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ADEOS-II Ground System Interface Requirements Document (NASDA/NASA/NOAA)

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Revision History

Version Name/Number	Date	Change Summary
US draft	9/1/95	Initial draft
With NASDA comments shown	10/24/95	Interim update
Preliminary 1 Version with NASDA and US comments	12/18/95	Interim update
Preliminary 2 Version with NASDA comments	2/96	Interim update
Ver. 0	7/96	Complete update
Ver. 1	12/96	Baseline version
Ver. 2	7/97	Final version (Based on the comments from NASA/NOAA)
Ver. 3	7/98	Based on the comments from NASA/NOAA
Ver. 4	2/99	
Ver. 5	10/99	
Ver. 6	8/01	
Ver. 7	12/01	Sign up

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1. Introduction

1.1 Purpose

The purpose of this document is to describe the operations concepts, responsibilities of agency and data flow requirements between NASDA and NASA/NOAA for the ground segment portion of the ADEOS-II mission.

1.2 Scope

This document lists the operations and interface requirements needed for the ground segment design and implementation between NASDA-NASA and NASDA-NOAA facilities committed by these agencies to the ADEOS-II mission. NASA-NOAA interfaces are managed by US internal documents.

1.3 Document Organization

Section 1 provides background and general introductory information. Section 2 is an overview of the satellite, ground segment and operations concept. Section 3 lists the operation requirements. Section 4 lists the data flow requirements. Finally, the appendices list supplementary details that are needed for understanding the mission. Sections 3 and 4 are the functional commitments of NASDA, NASA and NOAA to the ADEOS-II ground segment.

1.4 Related Documents

- Memorandum of Understanding among the National Space Development Agency of Japan, the National Aeronautics Space Administration of the United States of America for cooperation in the Advanced Earth Observing Satellite-II Program
- Mission Operation Requirements for ADEOS-II Ground Segment (AD2-EOC-95-004)
- ADEOS-II Mission Operations Implementation Plan (NASDA/NASA/NOAA) (AD2-EOC-96-055)
- ADEOS-II Mission Operations Interface Specification (Common Part) (AD2-EOC-96-054)
- ADEOS-II Mission Operations Interface Specification (NASDA/NASA/NOAA)(AD2-EOC-97-046)
- Network Communications Interface Requirements Document between NASDA and NASA/NOAA for the ADEOS-II Project (EOIS/A II-ND-008)
- ADEOS-II Catalogue Interoperability Interface Requirements Document (NASDA-NASA) (EOIS/A II-ND-007)
- Network Communications Interface Control Document between NASDA and NASA/NOAA for ADEOS-II Project (EOIS/A II-ND-009)
- ADEOS-II Catalogue Interoperability Interface Control Document (NASDA-NASA)

1.5 Change Control

Changes to this document shall be controlled by NASDA. All change proposals shall be submitted to NASDA by the preparing organization. Changes will require agreement among all listed signatories. Changes will be discussed at an ADEOS-II Mission Operations Meeting or by exchanging Operations Coordination Letters (OCLs).

note : This IRD is an interim document; the contents of this document will be included in the MOIS and the MOIP. After the IRD is signed, it will not be maintained or revised. Further changes to the detailed requirements will be established and published in the MOIS and the MOIP.

2. Overview

The Advanced Earth Observing Satellite II (ADEOS-II) Project is a part of NASDA's continuing Earth Observation Program and is a platform of the International Earth Observing System (IEOS). The Program's objectives are to continue the observing record of the initial ADEOS Project and to complement and supplement the Earth observation experiments of other IEOS partners that are planned for the same mission period. The Project will utilize the Inter-orbit Communication System (IOCS) for the transmission of Earth observation data, to monitor spacecraft health and safety and for commanding of spacecraft operations. Management of flight operations is performed by NASDA.

2.1 Satellite Configuration

ADEOS-II is scheduled for launch in ~~February 2001~~ **November 2002** by NASDA H-IIA launch vehicle No. 3 from Tanegashima Space Center, Ohsaki launch site, Yoshinobu launch pad. Mission designed lifetime is 3 years with 5 years expected for operations. The mission characteristics and satellite configuration are listed in Appendix 1.

ADEOS-II sensors and their providers are:

SeaWinds	- US (NASA - JPL)
AMSR	- Japan (NASDA)
GLI	- Japan (NASDA)
ILAS-II	- Japan (EA)
POLDER	- France (CNES)
ADEOS-II/ARGOS DCS*	- France (CNES)
TEDA	- Japan (NASDA)
VMS	- Japan (NASDA)
DMS	- Japan (NASDA)

* Although ADEOS-II/ARGOS DCS (hereinafter referred to as "DCS") is the data collection system, DCS data are multiplexed with other mission data and sent to ground stations.

2.2 Ground Segment Configuration

The ADEOS-II ground segment is an interconnected network of data capture, data processing, data distribution and control center facilities. The principal NASDA, NASA and NOAA organizations that have responsibility for data system interfaces between NASDA and NASA/NOAA for the ADEOS-II Project are:

- NASDA Ground Segment for ADEOS II
- NASDA Earth Observation Data and Information System (EOIS) - Data Distribution and Management System (DDMS)
- NASDA Tracking and Control Center (TACC at TKSC)
- Kiruna Station
- NASA-JPL SeaWinds Processing and Analysis Center (SeaPAC)
- NASA Earth Observing System Data and Information System (EOSDIS) - Physical Oceanographic Distributed Active Archive Center (PO.DAAC)
- NASA/NOAA Ground Network (NGN)
- The National Environmental Satellite and Information Service of the National Oceanic and Atmospheric Administration (NOAA/NESDIS) - Office of Satellite Data Processing and Distribution

Figure 2-1 is a Diagram of the ADEOS-II ground segment.

This section briefly describes the roles and responsibilities of these organizations.

2.2.1 NASDA Facilities

a) ADEOS-II Ground Segment

The NASDA Ground Segment for ADEOS-II, located at the Earth Observation Center (EOC) in Hatoyama, is the main planning organization for ADEOS-II mission operations. In this role EOC integrates the Sensor provider operations requests and NASDA sensor operations, schedules data downlinks and plans Mission Data Recorder Operations (tape management). EOC exchanges mission operations files, Level 0 data and near real time products with the Sensor providers and related organizations using electronic file transfer or media mutually agreed in MOIS and ADEOS-II Network ICD.

Additionally, EOC serves as a Feeder Link Station of the Inter Orbit Communication System (IOCS via Ka-band); as a Direct Downlink Station (X-band); and, as a backup Tracking Telemetry and Command Station (TT&C). EOC archives all acquired observation data as Raw data; processes all mission data to Level 0 data; processes housekeeping data of all sensors; processes NASDA sensor data to higher level products (Level 1, 2, 3 and data sets for several sensors) and provides the time correlation information to convert satellite clock to UTC.

Finally, the ADEOS-II Ground segment obtains higher level products from the sensor on a request basis.

b) EOIS/DDMS

EOIS/DDMS in EOC, located at Hatoyama, provides network services for ADEOS-II operations, distributes NASDA sensor standard products, data sets and catalog information to users, and will provide catalog system interoperability with EOSDIS.
Additionally, DDS (Data Distribution Subsystem) is a part of DDMS and primary interface for ADEOS-II mission operation information and data between EOC and related agencies using electric file transfer.

c) Tracking and Control Center (TACC at TKSC)

