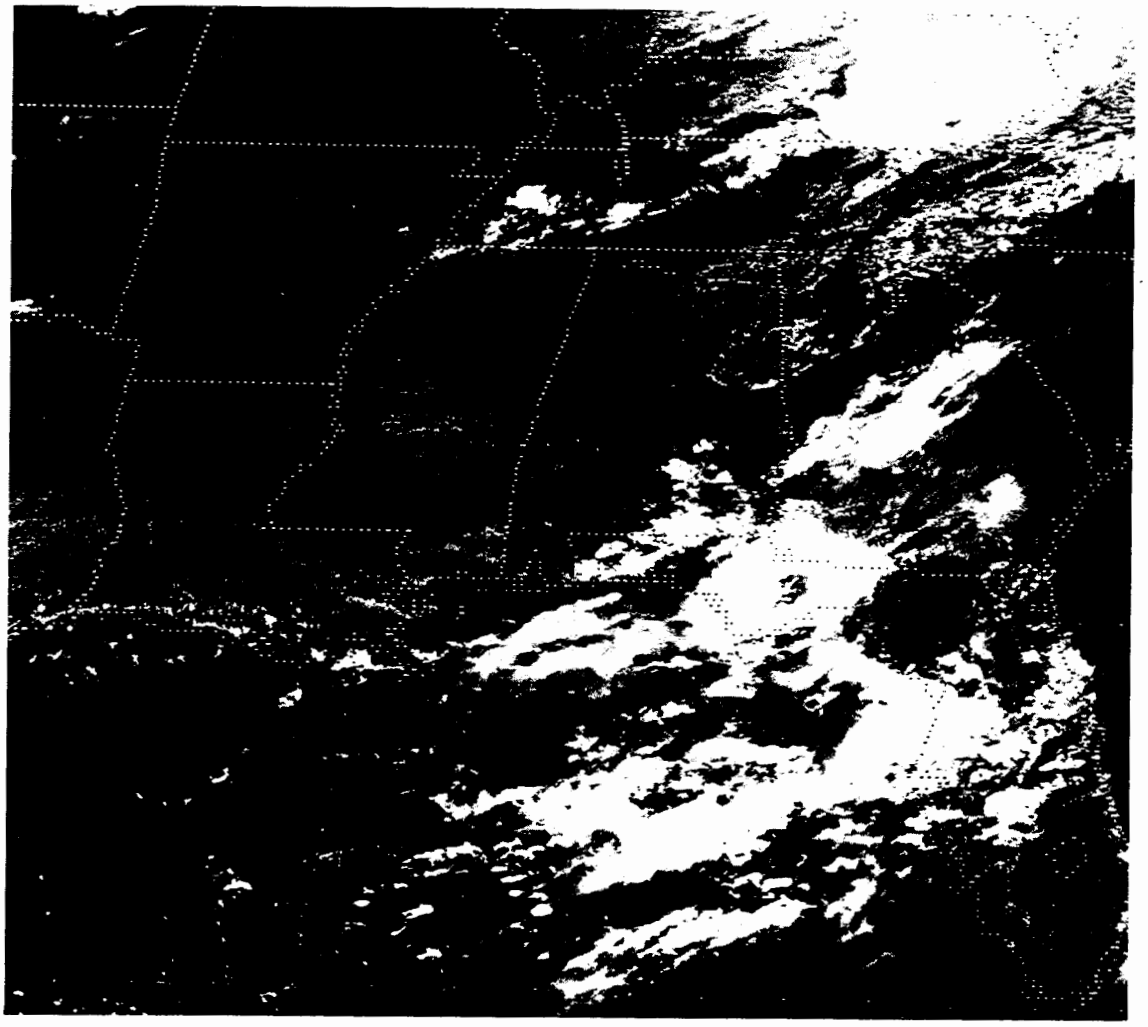


fig. 6-5 GOES EAST KA-3 VISIBLE (1 km)

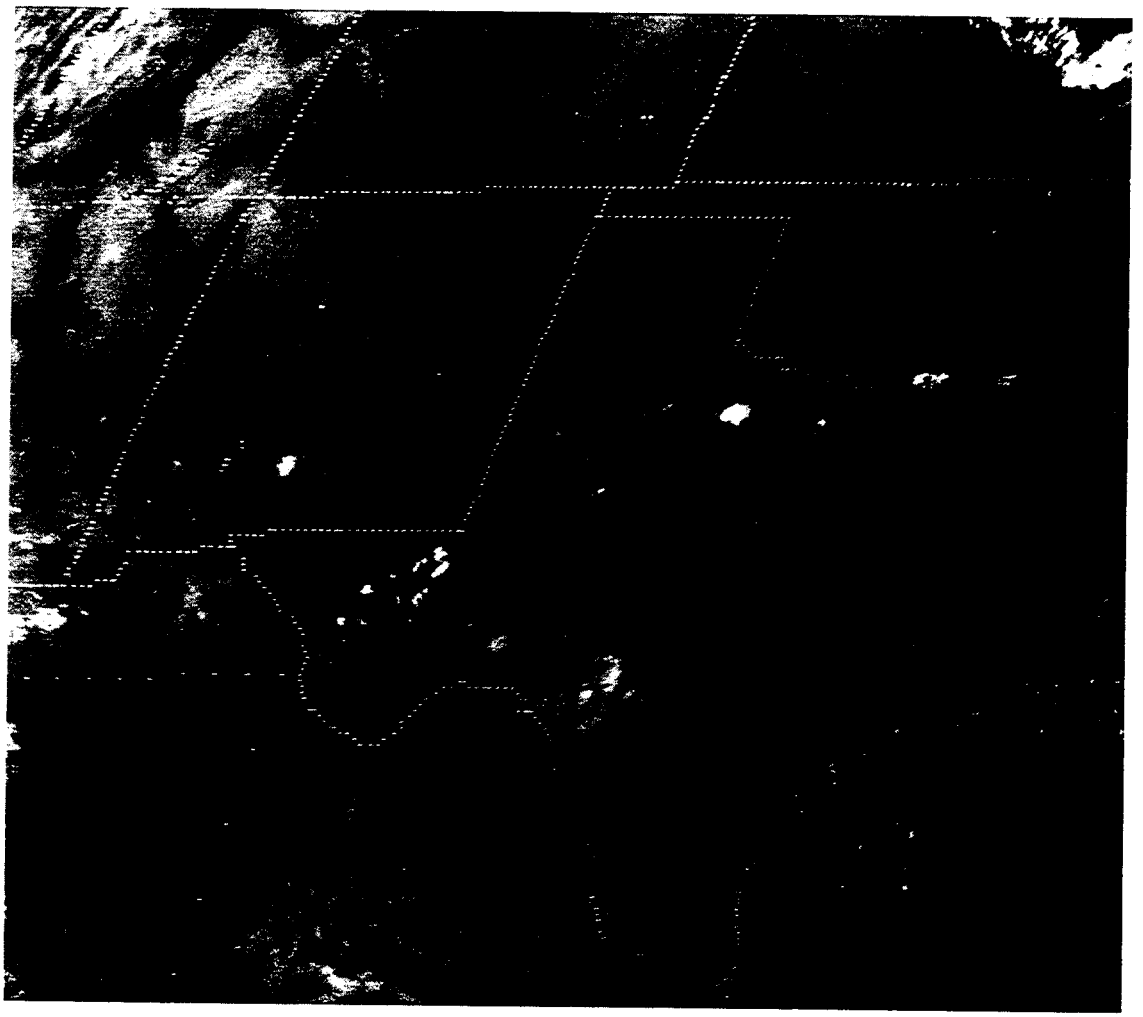


fig. 6-6 GOES EAST KA-4 VISIBLE (1 km)

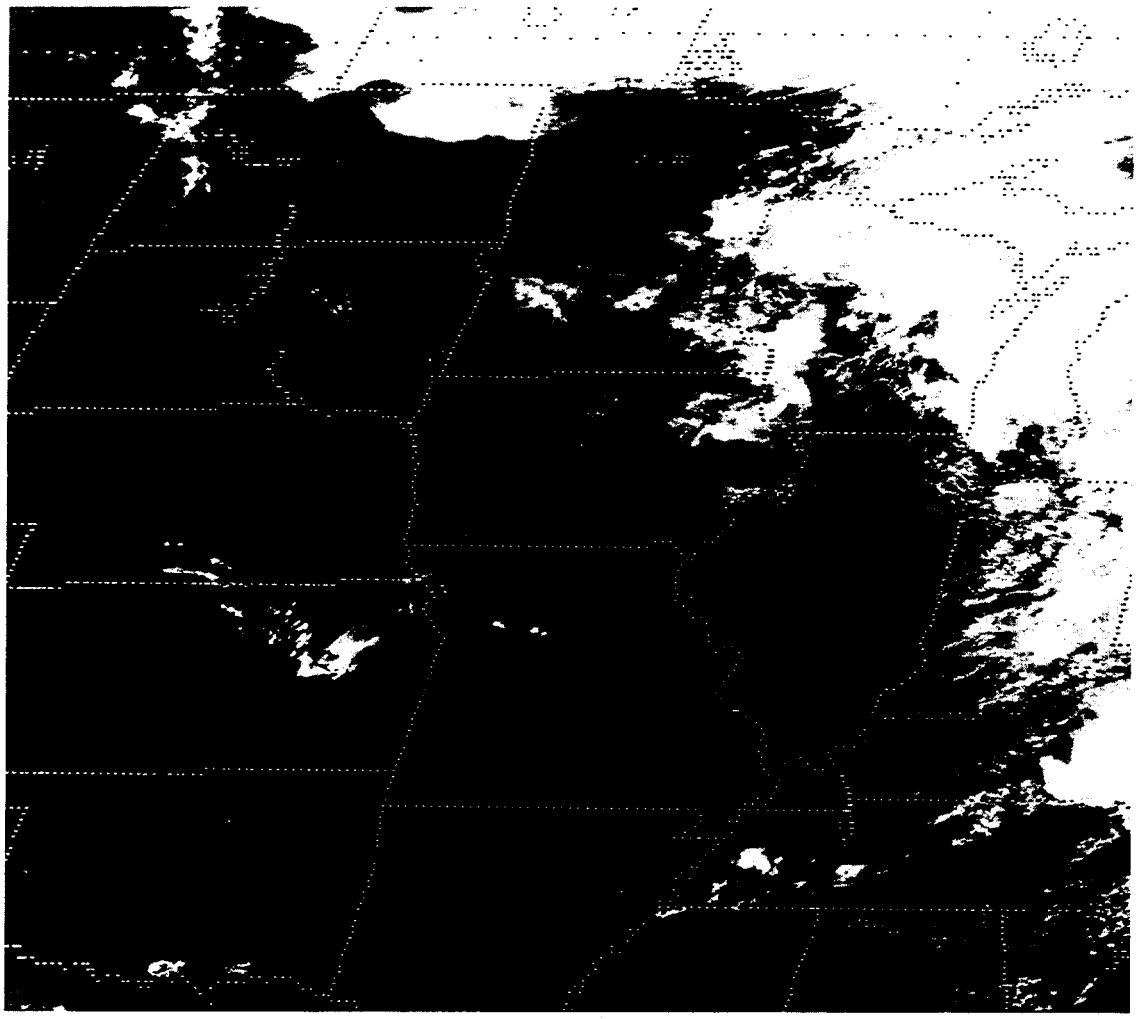


fig. 6-7 GOES EAST KA-5 VISIBLE (1 km)

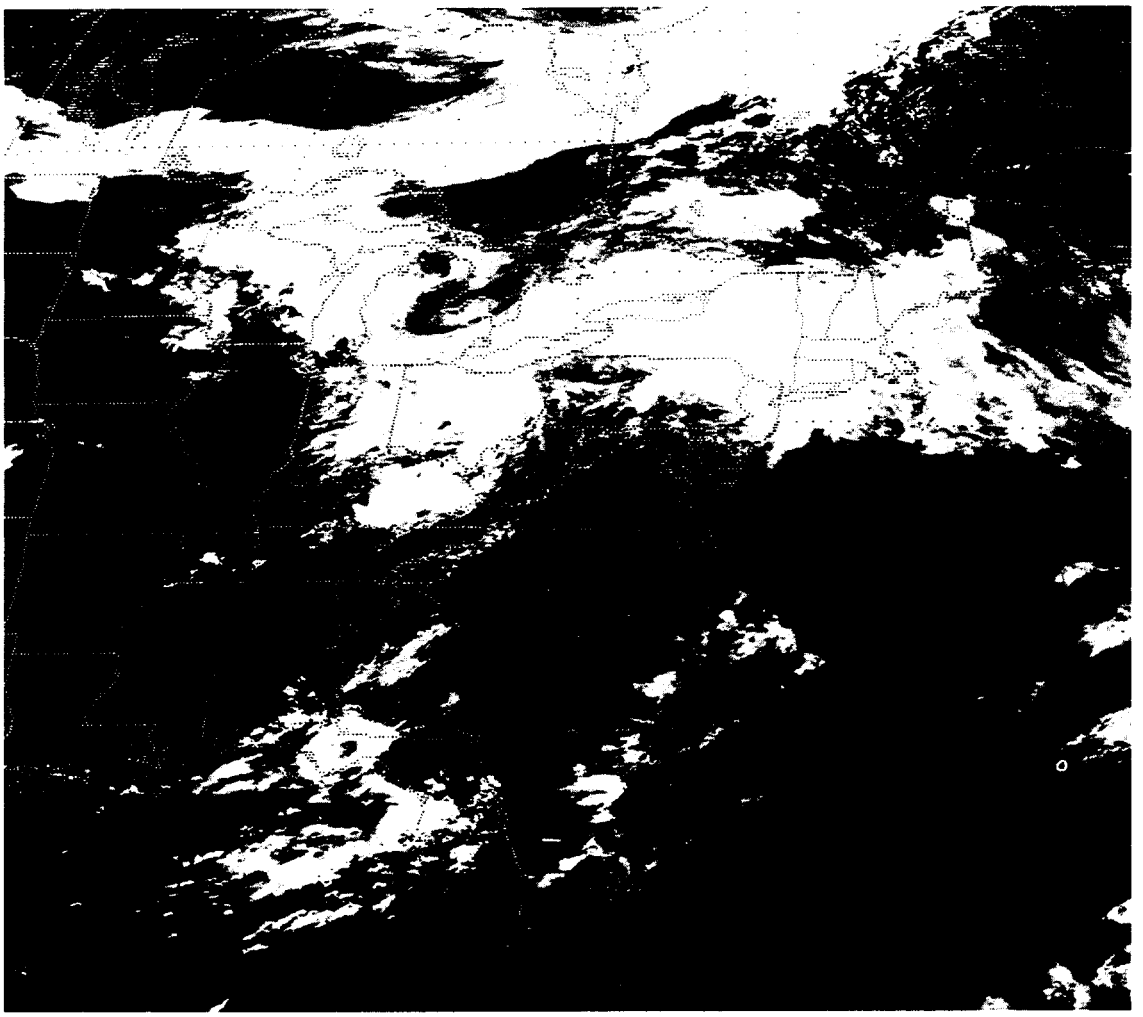


fig. 6-8 GOES EAST DB-5 VISIBLE (2 km)

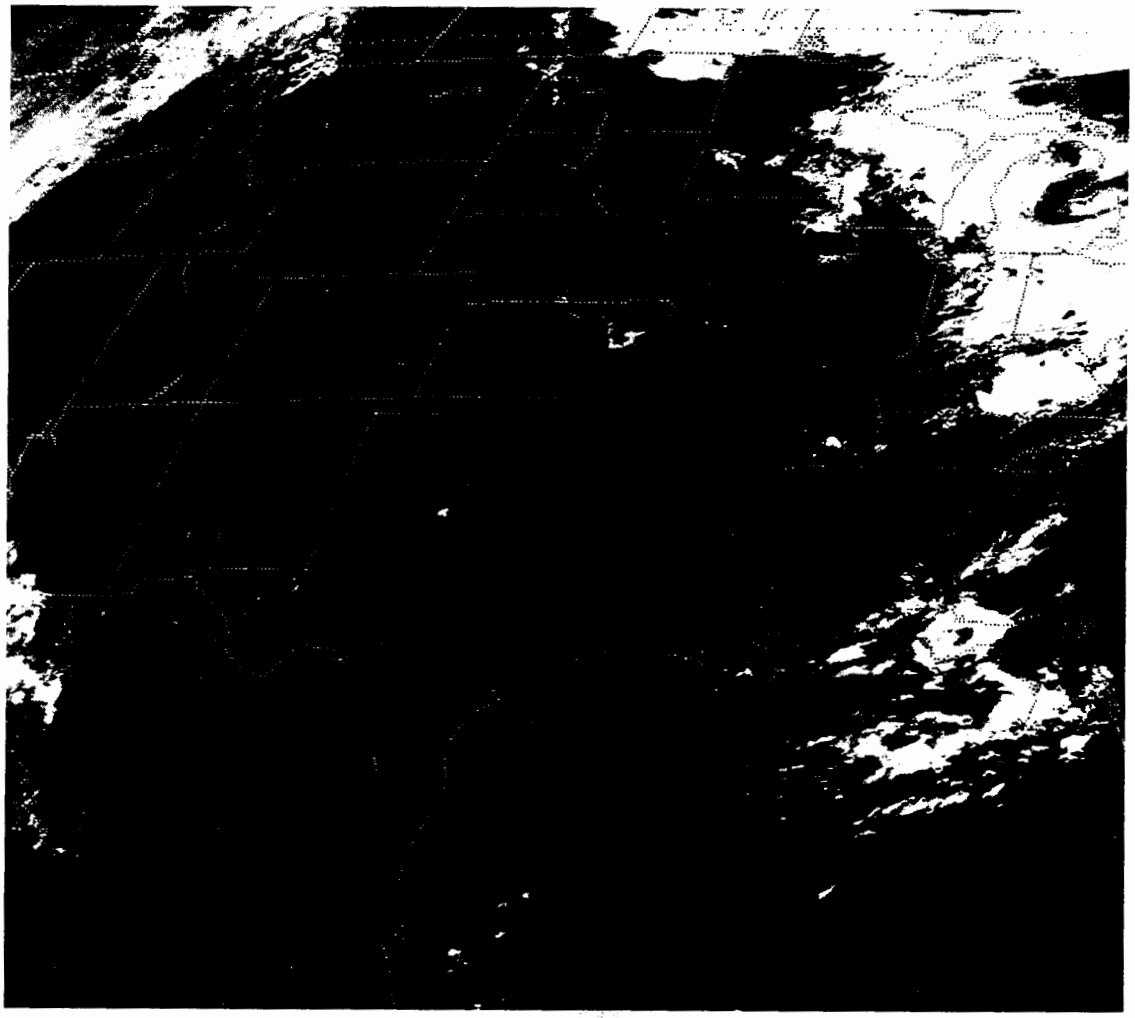


fig. 6-9 GOES EAST KB-8 VISIBLE (2 km)

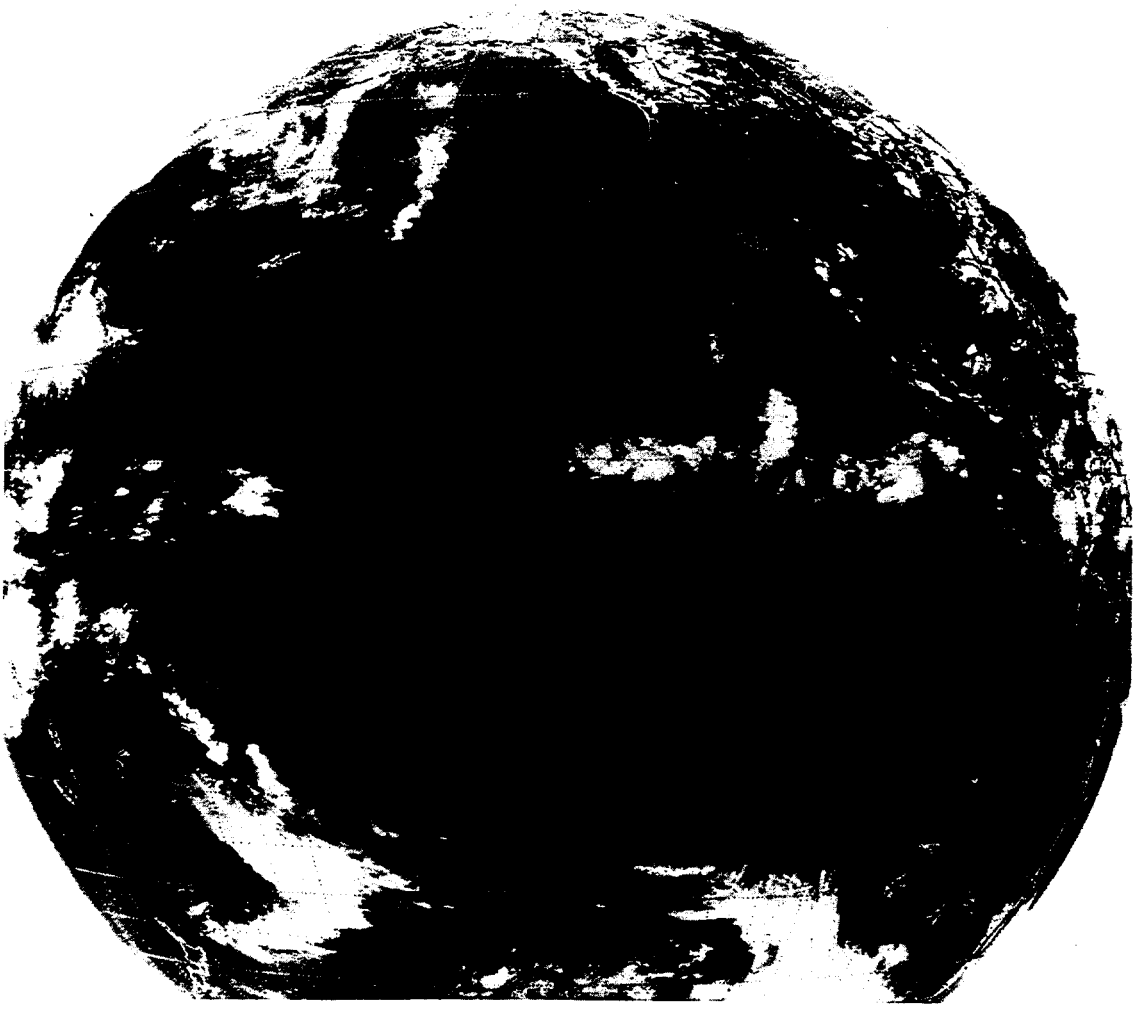


fig. 6-10 GOES WEST FULL DISC INFRARED (7 km)

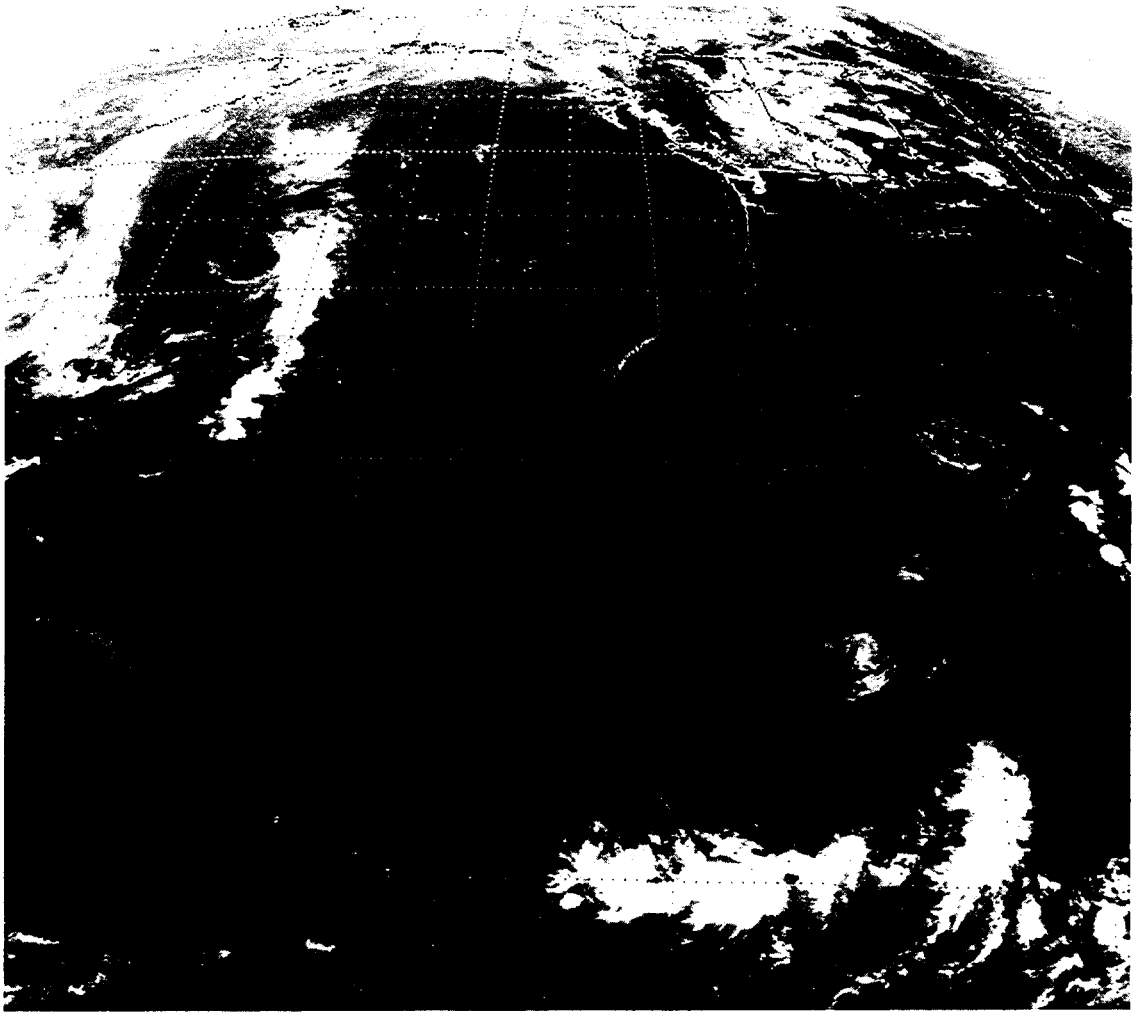


fig. 6-11 GOES WEST UC-2 EQUIVALENT INFRARED (4 km)

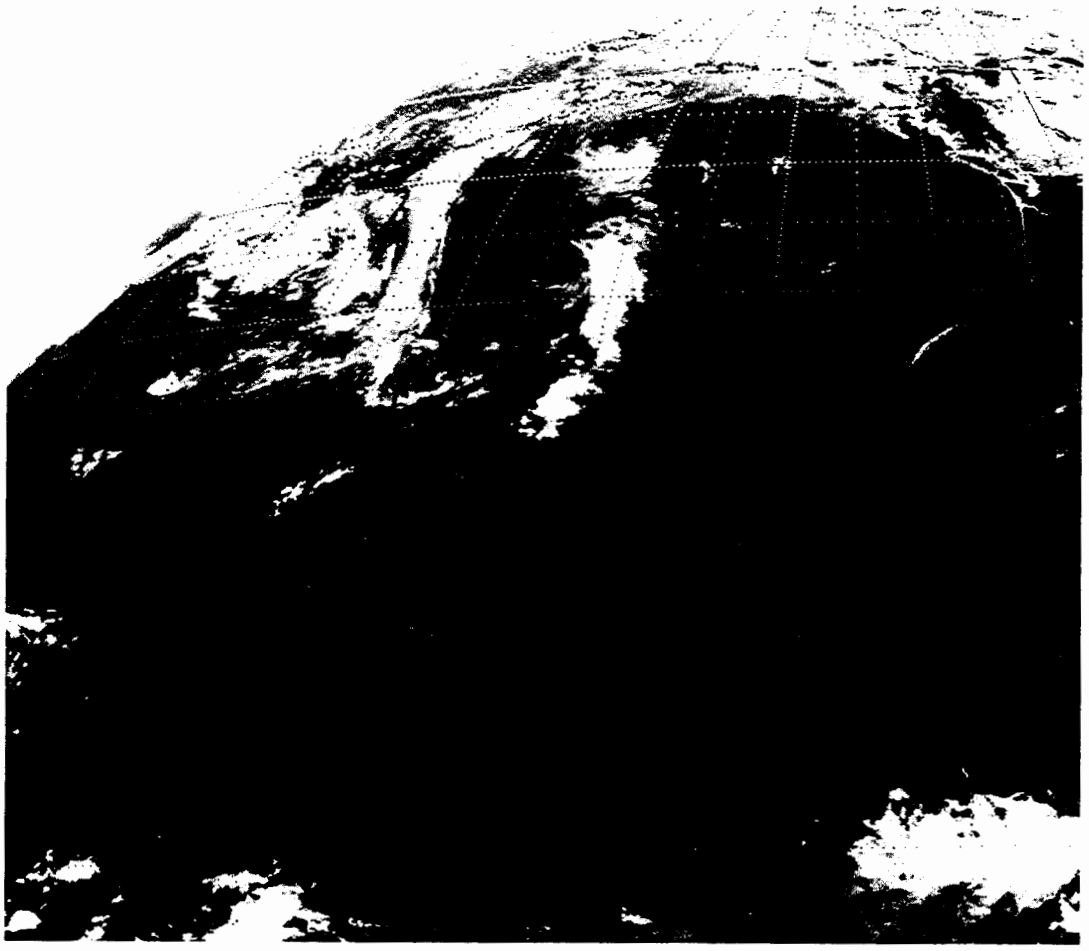


fig. 6-12 GOES WEST AC-1 EQUIVALENT INFRARED (4 km)

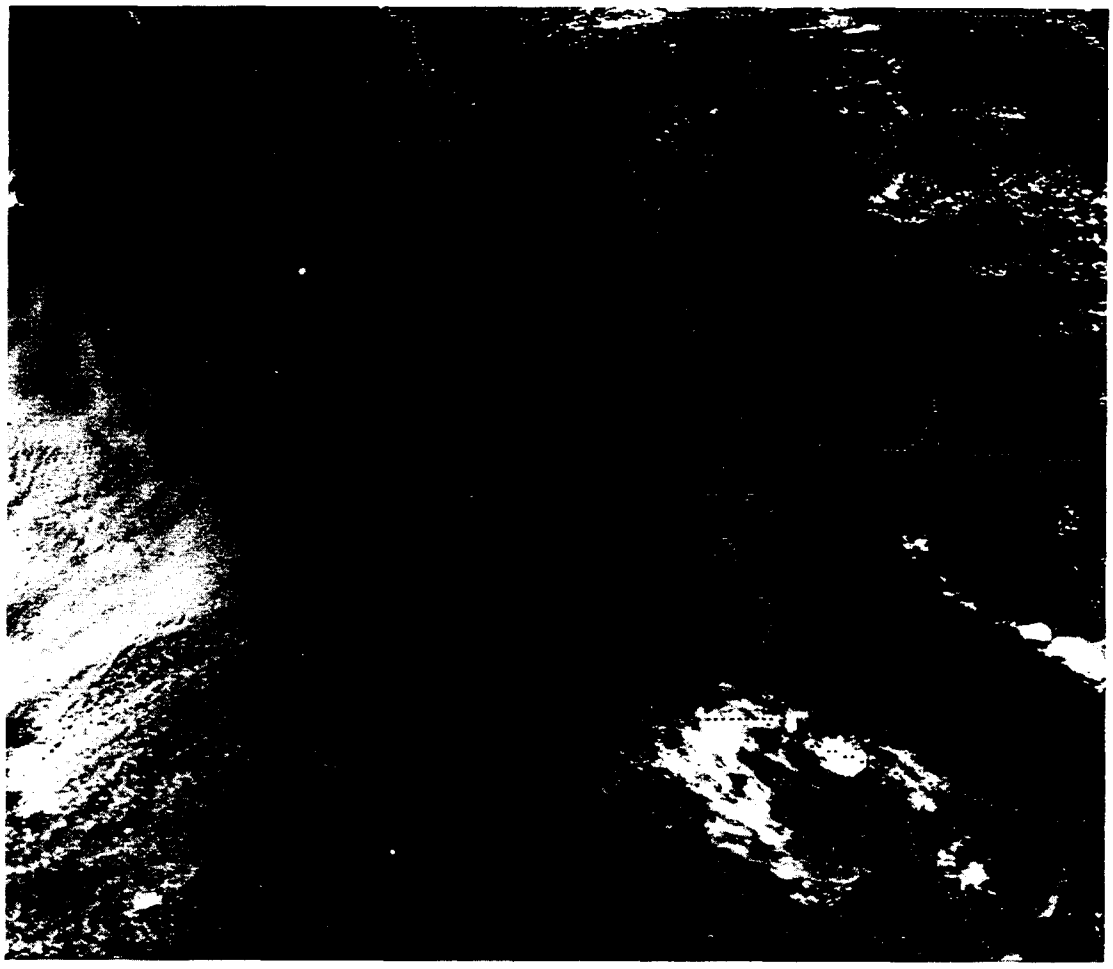


fig. 6-13 GOES WEST SA-1 VISIBLE (1 km)

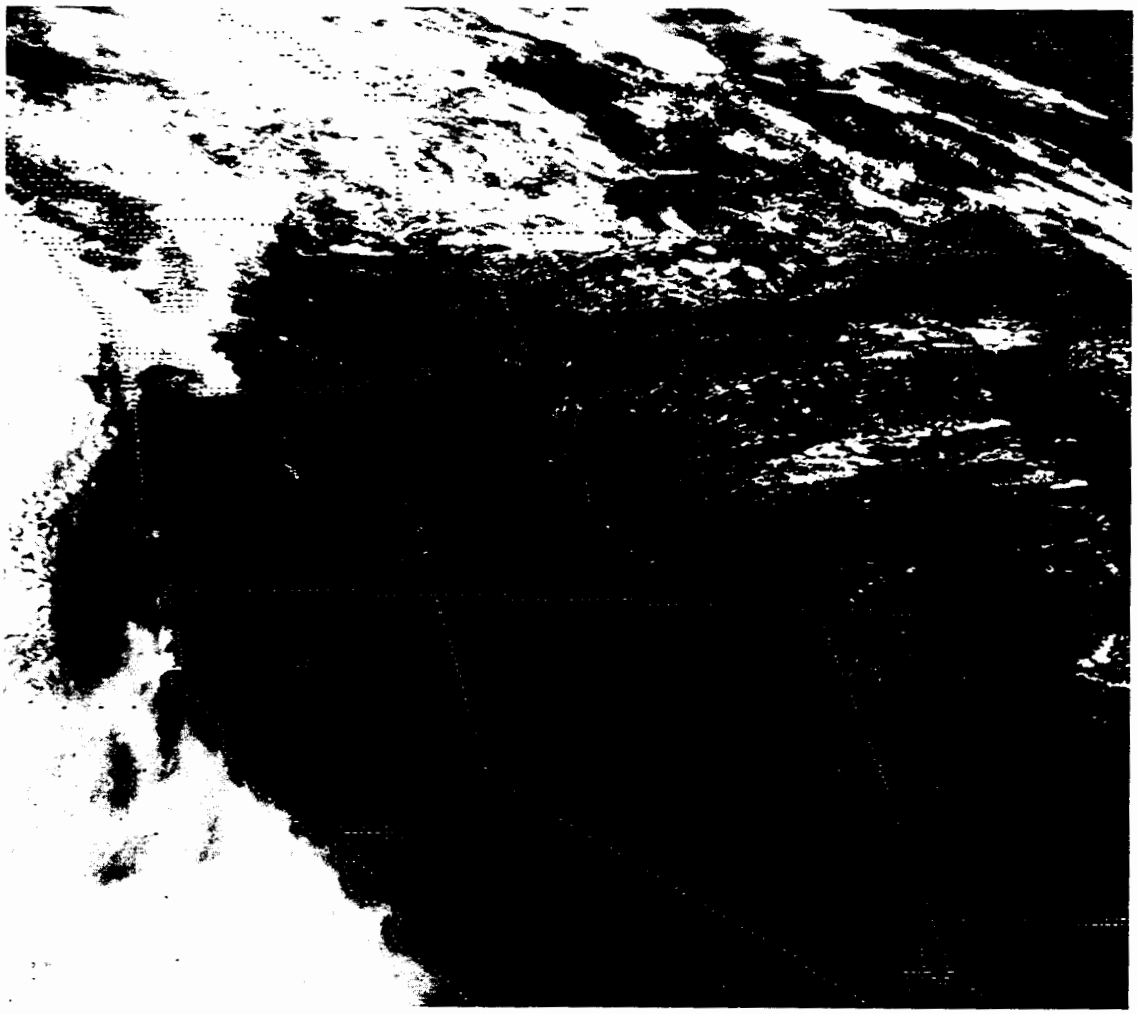


fig. 6-14 GOES WEST SA-2 VISIBLE (1 km)

fig. 6-15 GOES WEST AA-1 EQUIVALENT INFRARED (1 km)

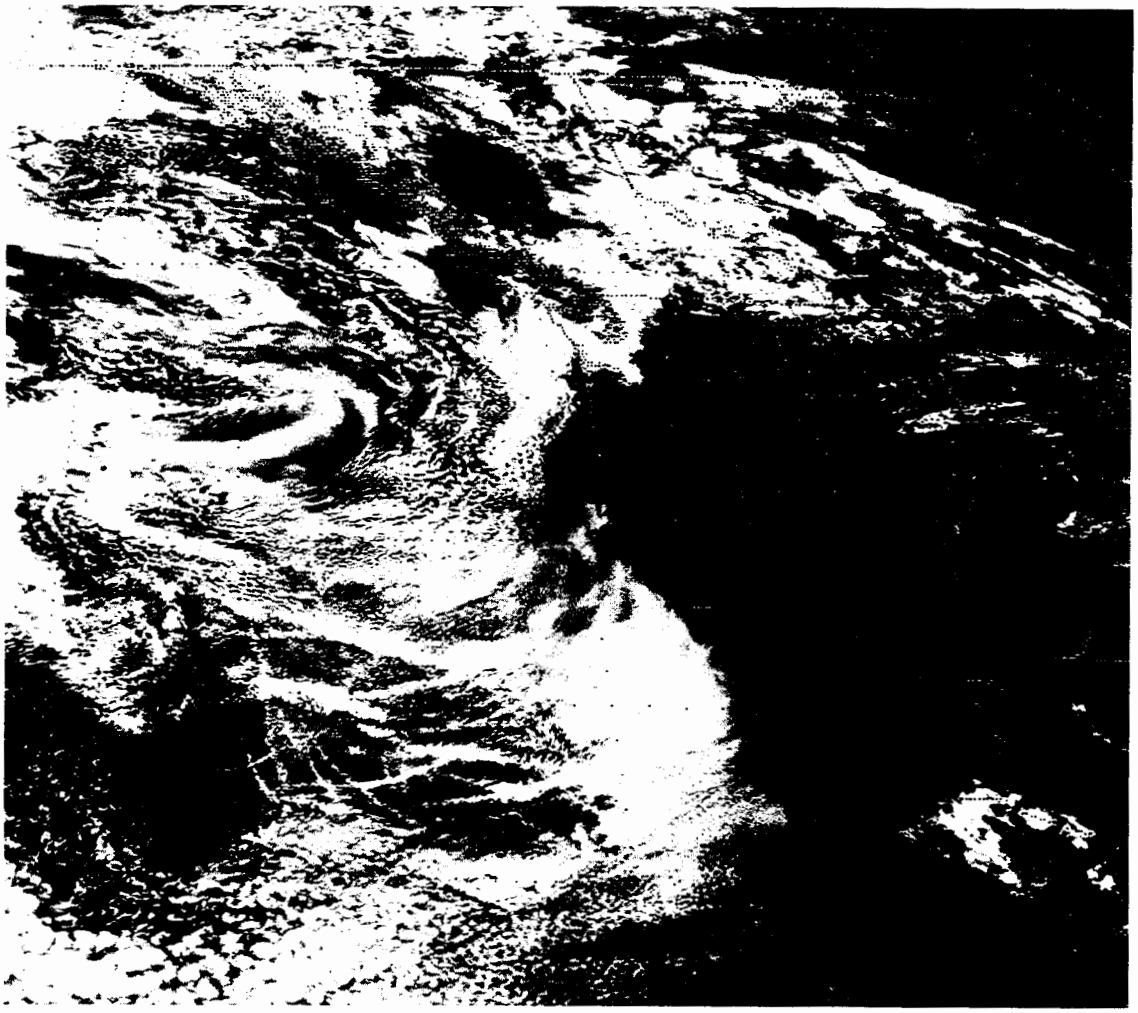


fig. 6-16 GOES WEST SB-6 VISIBLE (2 km)

