National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 3615 (DSI-3615)

NOAA Polar Orbiting Satellites

July 31, 2003

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

Table of Contents

Topic	Page Number
1. Abstract	3
2. Element Names and Definitions:	4
3. Start Date	8
4. Stop Date	8
5. Coverage	8
6. How to order data	8
7. Archiving Data Center.	8
8. Technical Contact	9
9. Known Uncorrected Problems	9
10. Quality Statement	9
11. Essential Companion Data Sets	9
12. References	9

1. Abstract: The Polar Orbiting Environmental Satellites (POES) system offers the advantage of daily global coverage, by making nearly polar orbits roughly 14.1 times daily. Currently in orbit there are morning and afternoon satellites, which provide global coverage four times daily. The POES system includes the Advanced Very High Resolution Radiometer (AVHRR) and the Tiros Operational Vertical Sounder (TOVS).

The satellite system includes the following instrument package:

AVHRR - Advanced Very High Resolution Radiometer, from which is obtained:

a. HRPT - High Resolution Direct Readout AVHRR

b. LAC - Recorded HRPT AVHRR

c. GAC - Reduced Resolution Recorded AVHRR

TOVS - TIROS Operational Vertical Sounder, which includes:

a. MSU - Microwave Sounding Unit

b. SSU - Stratospheric Sounding Unit

c. HIRS/2 - High Resolution Infrared Radiation Sounder/2

Because of the polar orbiting nature of the POES series satellites, these satellites are able to collect global data on a daily basis for a variety of land, ocean, and atmospheric applications. Data from the POES series supports a broad range of environmental monitoring applications including weather analysis and forecasting, climate research and prediction, global sea surface temperature measurements, atmospheric soundings of temperature and humidity, ocean dynamics research, volcanic eruption monitoring, forest fire detection, global vegetation analysis, search and rescue, and many other applications.

The Satellite Services Branch (SSB) of the National Climatic Data Center, under the auspices of the National Environmental Satellite, Data, and Information Service (NESDIS), has established a digital archive of data collected from the current generation of NOAA operational polar orbiting satellites. This series of satellites commenced with TIROS-N (launched in October 1978) and continued with NOAA-A (launched in June 1979 and renamed NOAA-6), NOAA-C (launched in June 1981 and renamed NOAA-7), NOAA-E (launched in March 1983 and renamed NOAA-8), NOAA-F (launched in December 1984 and renamed NOAA-9), NOAA-G (launched in September 1986 and renamed NOAA-10), NOAA-H (launched in September 1988 and renamed NOAA-11), NOAA-D (launched in May 1991 and renamed NOAA-12), NOAA-I (launched in August 1993 and renamed NOAA-13) and NOAA-J (launched in December 1994 and renamed NOAA-14). This series of satellites (TIROS-N and NOAA-6 through NOAA-14) will henceforth be referred to in this document as the TIROS-N series (Technically, TIROS-N through NOAA-D are called the TIROS-N series and NOAA-E through -N are called the TIROS ATN series or Advanced TIROS-N).

In the spring of 1998, a new series of NOAA Polar Operational Environmental Satellites (POES) commenced with the launch of NOAA-K. NOAA-K and its immediate successors, NOAA-L and NOAA-M, represent an improvement over the previous series of satellites that began with TIROS-N (launched in October 1978), and continued with NOAA-6 through NOAA-14 (launched in December 1994).

The NOAA KLM POES satellites begin a new era of improved environmental monitoring in support of NOAA missions. The instrument payload has significant improvements and additions/deletions. The instrument changes have affected the spacecraft subsystems and data formats.

The NOAA KLM satellites include improvements to instruments that are evolutionary and significant. The initial concept was to add more passive microwave instruments and channels in place of the four channel Microwave Sounding Unit (MSU) and the three channel Stratospheric Sounding Unit (SSU). During the satellite system design process, it became evident that the increased size, fields of view, and power requirements for the new instruments would have significant impacts on the spacecraft power, data handling, and attitude control systems. The NOAA KLM spacecraft are significantly heavier than previous spacecraft (2231.7 kg versus 1712.3) and require a more powerful Apogee Kick Motor (AKM) solid rocket booster and expendable launch vehicle, TITAN-II, to obtain orbit. Combined with command system security and frequency changes, NOAA KLM satellites look very much like previous satellites to the casual observer, but have significant changes to essentially every subsystem. To meet the increased power requirements, two additional solar panels have been added and the solar array has about 45% more output. The batteries, propulsion tank capacity, the size of the reaction wheels and magnetic coils used for momentum unloading and attitude control have also increased in capacity. The spacecraft structure has been stiffened primarily to support the heavier AMSU instruments and improve launch vehicle load margins. Several antennas have been relocated and/or built with new materials and processes to improve performance. Flight computer memory has been doubled and the flight software modified to meet new requirements.