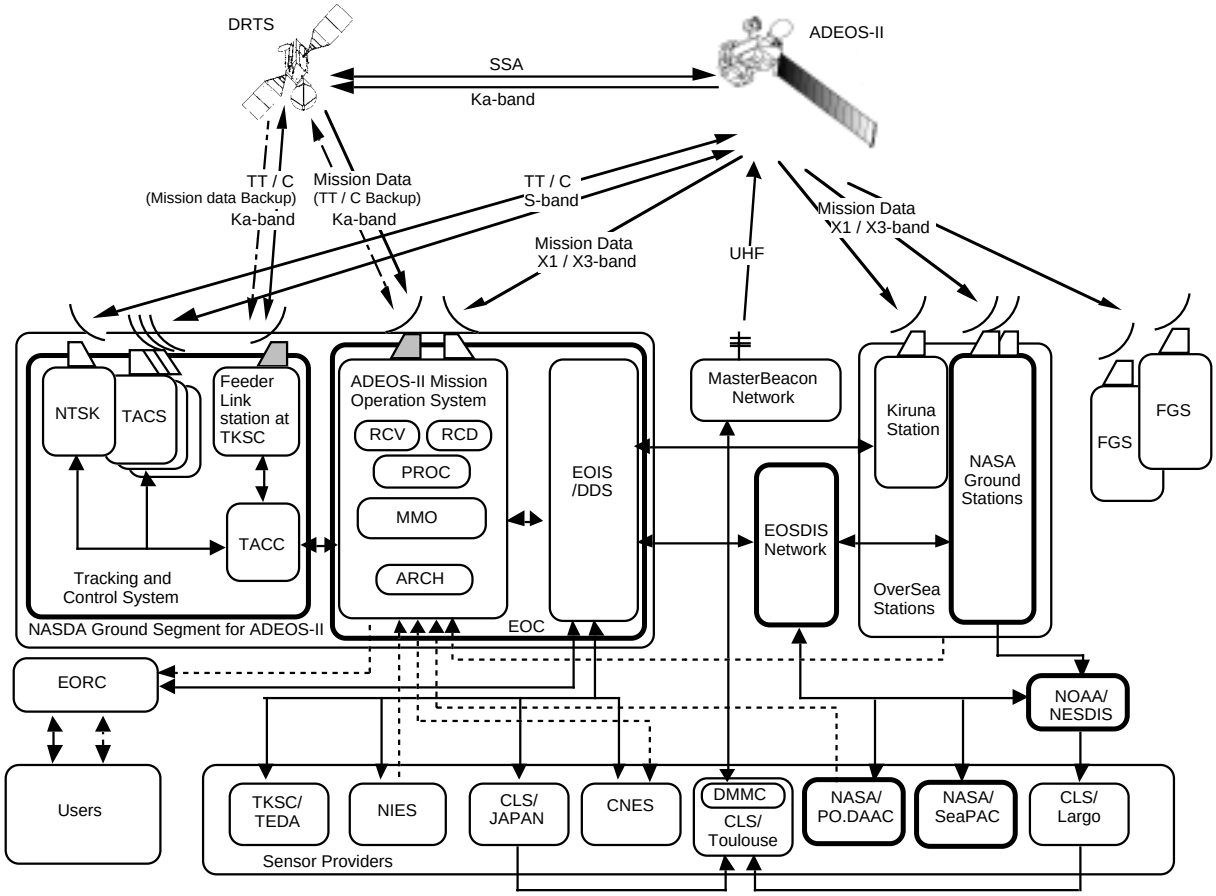
TACC, located at Tsukuba, verifies the EOC mission operations plan against satellite constraints and generates the satellite commands. Commands are transmitted from TACC to the satellite through the Feeder Link Stations at the Tsukuba Space Center (TKSC) or EOC as back up or through NASDA operated USB Tracking and Control Stations (TACS)/NASDA Transportable Station-Kiruna (NTSK).

TACC evaluates satellite engineering telemetry and controls the satellite orbit. Also, TACC monitors the safety of the instruments and activates emergency saving procedures according to the Spacecraft Orbital Operations Handbook (SOOH) instructions. Additionally, TACC processes Doppler tracking data to provide a predictive and definitive satellite ephemeris.

In anomaly case of EOC Feeder Link Station, additionally, TKSC Feederlink Station will receive ADEOS-II mission data as back up. The ADEOS-II mission data acquired at TKSC Feeder link station will be sent to EOC by D1 tape as raw data.

d) Kiruna station

Kiruna station, located in Sweden, is one of NASDA facility and acquires observation data via X band and provides it to EOC as raw data using media. Additionally Kiruna station processes acquired observation data to level 0 data and deliver them to Sensor providers and related organizations using electronic file transfer through EOIS/DDS.



EOC	: Earth Observation Center
EOIS	: Earth Observation and Information System
DDS	: Data Distribution Subsystem
RCV	: Receiving Subsystem
RCD	: Recording Subsystem
PROC	: Processing Subsystem
MMO	: Mission operation Management Organization
ARCH	: Archiving Subsystem
TACC	: Tracking And Control Center
TACS	: Tracking And Control Station
NTSK	: NASDA Transportable Station-Kiruna
EORC	: Earth Observation Research Center
EOSDIS	: Earth Observation System Data and Information System
TKSC	: Tsukuba Space Center
NIES	: National Institute for Enviromental Studies
CNES	: Center National des Etude Spatiales
CLS	: Collecte Localisation par Satellite
DMMC	: Downlink Messages Management Center
PO.DAAC	: Physical Oceanography Distributed Active Archive Center
SeaPAC	: SeaWinds Processing and Analysis Center
NESDIS	: National Environmental Satellite Data and Information Service
FGS	: Foreign Ground Station

Ground Station
Feeder Link Station
On-Line
Off-Line

Fig. 2-1 Diagram of the ADEOS-II Ground Segment

2.2.2 NASA Facilities

a) JPL SeaWinds Processing and Analysis Center (SeaPAC)

The NASA SeaWinds Scatterometer Project (SeaWinds) at the Jet Propulsion Laboratory is part of NASA's Earth Observation Program. The SeaWinds instrument is a specialized microwave radar and will be used to continue the observational record of the NASA Scatterometer (NSCAT) instrument flown on ADEOS for the frequent and accurate measurement of vector winds over the global ocean. The SeaWinds Project will operate the instrument.
The SeaWinds Project operates the SeaPAC and receives and processes the SeaWinds Level 0 data and HK source packet data. Level 0 data is processed to the higher level product.

The SeaPAC analysts request commands for controlling the instrument and to use Level 0 data and HK source packet data to monitor the near real-time health and safety of the instrument, determine long term instrument engineering trends.

Additionally, the SeaPAC analysts monitor the calibration of the instrument to determine performance trends and to provide algorithm updates; and provide quality assurance of the higher level products. The SeaPAC also provides user support for answering algorithm related questions.

The SeaPAC administers a bulletin board/world wide web Home page for disseminating ADEOS-II/SeaWinds mission status.

b) Earth Observing System Data and Information System (EOSDIS/PO.DAAC)

The NASA Earth Observing System Data and Information System (EOSDIS) is managed by the Earth Science Data and Information System (ESDIS) Project Office at the Goddard Space Flight Center (GSFC). EOSDIS supports NASA's Earth Observation Program with communication, processing, archive and distribution services. The Physical Oceanography Distributed Active Archive Center (PO.DAAC) at the Jet Propulsion Laboratory (JPL) is one of the data centers of EOSDIS.

For SeaWinds, EOSDIS/PO.DAAC generates catalog (inventory, directory) information, archives the data sets and distributes standard data and catalog information. The EOSDIS/PO.DAAC is the repository of SeaWinds higher level products and advertises SeaWinds standard product availability, services user requests for products and provides user support for answering data format and distribution related questions.

For AMSR, EOSDIS/PO.DAAC receives AMSR Level 1A products from EOC on near real time basis, delivers them to SeaPAC and NOAA and arrange for its archiving.

c) NASA/NOAA Ground Network (NGN)

The NASA/NOAA Ground Network (NGN) is the NASA management activity for the coordination of data acquisition from passes not available to EOC at Hatoyama, Japan or Kiruna, Sweden. The NGN Data Acquisition Stations are located at Fairbanks, Alaska and at Wallops Island, Virginia.

The NGN is managed by **NASA personnel stationed at** the **NASA/GSFC/**Wallops Flight Facility ~~(WFF) of the Goddard Space Flight Center~~ and processes MRT data to Level 0 data of DCS and selected GLI 1km in both Mode1 and Mode 2, and additionally processes MDR data to Level 0 data of **HK source packet,** AMSR, ILAS-II, SeaWinds, DCS, DMS, VMS, TEDA and selected GLI 1km in Mode2, and provides them to related organizations by electronic file transfer. The NGN also provides the Raw Data of GLI 250m in Mode 1, and Raw data of MDR, ODR and GLI 250m in Mode 2 to EOC using D1 cassette .
Additionally, NGN process MRT data to level 0 data of DMS and VMS in both mode 1 and mode 2 operation on a request basis from NASDA.