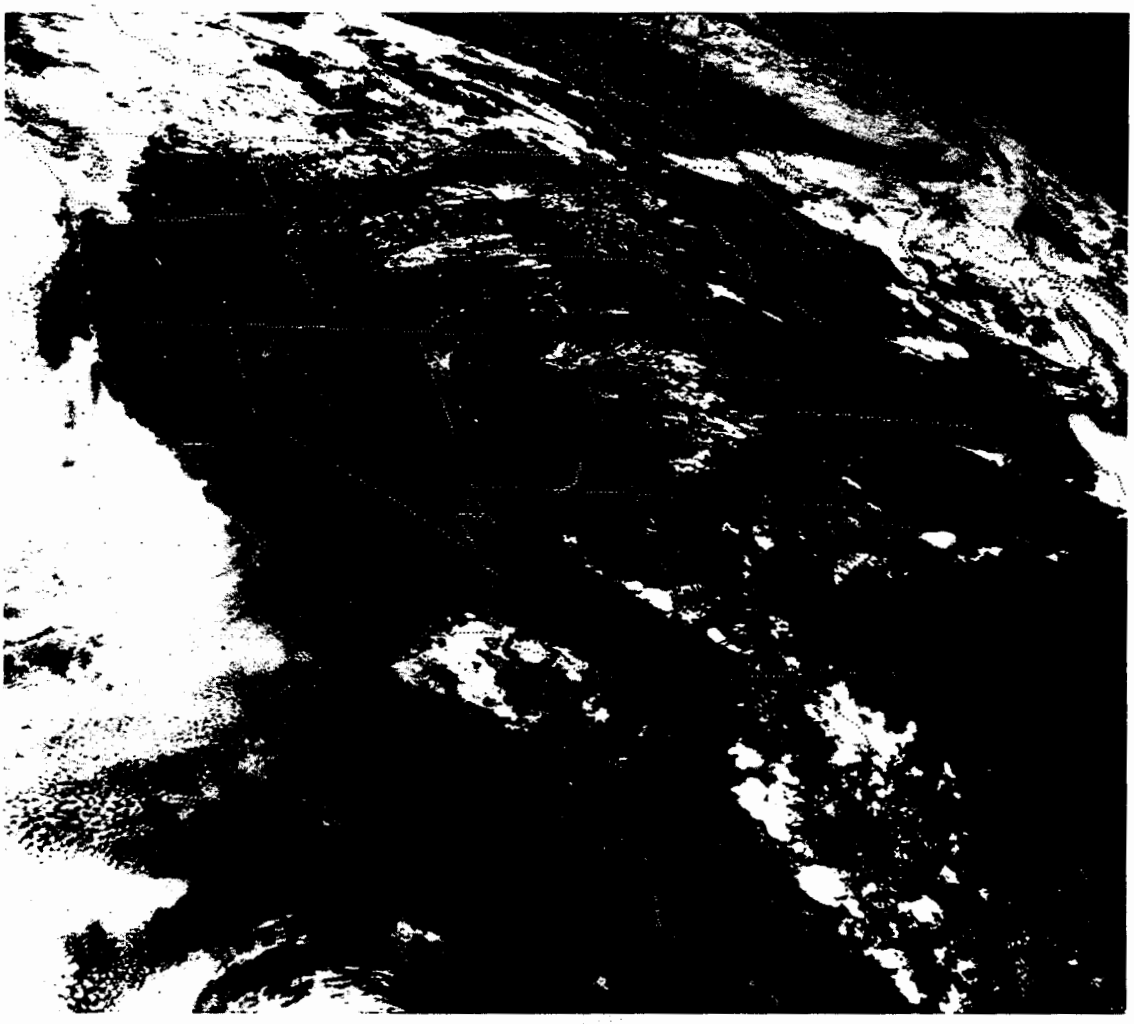


fig. 6-17 GOES WEST KB-7 VISIBLE (2 km)

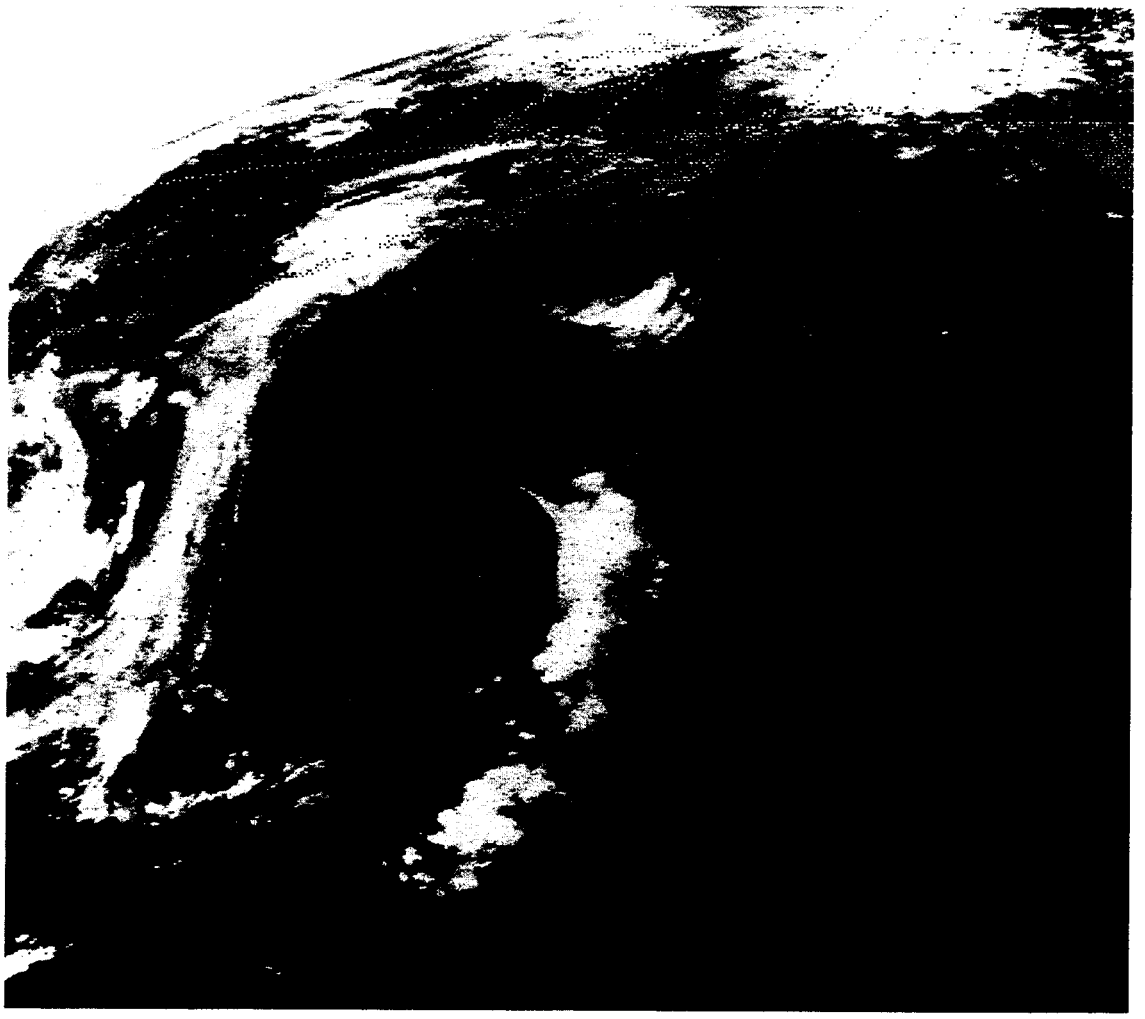


fig. 6-18 GOES WEST AB-1 EQUIVALENT INFRARED (2 km)

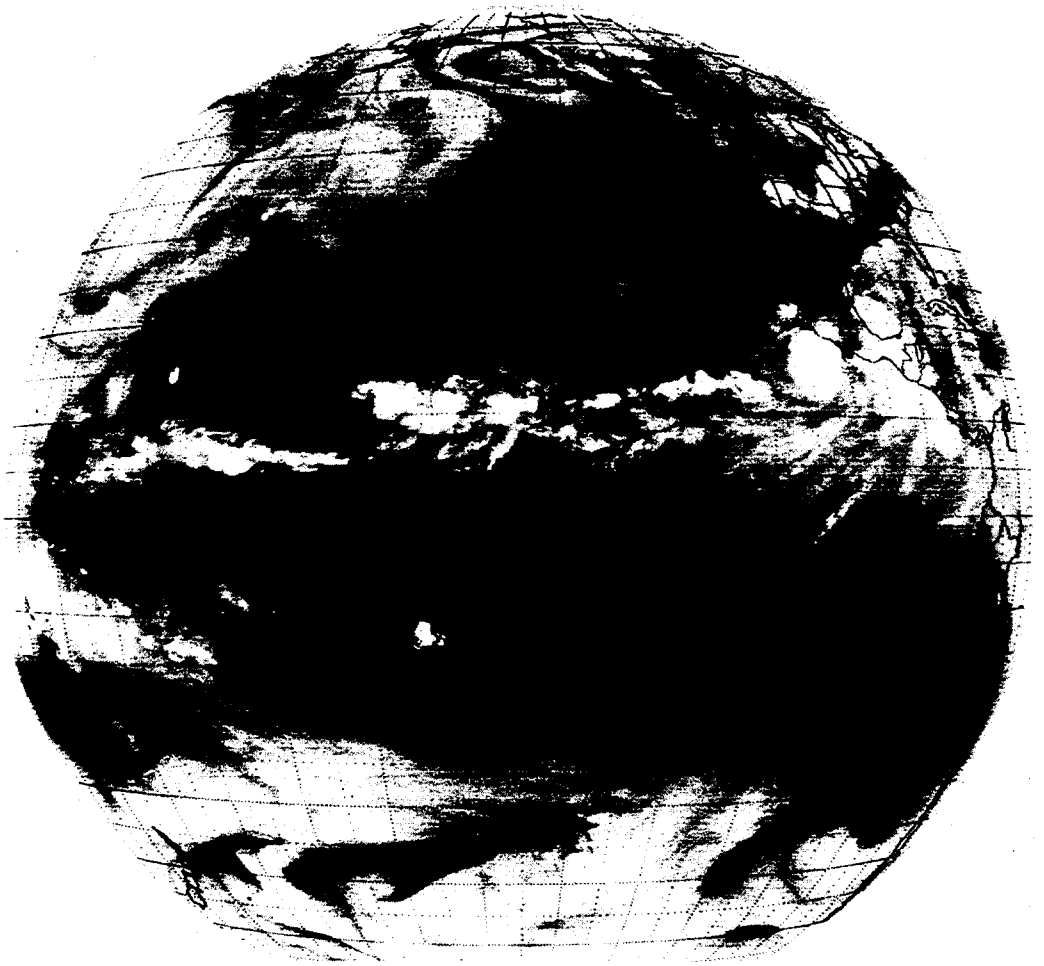


fig. 6-19 WATER VAPOR IMAGERY FROM GOES WEST

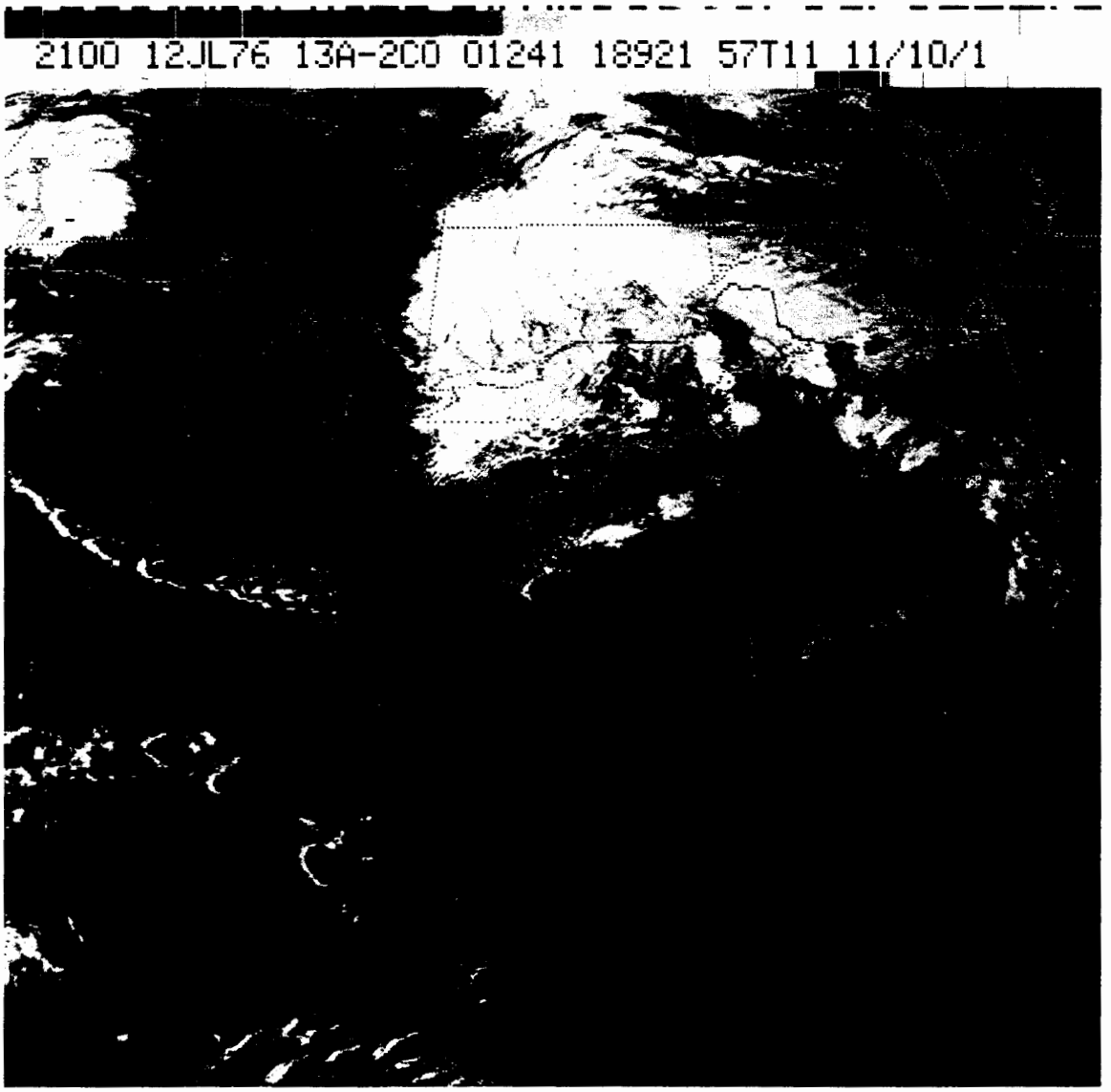


fig. 6-20 THIS VISIBLE/INFRARED COMPOSITE IMAGERY COMBINES THE DETAIL OF THE VISIBLE WITH THE TEMPERATURE SLICING CAPABILITY OF THE INFRARED

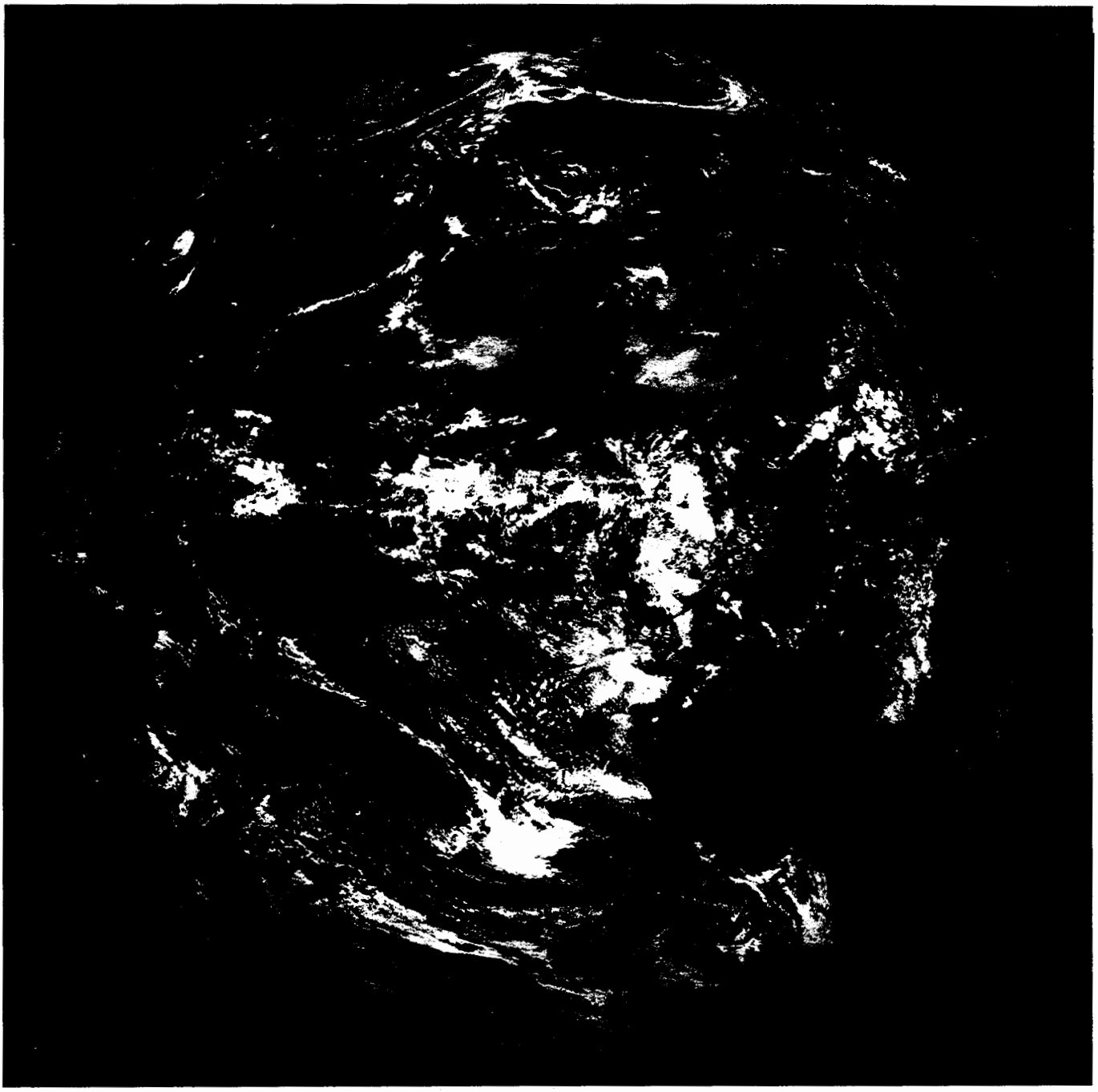


fig. 6-21 METEOSAT IMAGE. SECTORS OF VISIBLE, INFRARED AND WATER VAPOR DATA ARE AVAILABLE TO SOME GOES-TAP CUSTOMERS. (IMAGE COURTESY OF THE EUROPEAN SPACE AGENCY)

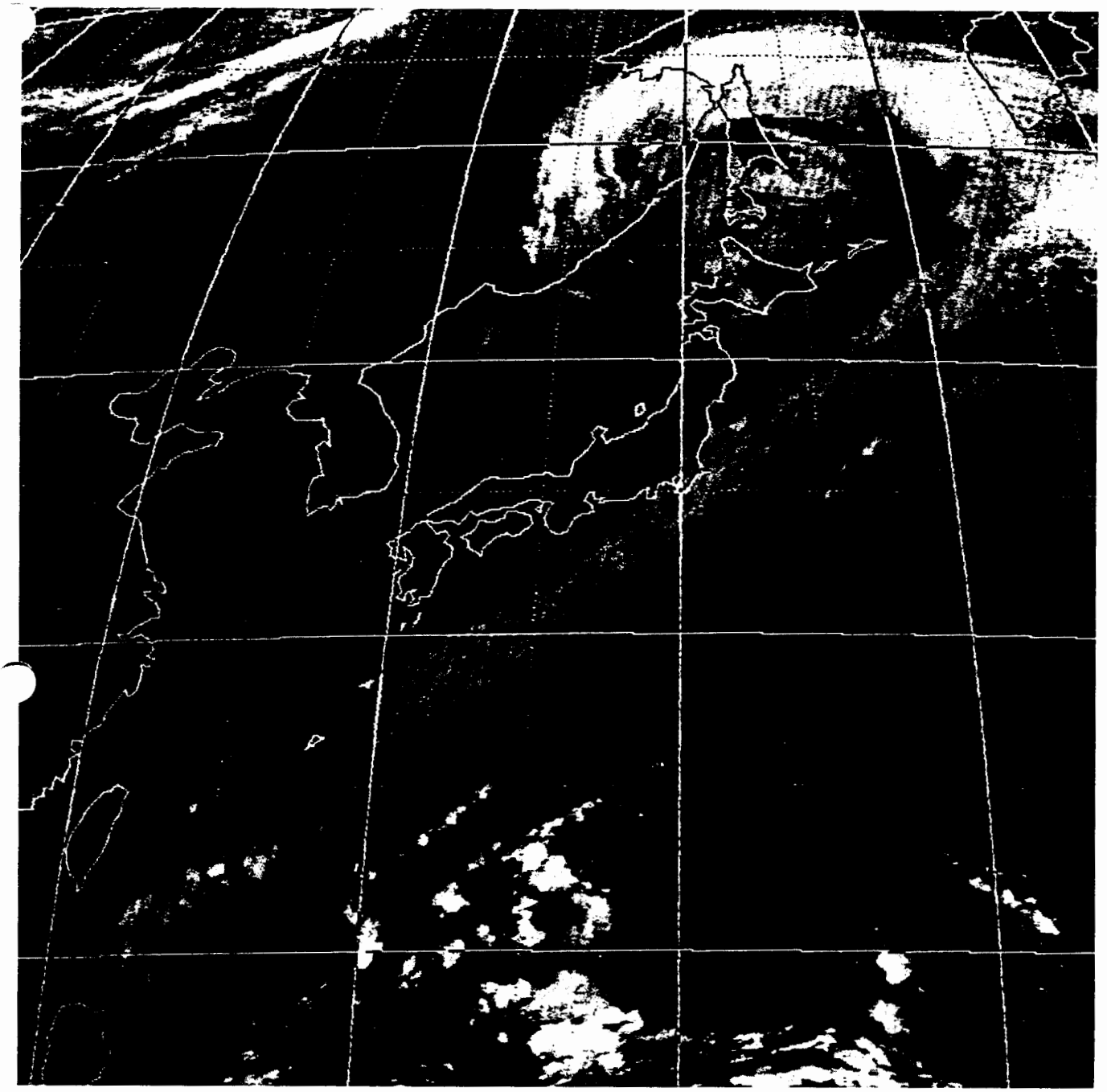


fig. 6-22 GEOSTATIONARY METEOROLOGICAL SATELLITE (GMS)

GOES IMAGERY CODED IDENTIFICATION HEADER

GOES HEADER	1230	27JN79	12A-2		01044	18162	DB5		
Coding Elements	a	b	cde	fg	h	i	j	k	(sector identification see below)

Coding Elements

a. Greenwich time in hours and minutes indicating time of actual picture start.

b. Calendar day, month, year.

c. Line Stretcher/Data Buffer (LS/DB) Identification.

d. Satellite Indentification:

1 = SMS-1	2 = SMS-2	3 = GOES-1
4 = GOES-2	5 = GOES-3	6 = GOES-4
7 = GOES-5	8 = GOES-6	9 = GOES-7

e. Image Type

F = Full Disk IR

E = Equivalent IR Sector

A, B, C, D = Denotes Visible Sectors as well as the (LS/DB) mode of operation. Details are beyond the scope of this document.

f. Resolution of image in nautical miles:

1 = 1 km
2 = 2 km
4 = 4 km
E* = 7 km

* Equivalent IR sector, same geographical area as corresponding visible sector

g. Enhancement curve identifier for IR data only. Two letters (AA thru ZZ) in this position identifies the enhancement curve displayed. A single letter, Z, identifies the enhancement curve used on Full-disc IR data. No letters signifies no enhancement.

h. Starting Scan Line number for the Image (Y axis).

Range = 0 to 1821

i. Vernier correction factor for starting scan line number.

j. The X axis element number of the midpoint of each horizontal line contained in the sector.

Range 0 to 3822

k. Vernier correction factor for sector center location.

Sector Identification

	Standard Sector	Floating Sector	Rapid Scan Sector
GOES HEADER Coding Elements	DB5 a b c	DA37N82W-1 a b d e f	PQ35N95W-1 g h i j k

Coding Elements

a. Major NESDIS hub (SFSS or Regional area requirement) for which the sector was generated.

S - San Francisco
K - Kansas City
D - Washington, D.C.
M - Miami
H - Honolulu
A - Anchorage
G - New Orleans

W - Washington complex production only (Not transmitted over GOES network)
WB - 4 km geographic sector with 2 km resolution
WC - 7 km geographic, or Full Disc, with 4 km resolution

b. Sector resolution in kilometers, except for equivalent IR products.

A - 1 km
B - 2 km
C - 4 km
IR - 7 km

c. Identifier number for the specific standard sector (1 thru 9).

d. Latitude of Image Center Point.

e. Longitude of Image Center Point.

f. Identifier number for the specific floater (1 or 2).

g. Identifier of type of scan.

P = Partial Disc

h. Identifier of cycle time of the rapid scan data.

Q = 15 min (standard scan cycle)

EXAMPLES:

Q = 15 minute scan cycle

i. Latitude of image center point.

j. Longitude of image center point.

k. Floater #1 = 1, Floater #2 = 2.

GOES REAL TIME SECTORIZER IMAGERY CODED IDENTIFICATION HEADER

```
↑ 17:00 31JL75 11A-Z 0006-1640 FULL DISC IR
a   b          c     d e f g    h    i      j
```

a. Direction of Spacecraft Scan

b. Time (Greenwich time in hours and minutes indicating time of actual picture start).

c. Calendar day, month, year.

d. Line stretcher/data buffer (LS/DB) identification

e. Satellite identification (same as page 6-26, item d)

f. Spacecraft/LS/DB Mode of Operation A, B, C, and D.

g. IR enhancement curve

h. Image start scan line

i. Image Length

j. Sector identification

Signal Structure and Characteristics

Carrier Frequency

2400 hz

Baseband

DC to 1600 hz

Maximum Transmitter Output

0 dBm at 600 ohms

Modulation

Amplitude modulated from 0 dbm to -26 dbm. Modulated signal is vestigially filtered; the upper sideband is suppressed.

Index of Cooperation

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THE FOLLOWING ITEMS DESCRIBE THE CONTENT AND DURATION OF EACH SEGMENT OF ALL TRANSMISSIONS:

Demultiplexer Tone - 5 sec

Square wave modulation of 700 hz for east satellite sectorized and west full disc images, and 1050 hz for west satellite sectorized and east full disc images. The tone is transmitted from the CDDF for 5 seconds but only 2 or 3 sec of the tone will be received by the GOES-TAP customers if east or west only data is selected. This is due to the response time of the demultiplexer (east/west data separator) at the SFSSs.

Maximum Carrier Reference - 5 sec

Continuous (unmodulated) carrier at maximum amplitude (0 dbm).

Receiver Start - 5 sec

Square wave modulation of 300 hz.

Receiver Phasing - 20 sec

25 msec. of minimum carrier (-26 dBm) followed by 475 msec. of maximum carrier (0 dbm). This pattern is transmitted for 40 scan lines.

THE FOLLOWING DATA PERIODS (EXCEPT RECEIVER STOP) CONSIST OF A SCAN LINE SYNC FOLLOWED BY 475 MSEC. OF IMAGE FORMATTED DATA. THE SCAN LINE SYNC CONSISTS OF 16 2/3 MSEC. OF MINIMUM CARRIER FOLLOWED BY 8 1/3 MSEC. OF MAXIMUM CARRIER. THE SCAN LINE SYNC PERIOD OCCURS COINCIDENT IN THE SCAN LINE WITH THE MINIMUM CARRIER PERIOD OF PHASING.

Minimum Carrier Reference - 1 sec.

Continuous carrier at minimum amplitude (-26 dBm).

Encoded Header - 3 sec.

Encoded header that provides identifying information about the sector.

Gray Scale - 21 sec.

A 17 step linear gray scale for quality control use.

Annotation - 25 sec.

Identifying information in image format.

Enhancement Table - 12.5 sec.

If image enhancement is being used in the sectorizer, it is identified by a 256 step enhanced gray scale. If no enhancement is being used, these 12 sec are used for additional Image Data (below).

Image Data -729.5 sec (or 717 sec. if enhanced)

Satellite image data is displayed as cold or white by minimum carrier (-26 dBm), and warm or dark by maximum carrier (0 dBm). Up to 4 additional seconds may be added on random transmission due to sector resolution and a scan line counting vagary in sector processing.

Receiver Stop - 5 sec.

Square wave modulation of 450 hz. There is no scan line sync during receiver stop.

Coded Identification Header

The following information applies to the coded identification header which will be added to the analog picture data transmission distributed via GOES-TAP.

The coding elements are described here in terms of "pixel" arrangements. The transmission rate is 4200 pixels per sec. A line of information contains 2100 pixels.

(1) Binary zero's and one's are generated by equivalent black and white data levels respectively. The NRZ coding technique is used.

(2) Bit timing is synchronous with scan line timing; therefore, the receiver crystal clock can be used to clock the bits and characters to decode the header data. Bit time is 10 pixels wide and each character consists of six bits (60 pixels).

(3) The header message is transmitted just after the phasing signal and is preceded by two lines of continuous white level. The total message consists of 31 characters, without spaces, in fixed format starting with the first pixel after start of each line in which it appears. It is repeated on six consecutive scan lines to allow redundancy checking. The message format is given in the following diagram:

H H M M D D m m Y Y r v h h S S S S S S S S S S S S S S S S X

(Note that the information used in the coded header does not include all that in the visual header.)

(4) Message format details are:

(a) Time
Greenwich time in hours and minutes.
HH = 00, 01, ..., 23. MM = 00, 01, ..., 59.

(b) Date:

Calendar day, month, and year.
DD = 01, 02, ..., 31. YY = 00, 01, ..., 99.
Months (mm) are abbreviated as:

JA, FE, MR, AP, MY, JN,
JL, AU, SE, OC, NO, DE.

(c) Resolution:

Resolution (r) of image in nautical miles r = H, 1, 2, 4 where:

H = 1/2 mile (1 km) 2 = 2 mile (4 km)
1 = 1 mile (2 km) 4 = 4 mile (8 km)

(d) Visible or IR Image

v = F, E, A, B, C, D; where
F = full disc IR
E = equivalent IR sector
A, B, C, D, = visible sectors

(e) Enhancement

Two character spaces (HH) are reserved to identify the enhancement curve being used. Pairs of letters (AA through ZZ) are used to name these curves. A "BLANK" in these spaces signifies that no enhancement curve was employed.

(f) Sector ID Field

A combination of letters, numbers, spaces, and dashes is used to identify the transmitted sector image. These identity elements relate to the SFSS or NWS Region requesting the image, scan rate and scan extent, cycle times, and the like. At the present time, a maximum of 13 fonts and spaces are used in this identification. This coding scheme reserves 16 character positions for the information. The "Sector ID Field" (SS...SS) will be a left-justified field; that is, the first character block will always be filled with a letter or numeral.

(g) Satellite I.D.

E = GOES-EAST

W = GOES-WEST

(5) The character code used in the header message is a subset of the standard ASCII code. Bits 1 through 6 represent the characters given in the following table. The most significant bit will be the first bit transmitted. That is, the bit stream will be: b6, b5, b4, b3, b2, b1.

				b6	1	1	0	0
b4	b3	b2	b1	b5	0	1	0	1
0	0	0	0		SPACE	0	@	P
0	0	0	1		!	1	A	Q
0	0	1	0		"	2	B	R
0	0	1	1		#	3	C	S
0	1	0	0		$	4	D	T
0	1	0	1		%	5	E	U
0	1	1	0		&	6	F	V
0	1	1	1		'	7	G	W
1	0	0	0		(	8	H	X
1	0	0	1		)	9	I	Y
1	0	1	0		*	:	J	Z
1	0	1	1		+	;	K	[
1	1	0	0		'	<	L	\
1	1	0	1		-	=	M	[
1	1	1	0		.	>	N	^
1	1	1	1		/	?	O	-

(6) The scan line format accommodating the coded header is shown below. Note that there are no changes in the size or position of the satellite image data or in the total length of the transmission; there has been merely a reallocation of the scan lines at the beginning of the transmission.

Format

Information	Scan Lines Allocated
East/West ID	10
Black level	10
Start	10
Phasing	40
White level	2
Coded Documentation	6
Gray Scale	42
Legend	50
Data	

Infrared Temperature Gray Scale

Temperature values are marked at ten degree intervals, from +50° C to −100° C, along the bottom of the gray scale. The gray shades are a photographic display of the enhancement curve used for the picture. Uniform changes in the gray shades from black to white in the lower end of the scale, in this example, correspond to linear temperature changes. Abrupt changes in the gray shades at the upper end of the scale, in this example, designate temperature steps in the enhancement curve to obtain "contouring" of the temperature features in the picture, as shown in the figure below.

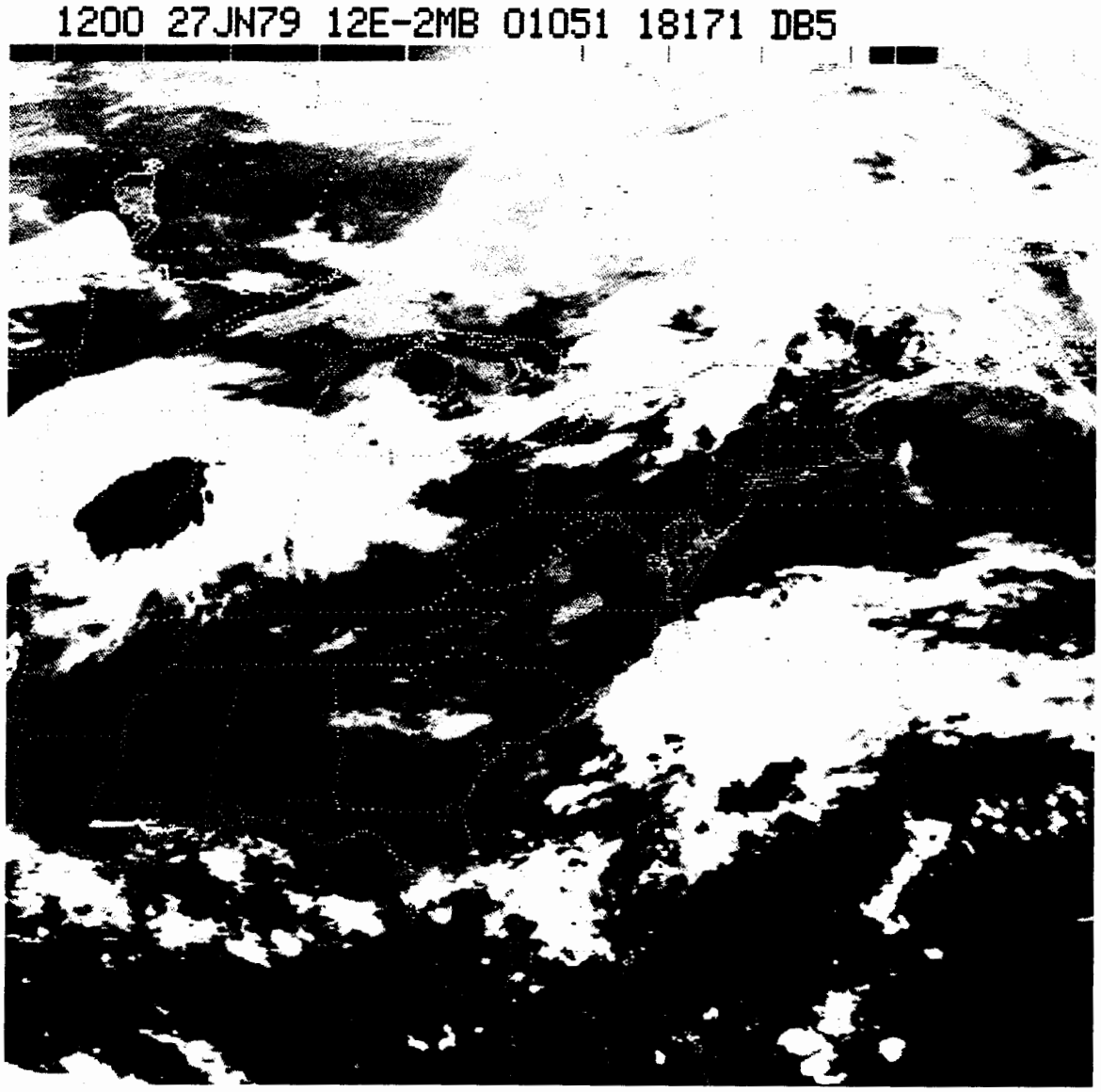


fig. 6-23 GOES Imagery header information

Section 7

ENHANCED IMAGERY

Goes Imagery Enhancement Capability

The Satellite Services Division of NESDIS implemented an operational Imagery Enhancement capability in early 1976. Since then, numerous Enhancement Curves have been tested for possible operational use.

As of January 1983, 16 curves were available in the active memory bank for fixed sectors and for distribution to SFSSs, via their floater capability. These curves are selected from the following master list: BD, CC, CE, DD, EC, FC, HC, HD, HE, IC, IB, JF, JG, LA, MB, NA, PC, SA, TA, ZA, and ZB. Visible/IR composite curves C1, C2, C3, C4 and C9 are also available for fixed sectors and SFSS floaters. Two enhancement curves, AZ and ZZ, are always available for the production of grids only. In order to provide samples of new enhanced products that will become operational, SFSSs will advise their respective users of data periods when new Enhancement Curves will be available for dissemination via SFSS floaters.

Submission of New Enhancement Curves for Operational Implementation

It is envisioned that WSFOs will desire to submit new Enhancement Curves to be considered for operational use. New curves will initially be submitted to NWS Regions for review, modification, and approval or disapproval. Approved curves will be forwarded to respective SFSS Managers for presentation to the NESDIS Imagery Enhancement Review Group (IERG). SFSSs and other staffs in NESDIS will submit their curves directly to SSD for review by the IERG. This group will be chaired by SSD and composed of one representative each from NESDIS Applications Laboratory, NESDIS Synoptic Analysis Branch, NESDIS Environmental Products Branch, and National Weather Service.

In order to properly record and implement Enhancement Curves, the following information and submission procedures will be required with each new curve that is forwarded for consideration:

1. A short narrative of the intent and justifications for the enhancement product; that is, what it will be used for; what specific information within the data will be enhanced; time of year desired (seasonal adjustment); desired geographical coverage (sector); and recommended schedule (data periods) for distribution of the enhanced product.