NOAA KLM Spacecraft Characteristics

The primary mission is to design, fabricate, integrate, test and launch five operational polar orbiter satellites into Sun-synchronous orbits. These satellites are designated NOAA-K, L, M, N, N' and NPOESS Preparatory Project (NPP) and their estimated launch dates are 1998, 2000, 2002, 2004, 2005 and 2008, respectively.

Mission Characteristics

Item	NOAA KLM Specifications
Launch Date	NOAA-K: May 13, 1998 NOAA-L: September 21, 2000 NOAA-M: June 24, 2002 (mid morning orbit) NOAA-N: June 2004 NPOESS Preparatory Project (NPP): December 2005 NOAA-N': March 2008
Mission Life	2 years minimum required
Orbit	Sun-synchronous, 833 ± 19 km or 870 ± 19 km
Launch Vehicles	U.S. Air Force (USAF) Titan II

DSI-3615 also covers the GVI and the Radiation Budget datasets. **Global Vegetation Index (GVI)** indicates the weekly condition of the Earth's vegetation. GVI, which is produced from NOAA's AVHRR sensor, is used as a tool to study the continental patterns and global-scale patterns of the Earth's vegetation. Available within HDSS are the Third Generation B, C, and D level GVI products and also Second Generation Daily, Plate, and Polar GVI products. The time period covered by these data is April 1985 through January 2001.

The **Radiation Budget** represents the balance between incoming energy from the Sun and outgoing thermal (longwave) and reflected (shortwave) energy from the Earth. Shortwave and longwave surface radiative fluxes will be computed on a 1 degree equal-angle grid with detailed and parameterized radiative transfer models using meteorological data (clouds, temperature and humidity profiles, ozone, etc). These data are produced from the low resolution Global Area Coverage (GAC) AVHRR daily data. Infrared and visible radiances are combined with time, earth location and

angular measurements of satellite altitude and solar zenith angle as an initial data base for analysis. The heat budget parameters are then derived, daytime and nighttime longwave flux from 12 hours of infrared retrievals each, and absorbed solar from the difference between the solar constant and the visible spectrum retrievals and mapped into 2.5 degree arrays by correcting for viewing angle and Earth curvature. The time period covered by these data begins in October 1984 and is continuous.

Also included within this dataset is the **Microwave Surface and Precipitation Products System (MSPPS)**. MSPPS project is dedicated to the retrieval of near-real-time operational surface and precipitation products using antenna temperatures from the AMSU-A and AMSU-B instruments on board of NOAA's KLM series polar orbiting satellites. This project has advanced from 5 products at its Day-1 phase to 9 products at the Day-2 phase. The current Day-2 MSPPS products include: total precipitable water, cloud liquid water, rain rate, snow cover, sea ice concentration, ice-water path, emissivity, and land surface temperature.

NOAA-15 (or NOAA-K), which was launched on May 13, 1998, is the first in the series to support microwave instruments, AMSU-A and AMSU-B, for the generation of hydrological products in cloudy regions where visible and infrared instruments have decreased capability.

AMSU-A is a 15-channel cross-track, stepped-line scanning, total power microwave radiometer. The instrument has an instantaneous field-of-view of 3.3° at the half-power points providing a nominal spatial resolution at nadir of 48km (29.8 mi). The antenna provides a cross-track scan, scanning +48.3°(-48.3°) from nadir with a total of 30 Earth fields-of-view per scan line. This instrument completes one scan every 8 seconds.

AMSU-B is a 5 channel cross-track, continuous line scanning, total power microwave radiometer. The instrument has an instantaneous field-of-view of 1.1°. Spatial resolution at nadir is nominally 16km (9.94 mi). The antenna provides a cross-track scan, scanning +48.95°(-48.95°) from nadir with a total of 90 Earth fields-of-view per scan line. This instrument completes one scan every 8/3 seconds.

Other products included within this dataset are: AMSU-B Soundings, ATOVS Soundings, RTOVS Soundings, Aerosols, SBUV/2 Ozone, SSM/T 1 Soundings, and Sea Surface Temperatures.

2. Element Names and Definitions:

The following table contains a list of the POES/DMSP data that are scheduled for population in the HDSS (what is available from NCDC), and includes an estimated completion date. Each dataset provides a link to the NOAA Polar Orbiter Data (POD) User's Guide. The blue links direct the user to the TIROS-N series of satellites and the red links direct the user to the NOAA KLM series.