Data acquisition schedule of WFF is controlled by Data Services Management Center (DSMC) located at White Sands, Texas.

2.2.3 NOAA Facilities

The National Oceanic and Atmospheric Administration (NOAA) processing of ADEOS-II data is managed and operated by National Environmental Satellite, Data, and Information Service (NESDIS). NOAA receives SeaWinds Level 0 data and operationally processes and distributes SeaWinds Met data on near real-time basis for operational purpose (ex. weather forecasting). Also, NOAA receives near real-time GLI-1Km data and operationally processes and distributes ocean color and thermal products as part of the US Coast Watch Program.

DCS Level 0 data will be received from NGN and EOC, for relay to CNES/CLS (Largo), Maryland and in support of EOC. These DCS data will be processed into environmental measurements at CNES and distributed to users worldwide.

2.3 ADEOS-II Satellite Operations

2.3.1 Sensor Operations

The SeaWinds instrument will operate continuously for global data acquisition. AMSR and GLI-1Km NASDA instruments will also operate continuously. All instruments (except GLI-250m data) and satellite data are formatted in CCSDS packets and recorded on mission data recorders (MDR) at 6 Mbps. Three MDRs will be operated in rotation, so that when one MDR is in reproduce operation another MDR is recording. Therefore, there is no loss of data. Additional sensor and MDR operation details are described in Appendix 3.

2.3.2 Data Acquisition and Processing

Data acquisition is made using both IOCS and X band links in Mode 1 during the life of the ADEOS-II mission. Additionally, data acquisition will be made solely through the X band link (Mode 2).
DRTS for ADEOS-II IOCS are assigned and the four X band reception ground stations, consisting of EOC, ASF, WFF and Kiruna.

ADEOS-II MDR data acquisition will be typically made using Mode 1 and Mode 2 according to the following condition in routine operation after completion of inspection for DRTS data relay function.

Mode 1 (DRTS and X band)	80 %
Mode 2 (X band Only)	20%

(1) Mode 1

- DRTS will be used to acquire a global set of multiplexed* data recorded on the MDR. The MDR data will be acquired at EOC.
- And also GLI 250m resolution data and Optical Data Recorder (ODR) data will be acquired at EOC via DRTS as long as it will not negatively impact acquisition of multiplexed data recorded on MDR. GLI 250m resolution data and ODR data transmission via IOCS will be not available while transmitting MDR data via DRTS. However, Mission Real Time (MRT) data transmissions will be available while transmitting MDR, GLI 250m or ODR data via DRTS.
- GLI 250m resolution data will be acquired by real time direct reception at the each ground station by X1 band.
- MRT data will be acquired by real time direct reception at the each ground station by X3 band. When MRT data is transmitted to EOC via X3 band and DRTS simultaneously, EOC will acquire either X3 band data or DRTS data.

* The following data types are multiplexed:
AMSR, GLI 1km, SeaWinds, ILAS-II, POLDER, TEDA, DCS, VMS, DMS and HK Telemetry.

(2) Mode 2

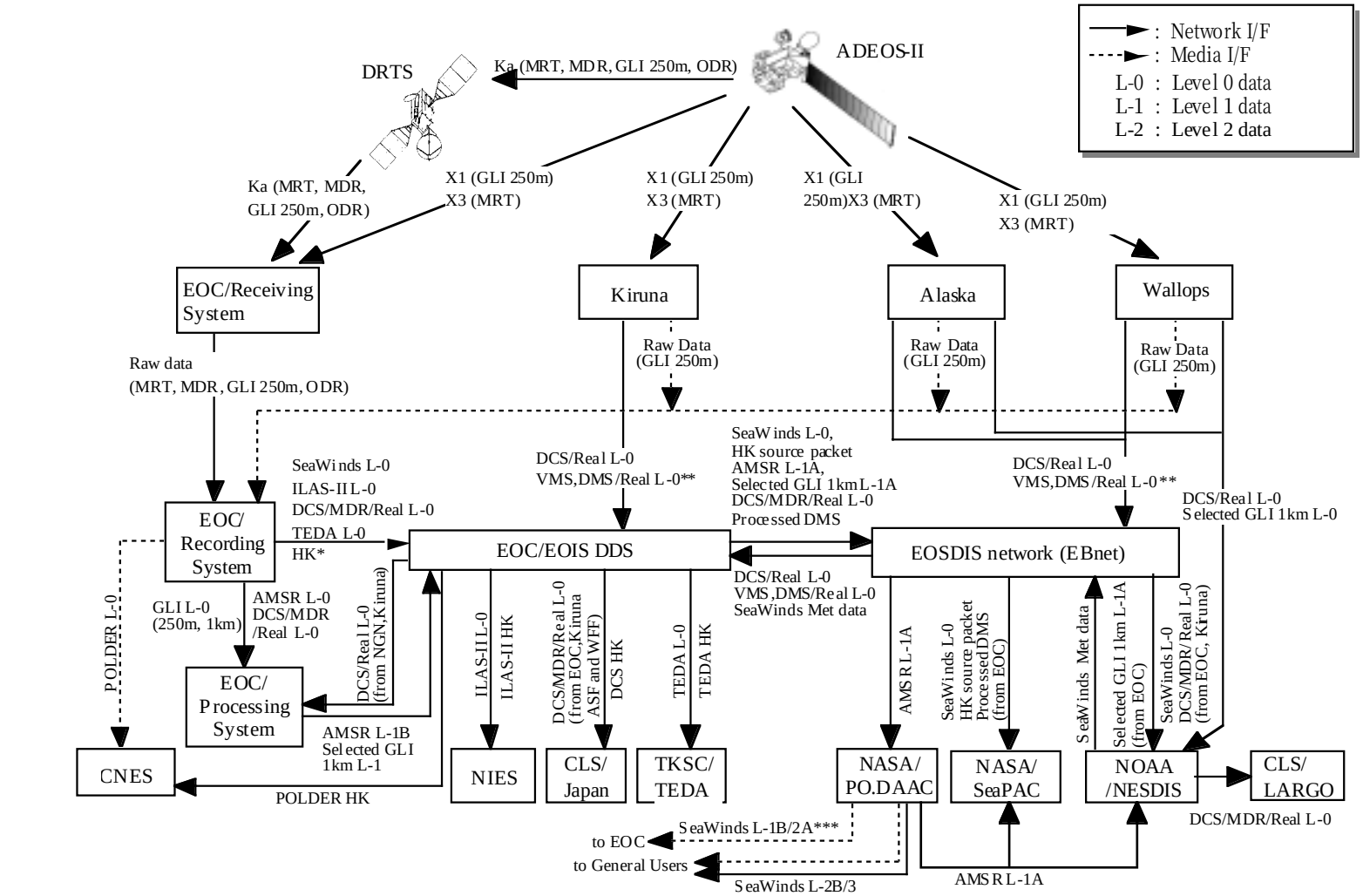
- As to acquiring multiplexed data globally, MDR reproduced data containing the multiplexed data will be received at each ground station by X1 band.
- GLI 250m resolution data and ODR data will be acquired by real time direct reception at each ground station by X1 band as long as it will not negatively impact acquisition of multiplexed data.
- MRT data will be acquired by real time direct reception at each ground station by X3 band.

Global data transfer schemes of each mode are shown in Figure 2-2 and 2-3.

Periodically during each orbit, the MDR recorded data is reproduced at 60 Mbps, using the DRTS and Feeder Link Station at EOC in Mode1. Received mission data is forwarded to recording systems in EOC to generate Level 0 data of all sensors including SeaWinds. EOC performs standard product processing which consists of Level 1, 2, 3 and a data set for the NASDA sensors. SeaPAC processes the SeaWinds Level 0 to Level 1, Level 2 and Level 3 products. NOAA performs near real-time processing of SeaWinds level 0, GLI 1km level 0 and GLI 1km level 1A data to operational SeaWinds Met data and GLI 1km data.