ENHANCEMENT TABLE

	000	001	002	003	004	005	006	007	008	009
000										
010										
020										
030										
040										
050										
060										
070										
080										
090										
100										
110										
120										
130										
140										
150										
160										
170										
180										
190										
200										
210										
220										
230										
240										
250										

fig. 7-1 ENHANCEMENT TABLE

COUNT VALUE	KELVIN	CENTIGRADE	FAHRENHEIT	COUNT VALUE	KELVIN	CENTIGRADE	FAHRENHEIT	COUNT VALUE	KELVIN	CENTIGRADE	FAHRENHEIT	COUNT VALUE	KELVIN	CENTIGRADE	FAHRENHEIT	COUNT VALUE	KELVIN	CENTIGRADE	FAHRENHEIT
000	330.0	56.8	134.3	051	304.5	31.3	88.4	102	279.0	5.8	42.5	153	253.5	-19.7	-3.4	204	214.0	-59.2	-74.5
001	329.5	56.3	133.4	052	304.0	30.8	87.5	103	278.5	5.3	41.6	154	253.0	-20.2	-4.3	205	213.0	-60.2	-76.3
002	329.0	55.8	132.5	053	303.5	30.3	86.6	104	278.0	4.8	40.7	155	252.5	-20.7	-5.2	206	212.0	-61.2	-78.1
003	328.5	55.3	131.6	054	303.0	29.8	85.7	105	277.5	4.3	39.8	156	252.0	-21.2	-6.1	207	211.0	-62.2	-79.9
004	328.0	54.8	130.7	055	302.5	29.3	84.8	106	277.0	3.8	38.9	157	251.5	-21.7	-7.0	208	210.0	-63.2	-81.7
005	327.5	54.3	129.8	056	302.0	28.8	83.9	107	276.5	3.3	38.0	158	251.0	-22.2	-7.9	209	209.0	-64.2	-83.5
006	327.0	53.8	128.9	057	301.5	28.3	83.0	108	276.0	2.8	37.1	159	250.5	-22.7	-8.8	210	208.0	-65.2	-85.3
007	326.5	53.3	128.0	058	301.0	27.8	82.1	109	275.5	2.3	36.2	160	250.0	-23.2	-9.7	211	207.0	-66.2	-87.1
008	326.0	52.8	127.1	059	300.5	27.3	81.2	110	275.0	1.8	35.3	161	249.5	-23.7	-10.6	212	206.0	-67.2	-88.9
009	325.5	52.3	126.2	060	300.0	26.8	80.3	111	274.5	1.3	34.4	162	249.0	-24.2	-11.5	213	205.0	-68.2	-90.7
010	325.0	51.8	125.3	061	299.5	26.3	79.4	112	274.0	.8	33.5	163	248.5	-24.7	-12.4	214	204.0	-69.2	-92.5
011	324.5	51.3	124.4	062	299.0	25.8	78.5	113	273.5	.3	32.6	164	248.0	-25.2	-13.3	215	203.0	-70.2	-94.3
012	324.0	50.8	123.5	063	298.5	25.3	77.6	114	273.0	-.2	31.7	165	247.5	-25.7	-14.2	216	202.0	-71.2	-96.1
013	323.5	50.3	122.6	064	298.0	24.8	76.7	115	272.5	-.7	30.8	166	247.0	-26.2	-15.1	217	201.0	-72.2	-97.9
014	323.0	49.8	121.7	065	297.5	24.3	75.8	116	272.0	-1.2	29.9	167	246.5	-26.7	-16.0	218	200.0	-73.2	-99.7
015	322.5	49.3	120.8	066	297.0	23.8	74.9	117	271.5	-1.7	29.0	168	246.0	-27.2	-16.9	219	199.0	-74.2	-101.5
016	322.0	48.8	119.9	067	296.5	23.3	74.0	118	271.0	-2.2	28.1	169	245.5	-27.7	-17.8	220	198.0	-75.2	-103.3
017	321.5	48.3	119.0	068	296.0	22.8	73.1	119	270.5	-2.7	27.2	170	245.0	-28.2	-18.7	221	197.0	-76.2	-105.1
018	321.0	47.8	118.1	069	295.5	22.3	72.2	120	270.0	-3.2	26.3	171	244.5	-28.7	-19.6	222	196.0	-77.2	-106.9
019	320.5	47.3	117.2	070	295.0	21.8	71.3	121	269.5	-3.7	25.4	172	244.0	-29.2	-20.5	223	195.0	-78.2	-108.7
020	320.0	46.8	116.3	071	294.5	21.3	70.4	122	269.0	-4.2	24.5	173	243.5	-29.7	-21.4	224	194.0	-79.2	-110.5
021	319.5	46.3	115.4	072	294.0	20.8	69.5	123	268.5	-4.7	23.6	174	243.0	-30.2	-22.3	225	193.0	-80.2	-112.3
022	319.0	45.8	114.5	073	293.5	20.3	68.6	124	268.0	-5.2	22.7	175	242.5	-30.7	-23.2	226	192.0	-81.2	-114.1
023	318.5	45.3	113.6	074	293.0	19.8	67.7	125	267.5	-5.7	21.8	176	242.0	-31.2	-24.1	227	191.0	-82.2	-115.9
024	318.0	44.8	112.7	075	292.5	19.3	66.8	126	267.0	-6.2	20.9	177	241.0	-32.2	-25.9	228	190.0	-83.2	-117.7
025	317.5	44.3	111.8	076	292.0	18.8	65.9	127	266.5	-6.7	20.0	178	240.0	-33.2	-27.7	229	189.0	-84.2	-119.5
026	317.5	43.8	110.9	077	291.5	18.3	65.0	128	266.0	-7.2	19.1	179	239.0	-34.2	-29.5	230	188.0	-85.2	-121.3
027	316.5	43.3	110.0	078	291.0	17.8	64.1	129	265.5	-7.7	18.2	180	238.0	-35.2	-31.3	231	187.0	-86.2	-123.1
028	316.0	42.8	109.1	079	290.5	17.3	63.2	130	265.0	-8.2	17.3	181	237.0	-36.2	-33.1	232	186.0	-87.2	-124.9
029	315.5	42.3	108.2	080	290.0	16.8	62.3	131	264.5	-8.7	16.4	182	236.0	-37.2	-34.9	233	185.0	-88.2	-126.7
030	315.0	41.8	107.3	081	289.5	16.3	61.4	132	264.0	-9.2	15.5	183	235.0	-38.2	-36.7	234	184.0	-89.2	-128.5
031	314.5	41.3	106.4	082	289.0	15.8	60.5	133	263.5	-9.7	14.6	184	234.0	-39.2	-38.5	235	183.0	-90.2	-130.3
032	314.0	40.8	105.5	083	288.5	15.3	59.6	134	263.0	-10.2	13.7	185	233.0	-40.2	-40.3	236	182.0	-91.2	-132.1
033	313.5	40.3	104.6	084	288.0	14.8	58.7	135	262.5	-10.7	12.8	186	232.0	-41.2	-42.1	237	181.0	-92.2	-133.9
034	313.0	39.8	103.7	085	287.5	14.3	57.8	136	262.0	-11.2	11.9	187	231.0	-42.2	-43.9	238	180.0	-93.2	-135.7
035	312.5	39.3	102.8	086	287.0	13.8	56.9	137	261.5	-11.7	11.0	188	230.0	-43.2	-45.7	239	179.0	-94.2	-137.5
036	312.0	38.8	101.9	087	286.5	13.3	56.0	138	261.0	-12.2	10.1	189	229.0	-44.2	-47.5	240	178.0	-95.2	-139.3
037	311.5	38.3	101.0	088	286.0	12.8	55.1	139	260.5	-12.7	9.2	190	228.0	-45.2	-49.3	241	177.0	-96.2	-141.1
038	311.0	37.8	100.1	089	285.5	12.3	54.2	140	260.0	-13.2	8.3	191	227.0	-46.2	-51.1	242	176.0	-97.2	-142.9
039	310.5	37.3	99.2	090	285.0	11.8	53.3	141	259.5	-13.7	7.4	192	226.0	-47.2	-52.9	243	175.0	-98.2	-144.7
040	310.0	36.8	98.3	091	284.5	11.3	52.4	142	259.0	-14.2	6.5	193	225.0	-48.2	-54.7	244	174.0	-99.2	-146.5
041	309.5	36.3	97.4	092	284.0	10.8	51.5	143	258.5	-14.7	5.6	194	224.0	-49.2	-56.5	245	173.0	-100.2	-148.3
042	309.0	35.8	96.5	093	283.5	10.3	50.6	144	258.0	-15.2	4.7	195	223.0	-50.2	-58.3	246	172.0	-101.2	-150.1
043	308.5	35.3	95.6	094	283.0	9.8	49.7	145	257.5	-15.7	3.8	196	222.0	-51.2	-60.1	247	171.0	-102.2	-151.9
044	308.0	34.8	94.7	095	282.5	9.3	48.8	146	257.0	-16.2	2.9	197	221.0	-52.2	-61.9	248	170.0	-103.2	-153.7
045	307.5	34.3	93.8	096	282.0	8.8	47.9	147	256.5	-16.7	2.0	198	220.0	-53.2	-63.7	249	169.0	-104.2	-155.5
046	307.0	33.8	92.9	097	281.5	8.3	47.0	148	256.0	-17.2	1.1	199	219.0	-54.2	-65.5	250	168.0	-105.2	-157.3
047	306.5	33.3	92.0	098	281.0	7.8	46.1	149	255.5	-17.7	.2	200	218.0	-55.2	-67.3	251	167.0	-106.2	-159.1
048	306.0	32.8	91.1	099	280.5	7.3	45.2	150	255.0	-18.2	-.7	201	217.0	-56.2	-69.1	252	166.0	-107.2	-160.9
049	305.5	32.3	90.2	100	280.0	6.8	44.3	151	254.5	-18.7	-1.6	202	216.0	-57.2	-70.9	253	165.0	-108.2	-162.7
050	305.0	31.8	89.3	101	279.5	6.3	43.3	152	254.0	-19.2	-2.5	203	215.0	-58.2	-72.7	254	164.0	-109.2	-164.5
																255	163.0	-110.2	-165.3

STANDARD IR CALIBRATION

fig. 7-2 STANDARD IR CALIBRATION TABLE

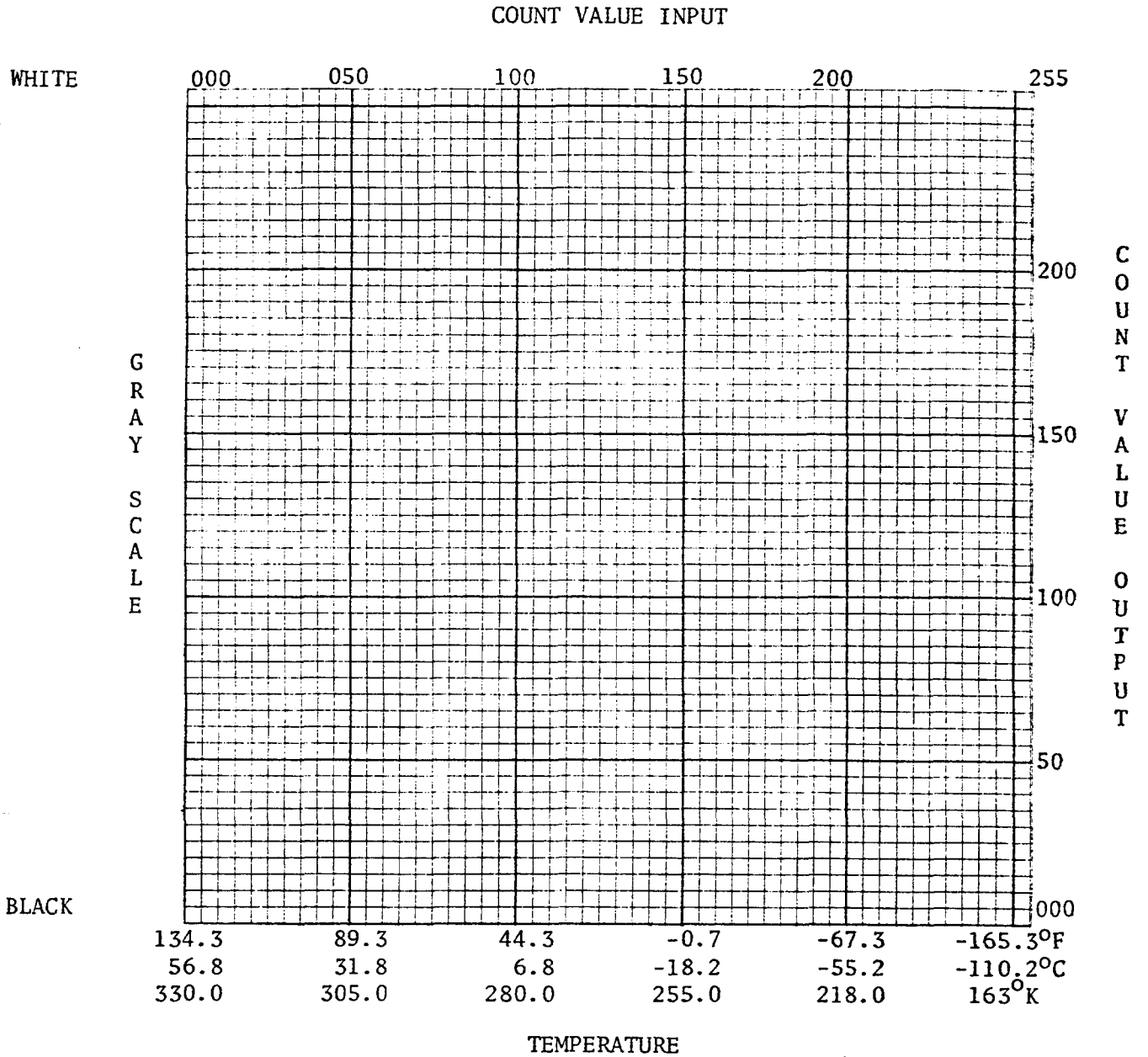
2. A completed enhancement table is prepared by locally reproducing the attached table (fig. 7-1) and filling in the 256 values in the Enhancement Table. (A calibration table, fig. 7-2, listing temperature versus count value is included.) Interpolated count values should be rounded to whole numbers.

3. A graphical display of the enhancement table is plotted on the enclosed form (fig. 7-3). Each segment of the graph should be numbered consecutively from the origin. Fill in the chart below the graph so that other users can easily identify the exact temperature range of each segment. For quick reference indicate the count value at the beginning and end of each segment on the graph. Fill in comment block for temperature segments. Leave "Enhancement Table" legend and "Data Submitted/Implemented" (in upper right corner) blank. Indicate in the upper left corner of fig. 7-3, the WSFO, NWS Region, SFSS or NESDIS unit submitting the curve.

Upon approval by the IERG, the curve will normally be evaluated as a test curve for at least 2 weeks before a decision is made whether it will be placed in the active inventory for use either as a scheduled product or SFSS Floater Call-up. All WSFOs will receive, from their respective SFSSs, a copy of the Enhancement Curve (table) and its availability (either SFSS Floater and/or approved NWS sector schedule) via telecopier or mail prior to its implementation.

Amendments to the Imagery Enhancement Program

As new Enhancement Curves are implemented for operational use, amendments to this section will be forwarded to all users so that a current inventory of Enhancement Curves, and a current list of those Enhancement Curves in the active memory banks, can be maintained.



SEGMENT NUMBER	°C TEMPERATURE _____ to _____	COMMENTS REASON FOR SEGEMENT ENHANCEMENT

fig. 7-3 ENHANCEMENT GRAPH FOR NEW TABLES

Introduction To Goes Imagery Enhancement

Background

Infrared energy detected by the GOES infrared sensor is transmitted in digital form from the satellites to the Wallops CDA station. Here the radiance measurements are converted to equivalent black body temperatures (the calibration process). The data are then retransmitted in digital form via the satellite to the CDDF where it is sectorized and converted to analog for retransmission to users.

In the sectorizer, 256 digital count values represent a specific range of temperatures. After conversion to analog, these count values are transmitted to field offices as 256 gray shades. This number of gray shades cannot be seen on the displayed image for several reasons (primarily the gray scale range and linearity of the display equipment and the level of noise on the C-5 telephone circuits). The maximum number of gray shades visible, ranges from about 15 to about 40, depending on the combined effect of the limiting conditions at each specific office. The 256 gray shades in the satellite data should not be confused with the gray scale at the top of each transmitted image. That gray scale contains only 17 steps when transmitted and is intended only to check the gray scale range and linearity of the display equipment.

Presently, the count values of the satellite data are unchanged by the sectorizers. Also, calibration of the data received at the CDDF is maintained constant by the Wallops CDA station and is defined in fig. 7-2. It should be noted that this satellite calibration is not linear. Each count represents a 0.5° change from 330° K to 242° K and a 1.0° change from 242° K to 163° K.

Enhancement

When temperature gradients are small, it is difficult to recognize significant cloud and surface features in IR imagery. These include fog and stratus, haze, ocean current boundaries, and terrain features. The purpose of enhancement is to increase the contrast between those features and their background. If more temperature definition is desired than can be displayed without enhancement, the available gray shades can be displayed through a smaller temperature range by modification of the count values in the sectorizers (before conversion to analog). Completion of the "Enhancement Table" (fig. 7-1) will define the desired modification.

Figure 7-4 is a graphic illustration of a sectorized enhancement table. Count values as input to the sectorizers are plotted on the horizontal axis, and count values as modified by the sectorizers are plotted on the vertical axis. As points of

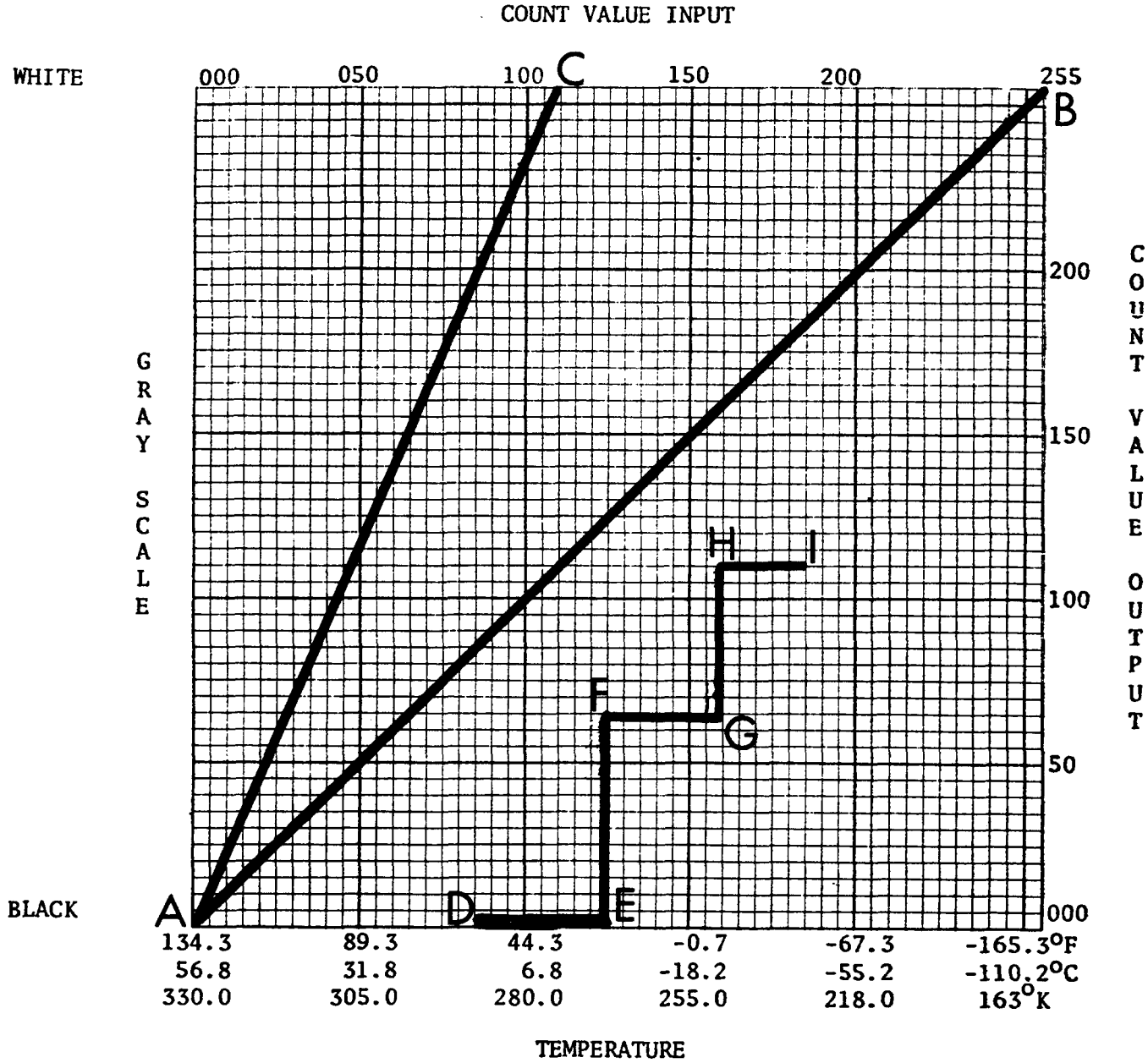


fig. 7- 4 GRAPHIC ILLUSTRATION OF A SECTORIZED ENHANCEMENT TABLE

reference, six count values on the horizontal axis correspond to the six sets of temperatures at the top of the graph. Count values on the vertical axis result in the gray shade range as referenced at the right of the graph. The solid line (AB) represents the case of no enhancement (output count values equal input count values).

If, for example, the warmer (darker) end of the spectrum requires greater definition, data can be modified in the sectorizers as illustrated by the segment (AC) in fig. 7-4. Here all gray shades are displayed from +56 to 5.8 C. This technique is commonly referred to as a steep linear enhancement with a slope of greater than 1.0. Another enhancement technique is contouring or "step function" construction. In this technique, certain temperature ranges are assigned specific gray shades. An example is given in fig. 7-4 as segment D E F, G H I. A black shade is assigned to all temperatures from +5.8 C to -8.0 C, a dark gray shade within the range -8.0 C to -19.7 C, and a lighter gray shade from -19.7 C to -39.5 C. This technique has the advantage of simplicity in interpretation.

For an enhancement curve to be fully utilized by field forecasters, two basic criteria should be considered: (1) limit the number of features to be enhanced, and (2) afford as much detail in the data as possible without making the display overly confusing. The "step function" enhancement technique has the advantage of making deep vertically structured cloud areas obvious. However, some data loss is encountered when assigning a range of temperatures to a given gray shade. The steep linear enhancing technique, on the other hand, provides excellent detail in the data. Multiple liner enhancement provides increased contrast over the total temperature range but also introduces multiple gray scale boundaries in cloud systems, which may mask meteorologically significant cloud edges. There are always trade-offs between simple enhancement curves, which sacrifice detail but can be quickly interpreted in an operational environment, and complex curves, which maximize the information content but require more time to interpret. Experience to date indicates a blend of contouring and steep linear enhancing is the best approach in constructing an operational display.

Gray Scale With Temperature Values

A gray scale with temperature values from +50 C to -100 C marked at 10 intervals appears immediately below the header information. This scale replaces 20 lines of data. The scale is a representation of the enhancement curve displayed in the picture. Linear changes are reflected as gradual change within the gray scale. Step function or contours are easily identified as abrupt changes in scale. Temperature values or ranges can be

easily identified for contours (step functions), and an approximation of the enhanced curve can be made directly from the scale. It is anticipated the scale will aid users of enhanced data by providing direct comparison to pictorial data without reference to tabular values of a particular enhancement curve.

GOES IR Accuracy and Stability

Since the implementation of the GOES IR enhancement program, IR calibration accuracy has occasionally limited the usefulness of the enhanced imagery. It is the intent of this subsection to provide a brief overview of the calibration process and the reasons for the varying calibration accuracy and to provide prospects for the future.

The equipment at the Wallops CDA Station uses tables supplied by the Sensor Calibration Section to convert raw instrument counts to calibrated counts suitable for use in the NOAA standard calibration equations relating counts to equivalent black body temperatures. These tables are computer generated from a model of the instrument that in addition to the Planck model of radiance to equivalent black body transforms accounts for the thermal gradients within the VISSR. Variations in these thermal gradients follow an annual cycle in addition to a diurnal cycle during spacecraft solar eclipse periods (spring and fall equinoxes). Calibration parameters are normally updated once weekly. Therefore, variations that occur between parameter updatings cannot be compensated for.

The following data contributes to the determination of the table values for the weekly updating:

1. The basic calibration of the VISSR instrument is accomplished by the use of an internal calibration source whose temperature is measured and telemetered from the spacecraft.

2. The uncalibrated instrument values are obtained once daily by utilizing the three special lines inserted into the data on each normal start picture.

Factors that influence calibration stability are:

1. No routine ground truth - Since no routine ground truth comparison is currently available, calibration is based entirely upon the internal instrument calibrator, a model by which calibration data are evaluated utilizing the VISSR's linear response to energy over the specified temperature range.

2. Diurnal variation during elipse - Unfortunately, major system changes would be required to update calibration parameters at the frequency required to correct diurnal changes. No improvement is forecast at this time. Variations may approach 5° K immediately after the daily eclipse event.

3. Unusual instrument variations, human errors, and system hardware problems are monitored routinely to provide a stable data base for the timely detection of these problems. To minimize these problems, procedures are modified and new methods are devised as experience is gained and resources become available.

SUMMARY

With presently available resources and techniques, it is the objective of NESDIS to maintain a VISSR IR calibration stability of $\pm 5^{\circ}$ at 295° K. NESDIS is establishing an operational procedure which will result in an effort to notify all users when this stability is not being achieved. For many occurrences, the detection of calibration instability cannot be made in real time. Therefore, short term occurrences may not result in notification.

Users should be aware that calibrated data are not corrected for the effects of varying emissivity of the target or the attenuation due to water vapor in the atmosphere. Variations in surface and cloud emissivities and in atmospheric moisture content preclude any attempt to eliminate these effects as part of the calibration procedures. Quantitative users of the data should attempt to establish ground truth by some comparative technique for each product received.

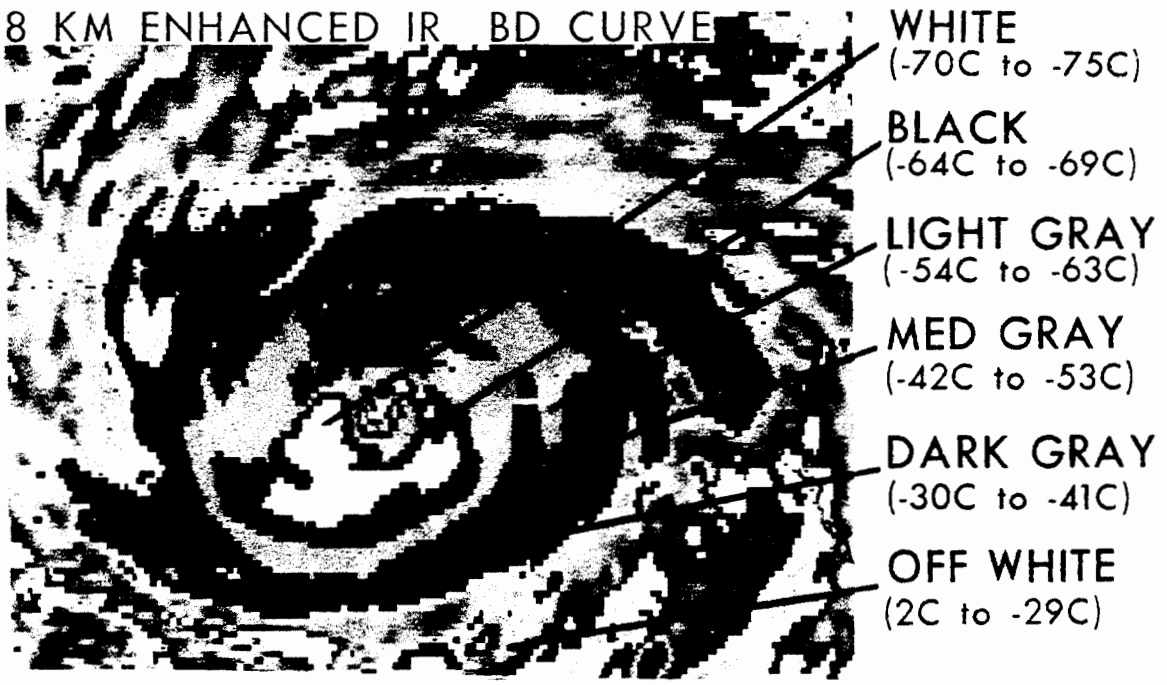
OPERATIONAL ENHANCEMENT CURVES IN ACTIVE MEMORY BANK

More than 200 Enhancement Curves have been tested and evaluated by NESDIS since the implementation of the IR Imagery Enhancement Program. Presentation of these tests and evaluations are beyond the scope of this document. Consequently, only the operational Enhancement Curves as of January 1983 are provided.

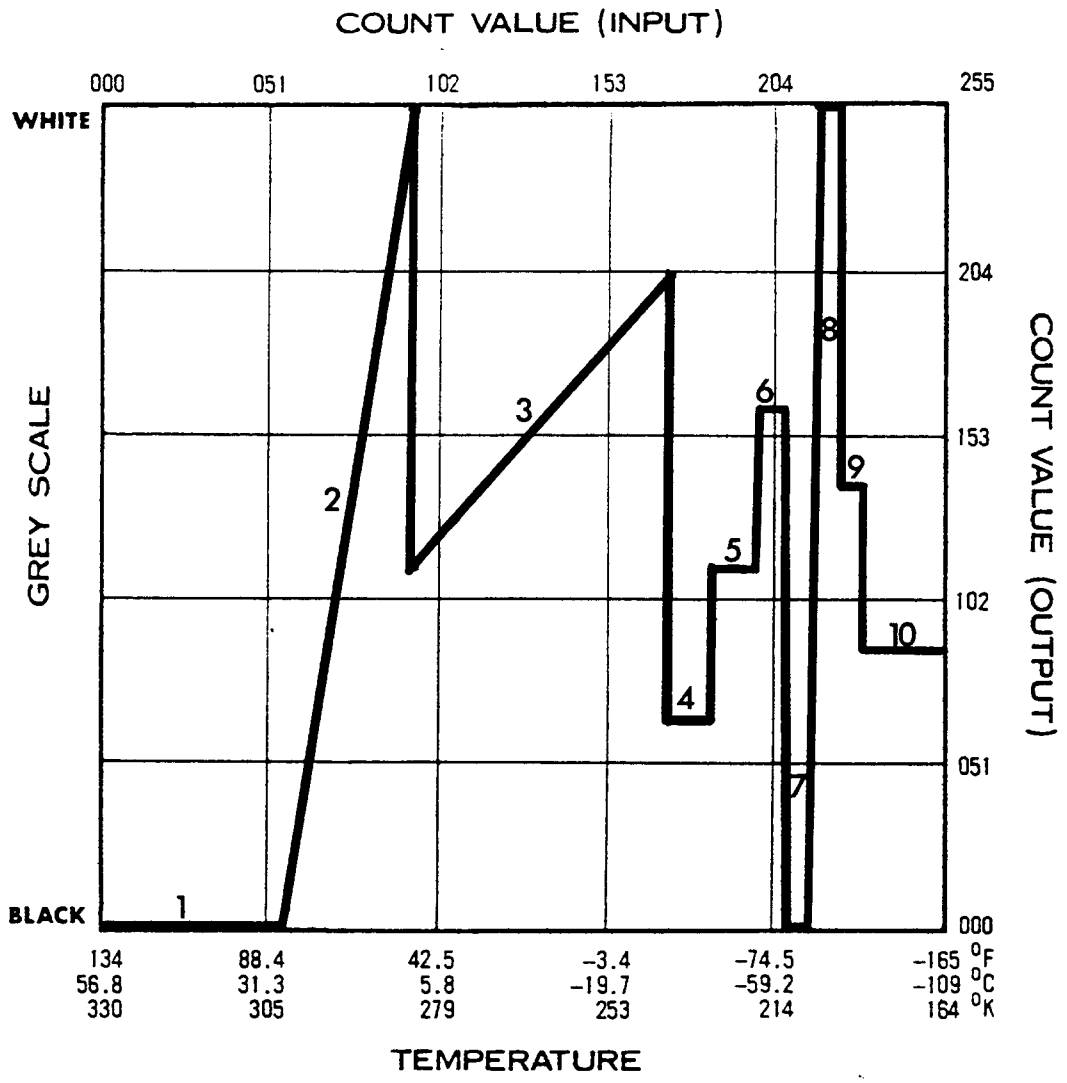
ENHANCEMENT BD

General Description

This is the Dvorak Hurricane Curve for Tropical Cyclone Classification using infrared (IR) techniques. Temperature ranges have been selected to provide a more objective analysis.



ENHANCEMENT BD

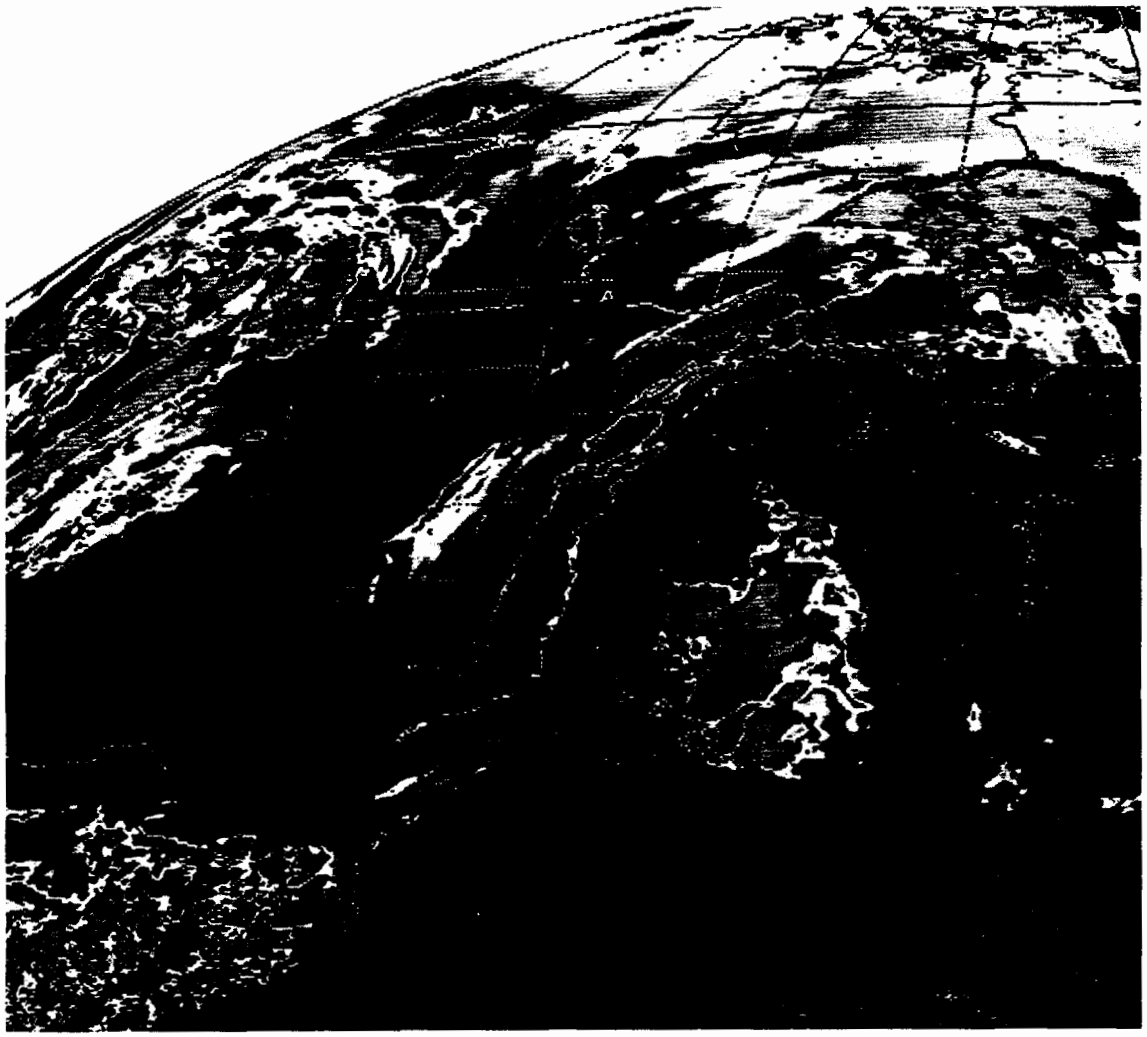


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 28.3	No significant Data
2	27.8 to 9.3	Low Clouds
3	8.8 to -30.2	Cirrus Outflow Pattern
4	-30.7 to -41.2	Dark Gray
5	-42.2 to -53.2	Medium Gray
6	-54.2 to -63.2	Light Gray
7	-64.2 to -69.2	BlacK
8	-70.2 to -75.2	White
9	-76.2 to -80.2	Top Medium
10	-81.2 to -110.2	Top Dark

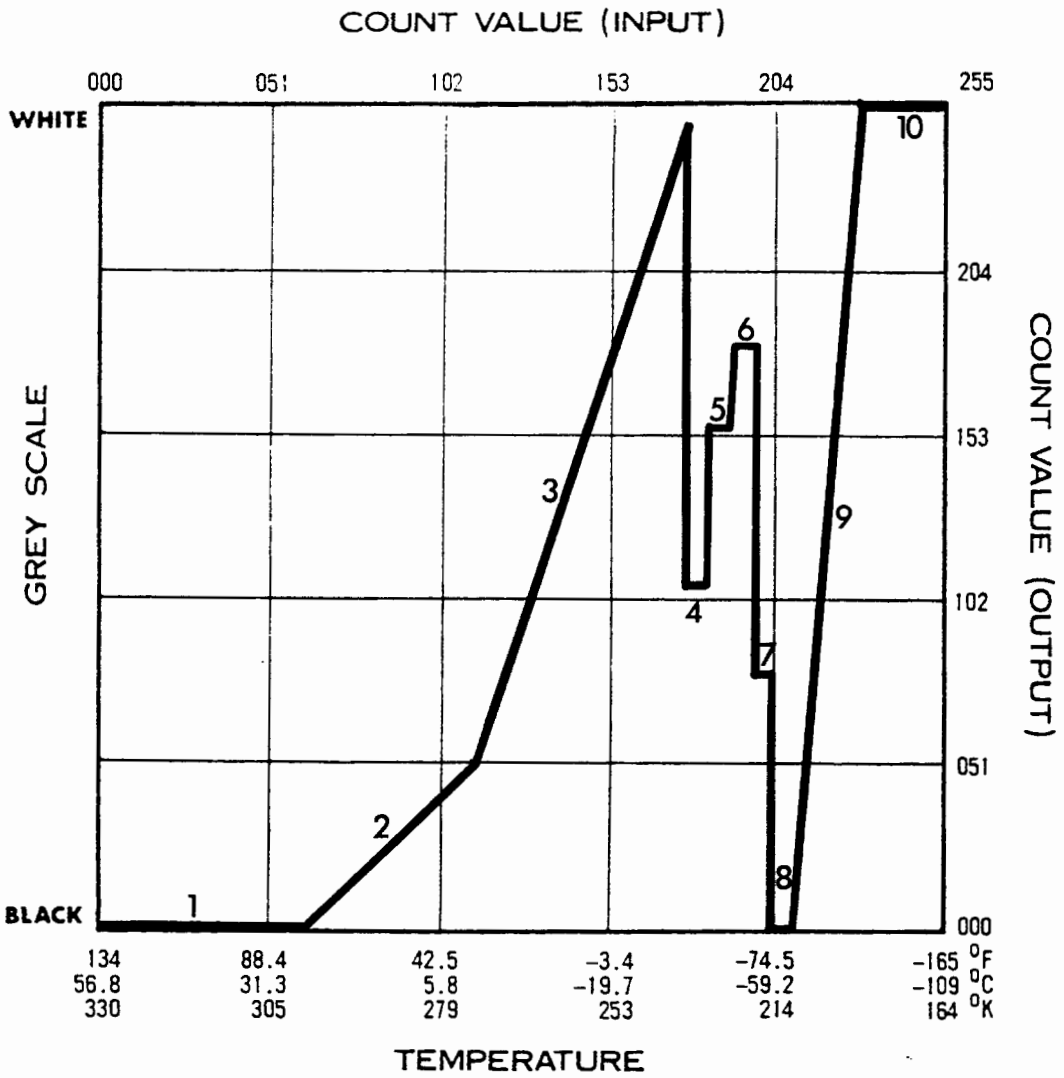
ENHANCEMENT CC

GENERAL DESCRIPTION

This enhancement is used to facilitate cloud interpretation over the colder northern latitudes in winter. The coldest portion of the curve, less than -53° C, is the same as the MB for thunderstorm enhancement and quantitative precipitation estimation. There is no enhancement of features warmer than 0° C.