Product Name	Period of Record	Expected Completion Date	Migration Date (to HDSS)
TOVS/RTOVS Sounding TOVS/RTOVS Sounding	3/92- 6/00 *	**Completed**	6/2001
TOVS CDB 3662	1/79-8/98	**Completed**	11/2002
RTOVS CBD XXXX	1/98-1/00	**Completed**	11/2002

RTOVS CBD XXXX			
Third Generation B- level GVI 3669	4/85- 1/00	**Completed**	11//2002
Third Generation C-Level GVI 3670	4/85- 12/00	**Completed**	9/2002
Third Generation D-Level GVI	4/85- 12/90	**Completed**	06/2002
Heat Budget Monthly 3680 Heat Budget Monthly 3680	1/79- 5/99	**Completed**	12/2002
Heat Budget Seasonal 3679 Heat Budget Seasonal 3679	1/74- 3/99	**Completed**	02/03
Heat Budget Monthly Mean 3667 Heat Budget Monthly Mean 3667	1/79- 3/99	**Completed**	01/03
Heat Budget Seasonal Mean 3668 Heat Budget Seasonal Mean 3668	9/88- 3/99	**Completed**	03/03
Heat Budget Annual Means 3704 Heat Budget Annual Means 3704	12/90- 11/98	**Completed**	03/03
Mapped GAC Stacked 3672	12/78- 10/94	**3/31/03	
Mapped GAC Polar 3673 Mapped GAC Polar 3673	10/94- 01/01	**Completed**	1/2002
Mapped GACc Mercator 3674 Mapped GACc Mercator 3674	10/94- 01/01	**Completed**	2/2002
SSMT Soundings 3675 SSMT Soundings 3675	1/89- 7/99	**Completed**	4/2003
SMT2 Soundings 3681 SMT2 Soundings 3681	3/96- 7/99	**Completed**	6/2003
SBUV/2 Level 1B 3676 SBUV/2 Level 1B 3676	3/85- 12/00	8/31/03	
SBUV/2 HIF 3677 SBUV/2 HIF 3677	3/85- 12/00	9/30/03	

SBUV/2 PMF 3678 SBUV/2 PMF 3678	3/85- 12/00	10/31/03	
Second Generation GVI Daily 3684 Second Generation GVI Daily 3684	4/85- 11/00	**Completed**	6/2002
Second Generation GVI Plate Carree 3685 Second Generation GVI Plate Carree 3685	4/85- 01/01	**Completed**	8/2002
Second Generation GVI Polar 3686 Second Generation GVI Polar 3686	4/85- 01/01	**Completed**	10/2002
Second Generation GVI Mercator 3687 Second Generation GVI Mercator 3687	4/85- 01/01	**Completed**	9/2002
SST Match1 Database 3691	1/82- 3/00	11/30/03	
SST Save 3693	12/78- 4/98	12/31/03	
SST IND 3695	11/78- 2/00	12/31/03	
Local 14km-AC1 9613	11/91- 5/99	**1/31/04	
Local 14km-AC2 9613	11/91-5/99	**2/28/04	
SST 50km-ACC 9613 SST 50km-ACC 9613	12/91- 1/00	**3/31/04	
SST 100km-FLD 9613 SST 100km-FLD 9613	12/91- 5/99	**4/30/04	
7- Day Observations 9613	TBD	**5/31/04	
8-Day Observations (NESDIS) 9613 8-Day Observations (NESDIS) 9613	12/91- 3/00	**6/30/04	
8-Day Observations (NAVY) 9613	7/95- 3/00	**7/31/04	
SST Monthly Mean 250km	1/91- 12/99	**8/31/04	

9613 SST Monthly Mean 250km 9613			
First Guess Field 9613	3/74- 2/79	**9/30/04	
SST ACC 14KM NA 9613 SST ACC 14KM NA 9613	12/79- 7/99	**9/30/04	
GOES Calibration short term GOES Calibration short term	5/94- 11/00	**Completed**	6/2003
GOES Calibration long term GOES Calibration long term	5/94- 4/99	**Completed**	6/2003
TBUS TBUS	6/90- 12/00	9/30/04	
Aerosol Analysis 9614 Aerosol Analysis 9614	7/89-2/99	**9/30/04	
Aerosol Obs SST Eight Day 9614	4/89-3/99	**10/31/04	

* These volumes do not include the dataset that are operationally ftp'ed to NCDC-Asheville.

** These dataset have been placed on HDSS in tape format but must be QC'ed and renamed by SSB-Suitland.

Updated July 2003.

3. **Start Date**: 19780101

4. **Stop Date**: Ongoing

5. **Coverage**:

   a. Southernmost Latitude: 90° N. Latitude
   b. Northernmost Latitude: 90° N. Latitude
   c. Westernmost Longitude: 180° E. Longitude
   d. Easternmost Longitude: 180° W. Longitude

6. **How to Order Data**:

   Ask NCDC's Climate Services about the cost of obtaining this data set.
   Phone: 828-271-4800
   FAX: 828-271-4876
   E-mail: **NCDC.Orders@noaa.gov**

7. **Archiving Data Center**:

   National Climatic Data Center
   Federal Building
   151 Patton Avenue

Asheville, NC 28801-5001
Phone: (828) 271-4800.

8. **Technical Contact**:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

9. **Known Uncorrected Problems**:

10. **Quality Statement**:

11. **Essential Companion Datasets**: None.

12. **References**:

NOAA GVI Guide

NOAA Polar Orbiter Users Guide

NOAA KLM Users Guide