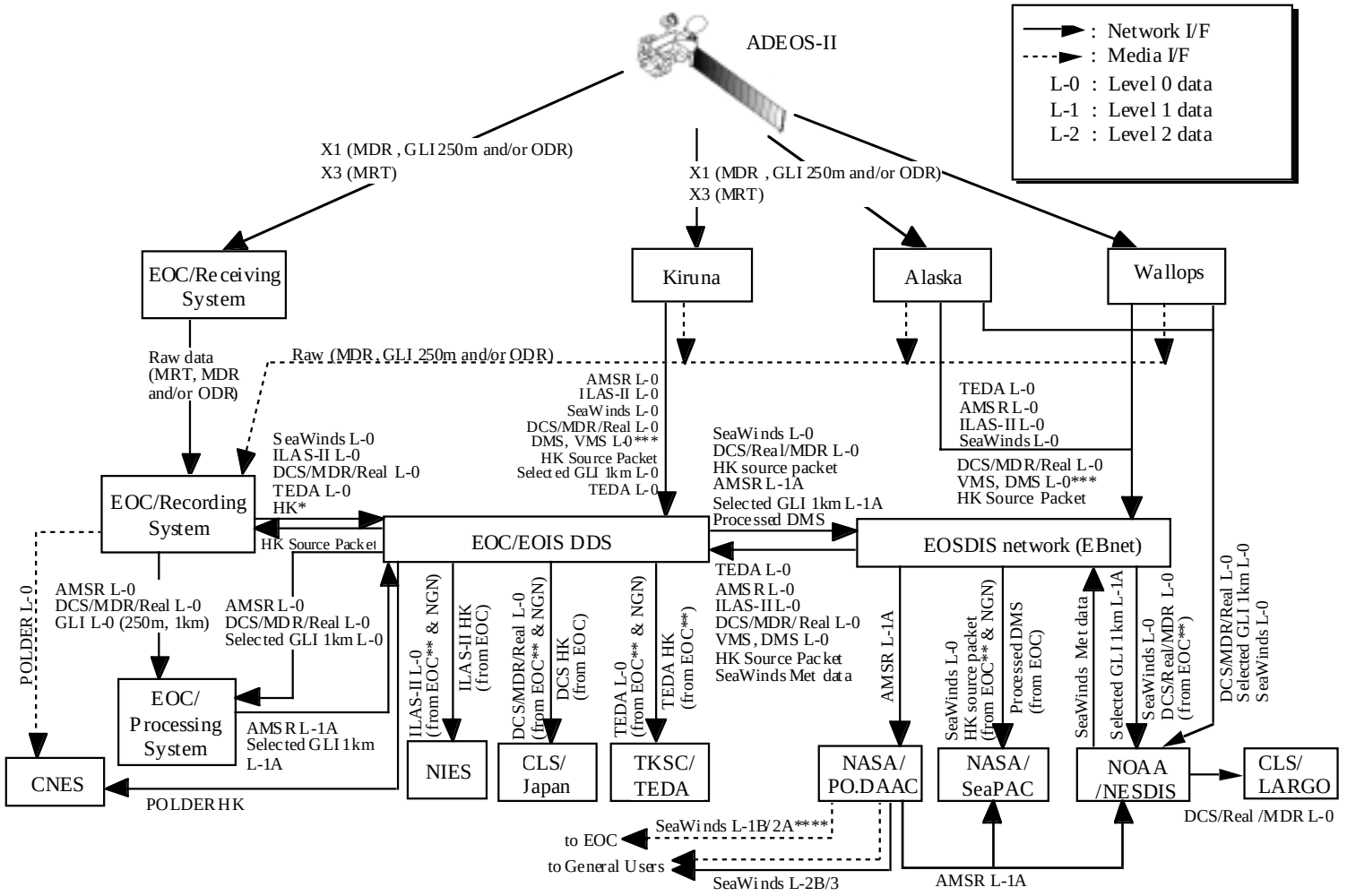
Note: NGN provides selected GLI 1km level 0 data to NOAA, and EOC (including Kiruna stations) provides selected GLI 1km level 1A data to NOAA.

Data acquisition is summarized in Appendix 3.



*: HK telemetry data of ILAS-II, DCS, POLDER, TEDA and HK telemetry source packet
**: VMS and DMS/Real L-0 data is provided from NGN and Kiruna to EOC on a request basis.
***: SeaWinds L-1B/2A is provided from PO.DAAC to EOC on an e-mail request basis from NASDA, pending individual approval by the SeaWinds Project Scientists.

Figure 2-2 Global Data Transfer Scheme (Mode1)



*: HK telemetry data of ILAS-II, DCS, POLDER, TEDA and HK telemetry source packet
**: Including Kiruna station
***: VMS, DMS/Real L-0 is provided from NGN and Kiruna to EOC on a request basis.
****: SeaWinds L-1B/2A is provided from PO.DAAC to EOC on an e-mail request basis from NASDA, pending individual approval by the SeaWinds Project Scientists.

Figure 2-2 Global Data Transfer Scheme (Mode2)

3. Operation Requirements

The operation requirements, listed below, are specific to the ADEOS-II NASDA, NASA and NOAA interface requirements and agency commitments derived from the MOU. Each agency performs additional functions, separate from the MOU commitments, that are not listed.

3.1 EOC

3.1.1 Data Acquisition

(1) Mode 1

a) Acquire ADEOS-II Mission data using DRTS and X-band downlinks.
(MDR data, GLI 250m data and ODR data from the Q channel,
GLI 250 m data from X1 band,
MRT data from the I channel or X3 band)

Note: The definition of MDR data, GLI 250m data, ODR data and MRT data is shown in the appendix 1 (page A-3).

b) Acquire Raw data of GLI 250m data, received and recorded at Kiruna, Alaska, Wallops, by D-1 tape.

c) Acquire level 0 data of VMS/Real, DMS/Real and DCS/Real, processed at Kiruna, Alaska and Wallops, by electronic file transfer.

Note: VMS/Real and DMS/Real is processed at Kiruna, Alaska and Wallops station on a request basis in case of space craft anomaly.

(2) Mode 2

a) Acquire ADEOS-II Mission data using X-band downlinks.
(MDR data, GLI 250m data and ODR data from the X1 band,
MRT data from the X3 band)

b) Acquire Level 0 data of AMSR, ILAS-II, TEDA, VMS/MDR, DMS/MDR and DCS/MDR and DCS/Real, processed at Alaska and Wallops, by electronic file transfer.

c) Acquire Level 0 data of AMSR, ILAS-II, SeaWinds, selected GLI 1km, VMS/MDR, DMS/MDR, TEDA and DCS/MDR and DCS/Real, processed at Kiruna, by electronic file transfer.

Note: In addition to the above, VMS/Real and DMS/Real is processed at Kiruna, Alaska and Wallops station on a request basis in case of space craft anomaly.

d) Acquire HK TLM source packet*, processed at Kiruna, Alaska and Wallops by electronic file transfer.

e) Acquire Raw data of MDR and GLI 250m and ODR data, received and recorded at Kiruna, Alaska, Wallops, by D-1 tape.

*: HK telemetry data of all sensors are multiplexed in HK TLM source packet.

3.1.2 Data Processing

a) Process Raw data of MDR to Level 0 data of GLI-1Km, AMSR, DCS/MDR, TEDA, POLDER, ILAS-II, VMS/MDR, DMS/MDR and SeaWinds.

b) Process Raw data of MRT to Level 0 data of DCS/Real.

c) Process Raw data of GLI 250m and ODR**, including D-1 tapes from Kiruna, Alaska and Wallops,** to Level 0 data of GLI 250m.

d) Process Raw data of MDR to HK TLM source packet

e) Process HK TLM source packet to housekeeping data of each sensor excluding SeaWinds.

f) Process Level 0 data of AMSR and GLI to standard products.

g) Process AMSR and GLI Level 0 data to near real-time product (including AMSR level 1A product and selected GLI 1km level 1A product).

h) Process DMS/MDR level 0 data to DMS processed data.

i) Process Raw data of MRT to Level 0 data of VMS/Real and DMS/Real, as needed.

j) In mode 2, Raw data of MDR on D-1 tapes from Kiuna, Alaska and Wallops are processed to level 0 data of POLDER, GLI 1km.