ENHANCEMENT CC

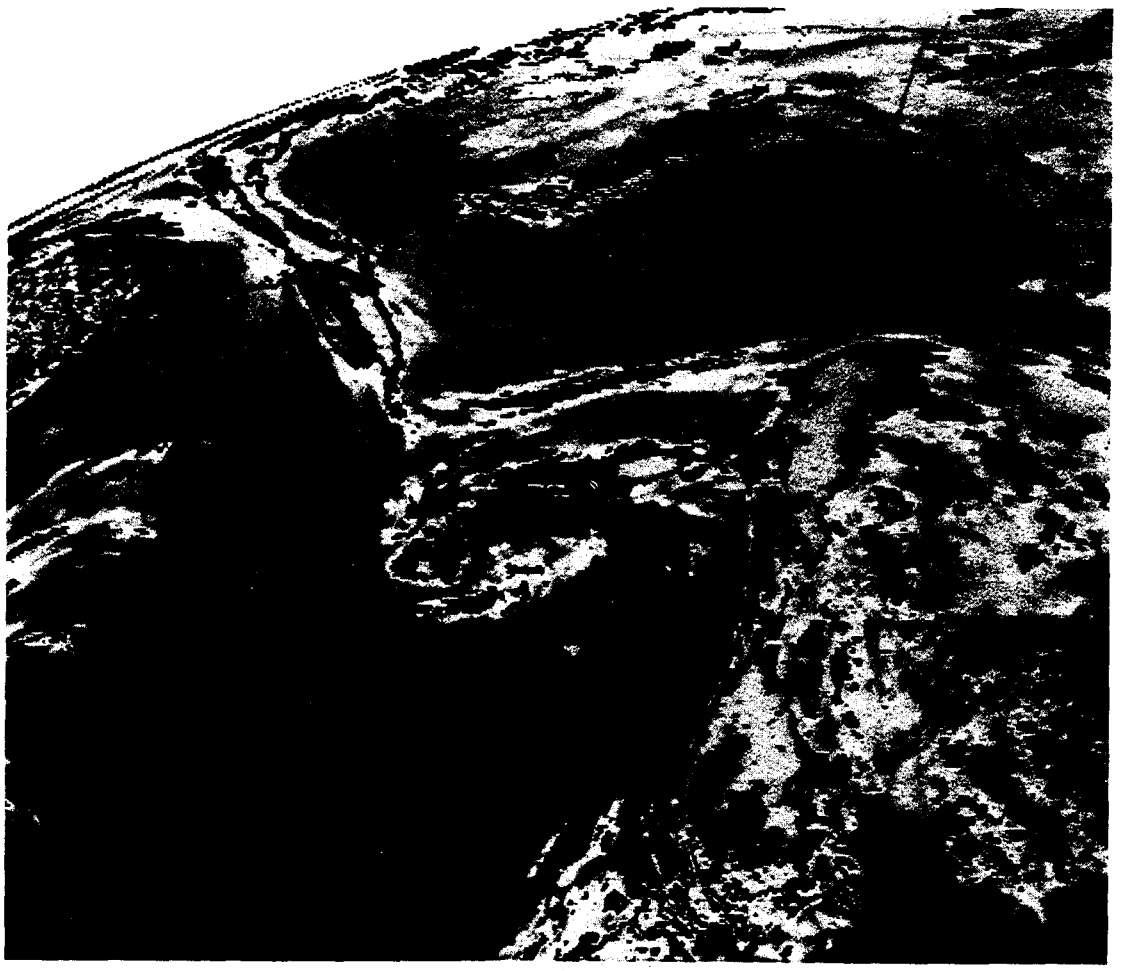


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 24.8	No significant data (Black)
2	24.3 to -0.2	Low level No enhancement
3	-0.7 to -35.2	Mid level enhancement
4	-36.2 to -41.2	Thunderstorm enhancement
5	-42.2 to -47.2	" "
6	-48.2 to -52.2	" " (Light Gray)
7	-53.2 to -58.2	" " (Dark Gray)
8	-49.2 to -62.2	" " (Black)
9	-63.2 to -80.2	Overshooting tops enhancement
10	-81.2 to -109.0	(White)

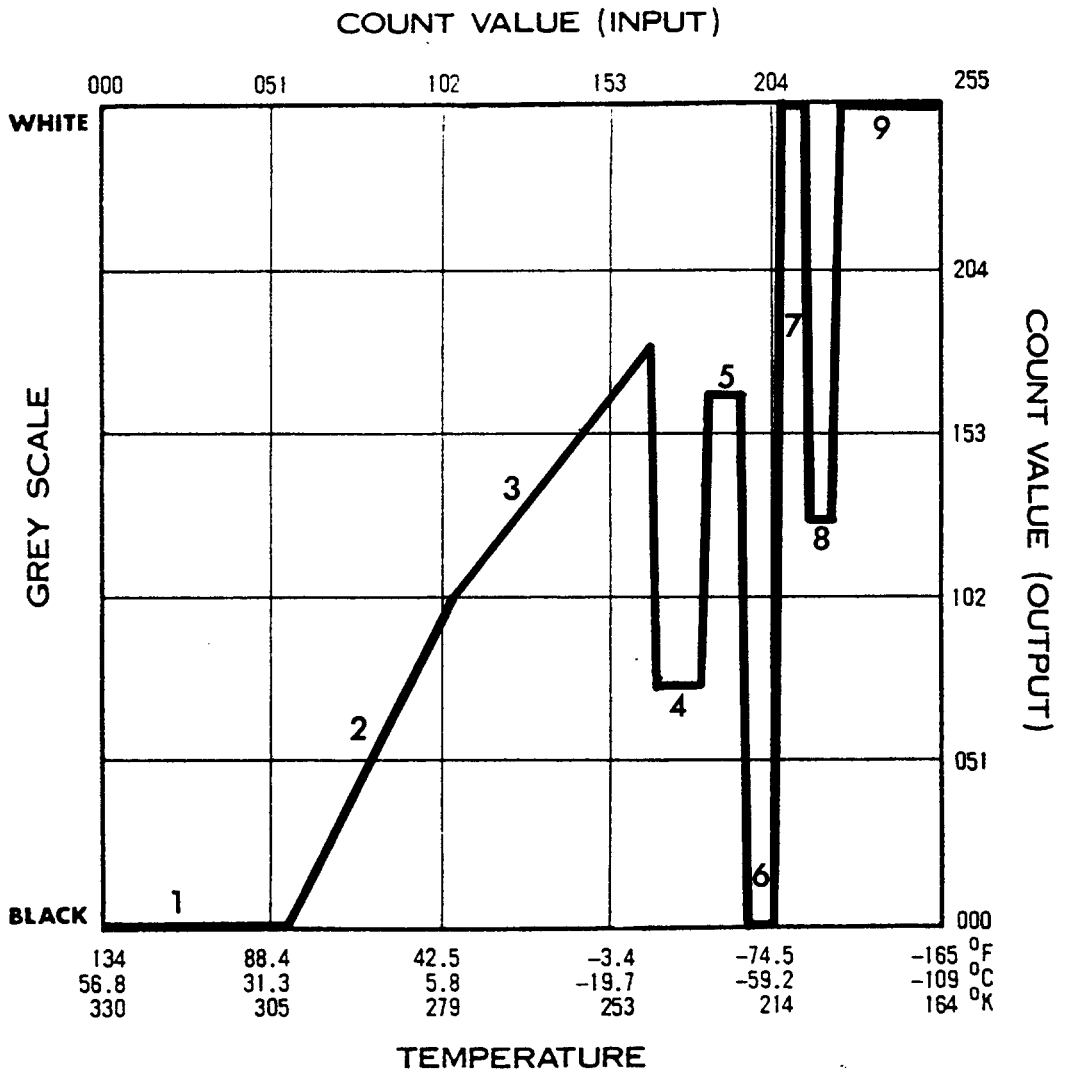
ENHANCEMENT CE

GENERAL DESCRIPTION

The CE enhancement is another modification to the CB/CD series of enhancement curves that has been designed for general use at higher latitudes. The warmer end contains two segments to separate land, water, and low clouds. Segment 3 is designed to display middle clouds. Segment 4 is the threshold for summer thunderstorm lightning occurrence and the remaining levels contour this convection. During winter, this enhancement should delineate the more active precipitating segments of weather systems.



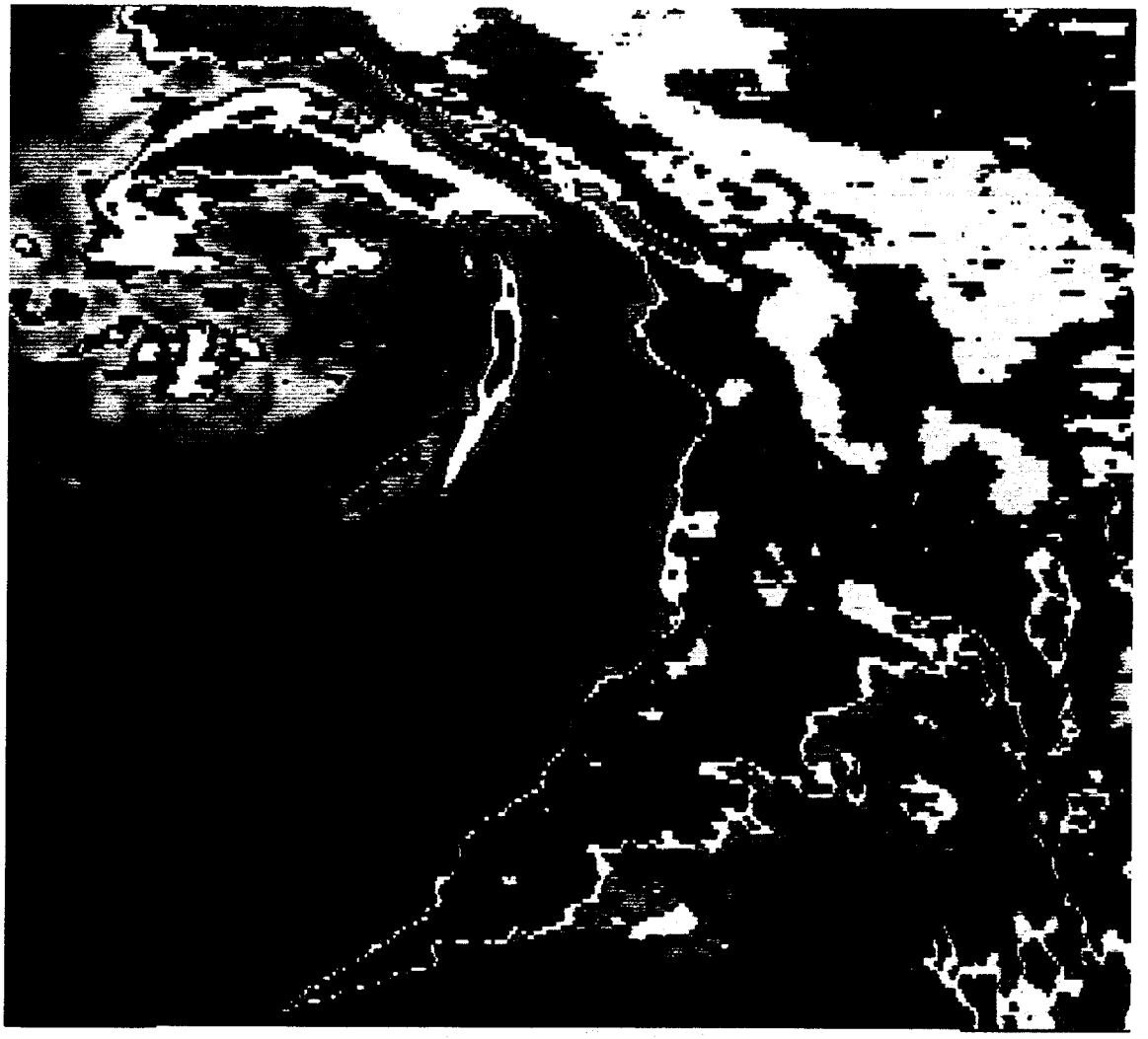
ENHANCEMENT CE



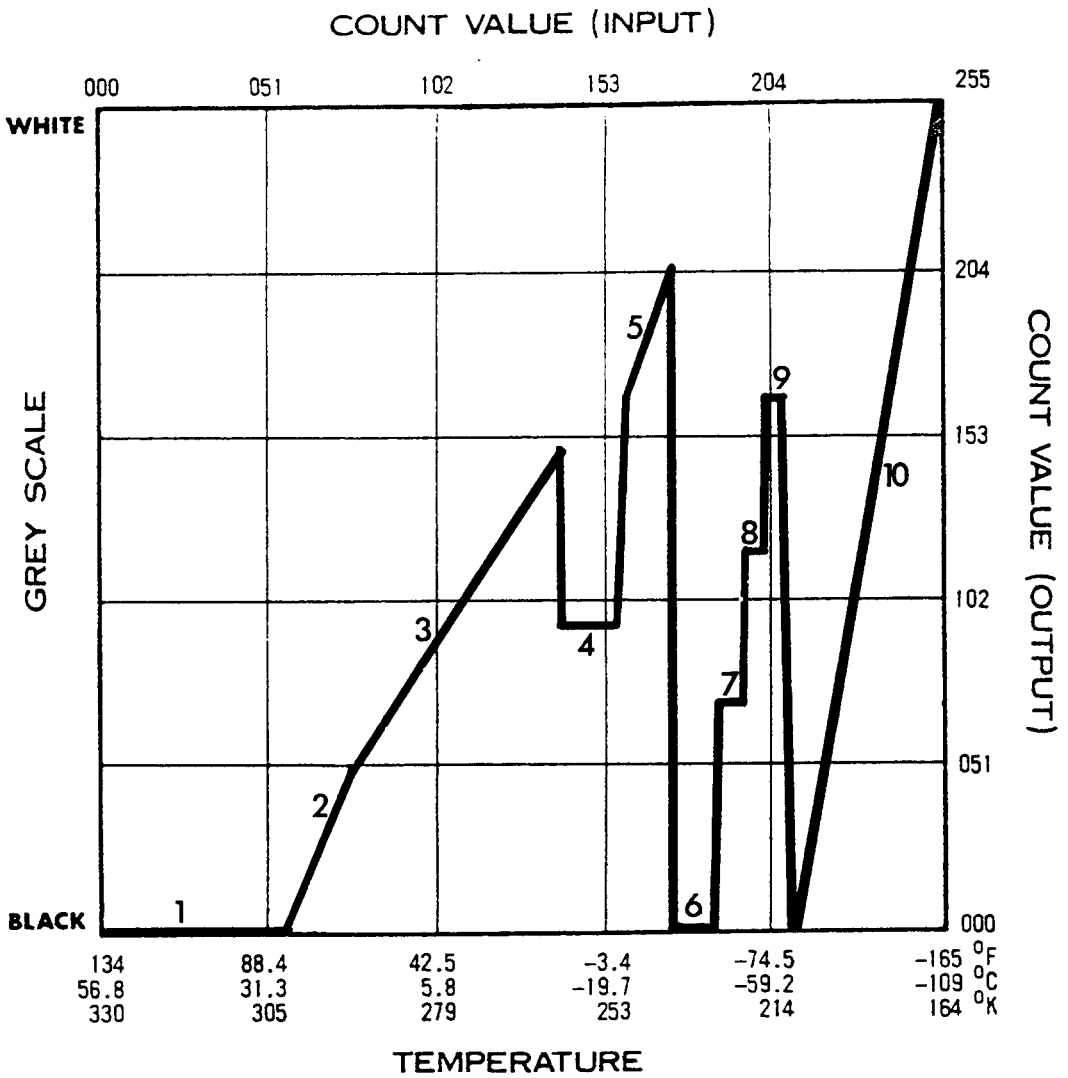
SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 28.8	No significant Data/Land
2	28.3 to 4.8	Land, Water, and low clouds
3	4.3 to -27.7	Area of Freezing Level to middle clouds
4	-28.2 to -39.2	Glaciation Level
5	-40.2 to -49.2	Anvil Growth
6	-50.2 to -59.2	Tropopause
7	-60.2 to -69.2	Growth above Tropopause
8	-70.2 to -79.2	Growth above Tropopause
9	-80.2 to -110.2	No Significant Data

ENHANCEMENT DD

The curve is a further modification of the D series of enhancement curves. Originally designed to bring out features in the snow production temperature zone, this curve will probably be modified in the near future.



ENHANCEMENT DD

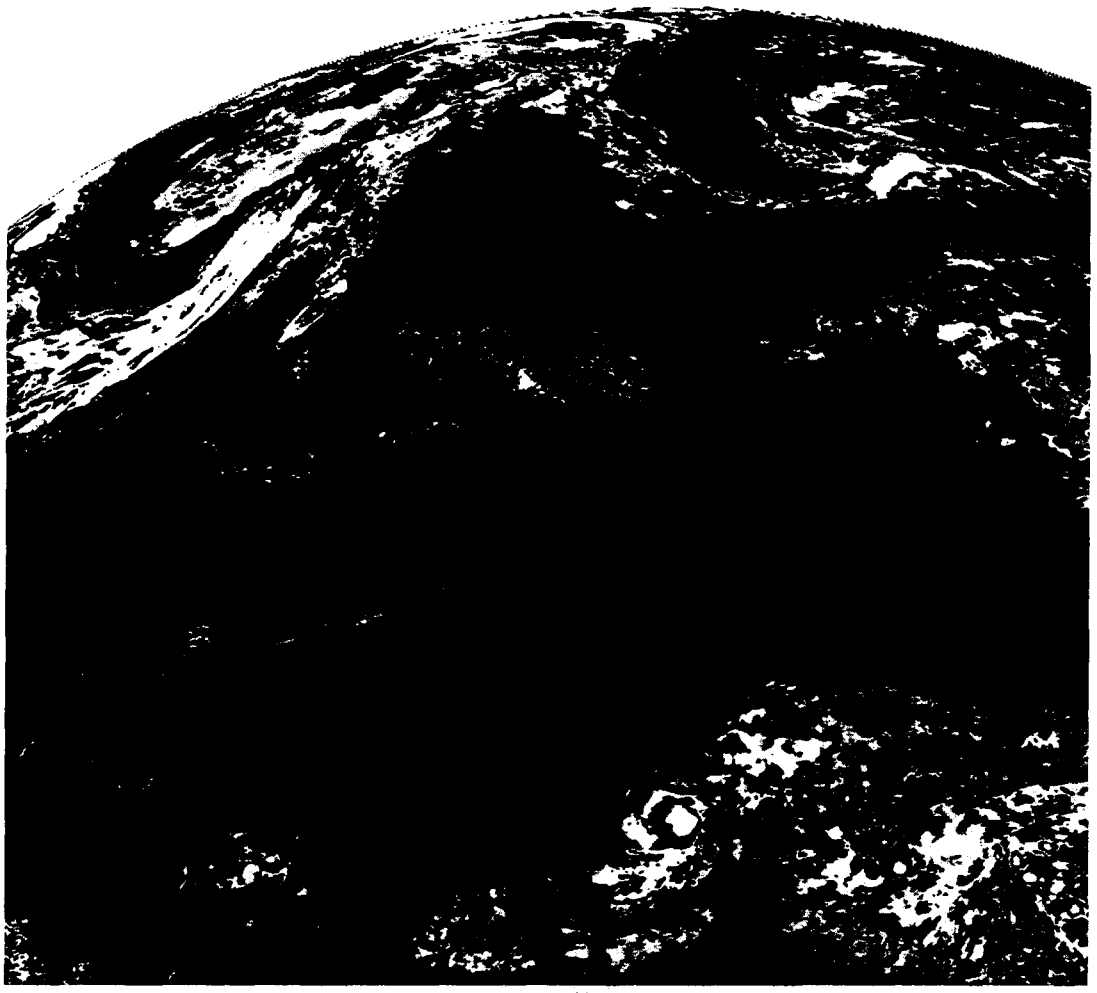


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 29.3	Little or no useful data
2	28.8 to 17.3	Land/Sea difference
3	16.8 to -15.7	Cold low or mid clouds
4	-16.2 to -22.2	Snow Production area
5	-22.7 to -31.2	Mid/High clouds
6	-32.2 to -39.2	Jet cirrus flag
7	-40.2 to -47.2	Cirrus/thunderstorms
8	-48.2 to -55.2	Thunderstorms & heavy precip.
9	-56.2 to -62.2	Thunderstorms & heavy precip.
10	-63.2 to -110.2	Overshooting tops

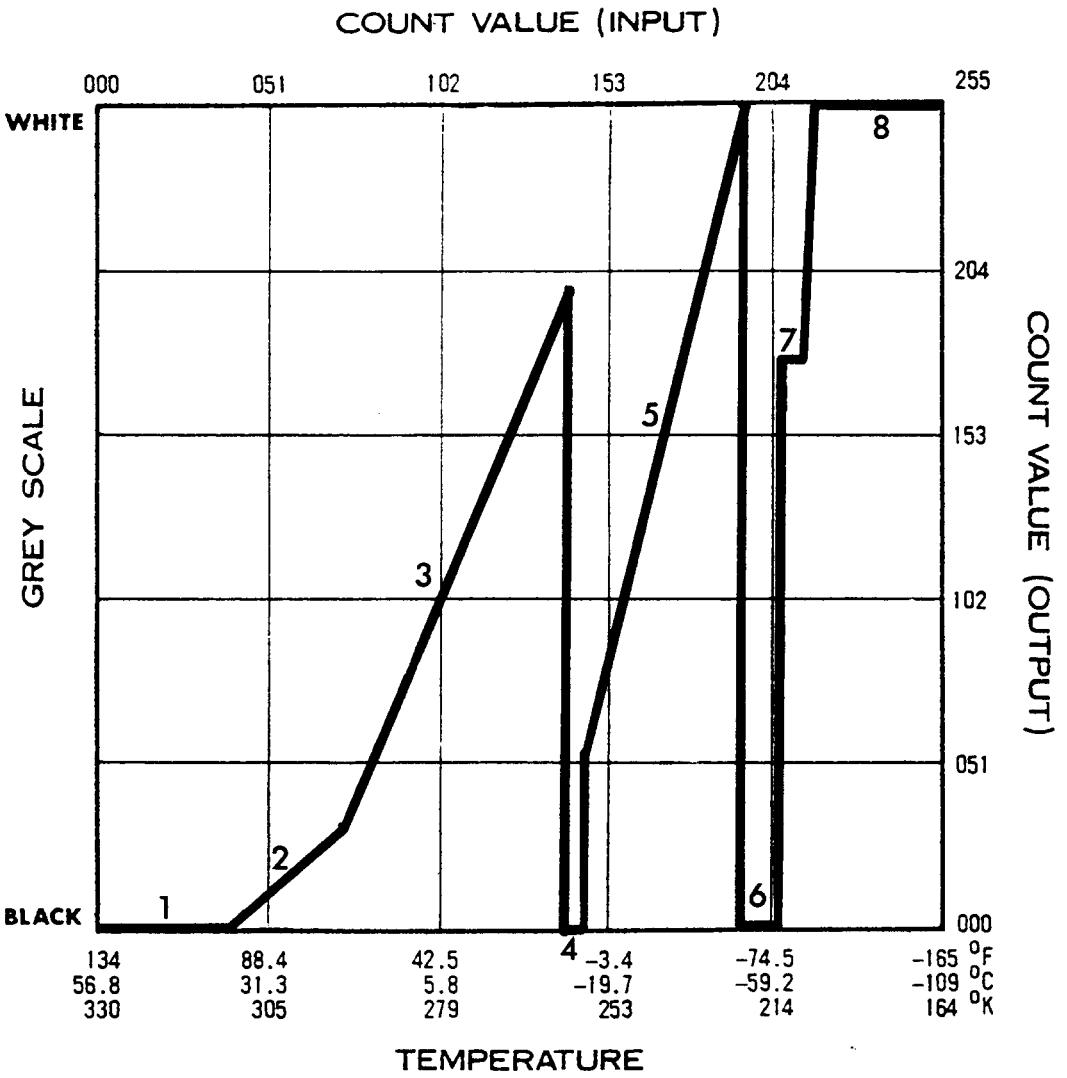
ENHANCEMENT EC

GENERAL DESCRIPTION

This curve is designed to be a general purpose enhancement curve for the cool season. Segment 5 has been designed to contain the cool-season cloud-top temperature range that normally is associated with precipitation (-13 to -50^{0} C). Segments 6 and 7 were inserted to depict convective cloud tops that might occur in the spring before switching to a warm season enhancement curve.



ENHANCEMENT EC

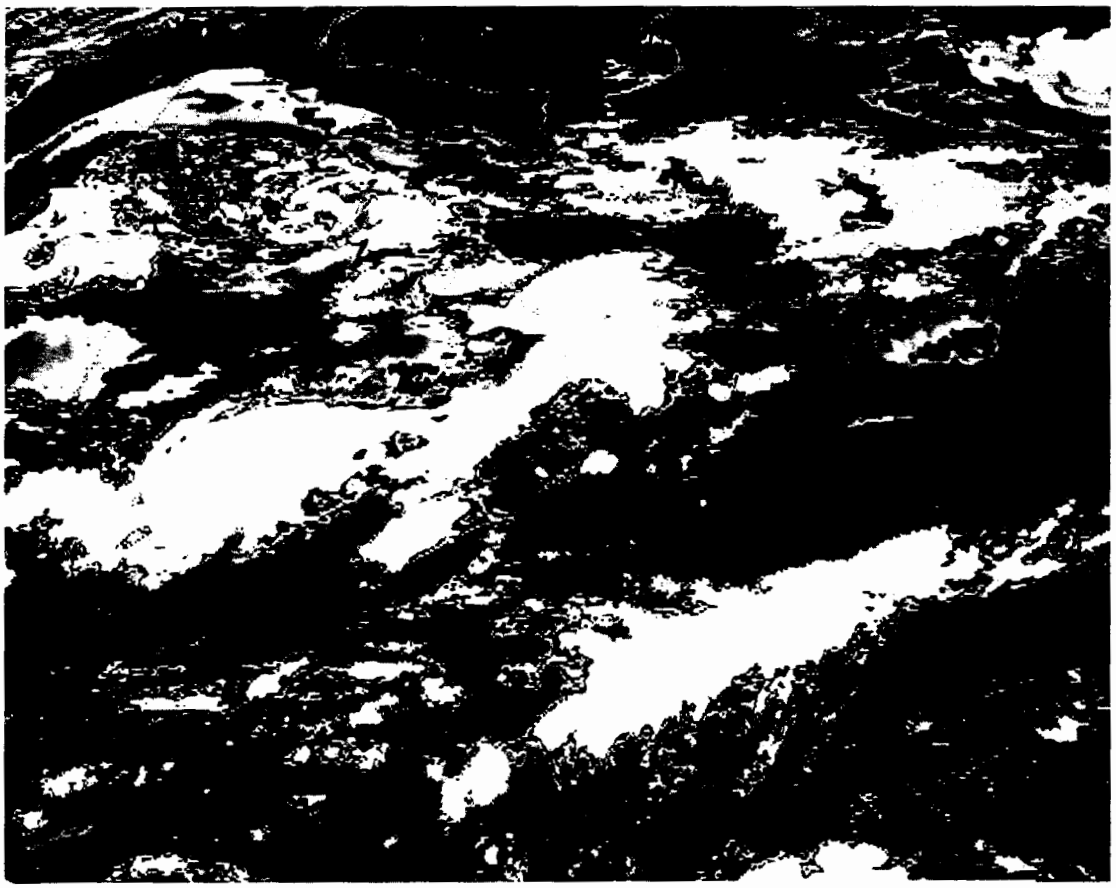


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 37.3	No significant data
2	36.8 to 20.8	Land and water
3	20.3 to -13.2	Water and low clouds
4	-13.7 to -15.7	Benchmark between low and middle clouds
5	-16.2 to -50.2	Middle and high clouds (Cool Season Precip)
6	-51.2 to -60.2	Convective cloud tops
7	-61.2 to -70.2	Convective cloud tops
8	-71.2 to -110.2	Coldest cloud tops

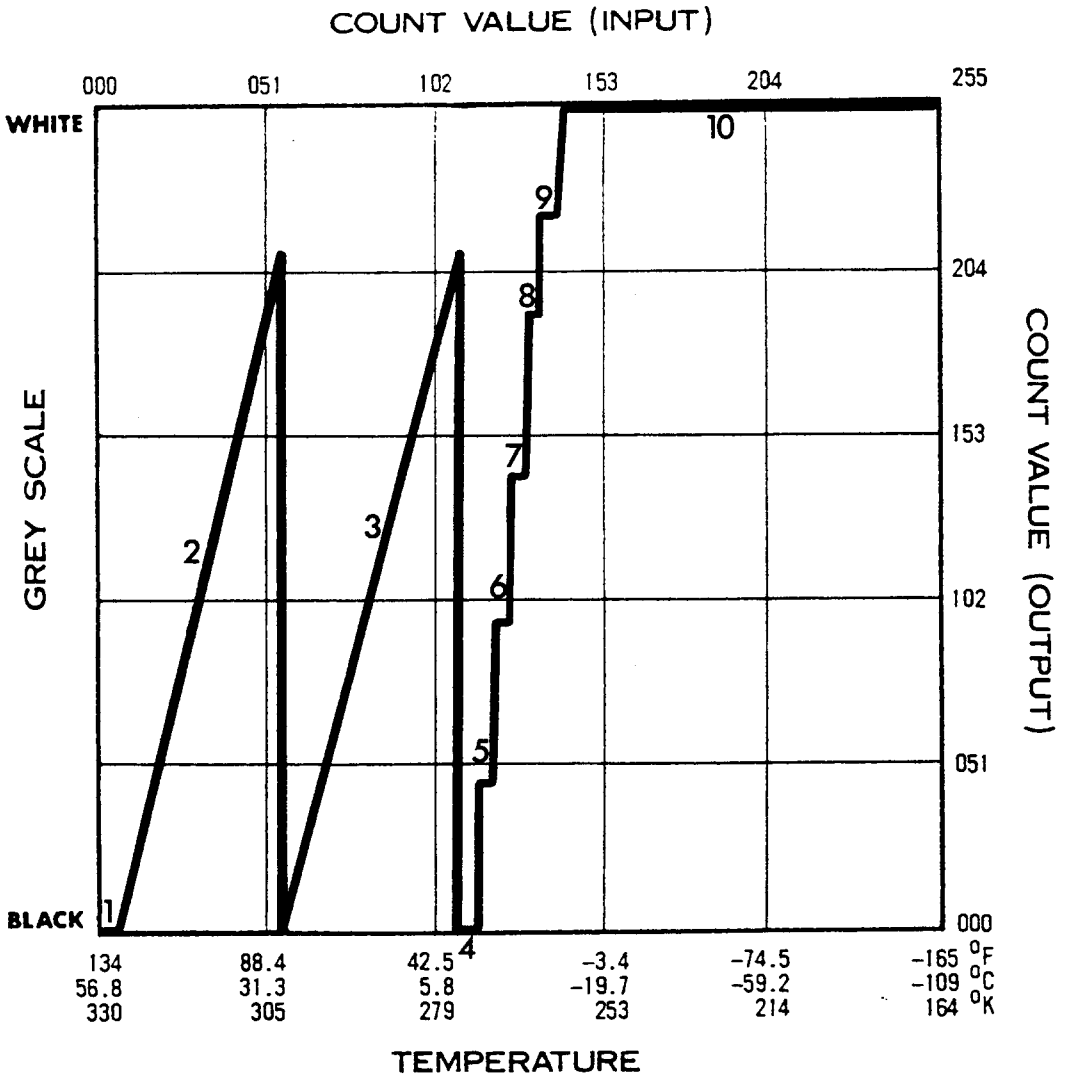
ENHANCEMENT FC

GENERAL DESCRIPTION

Hydrology Curve. The FC is a modified enhancement curve which was developed for special support projects in the mid-West. It is utilized for snow melt in spring and also for soil moisture content projects in support of agricultural interests. This modification more easily identifies ground temperatures in summer.



ENHANCEMENT FC

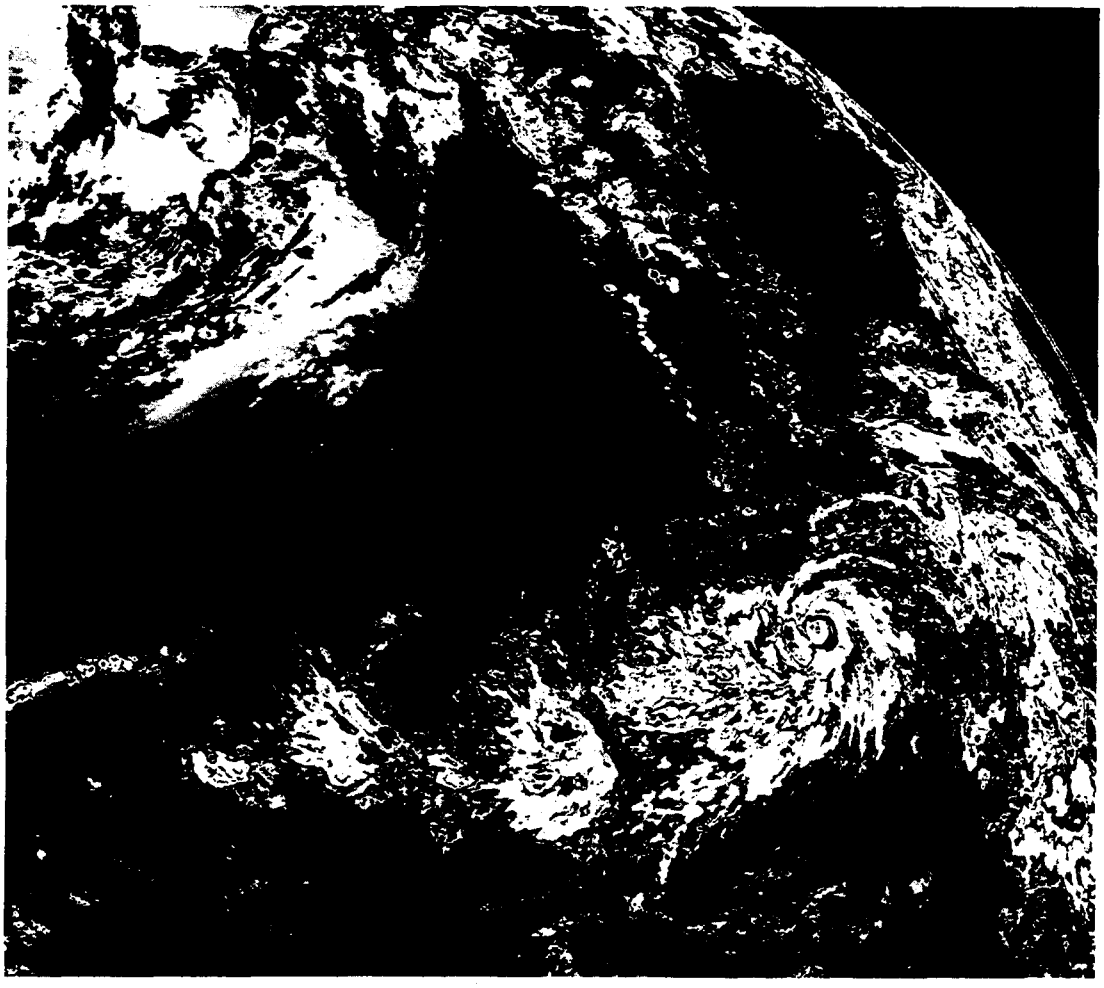


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 55.3	No significant information
2	54.8 to 28.3	Land temperature & features
3	27.8 to 01.3	Land temperature & features
4	00.8 to -01.2	Approximate snow line
5	-01.7 to 04.2	
6	-04.7 to -07.2	steps to show temperature
7	-07.7 to -10.2	distribution snowfield
8	-10.7 to -13.2	
9	-13.7 to -16.2	
10	-16.7 to -110	White

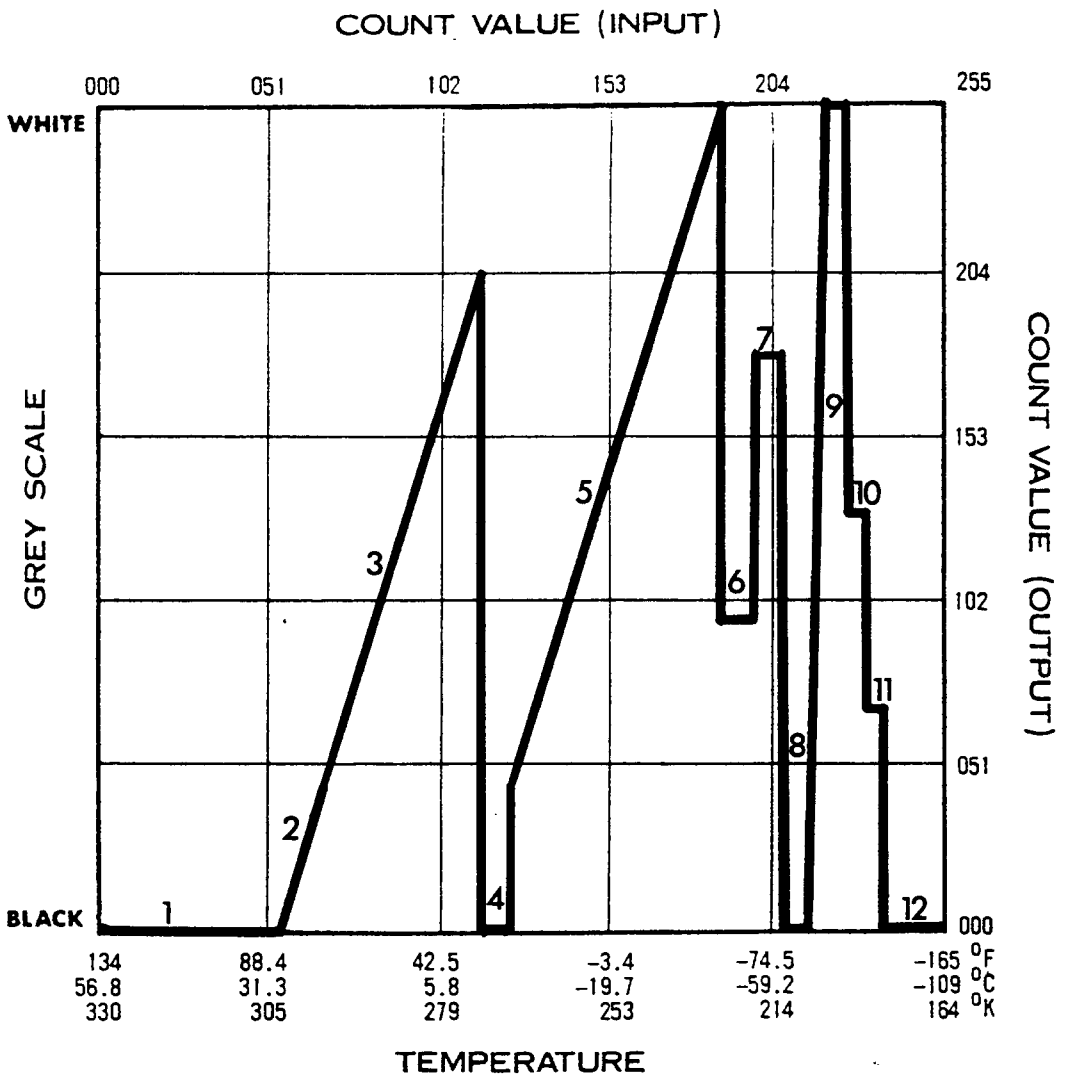
ENHANCEMENT HC

GENERAL DESCRIPTION

The warm portion of the HB curve above the freezing level increases the resolution of the midlatitude stratus and tropical cumulus. The slope is increased in the midtropospheric range from -3° to -47° C for better resolution of frontal band cloudiness. The temperature range colder than -53° C is the same as the BC used for hurricane pattern recognition. The HC can be used for pattern recognition in hurricane strength storms only.