3.1.3 Data Storage

Archive Raw data and NASDA sensor standard products.

3.1.4 Data Distribution and Retrieval (for NASA/NOAA)

a) Provide the SeaWinds Level 0 data and HK source packet to SeaPAC by electronic file transfer.

b) Provide the AMSR Level 1A data to EOSDIS/PO.DAAC by electronic file transfer.

c) Provide the SeaWinds Level 0 data, DCS/MDR/Real Level 0 data and the GLI 1km Level 1A data to NOAA/NESDIS by electronic file transfer.

d) Provide the spacecraft operation plan, orbit data and spacecraft clock data to NASA/NOAA by electronic file transfer.

e) Retrieve SeaWinds ~~standard~~ **Level 1B and Level 2A** products from EOSDIS PO.DAAC by **physical media** ~~8mm tape DLT , CD-R or FTP via internet~~, as needed **(pending individual approval by the SeaWinds scientists)**.

f) Retrieve SeaWinds Level 2B and 3 products from EOSDIS PO.DAAC by physical media or FTP via internet, as needed.

g) Retrieve SeaWinds Met data from NOAA by electronic file transfer.

h) Provide DMS processed data to SeaPAC by electronic file transfer.

3.1.5 User Service

For AMSR and GLI, generate catalog information and distribute standard product data sets and catalog information to users.

3.1.6 Mission Instrument (SeaWinds) Operation

a) Receive SeaWinds operations requests.

b) Iterate and generate the mission instrument operation plan in coordination with TACC.

3.1.7 Testing

a) Collect ADEOS-II data at SITE (Spacecraft Integration and Test Building) during satellite Engineering Model (EM) test and during Proto-Flight Model (PFM) test for later use in Ground Segment testing.

b) Establish and administer, with NASA/NOAA support, an ADEOS-II Ground Segment testing and End-to-End testing plan, to include a plan for the generation and use of simulated data.

3.1.8 Satellite Monitoring

Process VMS, DMS level 0 data and housekeeping telemetry data to monitor health and safety of ADEOS-II satellite and instruments.

3.2 SeaWinds Processing and Analysis Center (SeaPAC)

3.2.1 Data Distribution and Retrieval

(1) Mode 1
a) Retrieve SeaWinds Level 0 data, HK source packet and DMS Processed data from EOC by electronic file transfer.

b) Retrieve AMSR Level 1A products from PO.DAAC.

c) Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.

(2) Mode 2
a) Retrieve SeaWinds Level 0 data from EOC and NGN by electronic file transfer.

b) Retrieve HK source packet from EOC and NGN by electronic file transfer.

c**) Retrieve AMSR Level 1A products from PO.DAAC.**

d) Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.

e) Retrieve DMS processed data from EOC by electronic file transfer.

3.2.2 Data Processing

Process SeaWinds Level 0 data to **Level 1B, 2A, 2B and 3 products.** ~~standard products~~.

3.2.3 Mission Instrument (SeaWinds) Operation

a) Generate SeaWinds routine and anomaly operations requests.

b) Provide SeaWinds routine and anomaly operations requests to EOC by electronic file transfer, including FAX coordination messages.

3.2.4 Testing

Participate in ADEOS-II Ground Segment testing and End-to-End testing.

3.2.5 Instrument Monitoring

Process SeaWinds Level 0 data and HK source packet to monitor health and safety of SeaWinds instrument.

3.3 EOSDIS/PO.DAAC

3.3.1 Data Storage

Archive SeaWinds Level 0 data **and SeaWinds Level 1B, 2A, 2B and 3 products.** ~~and standard products.~~

3.3.2 Data Distribution and Retrieval

a) Retrieve AMSR Leve1A data from EOC by electronic file transfer.

b) Provide AMSR Level 1A products to SeaPAC and NOAA, and arrange for its archiving.

c) Provide SeaWinds Level 1B and Level 2A products to EOC using physical media on an e-mail request basis from NASDA, pending individual approval by the SeaWinds scientists.

d) Provide SeaWinds Level 2B and 3 products to NASDA by physical media or FTP via internet on a request basis.

~~b) Provide SeaWinds standard products to EOC by 8mm tape, DLT, CD-R or FTP via internet on a request basis from NASDA.~~

3.3.3 User Service

Generate catalog information and distribute standard product data sets and catalog information, supporting software and documentation to users.

3.3.4 Testing

Participate in ADEOS-II Ground Segment testing.

3.4 NGN

3.4.1 Data Acquisition

(1) Mode 1
Acquire ADEOS-II Mission data using X-band downlinks.
(GLI 250m data from the X1 band,
MRT data from the X3 band)

(2) Mode 2
Acquire ADEOS-II Mission data using X-band downlinks.
(MDR data, GLI 250m data and ODR data from the X1 band,
MRT data from the X3 band)

3.4.2 Data Processing

(1) Mode 1
a) Process Raw data of MRT to Level 0 data of DCS/Real and selected GLI 1km.
b) Process Raw data of MRT to level 0 data of VMS/Real and DMS/Real on a request basis from NASDA.

(2) Mode 2
a) Process Raw data of MDR to Level 0 data of ILAS-II, AMSR, VMS/MDR, DMS/MDR, TEDA and DCS/MDR, SeaWinds and selected GLI 1km.

b) Process Raw data of MRT to Level 0 data of DCS/Real and selected GLI 1km.
c) Process Raw data of MRT to level 0 data of VMS/Real and DMS/Real on a request basis from NASDA.

d) Process Raw data of MDR to HK TLM source packet.

3.4.3 Data Storage

a) Archive ADEOS-II raw data temporarily until receiving the readability good report of the raw data or 30 days after data acquisition.

b) Archive Level 0 data and HK TLM source packet for period of 96 hours after data acquisition.

3.4.4 Data Distribution and Retrieval

(1) Mode 1
a) Provide the Level 0 data of VMS/Real, DMS/Real and DCS/Real to EOC by electronic file transfer.

Note: VMS/Real and DMS/Real data is transmitted to EOC, in only case that they are generated.

b) Provide the Level 0 data of DCS/Real and selected GLI 1km to NOAA/NESDIS by electronic file transfer.

c) Provide the GLI 250m raw data to EOC by D1 tape.

d) Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.

e) Provide the back-up D1 tape of GLI 250m raw data, when readability problem of primary D1 tape is reported from EOC.

(2) Mode 2
a) Provide the Level 0 data of AMSR, ILAS-II, TEDA, VMS/Real/MDR, DMS/Real/MDR, DCS/Real, DCS/MDR and HK TLM source packet to EOC by electronic file transfer.

Note: VMS/Real and DMS/Real data is transmitted to EOC, in only case that they are generated.

b) Provide the MDR, GLI 250m and ODR Raw data to EOC by D1 tape.

c) Provide the SeaWinds Level 0 data and HK source packet to SeaPAC by electronic file transfer.

d) Provide the DCS/Real/MDR, SeaWinds and selected GLI 1km Level 0 data to NOAA by electronic file transfer.

e) Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.

g) Provide the back-up D1 tape of MDR, ODR and/or GLI 250m raw data, when readability problem of primary D1 tape is reported from EOC.

3.4.5 Testing

a) Support writing the ADEOS-II Ground Segment test and End-to-End test plan.

b) Participate in ADEOS-II Ground Segment Testing and End-to-End Testing.

3.5 NOAA

3.5.1 Data Processing

(1) Mode 1
a) Process SeaWinds Level 0 to the near real-time SeaWinds Met data.

b) Process selected GLI 1Km Level 1A products to Level 2 Ocean Color and Thermal products.

(2) Mode 2
a) Process SeaWinds Level 0 data to the near real-time SeaWinds Met data.

b) Process selected GLI 1km Level 0 date provided from NGN to Level 1A products using NASDA software.

c) Process selected GLI-1Km Level 1A products to Level 2 Ocean Color and Thermal products.

note : NASDA will provide the software to process GLI-1km level 0 data to level 1A products.

3.5.2 Data Distribution and Retrieval

(1) Mode 1
a) Retrieve SeaWinds Level 0 data from EOC by electronic file transfer.

b) Retrieve DCS/MDR/Real Level 0 data and selected GLI 1Km Level 1A products from EOC by electronic file transfer. (EOC acquired data)

c) Retrieve DCS/Real and selected GLI 1km Level 0 data from NGN by electronic file transfer.

d) Retrieve AMSR Level 1A products from PO.DAAC.

e) Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.

f) Make the SeaWinds Met data available to EOC by electronic file transfer.

g) Make DCS/MDR/Real Level 0 data available to CLS/Largo by electronic file transfer.

(2) Mode 2
a) Retrieve SeaWinds Level 0 data from EOC and NGN by electronic file transfer.

b) Retrieve selected GLI-1Km Level 1A products from EOC and selected GLI 1km Level 0 data from NGN by electronic file transfer.

c) Retrieve DCS/Real and DCS/MDR Level 0 data from EOC and NGN by electronic file transfer.

d) Retrieve AMSR Level 1A products from PO.DAAC.

e) Retrieve the spacecraft operation plan, orbit data and spacecraft clock data from EOC by electronic file transfer.

f) Make the SeaWinds Met data available to EOC by electronic file transfer.

g) Make DCS/Real and DCS/MDR Level 0 data available to CLS/Largo by electronic file transfer.

3.5.3 Testing

Participate in ADEOS-II Ground Segment testing and End-to-End testing.

4. Data Flow Requirements

Mission information file exchange and Mission data file transfer, among NASDA, NASA and NOAA, will use electronic communications and physical media. The electronic file transfer between NASDA and NASA/NOAA will use the handshake protocol specified in the "Network Interface Control Document between NASDA and NASA/NOAA for the ADEOS-II Project". File transfer for catalog interoperability is specified in the "ADEOS II Catalogue Interoperability Interface Requirements Document (NASDA-NASA)" and "ADEOS-II Catalogue Interoperability Interface Control Document (NASDA - NASA)" written by NASDA.

Level 0 data is defined as data files of packet synchronized, time ordered data within a receiving segment unit. The information of continuity of VCDU counter and source packet counter and number of source packet will be provided by the different file from level 0 data (see Appendix 2). The file format definition of Level 0 data is specified in the "Level 0 Format Description" provided for related agencies.

Circuit availability of .98 with MTTRS of 4 hours is required.

Delivery requirements in this document are the target time of each organization, it does not mean 100% data acquisition with in the time.

4.1 EOC - SeaPAC

The SeaPAC at JPL will exchange data with EOC for performing higher level processing and instrument operations. The functions for SeaWinds will be similar to the corresponding functions done for NSCAT, and will include:

- receipt of SeaWinds Level 0 data, definitive ephemeris and housekeeping data from EOC for routine monitoring of instrument health and engineering performance, and for diagnosis of instrument performance anomalies (data flows 1, 2 and 6).
- receipt of SeaWinds Level 0 data, time correction data and orbit data from EOC for generating of defined standard products, including associated metadata (data flow 1, 4 and 6).
- maintenance of S/C events planning data base (data flows 3 through 5)
- preparation and transmission of instrument operation commands to EOC to accommodate operation needs (data flow 7).
- notification of Level 0 data readability (data flows 8)

The data flow descriptions are summarized in Table 4-1.

Table 4-1 EOC - SeaPAC Operations Data Flow Descriptions

From	To	Data Flow	Description	Delivery Requirement
EOC	SeaPAC	[1] SeaWinds Level 0 data	Including SeaWinds instrument engineering data, science data, attitude and GPS ephemeris data. The engineering data will be used for monitoring near real time instrument health and safety and for determining long term instrument engineering trends. The science data will be used for processing to standard products. This data is transmitted from EOC to SeaPAC.	Available for electronic distribution within 160min. of observation.
EOC	SeaPAC	[2]HK source packet	HK telemetry data of all instruments are multiplexed and including SeaWinds housekeeping data collected by the satellite separate from the instrument. Also, contains the Spacecraft attitude data and calculated ephemeris from the GPS.	Available for electronic distribution within 5 hours of ground data acquisition
EOC	SeaPAC	[3] Mission Information files	Operation planning results and operations and satellite status	Available for electronic distribution according to the Mission Planning Timeline
EOC	SeaPAC	[4] Spacecraft clock counter-to-UTC time correlation data	ADEOS-II spacecraft clock counter-to-UTC time correlation data with conversion accuracy of within plus-or-minus ten milliseconds	Available daily for electronic distribution
EOC	SeaPAC	[5] Orbit predict data files	Satellite predict ephemeris derived from ground station Doppler tracking by TACC	Electronically available according to the Mission Planning Timeline
EOC	SeaPAC	[6] Definitive spacecraft ephemeris	Definitive ephemeris derived from ground station Doppler tracking, as a backup to the onboard GPS derived ephemeris	Electronically available according to the Mission Planning Timeline
SeaPAC	EOC	[7] Mission Information files	SeaWinds operation and command requests.	Electronically available according to the Mission Planning Timeline
SeaPAC	EOC	[8] Data readability problem report	Notification of non-successful receipt of Level 0 data	using Fax.
EOC	SeaPAC	[9] Processed DMS data	Flame synchronized and time tagged DMS data, which includes accelerometer data and star tracker data.	Available for electronic distribution within 8 hr. of observation. (target)

4.2 EOC - EOSDIS/PO.DAAC

The EOSDIS/PO.DAAC at JPL will exchange standard products and catalogue information with EOC. The functions for SeaWinds will include:

- receipt of AMSR Level 1A products from EOC for **delivering to SeaPAC and NOAA.** ~~augmenting the SeaWinds processing~~(data flows 1)
- shipment of SeaWinds defined standard products, including associated metadata, to EOC on a request basis, after processing and quality assurance activities are completed (data flows 2 through 5)
- generation and provision of directory information of SeaWinds standard products to EOC for CEOS directory (data flow 6).

AMSR Level 1A data are distributed by electronic file transfer, SeaWinds standard products are distributed by 8mm tape, DLT, CD-R**, DVD** or FTP via internet.

The data flow descriptions are summarized in Table 4-2.

Table 4-2 EOC - EOSDIS/PO.DAAC Operations Data Flow Descriptions

From	To	Data Flow	Description	Delivery Requirement
EOC	EOSDIS/ PO.DAAC	[1] AMSR Level 1B products	AMSR Level 1B data time tagged, time ordered, non-redundant (within and between files), calibrated, earth located brightness temperatures with appropriate identification headers, including Quality, Quantity and Continuity (QQC) statistics.	Available for electronic distribution within 24 hours of ground data acquisition.
EOSDIS/ PO.DAAC	EOC	[2] SeaWinds Level 1B*	Backscatter power data product in HDF	Distributed by media (DLT~~, 8mm tape~~) when NASDA requires
EOSDIS/ PO.DAAC	EOC	[3] SeaWinds Level 2A* global sigma-0	Normalized backscatter cross-section product in HDF	Distributed by media (DLT, 8mm tape) when NASDA requires
EOSDIS/ PO.DAAC	EOC	[4] SeaWinds Level 2B* Vector Wind	Near-surface vector winds in swath over ocean data product in HDF	Distributed by media (FTP, 8mm tape) when NASDA requires
EOSDIS/ PO.DAAC	EOC	[5] SeaWinds Level 3* Vector Wind organized into a grid of cells	Near-surface vector winds organized into a grid product in HDF	Distributed by media (FTP, CD-R, **DVD** ~~8mm tape~~) when NASDA requires
EOSDIS/ PO.DAAC	EOC	[6] CEOS directory entries for SeaWinds standard products.	CEOS Master Directory entries	Provided to NASDA pre-mission and as needed during the ADEOS-II mission

* SeaWinds Level 1B, Level 2A, Level 2B and Level 3 are the SeaWinds standard products for science and general distribution. Delivery to EOC of “to be defined special products” will be negotiated with EOC as the products become available.