ENHANCEMENT HC

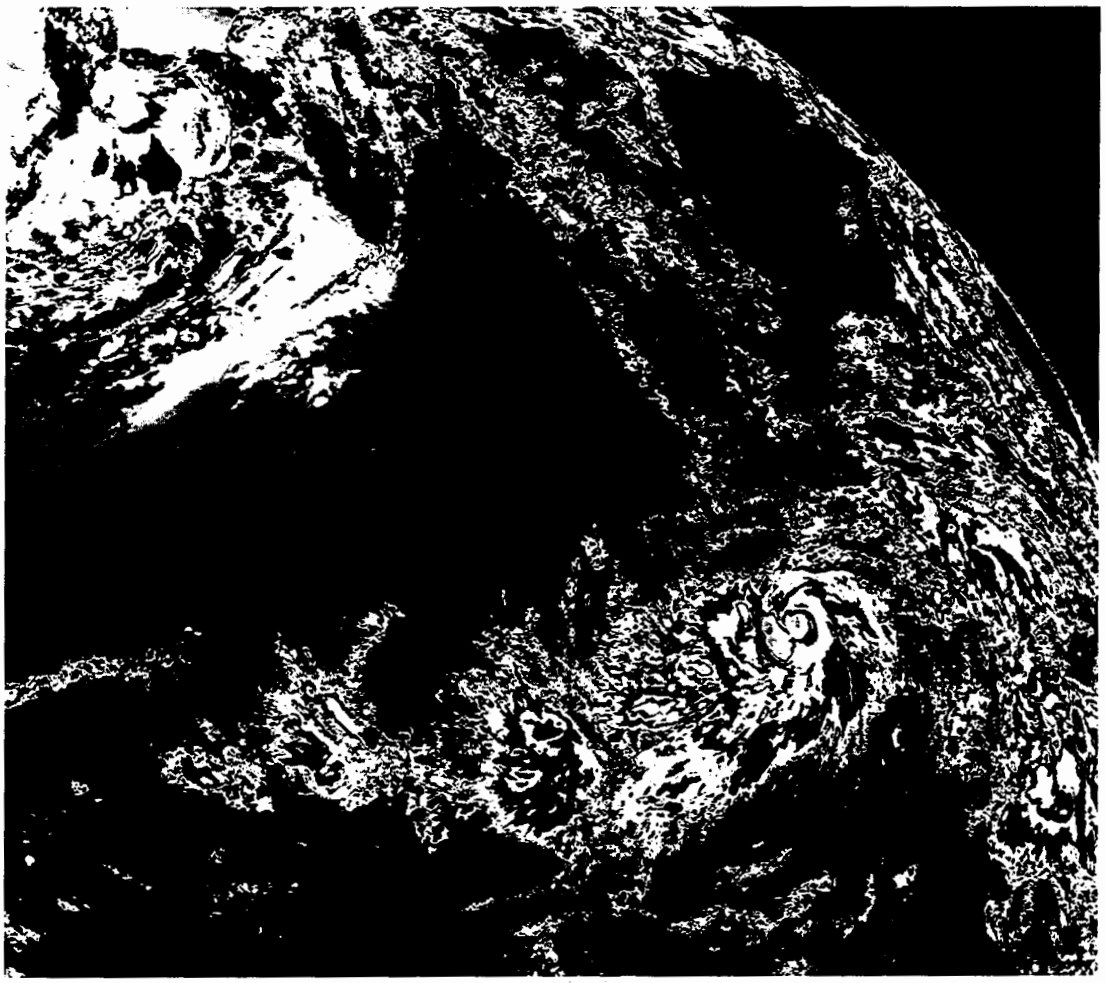


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS	
1	56.8 to 30.3	No significant data	
2	29.8 to 19.8	Land and water	
3	19.3 to 0.3	Water and low clouds	
4	-0.2 to -2.7	Freezing Zone	
5	-3.2 to -46.2	Mid trop/frontal zones	
6	-47.2 to -53.2	Dark gray	
7	-54.2 to -63.2	Light gray	CBs
8	-64.2 to -69.2	Black	and tropical
9	-70.2 to -75.2	White	developments
10	-76.2 to -80.2	Med gray	
11	-81.2 to -86.2	Dark gray	
12	-87.2 to -110.2	Black	

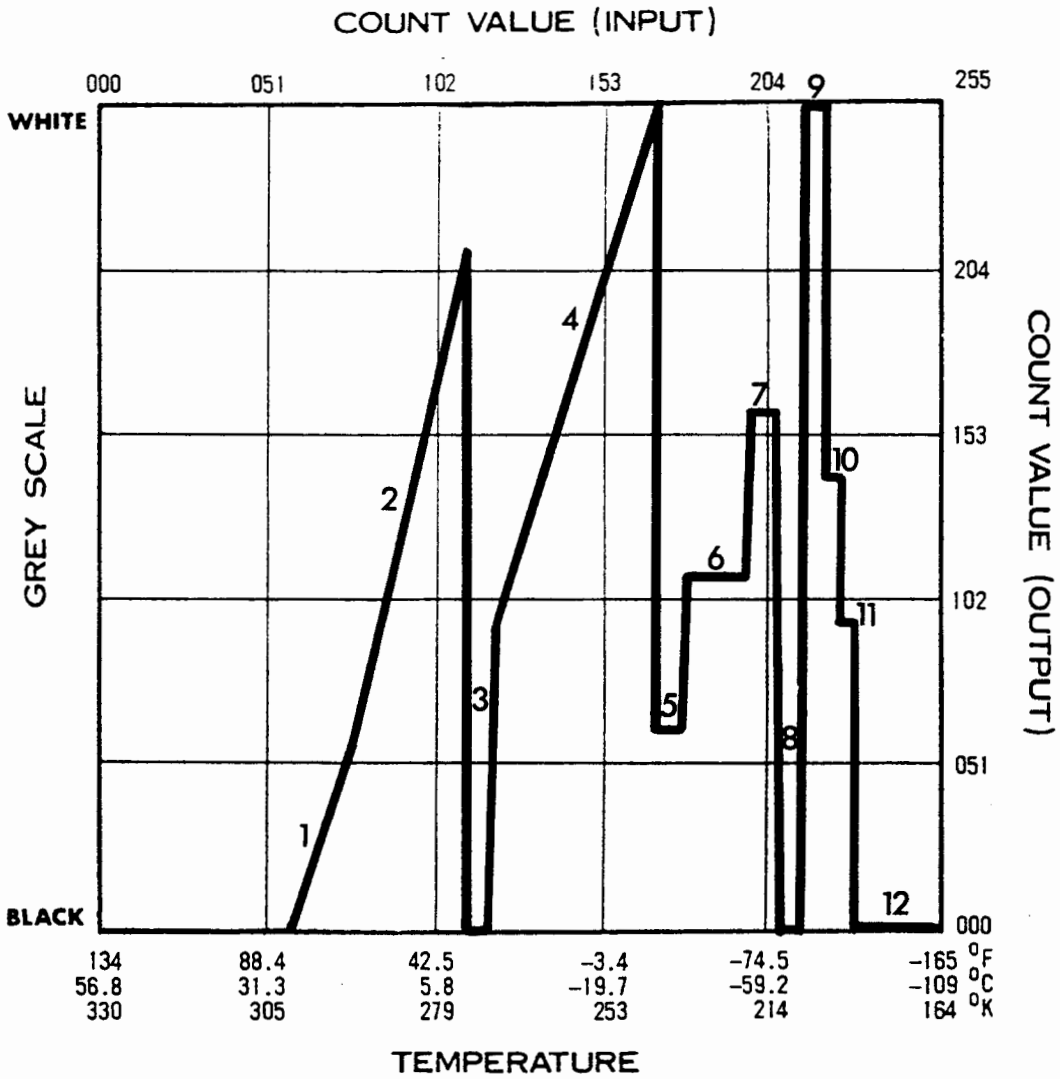
ENHANCEMENT HD

GENERAL DESCRIPTION

This curve is a modified HC curve to provide low cloud information, the freezing level, mid-troposphere frontal systems, and tropical storm classification data.



ENHANCEMENT HD



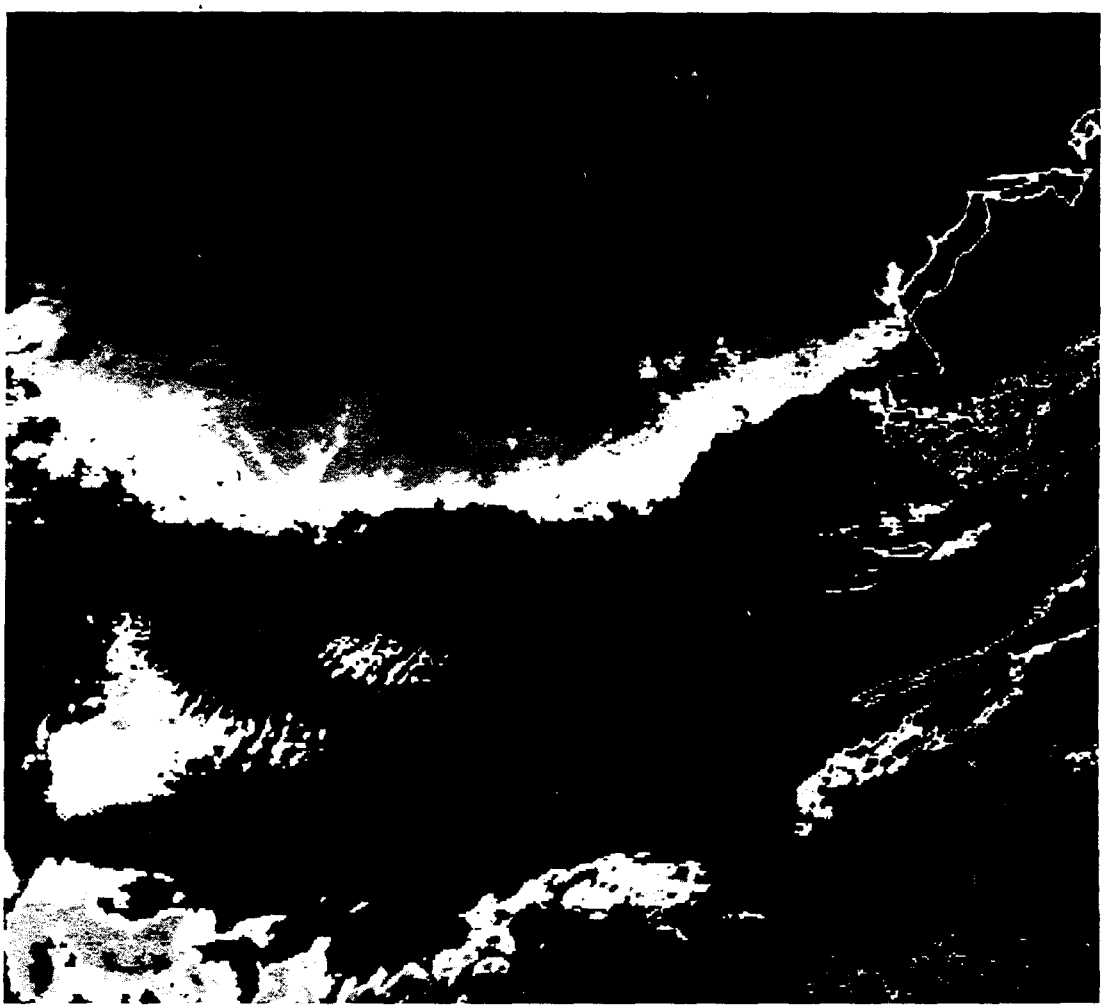
SEGMENT NUMBER	°C TEMPERATURE	COMMENTS	
1	27.3 to 15.8	Land and water for gridding	
2	15.3 to 0.3	Water and low clouds	
3	-0.2 to -2.7	Freezing zone	
4	-3.2 to -30.2	Mid-troposphere fronts	
5	-30.7 to -41.2	Dark gray	Tropical
6	-42.2 to -53.2	Medium gray	Storm
7	-54.2 to -63.2	Light gray	Classification
8	-64.2 to -69.2	Black	and
9	-70.2 to -75.2	White	Precipitation
10	-76.2 to -80.2	Medium gray	Estimates
11	-81.2 to -86.2	Dark gray	
12	-87.2 to -110.2	Black	

ENHANCEMENT IB

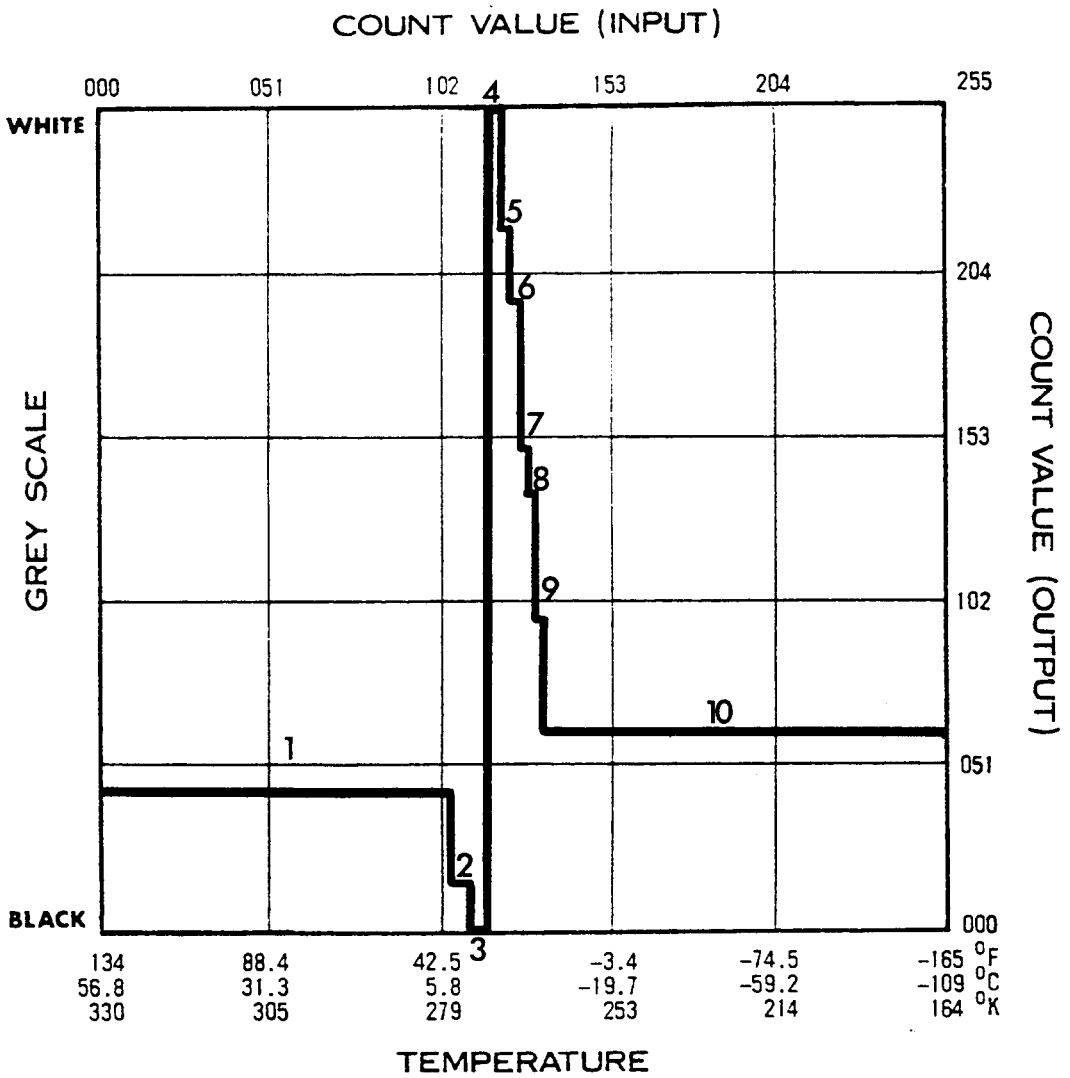
GENERAL DESCRIPTION

This IB curve uses a step function format to enhance near and below freezing surface temperatures (in approximately 2° F increments between 40 and 20° F) in support of the agricultural interests in Florida during the winter months.

This curve is intended to provide clearly readable enhancements of those specific temperature values critical to the minimum temperature forecasts in Florida. The gray shades of segments 1 and 10, although almost the same, should not be confused since these segments represent the warmest and coldest temperatures. The warm coastal waters will almost always appear in segment 1. Temperatures colder than 21° F are not resolved, since temperatures this cold are beyond concern to the service. The other temperatures are the most critical for the forecasts. Note that those temperatures just above the freezing band appear as black, and that the ground depiction flips to white as it goes to freezing.



ENHANCEMENT IB

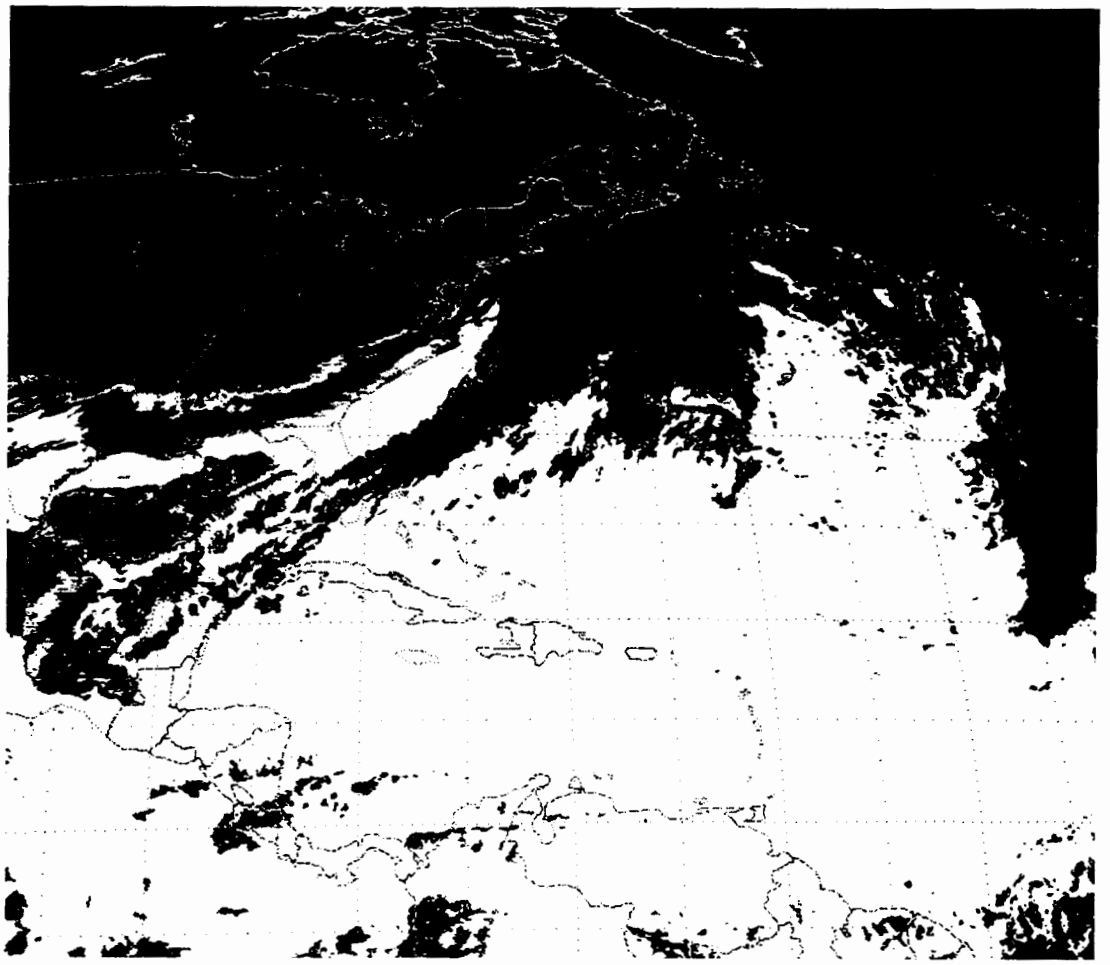


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 4.3	depict temps above 40° F
2	3.8 to 2.2	depict temps 40-36° F
3	1.8 to 0.8	depict 36-33° F
4	0.3 to -0.7	depict 33-31° F
5	-1.2 to -1.7	depict 31-29° F
6	-2.2 to -2.7	depict 29-27° F
7	-3.2 to -3.7	depict 27-25° F
8	-4.2 to -5.2	depict 25-23° F
9	-5.7 to -6.2	depict 23-21° F
10	-6.7 to -110.2	temps below 21° F

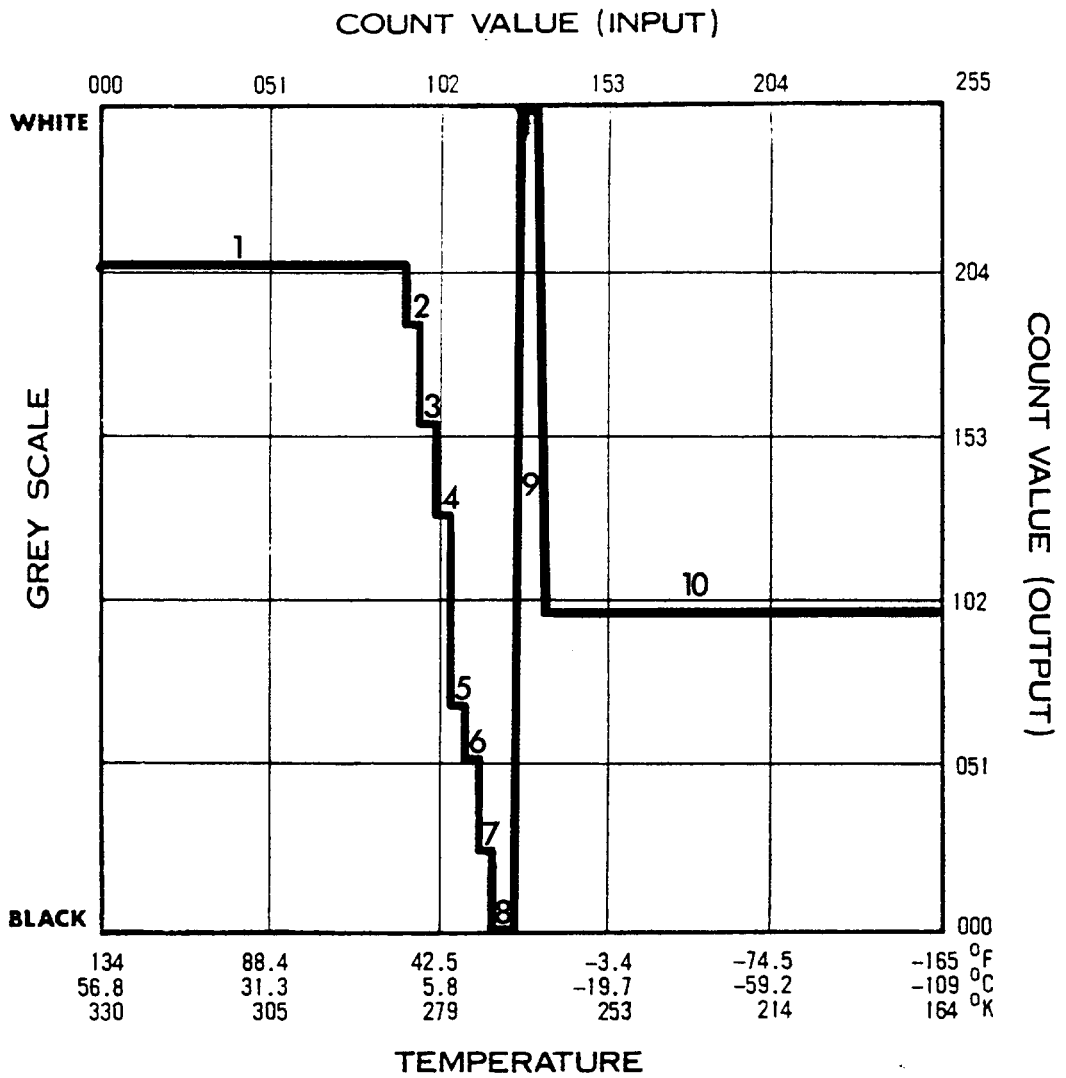
ENHANCEMENT IC

GENERAL DESCRIPTION

Fruit-Frost enhancement curve developed for Florida area for a temperature range warmer than IB curve. Step 9 of the IC curve is identical to Step 4 of the IB curve. Both curves are used for agricultural freeze warning support.



ENHANCEMENT IC

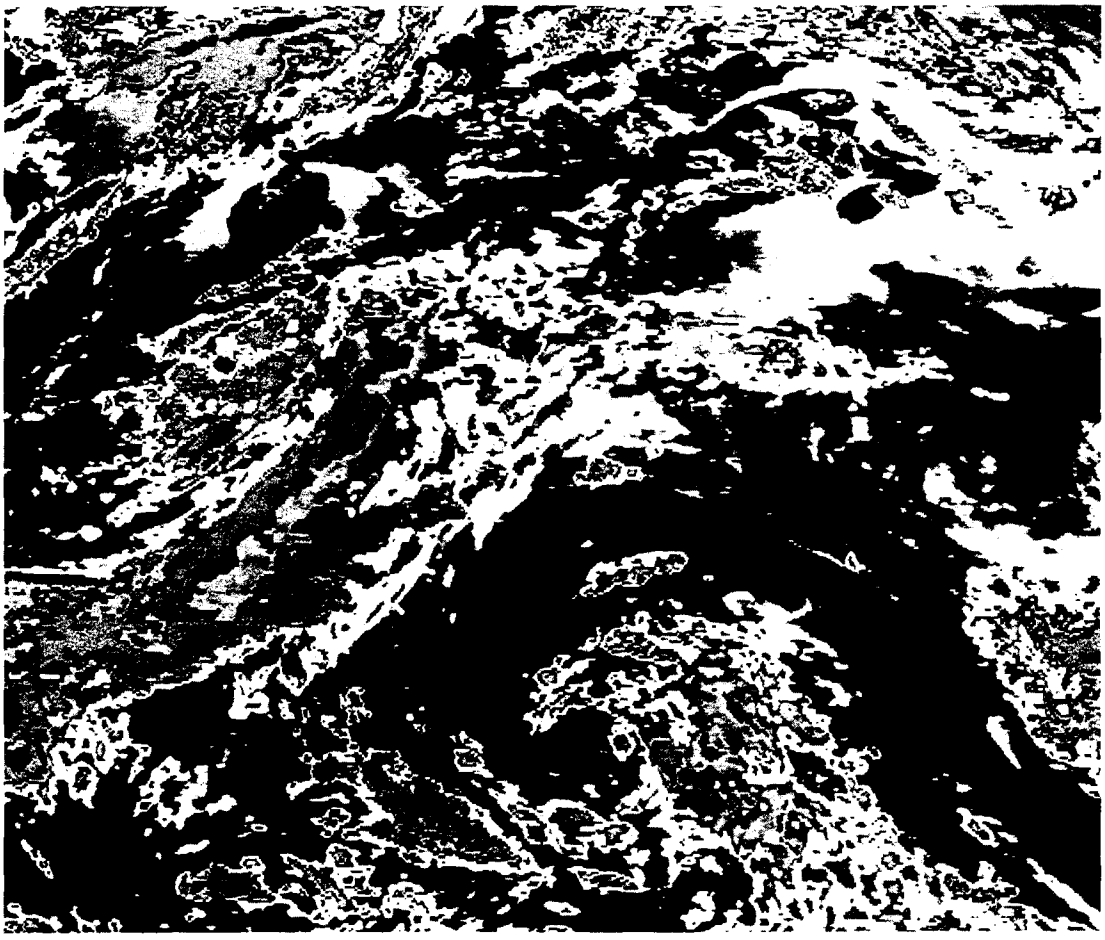


SEGMENT NUMBER	° C TEMPERATURE		COMMENTS
1	0 to 8.3	(WT 47 F)	To serve Ruskin WSO for
2	7.8 to 7.3	(45 - 47 F)	depiction of ground
3	6.8 to 6.3	(43 - 45 F)	temperatures in a range
4	5.8 to 4.8	(41 - 43 F)	warmer than the IB-curve
5	4.3 to 3.8	(39 - 41 F)	
6	3.3 to 2.8	(37 - 39 F)	Tabular temperatures are
7	2.3 to 1.8	(35 - 37 F)	corrected for moisture
8	1.3 to 0.3	(33 - 35 F)	(based on Florida data)
9	0.3 to -0.7	(31 - 33 F)	White
10	-1.2 to -110.2	No concern	

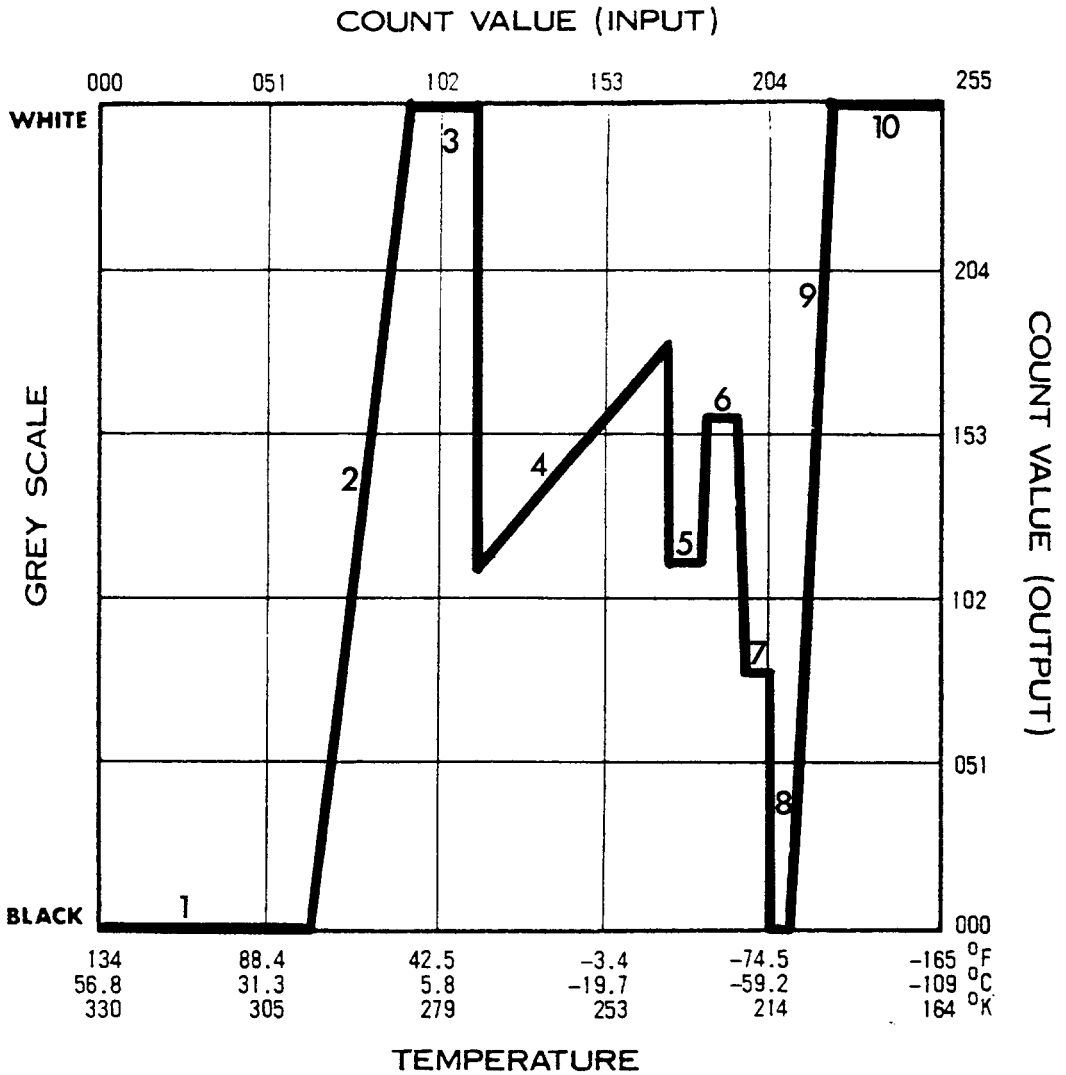
ENHANCEMENT JF

GENERAL DESCRIPTION

The JF enhancement curve combines the best features of the JE and MB curves. The warmest parts of the image may be used for locating the steep gradients that identify ocean currents such as the Gulf Stream. It is also excellent for depicting low cloud systems. An abrupt change in gray shade marks the freezing level. That portion colder than freezing is identical to the MB curve and can be used for rainfall estimation utilizing the Scofield/Oliver technique.



ENHANCEMENT JF



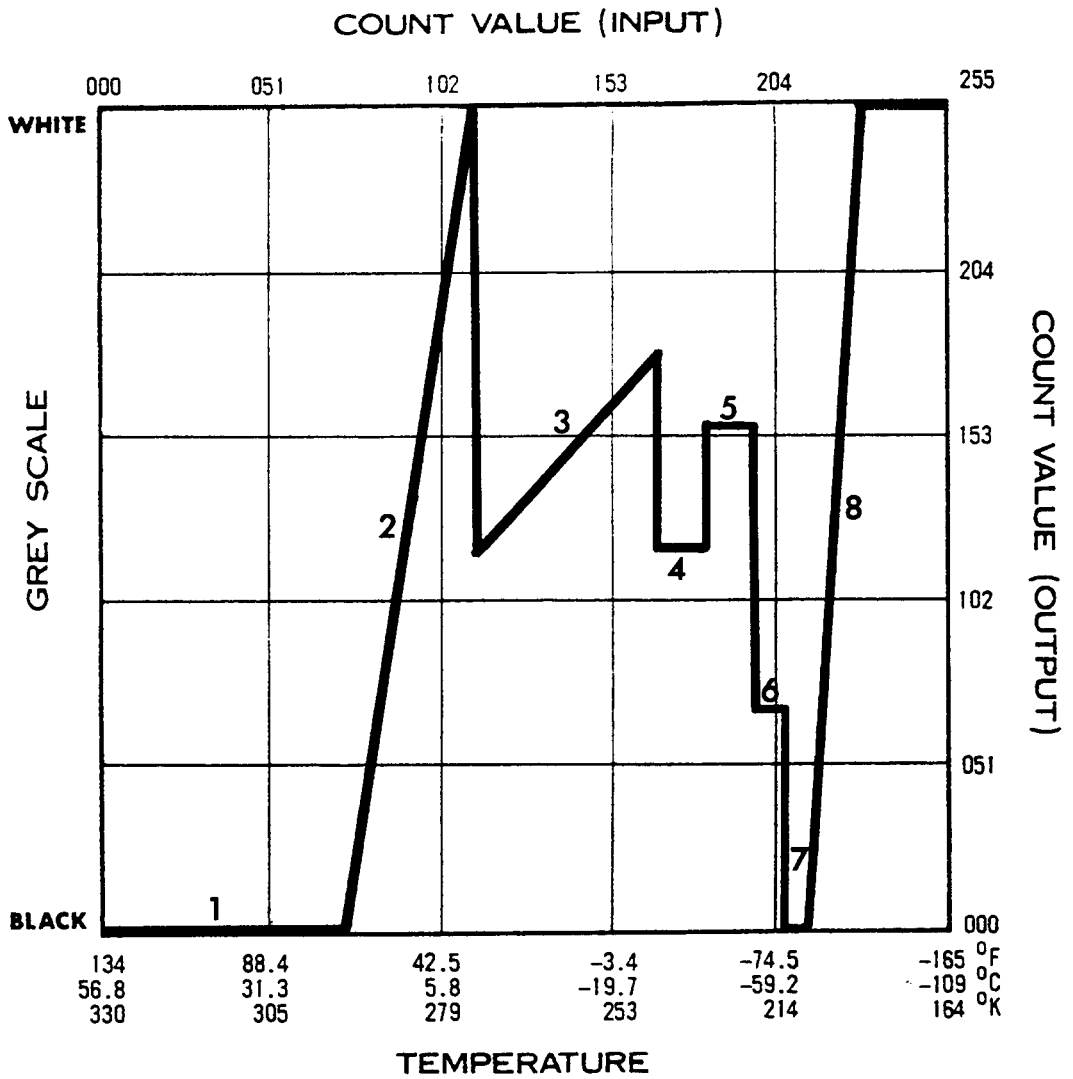
SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 24.8	Warm water & land
2	24.3 to 10.8	Water temperature gradient
3	10.3 to -0.2	Buffer Zone
4	-0.7 to -32.2	Mid. Lvl. clds, & Freezing level
5	-33.2 to -42.2	First level contour
6	-43.2 to -53.2	Thunderstorm enhancement
7	-54.2 to -59.2	Thunderstorm enhancement
8	-60.2 to -63.2	Thunderstorm enhancement
9	-64.2 to -80.2	Overshooting Tops
10	-81.2 to -110.2	White

ENHANCEMENT JG

GENERAL DESCRIPTION

The JG enhancement curve is a variation of the JF enhancement curve. It is to be used as a winter curve for locating water mass boundaries as well as low stratus and coastal fog. For temperatures colder than -0.2° C, both the JF and JG enhancement curves are identical to the MB curve.

ENHANCEMENT JG

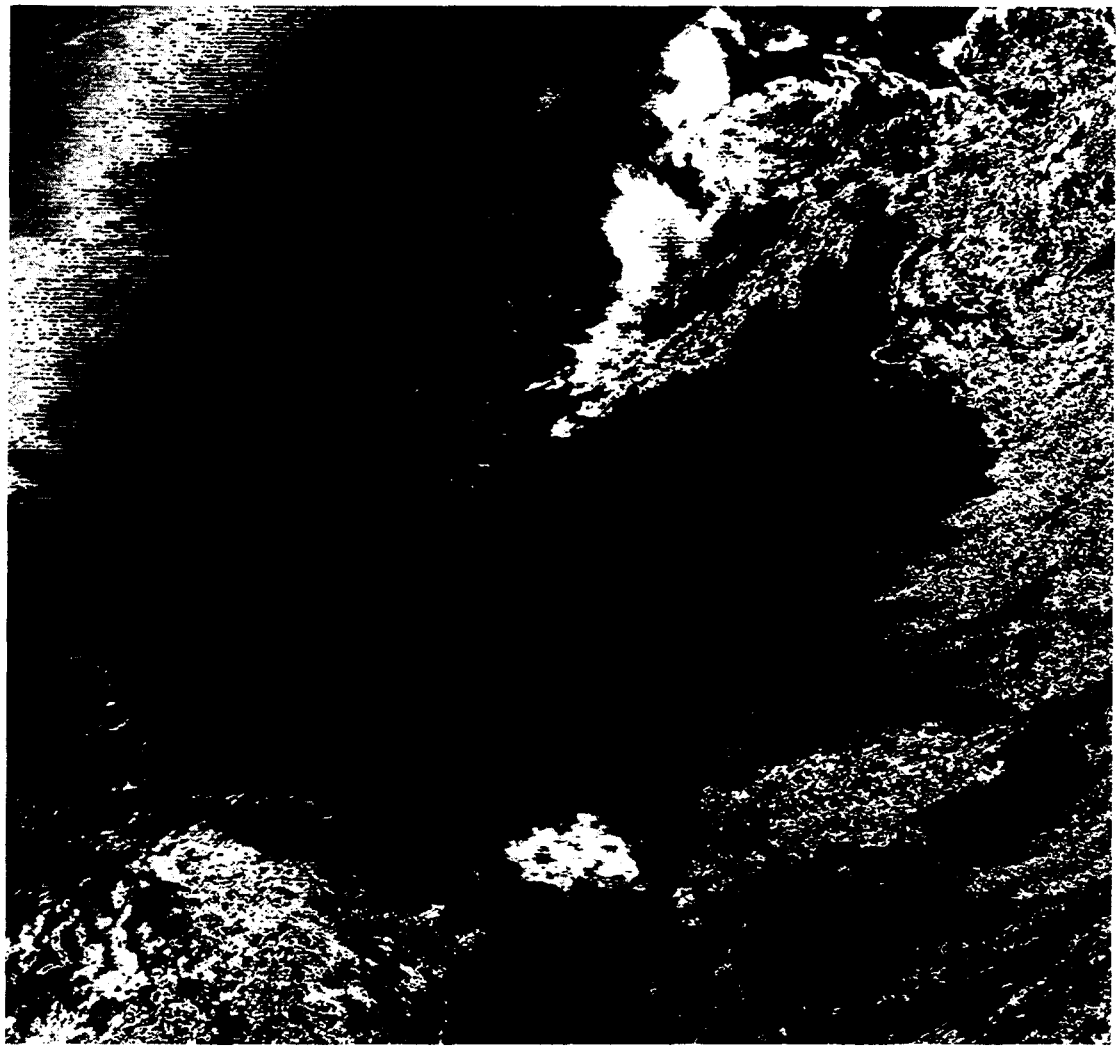


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 22.8	No significant data
2	22.3 to -0.2	Winter Ocean/Low Stratus Enhancement
3	-0.7 to -32.2	Freezing Level/Low to Middle Clouds
4	-33.2 to -42.2	First Level Contour for Convection
5	-43.2 to -53.2	Thunderstorm
6	-54.2 to -59.2	Enhancement
7	-60.2 to -63.2	Levels
8	-64.2 to -80.2	Overshooting Tops
9	-81.2 to -110.2	No significant data

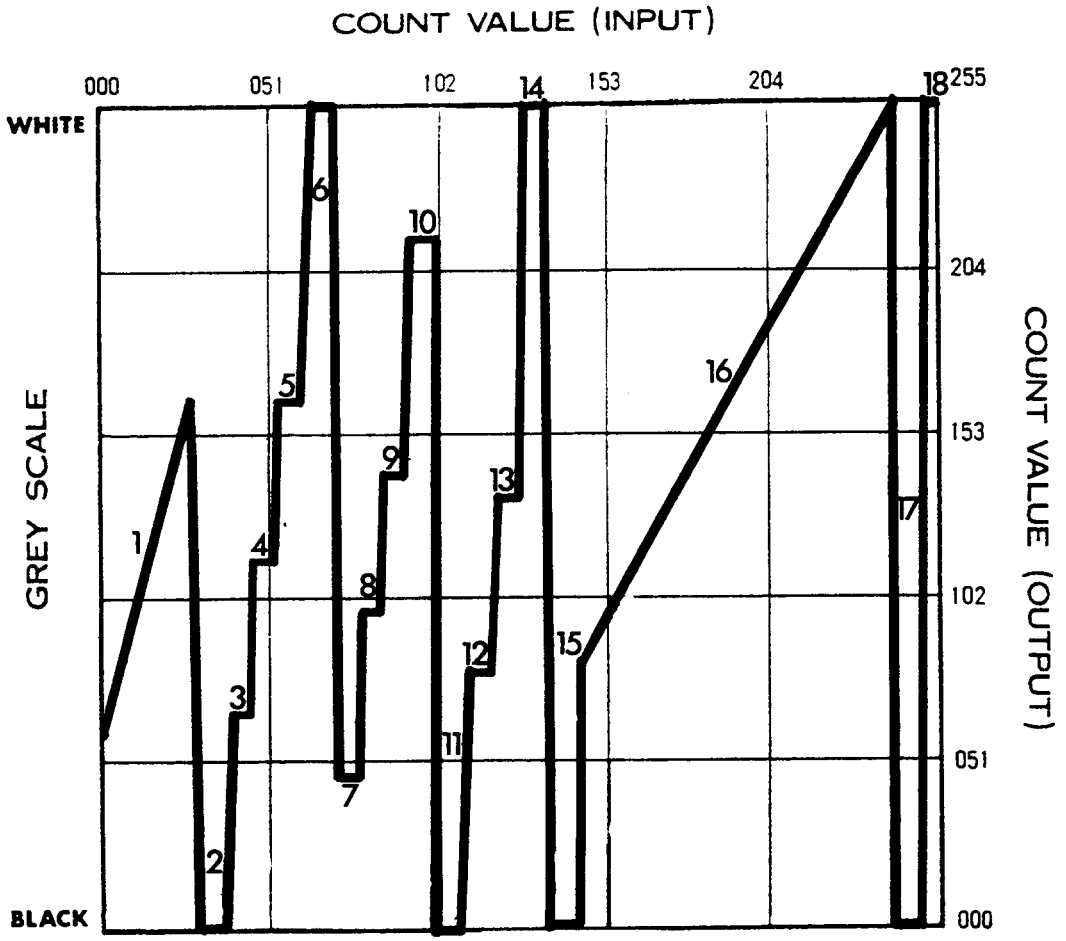
ENHANCEMENT LA

GENERAL DESCRIPTION

This is an experimental visible enhancement curve for use in forecasting early morning fog dissipation. It has been designed to be utilized approximately 1 - 1 1/2 hr after sunrise. The curve contours the visible image in increments of visible brightness counts. Differences in the brightness are used to compute fog duration. The brightness difference is defined as the brightness of a point within the fog minus the lowest detectable brightness within the cloud area. Computational details are described in Satellite Applications Information Note 78-4 and Preprint Volume "Conference on Weather Forecasting and Analysis and Aviation Meteorology, October 16-19, 1978" (James Gurka). Any questions concerning this curve and its uses should be referred to the Applications Laboratory, NESDIS (301-763-8282).



ENHANCEMENT LA



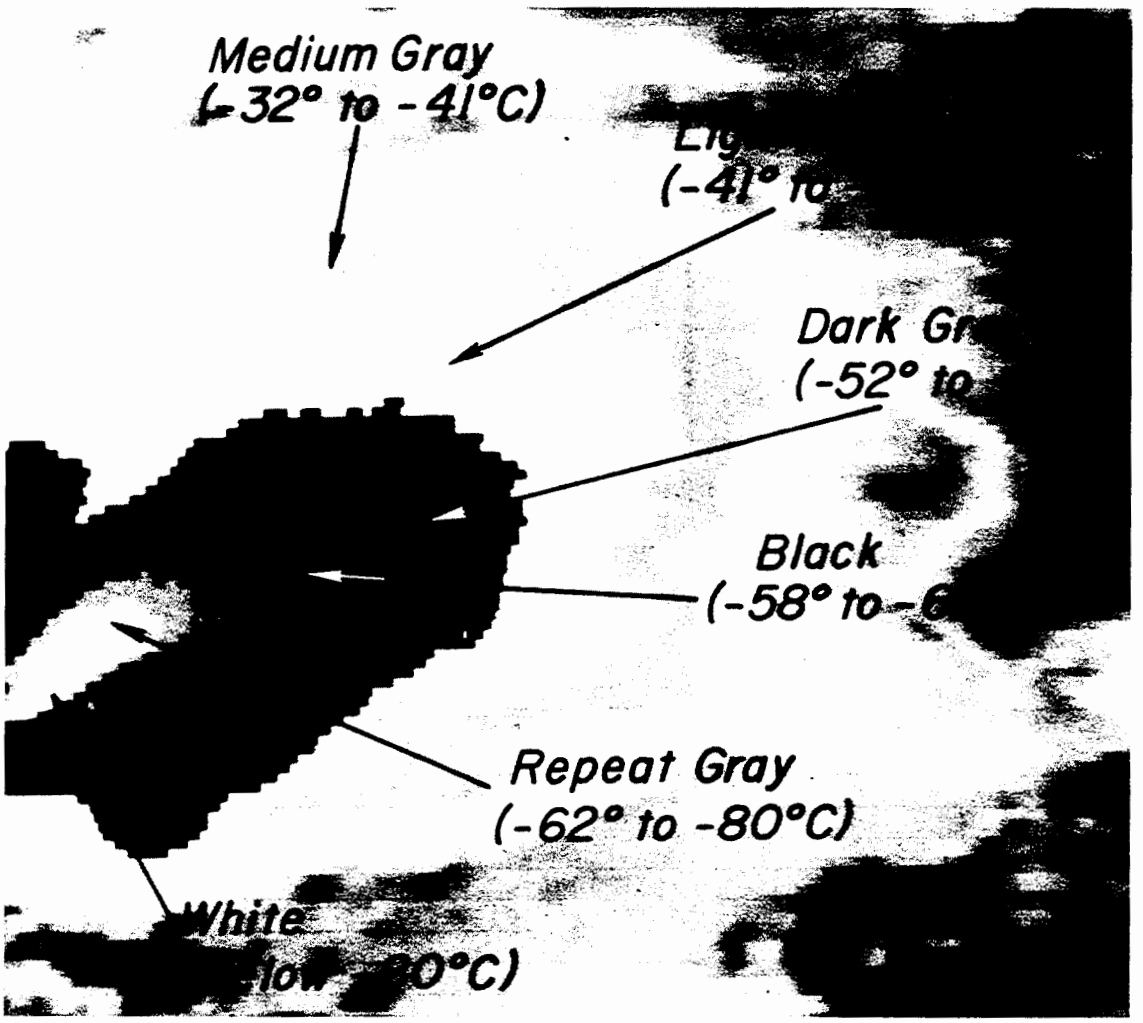
VISIBLE ENHANCEMENT

SEGMENT NUMBER	VIS BRIGHTNESS COUNTS	COMMENTS
1	0-28	First look at clouds near sunrise
2 & 3	29-36 37-44	
4 & 5	45-52 53-60	
6 & 7	61-68 69-76	Determination of fog
8 & 9	77-84 85-92	brightness differences
10 & 11	93-100 101-108	
12 & 13	109-116 117-124	
14 & 15	125-132 133-140	
16	141-240	Brightness outside of fog range
17 & 18	241-249 250-255	

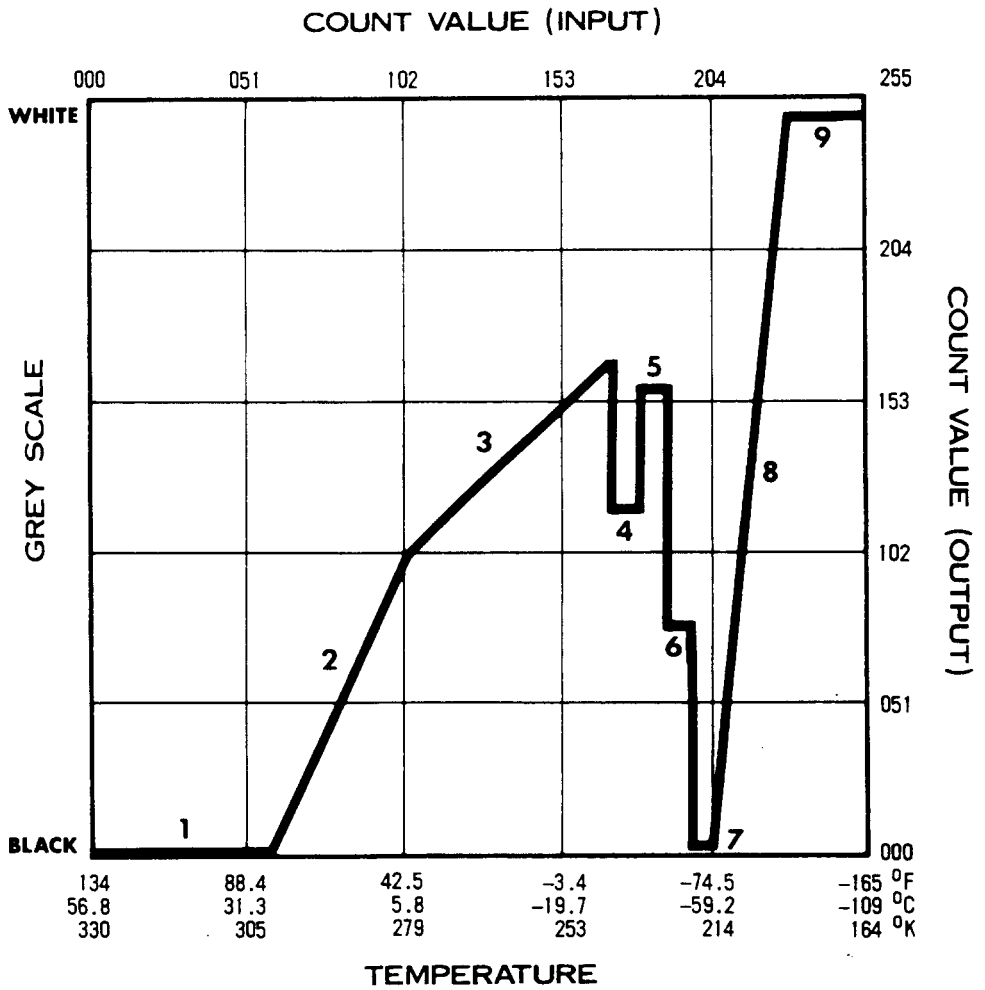
ENHANCEMENT MB

GENERAL DESCRIPTION

Segments 1, 2, and 3 are extracted directly from the old Z curve: This steeper slope will give better definition to the low and mid clouds. Segments 4 through 7 contours convective areas. Segment 8 slopes with a factor greater than zero from -63° C to -80° C which allows for good definitions of very cold domes. Although specific temperatures cannot be obtained--it better isolates the coldest tops by gradually going to white rather than producing a complete white-out at all temperatures colder than -65° C. This curve is utilized for rainfall estimates.



ENHANCEMENT MB

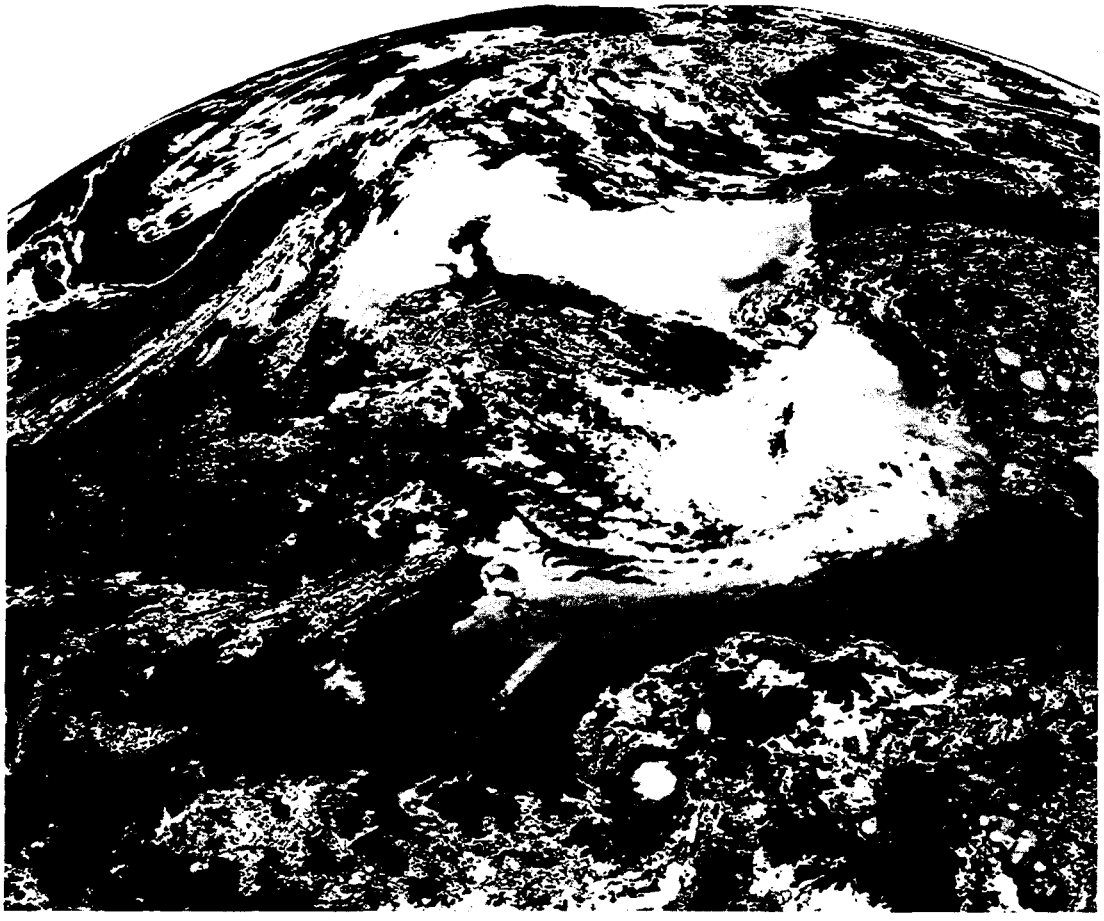


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	58.8 to 29.3	Little or no useful Met Data (Black)
2	28.8 to 6.8	Low Level/Sea Surface Difference
3	6.3 to -31.2	Middle Level - No Enhancement
4	-32.2 to -42.2	First Level Contour (Med Gray)
5	-43.2 to -53.2	(Light Gray)
6	-54.2 to -59.2	Thunderstorm (Dark Gray)
7	-60.2 to -63.2	Enhancement (Black)
8	-64.2 to -80.2	Overshooting Tops Enhancement
9	-81.2 to -110.2	(White)

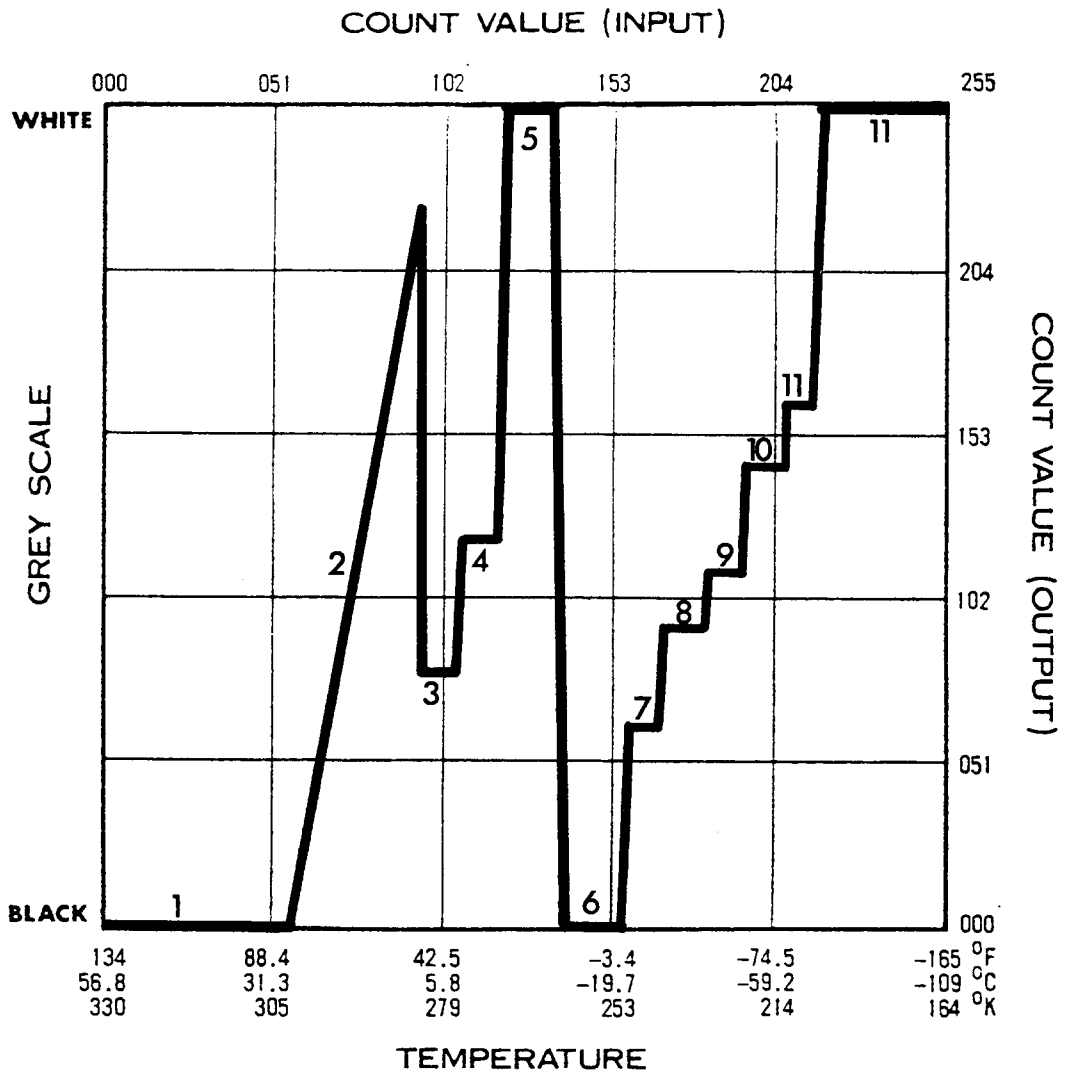
ENHANCEMENT NA

GENERAL DESCRIPTION

This curve is a modified version of the JD curve. It has been designated as a N-series curve to divide the J series of curves which has been used for two separate oceanic areas. NA is a summer curve which is designed to depict sea surface temperatures, low level clouds, and clouds near the trade wind inversion level. It also indicates a freezing level as well as discrete steps for measuring thunderstorm cloud top data.



ENHANCEMENT NA

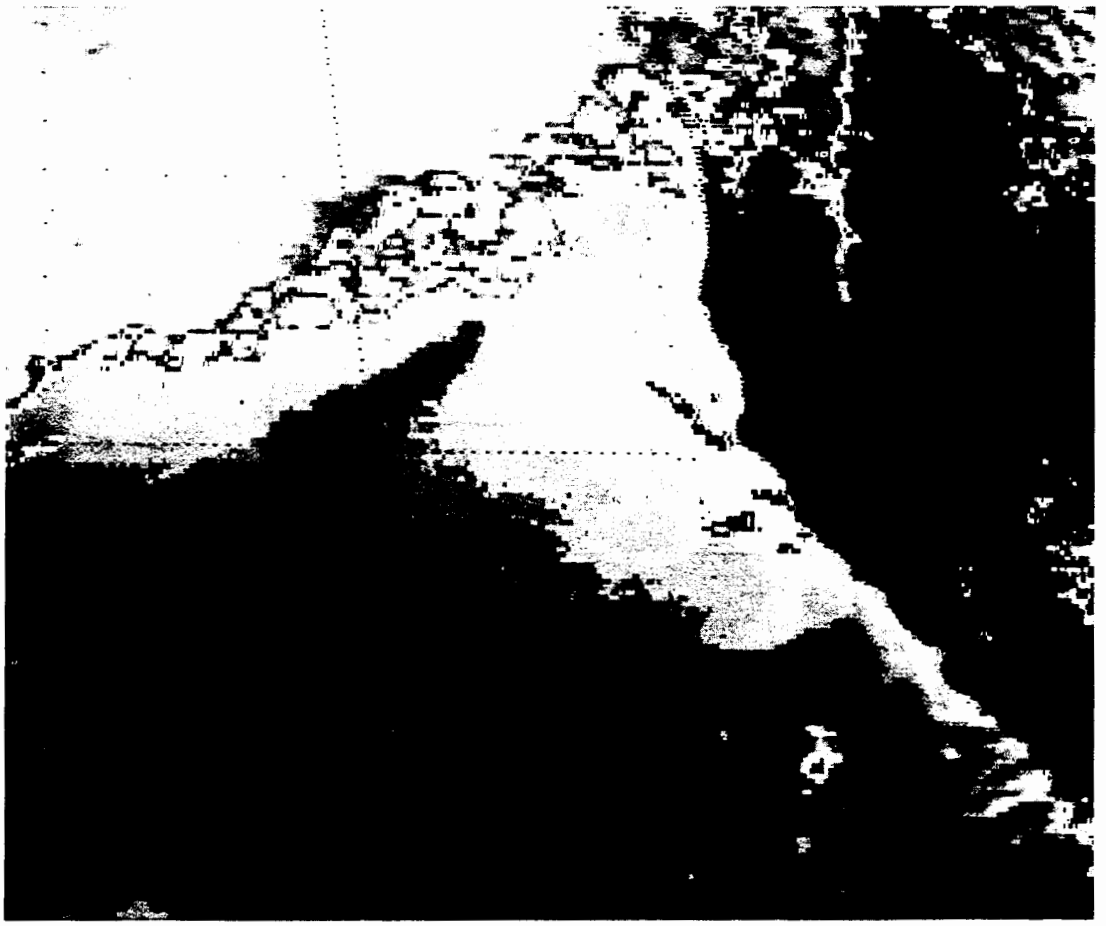


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 25.8	No significant data
2	25.3 to 9.8	Low clouds below inversion
3	9.3 to 5.3	Tops above inversion to
4	4.8 to 0.3	freezing level
5	-0.2 to -10.2	White - middle clouds
6	-10.7 to -20.2	Black
7	-20.7 to -30.2	middle and high clouds
8	-30.7 to -40.2	
9	-41.2 to -50.2	TCU/CB Tops in about 5,000 ft. increments
10	-51.2 to -60.2	
11	-61.2 to -70.2	
12	-71.2 to -110.2	White

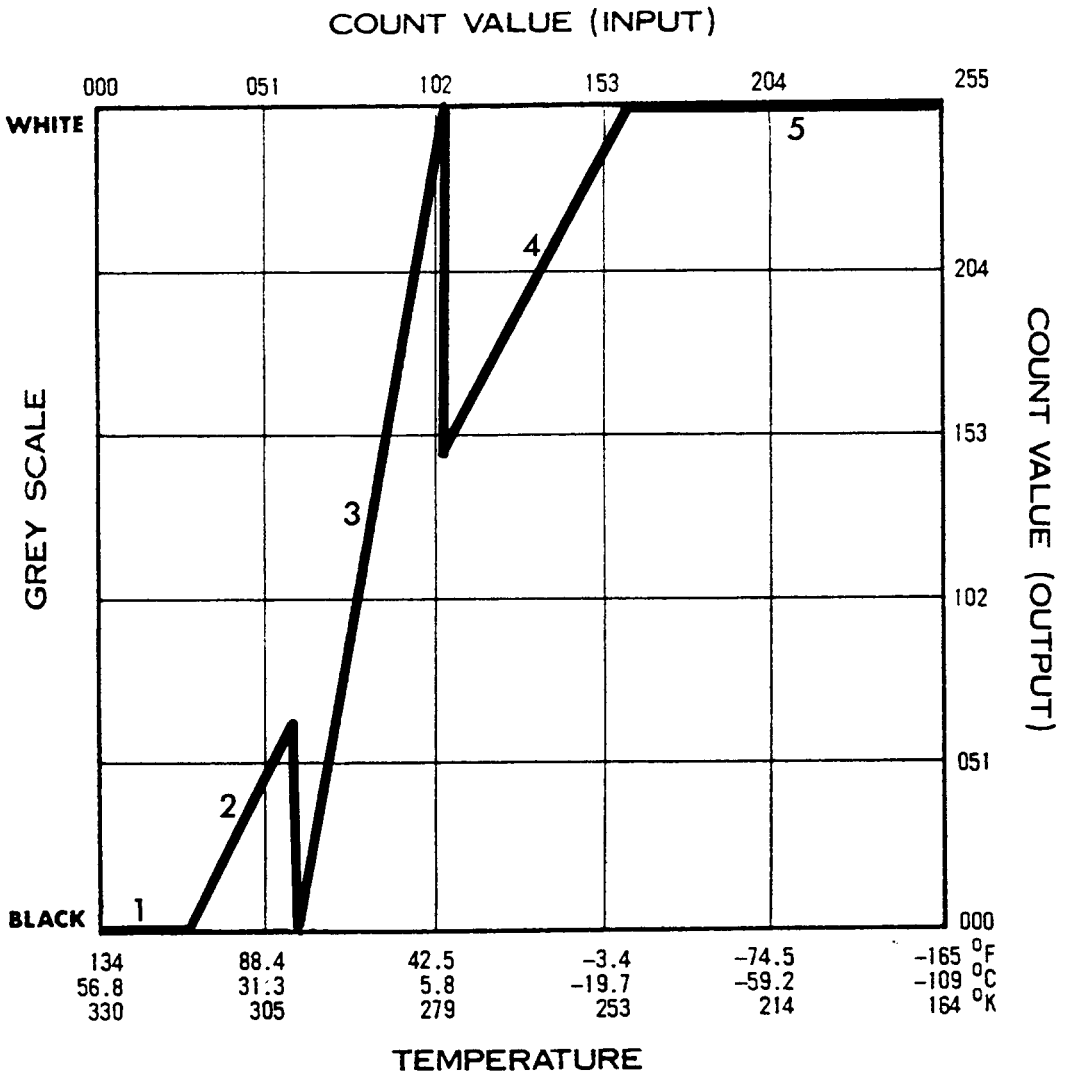
ENHANCEMENT PC

GENERAL DESCRIPTION

Primary purpose of this curve is to enhance coastal upwelling along the U.S. west coast from Washington south to Baja, California. The upwelling usually starts in the late spring and continues through early fall. This curve (PC) is a seasonal update of the PB curve and is intended for use during the latter half of the upwelling season. This curve is also useful for the Great Lakes and northeast U.S.



ENHANCEMENT PC

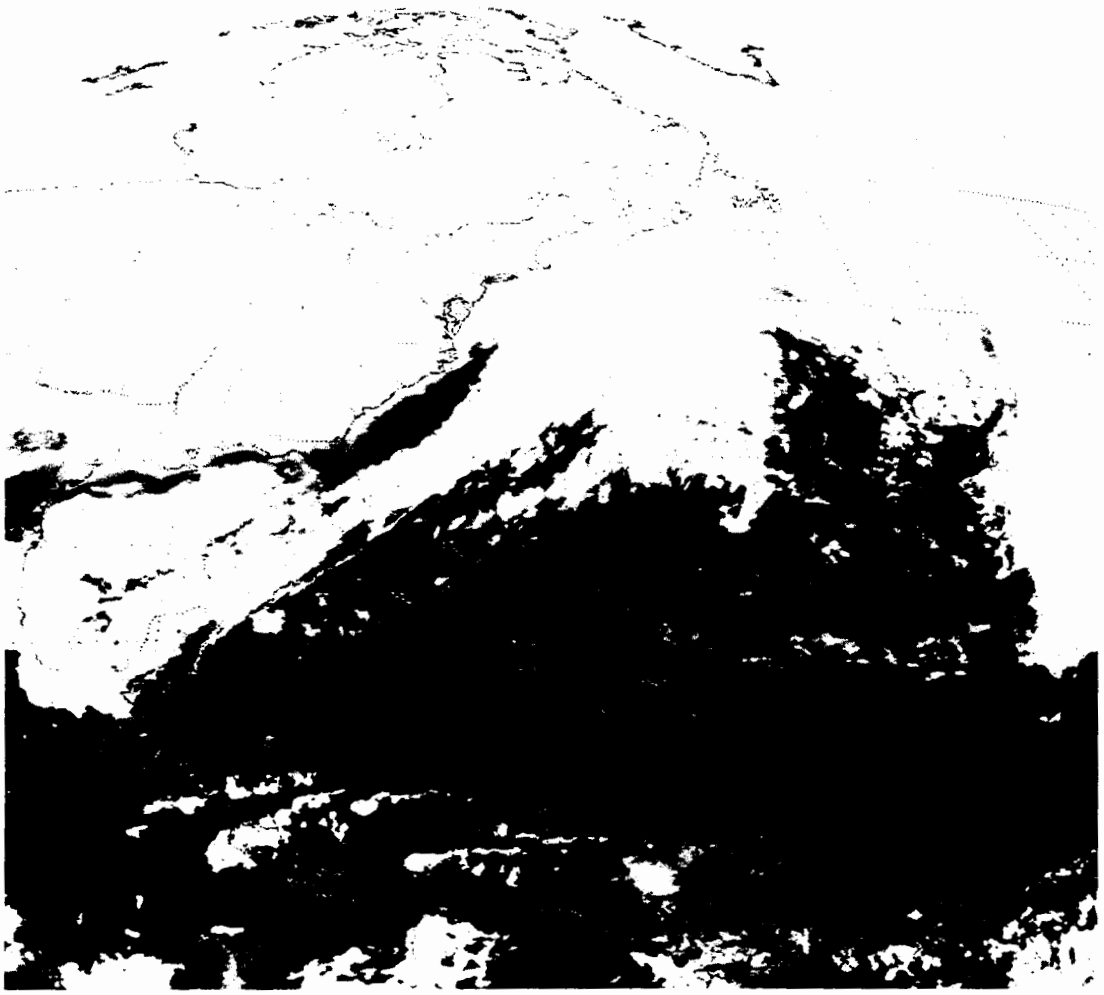


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 42.3	No meaningful data
2	41.8 to 21.3	Check for saturation on warm end
3	20.8 to 5.3	enhancement sea surface temperature
4	4.8 to -22.7	check for saturation on cold end
5	-23.2 to -110.2	no meaningful data (White)

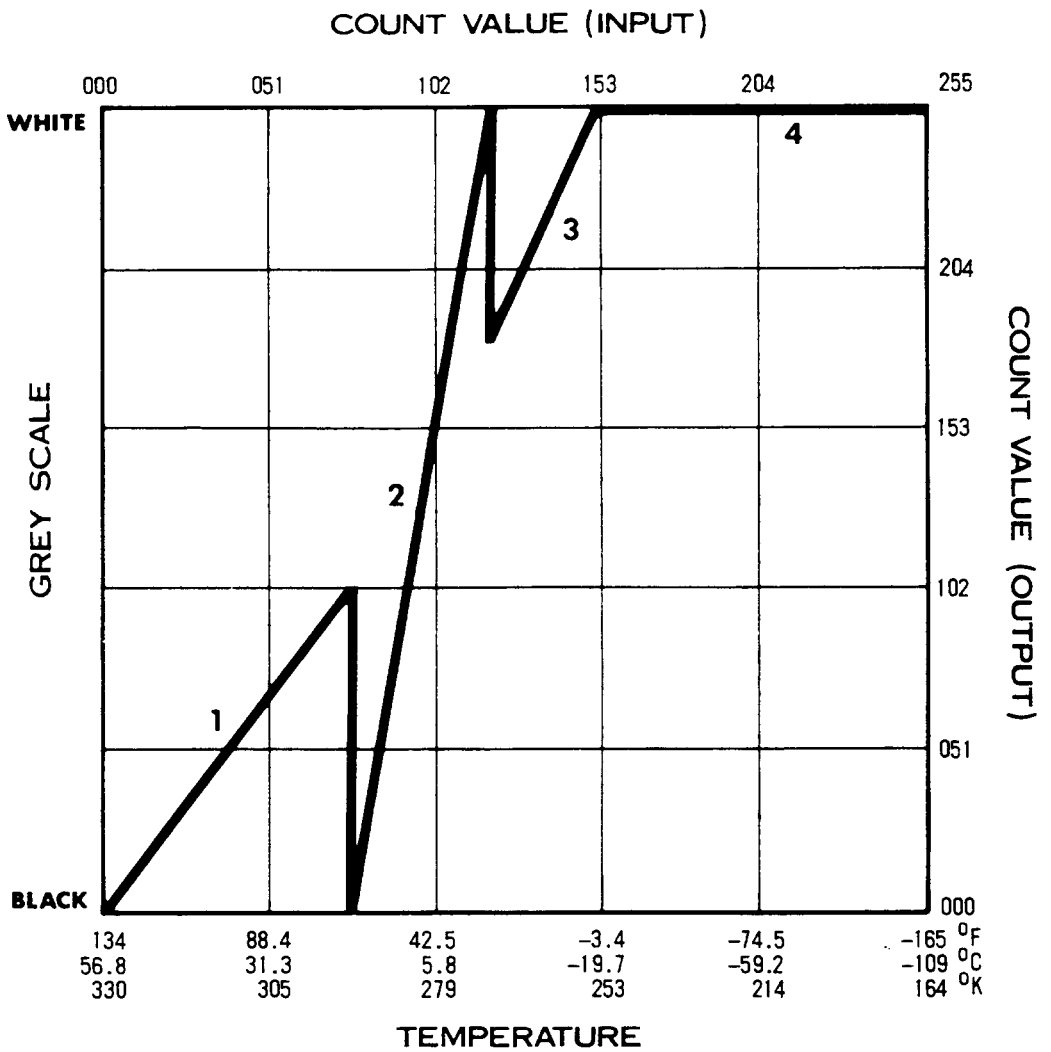
ENHANCEMENT SA

GENERAL DESCRIPTION

A curve designed to enhance sea surface temperature detail during the winter months and still maintain some land registration features. Cold end landmark spike gives geographic detail lost in winter when land surface temperatures fall well below freezing.