4.3 EOC - NGN

The NGN will support the ADEOS-II data acquisition for passes not available to EOC or Kiruna. The NGN data acquisition stations are ASF and WFF. Acquired data will be provided by D-1 tape or electronic file transfer. The NGN's function for ADEOS-II will include:

- receipt of mission information and ephemeris data from EOC to perform data acquisition and processing. (data flows 1, 2, 3 and 4)
- provision of DCS/real time Level 0 data to EOC. (data flow 6)
- provision of DMS/Real and VMS/Real Level 0 data to EOC, when NASDA requests. (data flow 12)
- provision of GLI 250m Raw data to EOC. (data flow 7)
- notification of Raw data shipment (data flows 5 and 10)
- notification of ground stations operation (data flow 8 and 9)

In Mode 2, the following function will be necessary in addition to above function:

- provision of AMSR, ILAS-II, TEDA and DCS/MDR Level 0 data to EOC. (data flow 11)
- provision of VMS/MDR, DMS/MDR Level 0 data to EOC. (data flow 12)
- provision of MDR and ODR Raw data to EOC. (data flow 13 and 14)
- provision of HK TLM source packet to EOC (data flow 11)

The data flows are summarized in Table 4-3.

Table 4-3 EOC - NGN Operations Data Flow Descriptions

From	To	Data Flow	Description	Delivery Requirement
EOC	~~NGN~~ **Alaska, DSMC**	[1] Orbit predict data file	Satellite Predict ephemeris derived from ground station Doppler tracking.	Electronically available according to the Mission Planning Timeline
EOC	~~NGN~~ **Alaska, DSMC**	[2] Mission Information files	operation planning results and operations and satellite status	Available for electronic distribution according to the Mission Planning Timeline
EOC	~~NGN~~ **Alaska, DSMC**	[3] Spacecraft clock counter-to-UTC time correction data	ADEOS-II spacecraft clock counter-to-UTC time correction data with conversion accuracy of within plus-or-minus ten milliseconds	Available daily for electronic distribution
EOC	~~NGN~~ **Alaska, DSMC**	[4] Request for raw data record	ADEOS-II raw data acquisition plans	Available for electronic distribution according to the Mission Planning Timeline
EOC	~~NGN~~ **Alaska, DSMC**	[5] Raw data readability report	Acknowledgment of successful receipt of Raw data	Available for electronic distribution
~~NGN~~ **Alaska, Wallops**	EOC	[6] DCS Level 0 data	DCS/Real Level 0 data are transmitted	Available for electronic distribution with no time requirement
~~NGN~~ **Alaska, Wallops**	EOC	[7] GLI 250m Raw data	GLI 250m Raw data are recorded and shipped	Available for media distribution (D-1 tape) within 1 week of ground data acquisition

~~NGN~~ **Alaska, DSMC**	EOC	[8] Ground Stations Operation Plan	Acknowledgment of request for raw data record	Available for electronic distribution
~~NGN~~ **Alaska, DSMC**	EOC	[9] Data recording report	notification of ADEOS-II data recording result	Available for electronic distribution
~~NGN~~ **Alaska, DSMC**	EOC	[10] Raw data shipment report	notification of readiness of Raw data	Available for electronic distribution. Upon shipment of raw data
~~NGN~~ **Alaska, Wallops**	EOC	[11] AMSR, ILAS-II, DCS/MDR, TEDA, DMS, VMS Level 0 data HK TLM source packet	In only Mode 2, the Level 0 data are transmitted.	Available for electronic distribution within 100 min. after level 0 data processing. The priority* for data transmission is: 1 HK TLM source 2 DCS 3 AMSR 4 ILAS-II 5 DMS 6 VMS 7 TEDA (S/C anomaly: DMS and VMS has top priority)
~~NGN~~ **Alaska, Wallops**	EOC	[12] DMS, VMS level 0 data	DMS/Real and VMS/Real level 0 data are transmitted, when NASDA requests.	Available for electronic distribution prior to other level 0 data. (top priority)
~~NGN~~ **Alaska, Wallops**	EOC	[13] MDR Raw data	In only Mode 2, the Raw data of MDR are recorded and shipped.	Available for media distribution (D-1 tape) within 1 week of ground data acquisition
~~NGN~~ **Alaska, Wallops**	EOC	[14] ODR Raw data	In only Mode 2, the Raw data of ODR are recorded and shipped.	Available for media distribution (D-1 tape) within 1 week of ground data acquisition

*: As needed, the priority for data transmission from NGN to EOC will be modified in accordance with the result of pre-launch mission simulation test and actual operation.

4.4 EOC - NOAA

The Office of Satellite Data Processing and Distribution (OSDPD) of NOAA/NESDIS will exchange data with EOC for operational data processing. The functions for ADEOS-II will be similar to the corresponding data processing done for ADEOS, and will include:

- receipt of SeaWinds Level 0 data, time correction data and orbit data from EOC for generation and distribution of operational oceanic surface wind vector fields (data flows 1, 4 and 5)
- receipt of selected GLI 1km Level 1A products from EOC for US Coast Watch Program. (data flow 2)
- receipt of DCS/MDR/Real Level 0 data for forwarding to CLS/Largo.(data flow 3)
- maintenance of S/C events planning information data base (data flows 4 through 6)
- preparation and transmission of SeaWinds Met data. (data flow 7)

The data flows are summarized in Table 4-4.

Table 4-4 EOC - NOAA Operations Data Flow Descriptions

From	To	Data Flow	Description	Delivery Requirement
EOC	NOAA	[1] SeaWinds Level 0 data	SeaWinds instrument science, engineering, attitude and GPS ephemeris data for processing to near real-time Level 2 operational wind vector products	Electronically available within 160 minutes of observation
EOC	NOAA	[2] GLI-1 Km Level 1A products	Selected GLI data for US Coast Watch Program	Electronically available within 11 hours of observation
EOC	NOAA	[3] DCS Level 0 data	DCS/MDR Level 0 data and DCS/Real Level 0 data are transmitted in Modes 1 and 2.	Available for electronic distribution to CLS/Largo through NOAA within 10 minutes of ground data acquisition (for DCS/Real), and within 3 hours of observation (for DCS/MDR).
EOC	NOAA	[4] Orbit predict data files	Satellite predict ephemeris derived from ground station Doppler tracking.	Electronically available according to the Mission Planning Timeline
EOC	NOAA	[5] Spacecraft clock counter-to-UTC time correlation data	ADEOS-II spacecraft clock counter-to-UTC time correlation data with conversion accuracy of within plus-or-minus ten milliseconds	Available daily for electronic distribution
EOC	NOAA	[6] Mission Information files	Operation planning results and operations and satellite status	Electronically available according to the Mission Planning Timeline
NOAA	EOC	[7] SeaWinds Met data	Near-surface vector winds in swath over ocean data product in BUFR format	Electronically available within 3 hours* of observation

*: As needed, the time reauirement for data transmission from NOAA to EOC will be modified in accordance with the result of pre-launch mission simulation test and actual operation.

4.5 NGN - NOAA

DCS data acquired at ASF and WFF will be transmitted to NOAA. Transmitted DCS data will be forwarded to CLS/Largo. In Mode 2, GLI data and SeaWinds data acquired at ASF and WFF will be transmitted to NOAA. The function for NGN will include :

- provision of DCS Level 0 data to NOAA. (data flows 1 and 2)
- provision of selected GLI 1km Level 0 data to NOAA (data flow 3)
- provision of SeaWinds Level 0 data to NOAA in Mode 2. (data flow 4)

The data flows are summarized in Table 4-5.