ENHANCEMENT SA

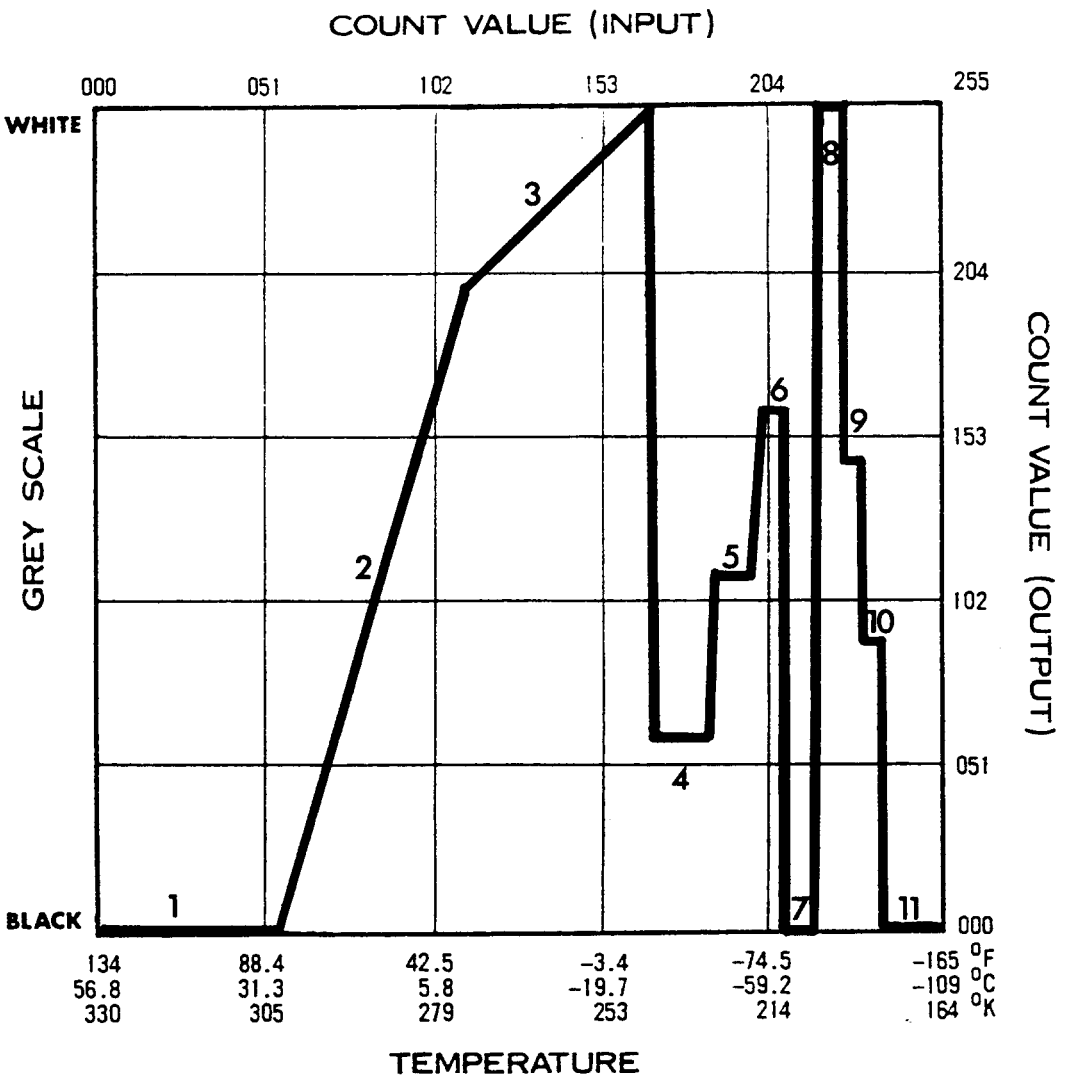


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 22.8	Landmarks
2	22.3 to -0.2	Winter Ocean Enhancement
3	-0.7 to -16.7	Landmarks
4	-17.2 to -110.2	White

ENHNACEMENT TA

The TA curve is a combination of the CA curve (warmer portion) and the HD curve (colder portion). The linear part of the curve is to improve land/water/low cloud contrast. The coldest part of the curve is in the same temperature ranges that are used for precipitation estimates and tropical storm classifications.

ENHANCEMENT TA

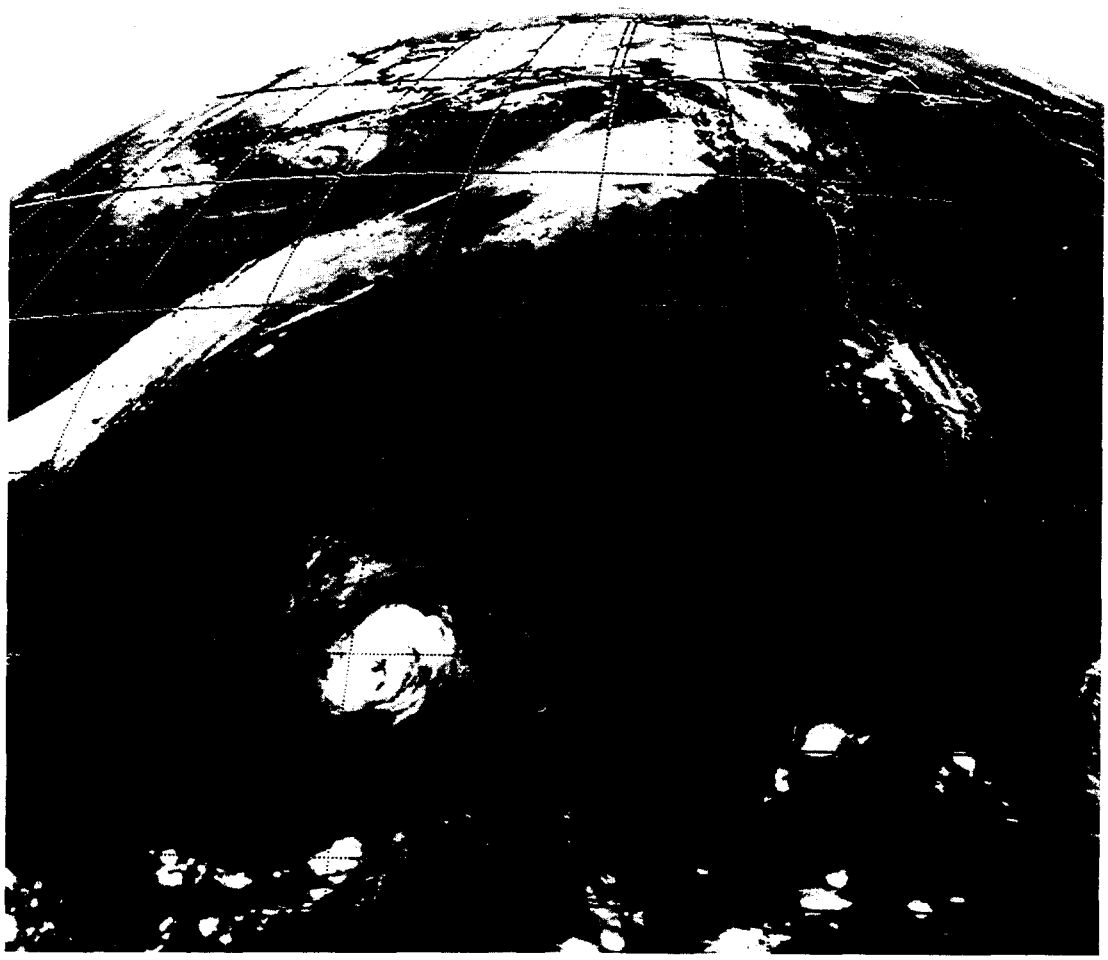


SEGMENT NUMBER	°C TEMPERATURE	COMMENTS	
1	56.8 to 29.8	No significant data	
2	29.3 to 0.3	Water and low clouds	
3	-0.2 to -30.2	Mid troposphere fronts	
4	-30.7 to -41.2	Dark gray	
5	-42.2 to -53.2	Medium gray	
6	-54.2 to -63.2	Light gray	Tropical storm
7	-64.2 to -69.2	Black	classification,
8	-70.2 to -75.2	White	convective tops
9	-76.2 to -80.2	Medium gray top	and precipitation
10	-81.2 to -86.2	Dark gray top	estimates
11	-87.2 to -110.2	Black maximum cold	

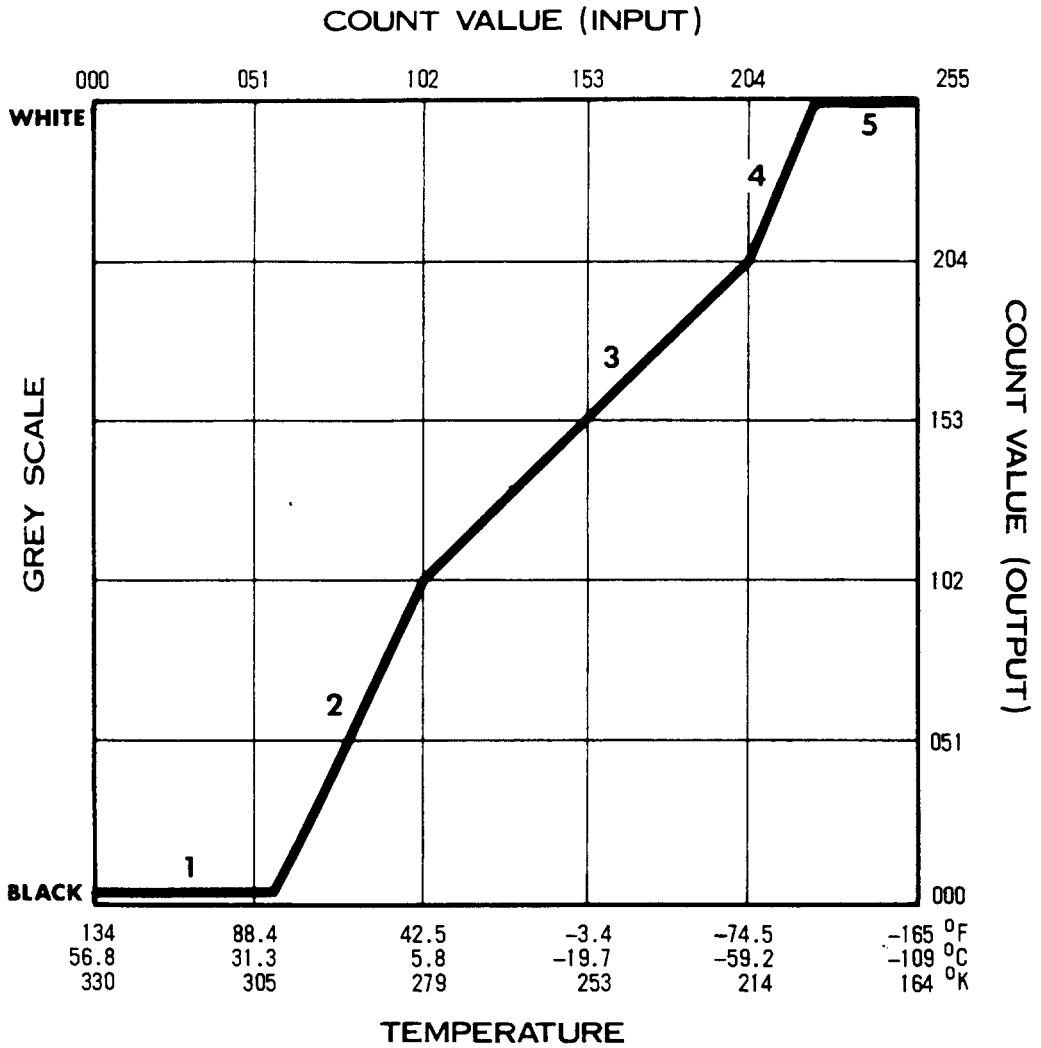
ENHANCEMENT ZA

GENERAL DESCRIPTION

This curve was developed for general purpose meteorological use on the full disc IR. It is primarily used on imagery that is animated at the Satellite Field Services Station, and the Synoptic Analysis Branch. Temperatures outside the range of +56.8^{o} C to 110.2^{o} C are excluded. Enhancement is applied to lower and upper level clouds, while a slope of 1 is applied to the middle levels. This curve has been in use in the Wallops Real Time FDIR sectorizers since enhancement capability was installed in April 1975 and is the standard general purpose enhancement used for equivalent IR sectors.



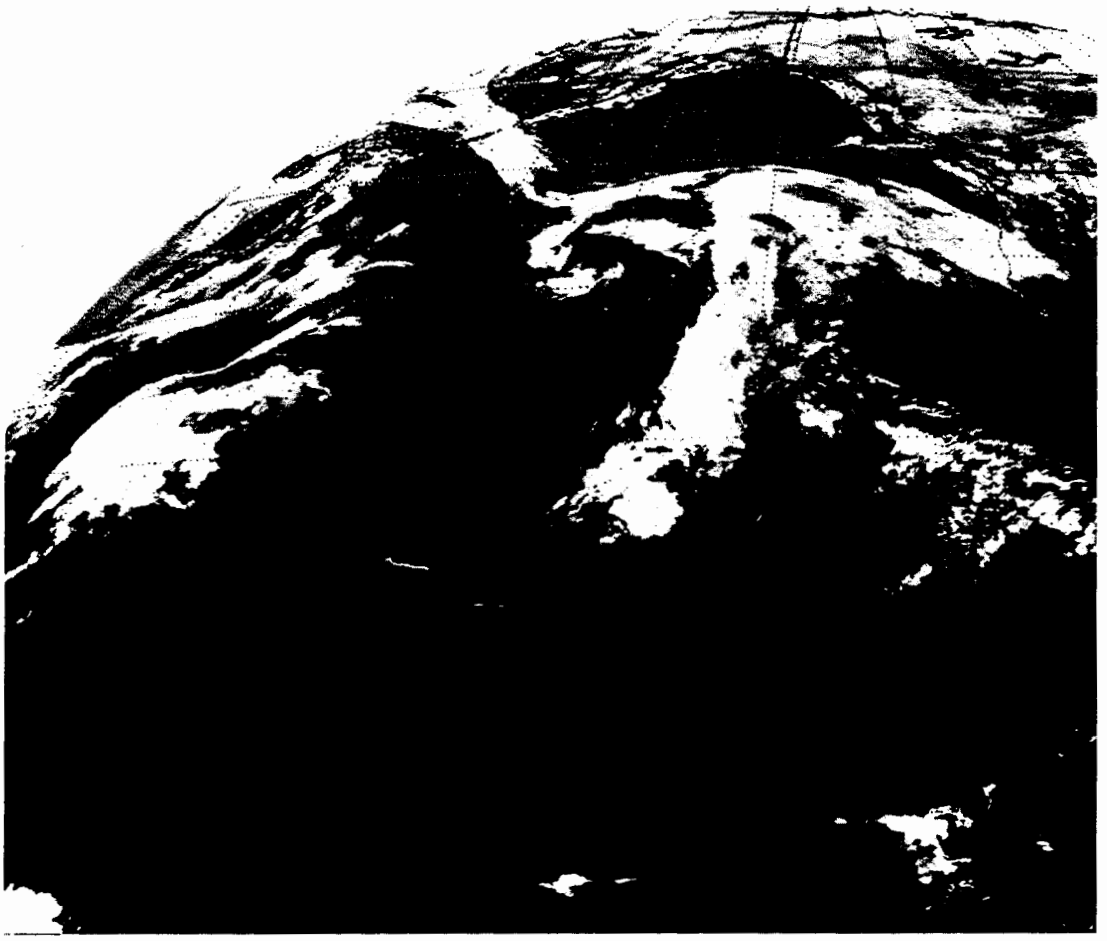
ENHANCEMENT ZA



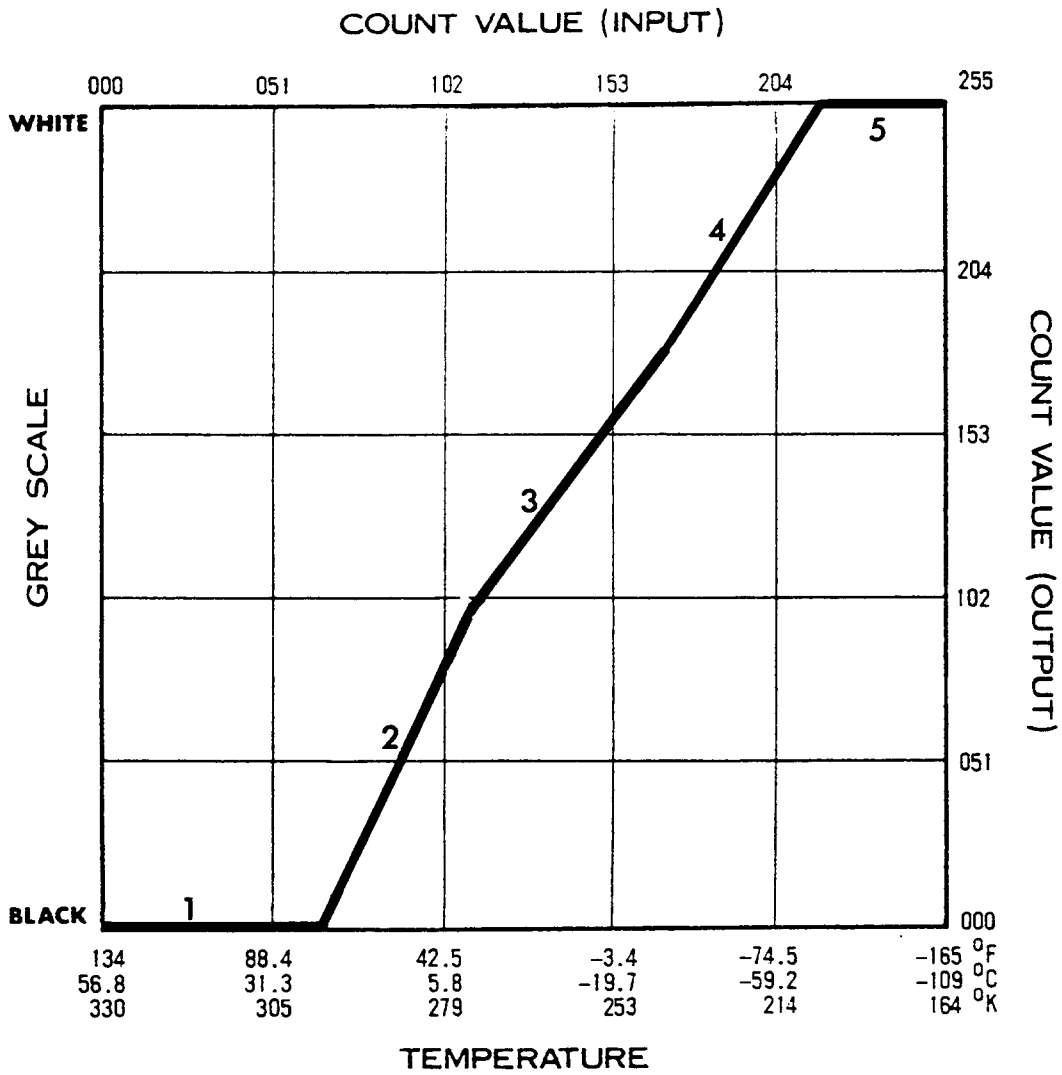
SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 29.3	Little or no Met. Data
2	28.8 to 6.8	Low Level/Sea Surface Difference
3	6.3 to -55.2	Middle Level-no enhancement
4	-56.2 to -75.2	Upper Level enhancement
5	-76.2 to -110.2	Little or no Met. Data

ENHANCEMENT ZB

This curve is a modified ZA curve which has been displaced toward colder temperatures for use in the northern latitudes in winter.



ENHANCEMENT ZB



SEGMENT NUMBER	°C TEMPERATURE	COMMENTS
1	56.8 to 23.3	No significant data
2	22.8 to 0.3	Increased slope for colder northern lat.
3	-0.2 to -31.2	Little or no enhancement
4	-32.2 to -70.2	Slight enhancement
5	-71.2 to -110.2	No significant data

Section 8

Sector Schedules and Coverage

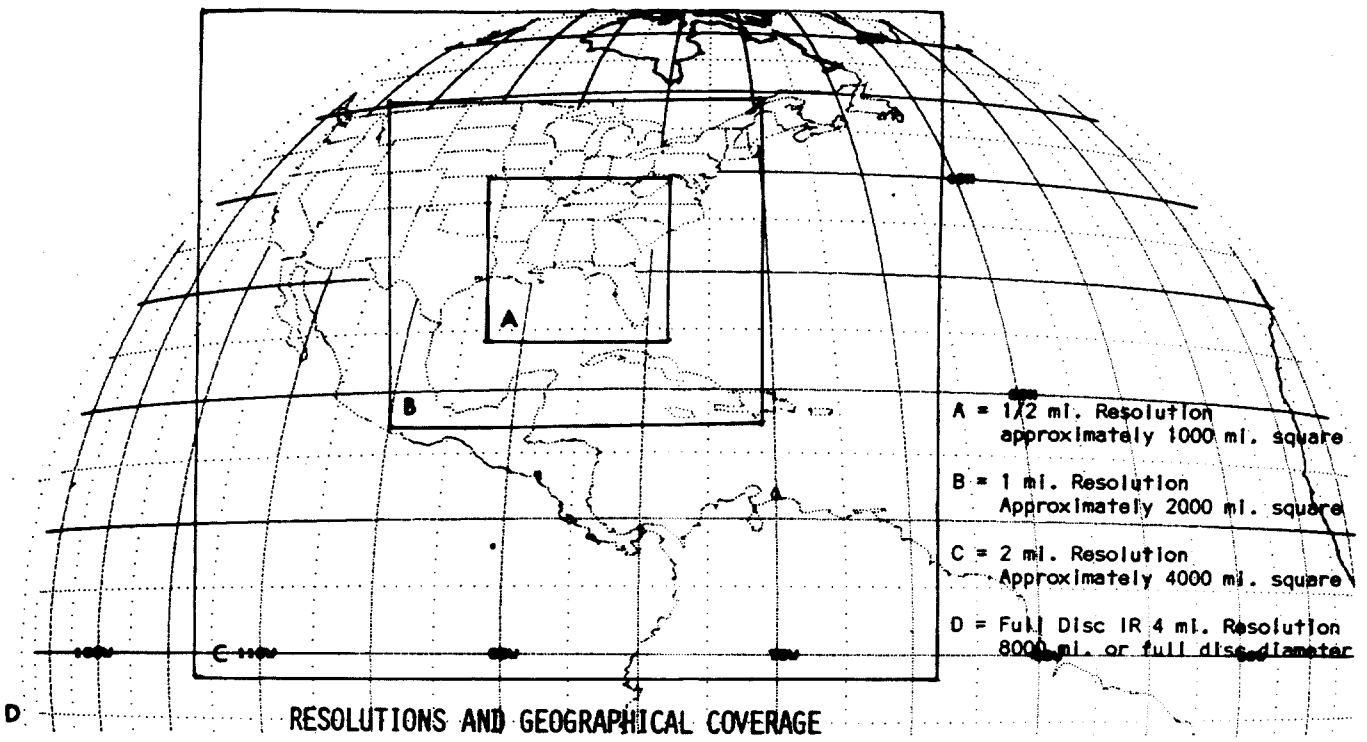


fig. 8-1 GOES SECTOR DIMENSIONS

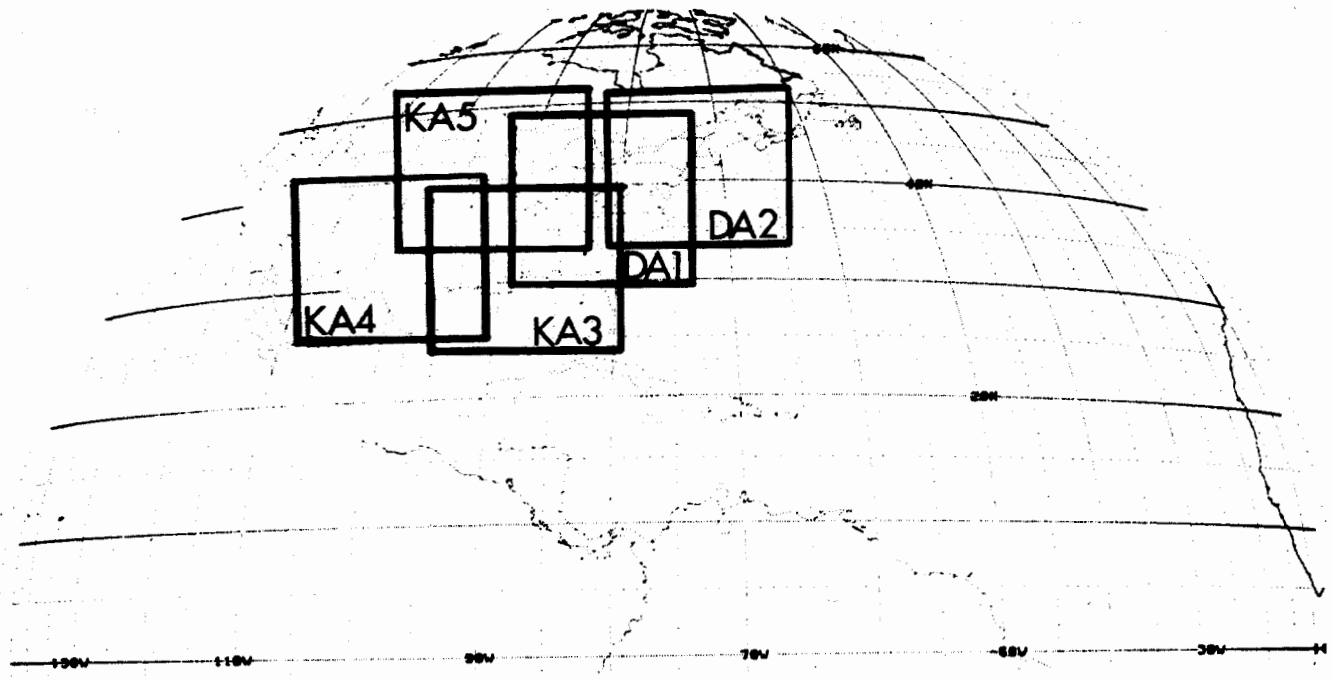


fig. 8-2 GOES EAST 1 km SECTORS

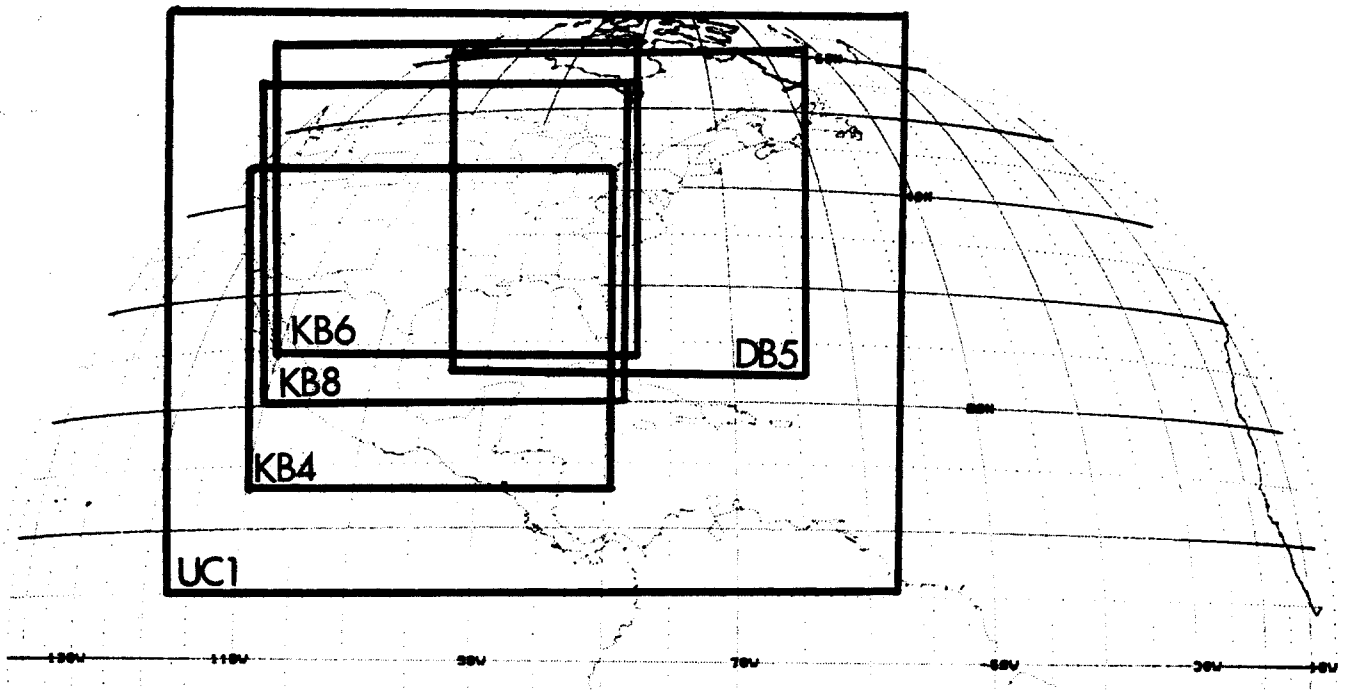


fig. 8-3 GOES EAST 2 km AND 4 km SECTORS

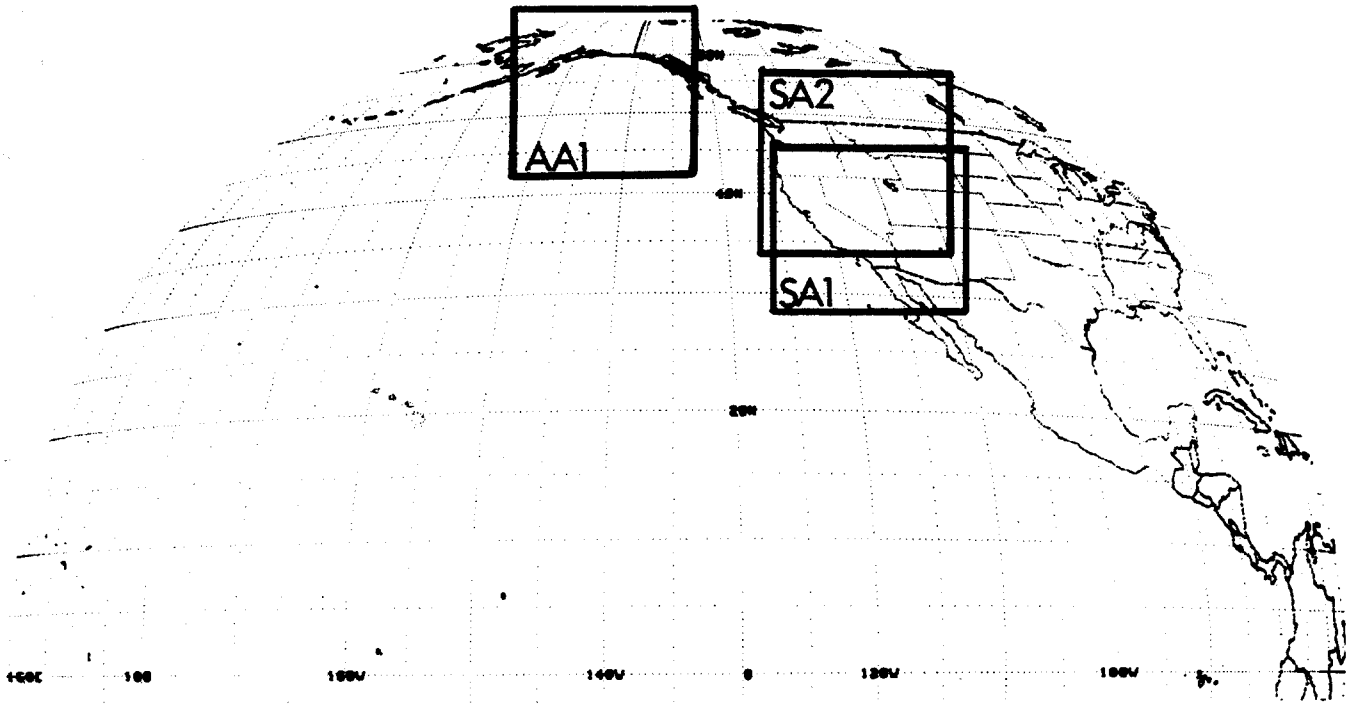


fig. 8-4 GOES WEST 1 km SECTORS

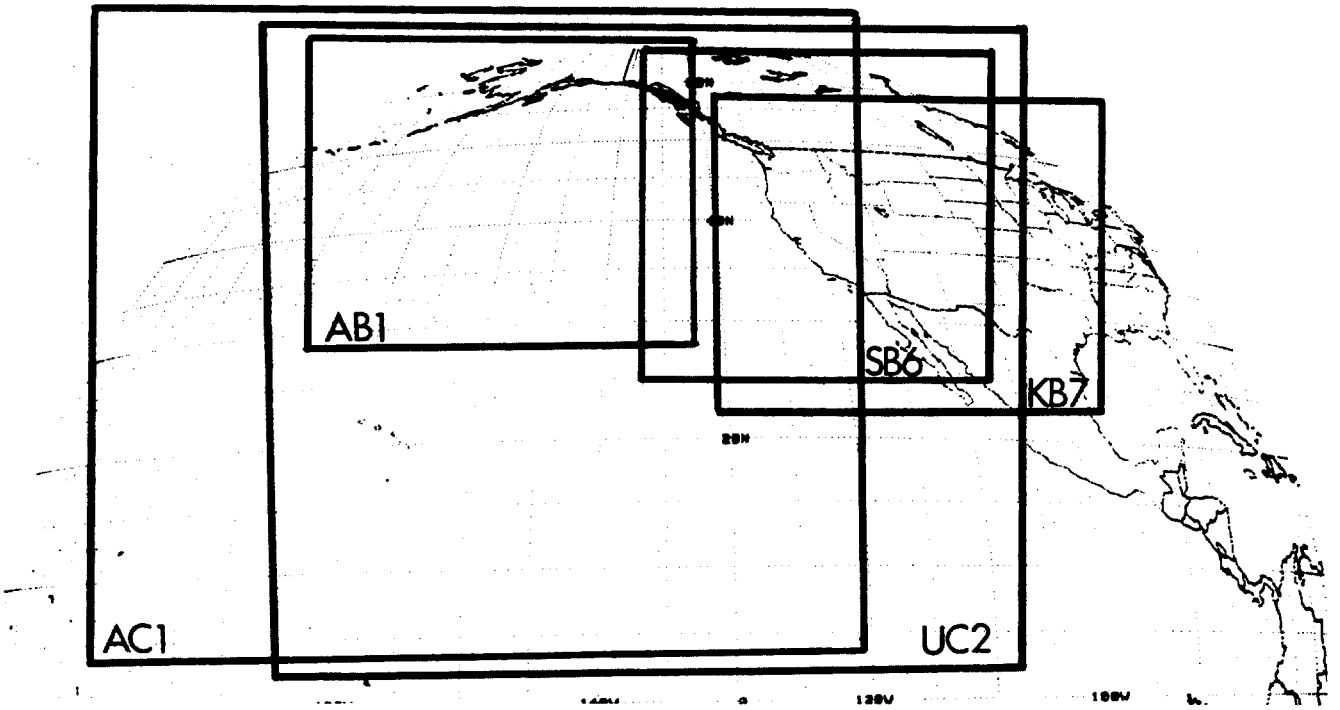


fig. 8-5 GOES WEST 2 km AND 4 km SECTORS

Imagery Available at the

WASHINGTON SATELLITE FIELD SERVICES STATION

Customer Controlled Switching System

DIAL CODE #	PRIMARY DATA
#	Service Request
00	Disconnect All
01	DA1, DB5-IR
02	DA2, DB5-IR
03	KA5, KB6-IR
04	KB8, KB8-IR
05	DB5, DB5-IR
06	DF-1 Floater
07	DF-2 Floater
08	AVHRR (VIS-IR)
09	Gulf Floater
10	UC1, UC1-IR
11	Full Disc East IR
12	Full Disc West IR
13	KA3, KB4-IR
14	KB7, KB7-IR
15	KA4, KB8-IR
16	SB6, SB6-IR, UC2-IR, UC2
17	SA1, SB6-IR
18	SA2
19	UC2, UC2-IR
20	AB1, AC1, AA1
21	MF-2 Floater
22	KF-1 Floater
23	SF-2 Floater
24	METEOSAT

Imagery Available at the

SAN FRANCISCO SATELLITE FIELD SERVICES STATION

Customer Controlled Switching System

DIAL CODE #	PRIMARY DATA
00	Disconnect All
01	*KA-5, KB-6IR/SA-2, SB-6IR, UC-2IR
02	KA-5, KB-6IR
03	SA-2, SB-6IR, UC-2IR
04	*KA-4, KB-8IR/SA-1, SB-6IR
05	KA-4, KB-8IR
06	SA-1, SB-6IR
07	*KB-8, KB-8IR/SB-6, SB-6IR
08	*KA-3, KB-4IR/UC-2, UC-2IR
09	KB-8, KB-8IR
10	SB-6, SB-6IR
11	KA-3, KB-4IR
12	UC-2, UC-2IR
13	*UC-1/SF-1 Floater
14	UC-1
15	SF-1 Floater
16	Reserved/SF-2 Floater
17	Reserved
18	SF-2 Floater
19	Spare
20	West Full Disc IR
21	Spare
22	Spare
23	SFO AVHRR VIS
24	SFO AVHRR IR

* Multiplexed Codes - East and West sector available in every 30-min. period on these dial codes. EAST only or WEST only sectors are available on subsequent codes.

Imagery Available at the

KANSAS CITY SATELLITE FIELD SERVICES STATION

Customer Controlled Switching System

DIAL CODE #	PRIMARY DATA
00	Disconnect All
01	*KA-5, KB-6IR/SA-2, SB-6IR, UC-2IR
02	KA-5, KB-6IR
03	SA-2, SB-6IR, UC-2IR
04	*KA-4, KB-8IR/SA-1, SB-6IR
05	KA-4, KB-8IR
06	SA-1, SB-6IR
07	*KB-8, KB-8IR/SB-6, SB-6IR, UC-2
08	*KA-3, KB-4IR/UC-2, UC-2IR
09	KB-8, KB-8IR
10	SB-6, SB-6IR
11	KA-3, KB-4IR
12	UC-2, UC-2IR
13	Spare
14	Spare
15	Spare
16	*KF-2 Floater/KB-7, KB-7IR
17	KF-2 Floater
18	KB-7, KB-7IR
19	*KF-1 Floater/RISOP Sector
20	Spare
21	KF-1 Floater
22	RISOP Sector
23	Full Disc East IR
24	Full Disc West IR

* Multiplexed Codes - (Same as SFO)

Imagery Available at the

MIAMI SATELLITE FIELD SERVICES STATION

DIAL CODE #	PRIMARY DATA
00	Disconnect All
01	*MF-1 Floater/SF-1 Floater
02	MF-1 Floater
03	SF-1 Floater
04	*MF-2 Floater/UC-2
05	MF-2 Floater
06	UC-2
07	*DB-5/Phase 2
08	Spare
09	DB-5
10	Phase 2
11	Spare
12	Spare
13	Full Disc East IR

* Multiplexed Codes - (Same as SFO)

Imagery Available at the

ANCHORAGE SATELLITE FIELD SERVICES STATION

PRIMARY DATA

*AA-1, AB-1, AC-1/Full Disc West IR
AVHRR-Visible
AVHRR-IR
GMS

The Anchorage SFSS provides GOES imagery on a scheduled basis. This schedule can be altered by the SFSS in coordination with the Alaskan NWS Region.

* Multiplexed data - One sector and Full Disc West IR are available in every 30-min. period.

Imagery Available at the

HONOLULU SATELLITE FIELD SERVICES STATION

PRIMARY DATA

HF-1
HF-2/Full Disc West IR
GMS

In general, sectors available from Honolulu SFSS include a mix of 1, 2, and 4 km Visible and IR sectors with appropriate IR enhancement curves covering Hawaii, and the Central and Southern Pacific areas.

* Multiplexed data - HF-2 and Full Disc West IR are available in every 30-min. period.

Imagery Available at the

NEW ORLEANS SATELLITE FIELD SERVICES STATION

PRIMARY DATA

GF-1/Full Disc East IR
One Sector (touchtone selection) from
DCA SFSS

The New Orleans SFSS provides GOES imagery on a scheduled basis. This schedule can be altered by the SFSS in coordination with the NWS.

* Multiplexed data - GF-1 and Full Disc East IR are available in every 30-min. periods.

Sector Schedules

The attached schedules reflect GOES sectors and other satellite data available at the Washington SFSS. These have been listed for June and for January. This basic schedule may change from time to time to accommodate new products or changing demands.

The following table shows sector schedules for the Kansas City and San Francisco SFSS. Note that the Washington SFSS Dial Code Schedule is the basis for this referencing because all GOES products (except for some Floaters) produced at the Central Facility in Camp Springs are contained in the Washington SFSS schedule. Products that are spelled out in the reference columns are not available at the Washington SFSS (and therefore have no DCA schedule reference). The NEW, MIA, HNL, and ANC SFSSs have product schedules that are limited and vary with user demands. For exact time and product schedules, contact these SFSSs.

Dial Code for MKC or SFO	Refer to the DCA Schedule # for MKC	Refer to the DCA Schedule # for SFO
1	*3, 18	*3, 18
2	3	3
3	18	18
4	*15, 17	*15, 17
5	15	15
6	17	17
7	*4, 16	*4, 16
8	*13, 19	*13, 19
9	4	4
10	16	16
11	13	13
12	19	19
13	Spare	*10, SF-1 Floater
14	Spare	10
15	Spare	SF-1 Floater
16	*KF-2 Floater, 14	23
17	KF-2 Floater	Spare
18	14	23
19	*22 RISOP Sector	Spare
20	Not Used	12
21	22	Spare
22	RISOP Sector	Spare
23	11	SFO AVHRR VIS
24	12	SFO AVHRR IR

* Note Dial Code entries showing two different schedules (East and West pairs) are multiplexed lines

Examples

1. MKC Dial Code #5 has the same schedule as DCA Dial Code #15
2. SFO Dial Code #10 has the same schedule as DCA Dial Code #16
3. MKC Dial Code #1 has both an EAST Schedule and a WEST Schedule. These are the same as DCA Dial Codes 3 and 18.
4. MKC dial code #17 has the KF-2 Floater (which is not available at the DCA SFSS).

WASHINGTON SFSS

Summer (June)

DIAL CODE SCHEDULE

Z TIME	DATA PERIOD	DC-01	DC-02	DC-03	DC-04	Z TIME	DATA PERIOD	DC-01	DC-02	DC-03	DC-04
0000 0015	1	DA1	DA2	KA5	KB8-MB	1200 1215	25	DA1	DA2	KB6-MB	KB8-MB
0030 0045	2	DB5-MB	DB5-ZA	KA5	KB8	1230 1245	26	DA1	DA2	KA5	KB8
0100 0115	3	DB5-JG	DB5-MB	KB6-MB	KB8-MB	1300 1315	27	DA1	DA2	KA5	KB8-MB
0130 0145	4	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	1330 1345	28	DA1	DA2	KA5	KB8
0200 0215	5	DB5-JG	DB5-MB	KB6-MB	KB8-MB	1400 1415	29	DA1	DA2	KA5	KB8-MB
0230 0245	6	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	1430 1445	30	DA1	DA2	KA5	KB8
0300 0315	7	DB5-JG	DB5-MB	KB6-MB	KB8-MB	1500 1515	31	DA1	DA2	KA5	KB8-MB
0330 0345	8	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	1530 1545	32	DA1	DA2	KA5	KB8
0400 0415	9	DB5-JG	DB5-MB	KB6-MB	KB8-MB	1600 1615	33	DA1	DA2	KA5	KB8-MB
0430 0445	10	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	1630 1645	34	DA1	DA2	KA5	KB8
0500 0515	11	DB5-JG	DB5-MB	KB6-MB	KB8-MB	1700 1715	35	DA1	DA2	KA5	KB8-MB
0530 0545	12	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	1730 1745	36	DA1	DA2	KA5	KB8
0600 0615	13	DB5-JG	DB5-MB	KB6-MB	KB8-MB	1800 1815	37	DA1	DA2	KA5	KB8-MB
0630 0645	14	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	1830 1845	38	DA1	DA2	KA5	KB8
0700 0715	15	DB5-JG	DB5-MB	KB6-MB	KB8-MB	1900 1915	39	DA1	DA2	KA5	KB8-MB
0730 0745	16	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	1930 1945	40	DA1	DA2	KA5	KB8
0800 0815	17	DB5-JG	DB5-MB	KB6-MB	KB8-MB	2000 2015	41	DA1	DA2	KA5	KB8-MB
0830 0845	18	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	2030 2045	42	DA1	DA2	KA5	KB8
0900 0915	19	DB5-JG	DB5-MB	KB6-MB	KB8-MB	2100 2115	43	DA1	DA2	KA5	KB8-MB
0930 0945	20	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	2130 2145	44	DA1	DA2	KA5	KB8
1000 1015	21	DB5-JG	DB5-MB	KB6-MB	KB8-MB	2200 2215	45	DA1	DA2	KA5	KB8-MB
1030 1045	22	DB5-MB	DB5-ZA	KB6-MB	KB8-MB	2230 2245	46	DA1	DA2	KA5	KB8
1100 1115	23	DB5-JG	DA2	KB6-MB	KB8-MB	2300 2315	47	DA1	DA2	KA5	KB8-MB
1130 1145	24	DA1	DA2	KB6-MB	KB8-MB	2330 2345	48	DA1	DA2	KA5	KB8

WASHINGTON SFSS

DIAL CODE SCHEDULE

Summer (June)

Z TIME	DATA PERIOD	DC-05	DC-06	DC-07	DC-08	Z TIME	DATA PERIOD	DC-05	DC-06	DC-07	DC-08
0000 0015	1	DB5-MB	DCA FLOATER 1 (DF-1)	DCA FLOATER 2 (DF-2)	AVHRR	1200 1215	25	DB5-MB	DCA FLOATER 1 (DF-1)	DCA FLOATER 2 (DF-2)	AVHRR
0030 0045	2	DB5-MB	DF-1	DF-2	AVHRR	1230 1245	26	DB5	DF-1	DF-2	AVHRR
0100 0115	3	DB5-MB	DF-1	DF-2	AVHRR	1300 1315	27	DB-5MB	DF-1	DF-2	AVHRR
0130 0145	4	DB5-MB	DF-1	DF-2	AVHRR	1330 1345	28	DB5	DF-1	DF-2	AVHRR
0200 0215	5	DB5-MB	DF-1	DF-2	AVHRR	1400 1415	29	DB5-MB	DF-1	DF-2	AVHRR
0230 0245	6	DB5-MB	DF-1	DF-2	AVHRR	1430 1445	30	DB5	DF-1	DF-2	AVHRR
0300 0315	7	DB5-MB	DF-1	DF-2	AVHRR	1500 1515	31	DB5-MB	DF-1	DF-2	AVHRR
0330 0345	8	DB5-MB	DF-1	DF-2	AVHRR	1530 1545	32	DB5	DF-1	DF-2	AVHRR
0400 0415	9	DB5-MB	DF-1	DF-2	AVHRR	1600 1615	33	DB5-MB	DF-1	DF-2	AVHRR
0430 0445	10	DB5-MB	DF-1	DF-2	AVHRR	1630 1645	34	DB5	DF-1	DF-2	AVHRR
0500 0515	11	DB5-MB	DF-1	DF-2	AVHRR	1700 1715	35	DB5-MB	DF-1	DF-2	AVHRR
0530 0545	12	DB5-MB	DF-1	DF-2	AVHRR	1730 1745	36	DB5	DF-1	DF-2	AVHRR
0600 0615	13	DB5-MB	DF-1	DF-2	AVHRR	1800 1815	37	DB5-MB	DF-1	DF-2	AVHRR
0630 0645	14	DB5-MB	DF-1	DF-2	AVHRR	1830 1845	38	DB5	DF-1	DF-2	AVHRR
0700 0715	15	DB5-MB	DF-1	DF-2	AVHRR	1900 1915	39	DB5-MB	DF-1	DF-2	AVHRR
0730 0745	16	DB5-MB	DF-1	DF-2	AVHRR	1930 1945	40	DB5	DF-1	DF-2	AVHRR
0800 0815	17	DB5-MB	DF-1	DF-2	AVHRR	2000 2015	41	DB5-MB	DF-1	DF-2	AVHRR
0830 0845	18	DB5-MB	DF-1	DF-2	AVHRR	2030 2045	42	DB5	DF-1	DF-2	AVHRR
0900 0915	19	DB5-MB	DF-1	DF-2	AVHRR	2100 2115	43	DB5-MB	DF-1	DF-2	AVHRR
0930 0945	20	DB5-MB	DF-1	DF-2	AVHRR	2130 2145	44	DB5	DF-1	DF-2	AVHRR
1000 1015	21	DB5-MB	DF-1	DF-2	AVHRR	2200 2215	45	DB5-MB	DF-1	DF-2	AVHRR
1030 1045	22	DB5-MB	DF-1	DF-2	AVHRR	2230 2245	46	DB5	DF-1	DF-2	AVHRR
1100 1115	23	DB5-MB	DF-1	DF-2	AVHRR	2300 2315	47	DB5-MB	DF-1	DF-2	AVHRR
1130 1145	24	DB5	DF-1	DF-2	AVHRR	2330 2345	48	DB5	DF-1	DF-2	AVHRR

WASHINGTON SFSS

DIAL CODE SCHEDULE Summer (June)

Z TIME	DATA PERIOD	DC- 09	DC- 10	DC- 11	DC-12	Z TIME	DATA PERIOD	DC-09	DC-10	DC-11	DC-12
0000 0015	1	GULF FLOATER	UC1-ZA	FULL DISK IR EAST	FULL DISK IR WEST	1200 1215	25	GULF FLOATER	UC1-ZA	FULL DISK IR EAST	FULL DISK IR WEST
0030 0045	2	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1230 1245	26	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0100 0115	3	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1300 1315	27	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0130 0145	4	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1330 1345	28	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0200 0215	5	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1400 1415	29	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0230 0245	6	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1430 1445	30	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0300 0315	7	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1500 1515	31	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0330 0345	8	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1530 1545	32	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0400 0415	9	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1600 1615	33	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0430 0445	10	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1630 1645	34	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0500 0515	11	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1700 1715	35	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0530 0545	12	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1730 1745	36	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0600 0615	13	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1800 1815	37	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0630 0645	14	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1830 1845	38	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0700 0715	15	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1900 1915	39	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0730 0745	16	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1930 1945	40	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0800 0815	17	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2000 2015	41	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0830 0845	18	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2030 2045	42	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0900 0915	19	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2100 2115	43	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0930 0945	20	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2130 2145	44	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
1000 1015	21	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2200 2215	45	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
1030 1045	22	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2230 2245	46	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
1100 1115	23	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2300 2315	47	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
1130 1145	24	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2330 2345	48	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST

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DIAL CODE SCHEDULE Summer (June)

Z TIME	DATA PERIOD	DC-13	DC-14	DC-15	DC-16	Z TIME	DATA PERIOD	DC-13	DC-14	DC-15	DC-16
0000 0015	1	KA3	KB7-MB	KA4	UC2-WV	1200 1215	25	KA3	KB7-MB	KB8-JF	UC2-WV
0030 0045	2	KB4-MB	KB7	KA4	UC2	1230 1245	26	KA3	KB7-MB	KA4	SB6-ZA
0100 0115	3	KB4-MB	KB7-MB	KB8-JF	SB6	1300 1315	27	KA3	KB7-MB	KA4	SB6
0130 0145	4	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	1330 1345	28	KA3	KB7	KA4	SB6-ZA
0200 0215	5	KB4-MB	KB7-MB	KB8-JF	SB6	1400 1415	29	KA3	KB7-MB	KA4	SB6
0230 0245	6	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	1430 1445	30	KA3	KB7	KA4	SB6-MB
0300 0315	7	KB4-MB	KB7-MB	GMS	SB6-MB	1500 1515	31	KA3	KB7-MB	KA4	SB6
0330 0345	8	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	1530 1545	32	KA3	KB7	KA4	SB6-MB
0400 0415	9	KB4-MB	KB7-MB	KB8-JF	SB6-MB	1600 1615	33	KA3	KB7-MB	KA4	SB6
0430 0445	10	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	1630 1645	34	KA3	KB7	KA4	SB6-MB
0500 0515	11	KB4-MB	KB7-MB	KB8-JF	SB6-MB	1700 1715	35	KA3	KB7-MB	KA4	SB6
0530 0545	12	KB4-MB	KB7-MB	KB8-JF	UC2-ZA	1730 1745	36	KA3	KB7	KA4	UC2-ZA
0600 0615	13	KB4-MB	KB7-MB	GMS	UC2-ZA	1800 1815	37	KA3	KB7-MB	KA4	UC2-ZA
0630 0645	14	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	1830 1845	38	KA3	KB7	KA4	UC2
0700 0715	15	KB4-MB	KB7-MB	KB8-JF	SB6-MB	1900 1915	39	KA3	KB7-MB	KA4	SB6
0730 0745	16	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	1930 1945	40	KA3	KB7	KA4	SB6-MB
0800 0815	17	KB4-MB	KB7-MB	KB8-JF	SB6-MB	2000 2015	41	KA3	KB7-MB	KA4	SB6
0830 0845	18	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	2030 2045	42	KA3	KB7	KA4	SB6-MB
0900 0915	19	KB4-MB	KB7-MB	KB8-JF	SB6-MB	2100 2115	43	KA3	KB7-MB	KA4	SB6
0930 0945	20	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	2130 2145	44	KA3	KB7	KA4	SB6-MB
1000 1015	21	KB4-MB	KB7-MB	KB8-JF	SB6-MB	2200 2215	45	KA3	KB7-MB	KA4	SB6
1030 1045	22	KB4-MB	KB7-MB	KB8-JF	SB6-ZA	2230 2245	46	KA3	KB7	KA4	SB6-MB
1100 1115	23	KB4-MB	KB7-MB	KB8-JF	SB6-MB	2300 2315	47	KA3	KB7-MB	KA4	SB6
1130 1145	24	KB4-MB	KB7-MB	KB8-JF	UC2-ZA	2330 2345	48	KA3	KB7	KA4	UC2-ZA

WASHINGTON SFSS

DIAL CODE SCHEDULE

Summer (June)

Z TIME	DATA PERIOD	DC-17	DC-18	DC-19	DC-20	Z TIME	DATA PERIOD	DC-17	DC-18	DC-19	DC-20
0000 0015	1	SA1	SA2	UC2	AC	1200 1215	25	SB6-ZA	SB6-ZA	UC2-ZA	AB-CE
0030 0045	2	SA1-MB	SA2-MB	UC2-ZA	AB-ZB	1230 1245	26	SA1-MB	SA2-MB	UC2-ZA	AB-ZB
0100 0115	3	SA1	SA2	UC2	AB-CE	1300 1315	27	SA1	SA2	UC2	AB-CE
0130 0145	4	SA1-MB	SA2-MB	UC2-ZA	AC-ZB	1330 1345	28	SA1-MB	SA2-MB	UC2-ZA	AB-ZB
0200 0215	5	SA1-MB	SA2-MB	UC2-	AB-CE	1400 1415	29	SA1	SA2	UC2-EC	AB-CE
0230 0245	6	SA1-MB	SA2-MB	UC2-ZA	AA	1430 1445	30	SA1-MB	SA2-MB	UC2-ZA	AB-ZB
0300 0315	7	GMS	SA2-MB	UC2-EC	AB-CE	1500 1515	31	SA1	SA2	UC2	AB-CE
0330 0345	8	SA1-MB	SA2-MB	UC2-ZA	AC-ZB	1530 1545	32	SA1-MB	SA2-MB	UC2-ZA	AC -ZB
0400 0415	9	SA1-MB	SA2-MB	UC2-EC	AB-CE	1600 1615	33	SA1	SA2	UC2	AB-AB
0430 0445	10	SA1-MB	SA2-MB	UC2-ZA	AB-ZB	1630 1645	34	PARAMETER #118 SA1	SA2-MB	UC2-ZA	AB-CE
0500 0515	11	SA1-MB	SA2-MB	UC2-EC	AB-CE	1700 1715	35	PARAMETER #118 SA1	SA2	UC2	AB-ZB
0530 0545	12	SA1-MB	SA2-MB	UC2-ZA	AC-ZB	1730 1745	36	PARAMETER #118 SA1	SA2-MB	UC2-ZA	AC-ZB
0600 0615	13	GMS	SB6-ZA	UC2- ZA	AB-CE	1800 1815	37	PARAMETER #118 SA1	SA2	UC2	AB
0630 0645	14	SA1-MB	SA2-MB	UC2-ZA	AB-ZB	1830 1845	38	SA1-MB	SA2-MB	UC2-ZA	AB
0700 0715	15	SA1-MB	SA2-MB	UC2-EC	AB-CE	1900 1915	39	SA1	SA2	UC2	AB
0730 0745	16	SA1-MB	SA2-MB	UC2-ZA	AC-ZB	1930 1945	40	SA1-MB	SA2-MB	UC2-ZA	AB
0800 0815	17	SA1-MB	SA2-MB	UC2-EC	AB-CE	2000 2015	41	SA1	SA2	UC2	AB-CE
0830 0845	18	SA1-MB	SA2-MB	UC2-ZA	AB-ZB	2030 2045	42	SA1-MB	SA2-MB	UC2-ZA	AA
0900 0915	19	SA1-MB	SA2-MB	UC2-EC	AB-CE	2100 2115	43	SA1	SA2	UC2	AB-CE
0930 0945	20	SA1-MB	SA2-MB	UC2-ZA	AC-ZB	2130 2145	44	SA1-MB	SA2-MB	UC2-ZA	AC-ZB
1000 1015	21	SA1-MB	SA2-MB	UC2-EC	AB-CE	2200 2215	45	SA1	SA2	UC2	AB-ZB
1030 1045	22	SA1-MB	SA2-MB	UC2-ZA	AB-ZB	2230 2245	46	SA1-MB	SA2-MB	UC2-ZA	AB-CE
1100 1115	23	SA1-MB	SA2-MB	UC2-EC	AB-CE	2300 2315	47	SA1	SA2	UC2	AA
1130 1145	24	SA1-MB	SA2-MB	UC2-ZA	AC-ZB	2330 2345	48	SA1-MB	SA2-MB	UC2-ZA	AC-ZB

WASHINGTON SFSS

DIAL CODE SCHEDULE

Summer (June)

Z TIME	DATA PERIOD	DC-21	DC-22	DC-23	DC-24	Z TIME	DATA PERIOD	DC-21	DC-22	DC-23	DC-24
0000 0015	1	MIA FLOATER 2(MF-2)	MKC FLOATER 1(KF-1)	SFO FLOATER 2(SF-2)	METEO SAT WEFAX	1200 1215	25	MIA FLOATER 2(MF-2)	MKC FLOATER 1(KF-1)	SFO FLOATER 2(SF-2)	METEO SAT WEFAX
0030 0045	2	MF-2	KF-1	SF-2		1230 1245	26	MF-2	KF-1	SF-2	
0100 0115	3	MF-2	KF-1	SF-2		1300 1315	27	MF-2	KF-1	SF-2	
0130 0145	4	MF-2	KF-1	SF-2		1330 1345	28	MF-2	KF-1	SF-2	
0200 0215	5	MF-2	KF-1	SF-2		1400 1415	29	MF-2	KF-1	SF-2	
0230 0245	6	MF-2	KF-1	SF-2		1430 1445	30	MF-2	KF-1	SF-2	
0300 0315	7	MF-2	KF-1	SF-2		1500 1515	31	MF-2	KF-1	SF-2	
0330 0345	8	MF-2	KF-1	SF-2		1530 1545	32	MF-2	KF-1	SF-2	
0400 0415	9	MF-2	KF-1	SF-2		1600 1615	33	MF-2	KF-1	SF-2	
0430 0445	10	MF-2	KF-1	SF-2		1630 1645	34	MF-2	KF-1	SF-2	
0500 0515	11	MF-2	KF-1	SF-2		1700 1715	35	MF-2	KF-1	SF-2	
0530 0545	12	MF-2	KF-1	SF-2		1730 1745	36	MF-2	KF-1	SF-2	
0600 0615	13	MF-2	KF-1	SF-2		1800 1815	37	MF-2	KF-1	SF-2	
0630 0645	14	MF-2	KF-1	SF-2		1830 1845	38	MF-2	KF-1	SF-2	
0700 0715	15	MF-2	KF-1	SF-2		1900 1915	39	MF-2	KF-1	SF-2	
0730 0745	16	MF-2	KF-1	SF-2		1930 1945	40	MF-2	KF-1	SF-2	
0800 0815	17	MF-2	KF-1	SF-2		2000 2015	41	MF-2	KF-1	SF-2	
0830 0845	18	MF-2	KF-1	SF-2		2030 2045	42	MF-2	KF-1	SF-2	
0900 0915	19	MF-2	KF-1	SF-2		2100 2115	43	MF-2	KF-1	SF-2	
0930 0945	20	MF-2	KF-1	SF-2		2130 2145	44	MF-2	KF-1	SF-2	
1000 1015	21	MF-2	KF-1	SF-2		2200 2215	45	MF-2	KF-1	SF-2	
1030 1045	22	MF-2	KF-1	SF-2		2230 2245	46	MF-2	KF-1	SF-2	
1100 1115	23	MF-2	KF-1	SF-2		2300 2315	47	MF-2	KF-1	SF-2	
1130 1145	24	MF-2	KF-1	SF-2		2330 2345	48	MF-2	KF-1	SF-2	

WASHINGTON SFSS

WINTER (January)

DIAL CODE SCHEDULE

Z TIME	DATA PERIOD	DC-01	DC-02	DC-03	DC-04	Z TIME	DATA PERIOD	DC-01	DC-02	DC-03	DC-04
0000 0015	1	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1200 1215	25	DB5-EC	DB5-CC	KB6-CC	KB8-MB
0030 0045	2	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1230 1245	26	DB5-MB	DB5-ZA	KB6-CC	KB8-MB
0100 0115	3	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1300 1315	27	DA1	DA2	KB6-CC	KB8-MB
0130 0145	4	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1330 1345	28	DA1	DA2	KB6-CC	KB8-MB
0200 0215	5	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1400 1415	29	DA1	DA2	KB6-CC	KB8-MB
0230 0245	6	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1430 1445	30	DA1	DA2	KB6-CC	KB8
0300 0315	7	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1500 1515	31	DA1	DA2	KA5	KB8-MB
0330 0345	8	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1530 1545	32	DA1	DA2	KA5	KB8
0400 0415	9	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1600 1615	33	DA1	DA2	KA5	KB8-MB
0430 0445	10	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1630 1645	34	DA1	DA2	KA5	KB8
0500 0515	11	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1700 1715	35	DA1	DA2	KA5	KB8-MB
0530 0545	12	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1730 1745	36	DA1	DA2	KA5	KB8
0600 0615	13	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1800 1815	37	DA1	DA2	KA5	KB8-MB
0630 0645	14	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1830 1845	38	DA1	DA2	KA5	KB8
0700 0715	15	DB5-EC	DB5-CC	KB6-CC	KB8-MB	1900 1915	39	DA1	DA2	KA5	KB8-MB
0730 0745	16	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	1930 1945	40	DA1	DA2	KA5	KB8
0800 0815	17	DB5-EC	DB5-CC	KB6-CC	KB8-MB	2000 2015	41	DA1	DA2	KA5	KB8-MB
0830 0845	18	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	2030 2045	42	DA1	DA2	KA5	KB8
0900 0915	19	DB5-EC	DB5-CC	KB6-CC	KB8-MB	2100 2115	43	DA1	DB5-CC	KA5	KB8-MB
0930 0945	20	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	2130 2145	44	DB5-MB	DB5-ZA	KA5	KB8
1000 1015	21	DB5-EC	DB5-CC	KB6-CC	KB8-MB	2200 2215	45	DB5-EC	DB5-CC	KA5	KB8-MB
1030 1045	22	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	2230 2245	46	DB5-MB	DB5-ZA	KB6-CC	KB8-MB
1100 1115	23	DB5-EC	DB5-CC	KB6-CC	KB8-MB	2300 2315	47	DB5-EC	DB5-CC	KB6-CC	KB8-MB
1130 1145	24	DB5-MB	DB5-ZA	KB6-CC	KB8-MB	2330 2345	48	DB5-MB	DB5-ZA	KB6-CC	KB8-MB

WASHINGTON SFSS

WINTER (January)

DIAL CODE SCHEDULE

Z TIME	DATA PERIOD	DC-05	DC-06	DC-07	DC-08	Z TIME	DATA PERIOD	DC-05	DC-06	DC-07	DC-08
0000 0015	1	DB5-CC	DCA FLOATER 1 (DF-1)	DCA FLOATER 2 (DF-2)	AVHRR	1200 1215	25	DB5-CC	DCA FLOATER 1 (DF-1)	DCA FLOATER 2 (DF-2)	AVHRR
0030 0045	2	DB5-CC	DF-1	DF-2	AVHRR	1230 1245	26	DB5-CC	DF-1	DF-2	AVHRR
0100 0115	3	DB5-CC	DF-1	DF-2	AVHRR	1300 1315	27	DB5-CC	DF-1	DF-2	AVHRR
0130 0145	4	DB5-CC	DF-1	DF-2	AVHRR	1330 1345	28	DB5	DF-1	DF-2	AVHRR
0200 0215	5	DB5-CC	DF-1	DF-2	AVHRR	1400 1415	29	DB5-CC	DF-1	DF-2	AVHRR
0230 0245	6	DB5-CC	DF-1	DF-2	AVHRR	1430 1445	30	DB5	DF-1	DF-2	AVHRR
0300 0315	7	DB5-CC	DF-1	DF-2	AVHRR	1500 1515	31	DB5-CC	DF-1	DF-2	AVHRR
0330 0345	8	DB5-CC	DF-1	DF-2	AVHRR	1530 1545	32	DB5	DF-1	DF-2	AVHRR
0400 0415	9	DB5-CC	DF-1	DF-2	AVHRR	1600 1615	33	DB5-CC	DF-1	DF-2	AVHRR
0430 0445	10	DB5-CC	DF-1	DF-2	AVHRR	1630 1645	34	DB5	DF-1	DF-2	AVHRR
0500 0515	11	DB5-CC	DF-1	DF-2	AVHRR	1700 1715	35	DB5-CC	DF-1	DF-2	AVHRR
0530 0545	12	DB5-CC	DF-1	DF-2	AVHRR	1730 1745	36	DB5	DF-1	DF-2	AVHRR
0600 0615	13	DB5-CC	DF-1	DF-2	AVHRR	1800 1815	37	DB5-CC	DF-1	DF-2	AVHRR
0630 0645	14	DB5-CC	DF-1	DF-2	AVHRR	1830 1845	38	DB5	DF-1	DF-2	AVHRR
0700 0715	15	DB5-CC	DF-1	DF-2	AVHRR	1900 1915	39	DB5-CC	DF-1	DF-2	AVHRR
0730 0745	16	DB5-CC	DF-1	DF-2	AVHRR	1930 1945	40	DB5	DF-1	DF-2	AVHRR
0800 0815	17	DB5-CC	DF-1	DF-2	AVHRR	2000 2015	41	DB5-CC	DF-1	DF-2	AVHRR
0830 0845	18	DB5-CC	DF-1	DF-2	AVHRR	2030 2045	42	DB5	DF-1	DF-2	AVHRR
0900 0915	19	DB5-CC	DF-1	DF-2	AVHRR	2100 2115	43	DB5-CC	DF-1	DF-2	AVHRR
0930 0945	20	DB5-CC	DF-1	DF-2	AVHRR	2130 2145	44	DB5-CC	DF-1	DF-2	AVHRR
1000 1015	21	DB5-CC	DF-1	DF-2	AVHRR	2200 2215	45	DB5-CC	DF-1	DF-2	AVHRR
1030 1045	22	DB5-CC	DF-1	DF-2	AVHRR	2230 2245	46	DB5-CC	DF-1	DF-2	AVHRR
1100 1115	23	DB5-CC	DF-1	DF-2	AVHRR	2300 2315	47	DB5-CC	DF-1	DF-2	AVHRR
1130 1145	24	DB5-CC	DF-1	DF-2	AVHRR	2330 2345	48	DB5-CC	DF-1	DF-2	AVHRR

WASHINGTON SFSS

DIAL CODE SCHEDULE

WINTER (January)

Z TIME	DATA PERIOD	DC-09	DC-10	DC-11	DC-12	Z TIME	DATA PERIOD	DC-09	DC-10	DC-11	DC-12
0000 0015	1	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1200 1215	25	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0030 0045	2	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1230 1245	26	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST
0100 0115	3	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1300 1315	27	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0130 0145	4	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1330 1345	28	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST
0200 0215	5	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1400 1415	29	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0230 0245	6	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1430 1445	30	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0300 0315	7	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1500 1515	31	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0330 0345	8	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1530 1545	32	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0400 0415	9	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1600 1615	33	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0430 0445	10	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1630 1645	34	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0500 0515	11	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1700 1715	35	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0530 0545	12	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1730 1745	36	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0600 0615	13	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1800 1815	37	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0630 0645	14	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1830 1845	38	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0700 0715	15	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	1900 1915	39	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0730 0745	16	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	1930 1945	40	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0800 0815	17	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2000 2015	41	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0830 0845	18	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2030 2045	42	GULF FLOATER	UC1	FDIR EAST	FDIR WEST
0900 0915	19	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2100 2115	43	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
0930 0945	20	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2130 2145	44	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST
1000 1015	21	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2200 2215	45	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
1030 1045	22	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2230 2245	46	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST
1100 1115	23	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST	2300 2315	47	GULF FLOATER	UC1-ZA	FDIR EAST	FDIR WEST
1130 1145	24	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST	2330 2345	48	GULF FLOATER	UC1-MB	FDIR EAST	FDIR WEST

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DIAL CODE SCHEDULE Winter (January)

Z TIME	DATA PERIOD	DC-13	DC-14	DC-15	DC-16	Z TIME	DATA PERIOD	DC-13	DC-14	DC-15	DC-16
0000 0015	1	KB4-MB	KB7-ZA	KB8-JG	UC2-ZA	1200 1215	25	KB4-MB	KB7-ZA	KB8-JG	UC2-ZA
0030 0045	2	KB4-ZA	KB7-MB	KB8-JG	UC2	1230 1245	26	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA
0100 0115	3	KB4-MB	KB7-MB	KB8-JG	SB6-EC	1300 1315	27	KB4-MB	KB7-MB	KB8-JG	SB6-EC
0130 0145	4	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	1330 1345	28	KB4-ZA	KB7	KB8-JG	SB6-ZA
0200 0215	5	KB4-MB	KB7-MB	KB8-JG	SB6-EC	1400 1415	29	KA3	KB7-MB	KA4	SB6-EC
0230 0245	6	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	1430 1445	30	KA3	KB7	KA4	SB6-ZA
0300 0315	7	KB4-MB	KB7-MB	KB8-JG	SB6-EC	1500 1515	31	KA3	KB7-MB	KA4	SB6
0330 0345	8	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	1530 1545	32	KA3	KB7	KA4	SB6-ZA
0400 0415	9	KB4-MB	KB7-MB	KB8-JG	SB6-EC	1600 1615	33	KA3	KB7-MB	KA4	SB6
0430 0445	10	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	1630 1645	34	KA3	KB7	KA4	SB6-ZA
0500 0515	11	KB4-MB	KB7-MB	KB8-JG	SB6-EC	1700 1715	35	KA3	KB7-MB	KA4	SB6
0530 0545	12	KB4-ZA	KB7-MB	KB8-JG	UC2-ZA	1730 1745	36	KA3	KB7	KA4	UC2
0600 0615	13	KB4-MB	KB7-MB	KB8-JG	SB6-EC	1800 1815	37	KA3	KB7-MB	KA4	UC2-ZA
0630 0645	14	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	1830 1845	38	KA3	KB7	KA4	SB6-ZA
0700 0715	15	KB4-MB	KB7-MB	KB8-JG	SB6-EC	1900 1915	39	KA3	KB7-MB	KA4	SB6
0730 0745	16	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	1930 1945	40	KA3	KB7	KA4	SB6-ZA
0800 0815	17	KB4-MB	KB7-MB	KB8-JG	SB6-EC	2000 2015	41	KA3	KB7-MB	KA4	SB6
0830 0845	18	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	2030 2045	42	KA3	KB7	KA4	SB6-ZA
0900 0915	19	KB4-MB	KB7-MB	KB8-JG	SB6-EC	2100 2115	43	KA3	KB7-MB	KA4	SB6
0930 0945	20	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	2130 2145	44	KA3	KB7	KA4	SB6-ZA
1000 1015	21	KB4-MB	KB7-MB	KB8-JG	SB6-EC	2200 2215	45	KA3	KB7-MB	KA4	SB6
1030 1045	22	KB4-ZA	KB7-MB	KB8-JG	SB6-ZA	2230 2245	46	KB4-ZA	KB7	KB8-JG	SB6-ZA
1100 1115	23	KB4-MB	KB7-MB	KB8-JG	SB6-EC	2300 2315	47	KB4-MB	KB7-MB	KB8-JG	SB6
1130 1145	24	KB4-ZA	KB7-MB	KB8-JG	UC2-ZA	2330 2345	48	KB4-ZA	KB7	KB8-JG	UC2-ZA

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DIAL CODE SCHEDULE

Z TIME	DATA PERIOD	DC-17	DC-18	DC-19	DC-20	Z TIME	DATA PERIOD	DC-17	DC-18	DC-19	DC-20
0000 0015	1	SA1	SA2	UC2	AC1-ZA	1200 1215	25	GMS	SB6-WV	UC2-ZA	AB1-ZA
0030 0045	2	SB6-HC	SA2	UC2-ZA	AB1-CE	1230 1245	26	SB6-HC	SB6-ZA	UC2-ZA	AB1-AE
0100 0115	3	SB6-HC	SB6-EC	UC2-EC	AB1-ZB	1300 1315	27	SB6-HC	SB6-EC	UC2-EC	AB1-CE
0130 0145	4	SB6-HC	SB6-ZA	UC2-ZA	AB1-ZB	1330 1345	28	SB6-HC	SB6-ZA	UC2-ZA	AC1-ZE
0200 0215	5	SB6-HC	SB6-EC	UC2-EC	AB1-CE	1400 1415	29	SB6-HC	SB6-EC	UC2-EC	AB1-CE
0230 0245	6	SB6-HC	SB6-ZA	UC2-ZA	AB1-ZB	1430 1445	30	SA1	SA2	UC2-ZA	AB1-ZB
0300 0315	7	GMS	SB6-EC	UC2-EC	AB1-CE	1500 1515	31	SA1-LA	SA2-LA	UC2-EC	AB1-CE
0330 0345	8	SB6-HC	SB6-ZA	UC2-ZA	AC1-ZB	1530 1545	32	SA1-LA	SA2-LA	UC2-ZA	AC1-ZB
0400 0415	9	SB6-HC	SB6-EC	UC2-EC	AB1-CE	1600 1615	33	SA1	SA2	UC2-EC	AB1-CE
0430 0445	10	SB6-HC	SB6-ZA	UC2-ZA	AB1-ZB	1630 1645	34	SA1	SA2	UC2-ZA	AB1-ZB
0500 0515	11	SB6-HC	SB6-EC	UC2-EC	AB1-CE	1700 1715	35	SA1	SA2	UC2	AB1-CE
0530 0545	12	SB6-HC	SB6-ZA	UC2-ZA	AC1-ZB	1730 1745	36	SA1	SA2	UC2-ZA	AC1-AB
0600 0615	13	GMS	SB6-EC	UC2-EC	AB1-CE	1800 1815	37	SA1	SA2	UC2	AC1
0630 0645	14	SB6-HC	SB6-ZA	UC2-ZA	AB1-ZB	1830 1845	38	SA1	SA2	UC2-ZA	AB1-ZB
0700 0715	15	SB6-HC	SB6-EC	UC2-EC	AB1-CE	1900 1915	39	SA1	SA2	UC2	AB1-CE
0730 0745	16	SB6-HC	SB6-ZA	UC2-ZA	AC1-ZB	1930 1945	40	SA1	SA2	UC2-ZA	AB1-ZB
0800 0815	17	SB6-HC	SB6-EC	UC2-EC	AB1-CE	2000 2015	41	SA1	SA2	UC2	AB1
0830 0845	18	SB6-HC	SB6-ZA	UC2-ZA	AB1-ZB	2030 2045	42	SA1	SA2	UC2-ZA	AB1
0900 0915	19	GMS	SB6-EC	UC2-EC	AB1-CE	2100 2115	43	SA1	SA2	UC2	AB1
0930 0945	20	SB6-HC	SB6-ZA	UC2-ZA	AC1-ZB	2130 2145	44	SA1	SA2	UC2-ZA	AB1
1000 1015	21	SB6-HC	SB6-EC	UC2-EC	AB1-CE	2200 2215	45	SA1	SA2	UC2	AB1-ZB
1030 1045	22	SB6-HC	SB6-ZA	UC2-ZA	AB1-ZB	2230 2245	46	SA1	SA2	UC2-ZA	AB1
1100 1115	23	SB6-HC	SB6-EC	UC2-EC	AB1-CE	2300 2315	47	SA1	SA2	UC2	AB1-CE
1130 1145	24	SB6-HC	SB6-ZA	UC2-ZA	AC1-ZB	2330 2345	48	SA1	SA2	UC2-ZA	AC1-ZB

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DIAL CODE SCHEDULE

Z TIME	DATA PERIOD	DC-21	DC-22	DC-23	DC-24	Z TIME	DATA PERIOD	DC-21	DC-22	DC-23	DC-24
0000 0015	1	MIA FLOATER 2 (MF-2)	MKC FLOATER 1 (KF-1)	SFO FLOATER 2 (SF-2)	METEO SAT WEFAX	1200 1215	25	MIA FLOATER 2 (MF-2)	MKC FLOATER 1 (KF-1)	SFO FLOATER 2 (SF-2)	METEO SAT WEFAX
0030 0045	2	MF-2	KF-1	SF-2		1230 1245	26	MF-2	KF-1	SF-2	
0100 0115	3	MF-2	KF-1	SF-2		1300 1315	27	MF-2	KF-1	SF-2	
0130 0145	4	MF-2	KF-1	SF-2		1330 1345	28	MF-2	KF-1	SF-2	
0200 0215	5	MF-2	KF-1	SF-2		1400 1415	29	MF-2	KF-1	SF-2	
0230 0245	6	MF-2	KF-1	SF-2		1430 1445	30	MF-2	KF-1	SF-2	
0300 0315	7	MF-2	KF-1	SF-2		1500 1515	31	MF-2	KF-1	SF-2	
0330 0345	8	MF-2	KF-1	SF-2		1530 1545	32	MF-2	KF-1	SF-2	
0400 0415	9	MF-2	KF-1	SF-2		1600 1615	33	MF-2	KF-1	SF-2	
0430 0445	10	MF-2	KF-1	SF-2		1630 1645	34	MF-2	KF-1	SF-2	
0500 0515	11	MF-2	KF-1	SF-2		1700 1715	35	MF-2	KF-1	SF-2	
0530 0545	12	MF-2	KF-1	SF-2		1730 1745	36	MF-2	KF-1	SF-2	
0600 0615	13	MF-2	KF-1	SF-2		1800 1815	37	MF-2	KF-1	SF-2	
0630 0645	14	MF-2	KF-1	SF-2		1830 1845	38	MF-2	KF-1	SF-2	
0700 0715	15	MF-2	KF-1	SF-2		1900 1915	39	MF-2	KF-1	SF-2	
0730 0745	16	MF-2	KF-1	SF-2		1930 1945	40	MF-2	KF-1	SF-2	
0800 0815	17	MF-2	KF-1	SF-2		2000 2015	41	MF-2	KF-1	SF-2	
0830 0845	18	MF-2	KF-1	SF-2		2030 2045	42	MF-2	KF-1	SF-2	
0900 0915	19	MF-2	KF-1	SF-2		2100 2115	43	MF-2	KF-1	SF-2	
0930 0945	20	MF-2	KF-1	SF-2		2130 2145	44	MF-2	KF-1	SF-2	
1000 1015	21	MF-2	KF-1	SF-2		2200 2215	45	MF-2	KF-1	SF-2	
1030 1045	22	MF-2	KF-1	SF-2		2230 2245	46	MF-2	KF-1	SF-2	
1100 1115	23	MF-2	KF-1	SF-2		2300 2315	47	MF-2	KF-1	SF-2	
1130 1145	24	MF-2	KF-1	SF-2		2330 2345	48	MF-2	KF-1	SF-2	