Table 4-5 NGN - NOAA Operations Data Flow Descriptions

From	To	Data Flow	Description	Delivery Requirement
~~NGN~~ **Alaska, Wallops**	NOAA	[1] DCS/Real Level 0 data	DCS/Real Level 0 data are transmitted in Modes 1 and 2.	Available for electronic distribution to CLS/Largo through NOAA within 10 minutes of ground data acquisition
~~NGN~~ **Alaska, Wallops**	NOAA	[2] DCS/MDR Level 0 data	DCS/MDR Level 0 data are transmitted in only Mode 2.	Available for electronic distribution to CLS/Largo through NOAA within 3 hour of observation
~~NGN~~ **Alaska, Wallops**	NOAA	[3] GLI 1km Level 0 data	Selected GLI 1km Level 0 data are transmitted	Electronically available within 11 hours of observation
~~NGN~~ **Alaska, Wallops**	NOAA	[4] SeaWinds Level 0 data	SeaWinds Level 0 data are transmitted in only Mode 2	Available for electronic distribution within 150 minutes of observation

4.6 NGN - SeaPAC (Mode 2)

In Mode 2, NGN supports the SeaWinds data acquisition including provision of SeaWinds Level 0 data to SeaPAC (data flow 1).

The data flows are summarized in Table 4-6.

Table 4-6 NGN - SeaPAC Operations Data Flow Descriptions (Mode 2)

From	To	Data Flow	Description	Delivery Requirement
~~NGN~~ **Alaska, Wallops**	SeaPAC	[1] SeaWinds Level 0 data	SeaWinds Level 0 data are transmitted in only Mode 2	Available for electronic distribution within 150 minutes of onservatoin

Appendices

Appendix 1 - Mission Characteristics and Satellite Configuration

1. Orbit Characteristics

Type	Sun-synchronous sub-recurrent
Altitude above equator	802.92 Km
Inclination	98.62 degrees (specification : bias at 1.5year after launch (half of designated mission life)) 98.69 degrees (initial orbit)
Period	101.05 minutes
Recurrence period	4 days
Revolutions per day	14.25
Local Sun time at descending node	10:30 am ±15 min.
Minimum distance of inner orbit	728.62 Km

2. Mission Instruments

(1) NASDA sensors

a) Advanced Microwave Scanning Radiometer (AMSR)

Frequencies	8 frequency bands
Swath width	1600 Km
Data rate	87.38Kbps

b) Global Imager (GLI)

Number of spatial bands	36
Scanning angle	~±45 degrees (scene width: ~1600 Km)
Instantaneous Field of View (IFOV)	1.25 mrad (scene resolution: 1 Km) 0.3125 mrad (scene resolution: 250m)
Tilt angle	+20, 0, -20 degrees
Data rate	3.8676 Mbps (1.25 mrad resolution) ~16 Mbps* (0.3125 mrad resolution)

* Data downlink rate is 60 Mbps with dummy data.

c) DMS (Dynamics Monitoring System)

Component	Accelerometer - Body Mount - Paddle Mount - Paddle Scroll - Paddle Tension Star Tracker - Attitude data - Image data
Data rate	3.02 Kbps (Accelerometer) 1.06 Kbps (Attitude data) 4.99 Kbps (Image data)

d) VMS (Visual Monitoring System)

Component	4 Cameras Control system Lighting system
Data rate	97.66 Kbps

(2) Provided Sensors

a) SeaWinds

Frequency	13.402 GHz
Spatial Resolution	25 Km
Swath Width	900 Km from nadir
Data Rate	35.378Kbps (default)

b) Improved Limb Atmospheric Spectrometer-II (ILAS-II)

Spectral Coverage	6.2 ~ 11.8 μm 3 ~ 5.7 μm 12.783 ~ 12.85 μm 753 ~ 784 nm
Field of View (FOV)	Interferometoric View - Center is Rising and Setting Sun Direction Vertical Views - ±10 degrees Horizontal Views - ±10 degrees
Data Rate	453.62 Kbps

c) Polarization and Directionality of the Earth's Reflectances (POLDER)

Number of Spectral Bands	9 bands
Field of view (FOV)	±43 x ±51 degrees
Pixel Size	0.37 x 0.37 degrees (6 Km x 7 Km)
Data Rate	882.352 Kbps

(3) Technical Data Acquisition Instruments (TEDA)

Item - Radioactive Rays Absorption, Charged Electric Potential , Heavy Ion, etc.	
Data Rate	672bps

(4) Relay for Data Collection System

Data rate	10 Kbps

a) DCP Data Uplink

Frequency	401.65 MHz
Data Rate	400 bps/ DCP

b) DCP Forward Message Link

Uplink	401.65 MHz 400 bps
Downlink	465.9875 Mhz 200 bps

3. Mission Data Definition

(1) Multiplexed Data

Multiplexed data is packetized data based on CCSDS and including AMSR, GLI-1Km, ILAS-II, SeaWinds, POLDER, DCS, TEDA, VMS, DMS and HK telemetry data. It is separated into MDR data and MRT data according to data transmission method.

(a) MDR data (Data rate: 60 Mbps)
It is multiplexed data in MDR reproduce mode and does not include GLI 250m data. MDR data includes multiplexed data of 1 orbit (or 2 orbits).

(b) MRT data (Data rate: 6Mbps)
It is multiplexed data and acquired by direct reception at each ground station via X3 or at EOC via IOCS.

(2) GLI 250m data (Data rate: 60 Mbps)

This data is observed land area in daytime, and acquired at each ground station via X1 band, or at EOC via IOCS in real time. GLI 250m data is also recorded on to ODR. GLI 250m data in real time mode including telemetry data, attitude data and orbit data.

(3) ODR data (Data rate: 60 Mbps)

ODR recorded data (mainly GLI 250 m data) is acquired at each ground station via X1 or at EOC via IOCS.

4. Bus Instruments

(1) Recorder

Mission Data Recorder (MDR)	3 units Recording Speed = 6 Mbps Reproducing Speed = 60 Mbps Recording Capacity => 9 Gbyte
Optical Data Recorder (ODR)	1 unit Recording Speed = 6 Mbps and 60 Mbps Reproducing Speed = 60 Mbps Recording Capacity = 3 Gbyte

(2) Inter Orbit Communication Subsystem (IOCS)

Mission data Transmission by way of COMETS/DRTS.
Transmission Speed: 66 Mbps
60 M bps (Qch) - MDR data, GLI-250m or ODR data
6 Mbps (I ch) - MRT data

(3) Direct Transmission Subsystem

X1 - 60 Mbps (MDR data, GLI-250m or ODR data)
X3 - 6 Mbps (MRT data)

(4) Direct Transmission for Local Users (DTL)

Direct transmission of GLI (selected bands) Browse data (6 km).
Frequency 467.7 MHz

5. RF Characteristics

(1) X1 band (8150 MHz)

EIRP	3.7 dBW (EL=90°), 19.6 dBW (EL=5°)
Data rate	60 Mbps
Modulation	DPCM-QPSK
Data	MDR data, GLI-250m data or ODR data

(2) X3 band (8250 MHz)

EIRP	-10.3 dBW (EL=90°), 5.6 dBW (EL=5°)
Data rate	6 Mbps
Modulation	DPCM-QPSK
Data	MRT data

(3) DTL (Direct Transmission for Local Users)

Frequency	467.7 MHz
EIRP	2.1 dBW (+Z axis), 2.4 dBW (+Z axis $\pm$40°)
Data rate	23.5294 kbps
Modulation	PCM-BPSK
Data	Subsampled GLI data

(4) IOCS feeder link

Band	Ka band (19.685 GHz)
Modulation	QPSK
Data rate	66 Mbps Qch - 60 Mbps (MDR data, GLI-250m data or ODR data) I ch - 6 Mbps (MRT)
IOCS	DRTS

Appendix 2 - ADEOS-II/CCSDS Packet Description

Except for GLI-250m source data, all instrument and housekeeping data packets are forwarded to the Spacecraft Transfer Frame Generator (TFG) within the Multiplexing data unit (M_PDU) for processing. Reed-Solomon encoding occurs in the Virtual channel data unit (VCDU) and headers are applied in the transfer frame data unit (PCA_PDU), according to CCSDS standards.

Packets of each different source type are assigned to individual transfer frames.

The transfer frame is forwarded at 6Mbps data rate to the X-band/DT transmitter and Ka-band/IOCS transmitter for real time transmission, and is also recorded on the Mission Data Recorder (MDR).

1. ADEOS-II/CCSDS packet service

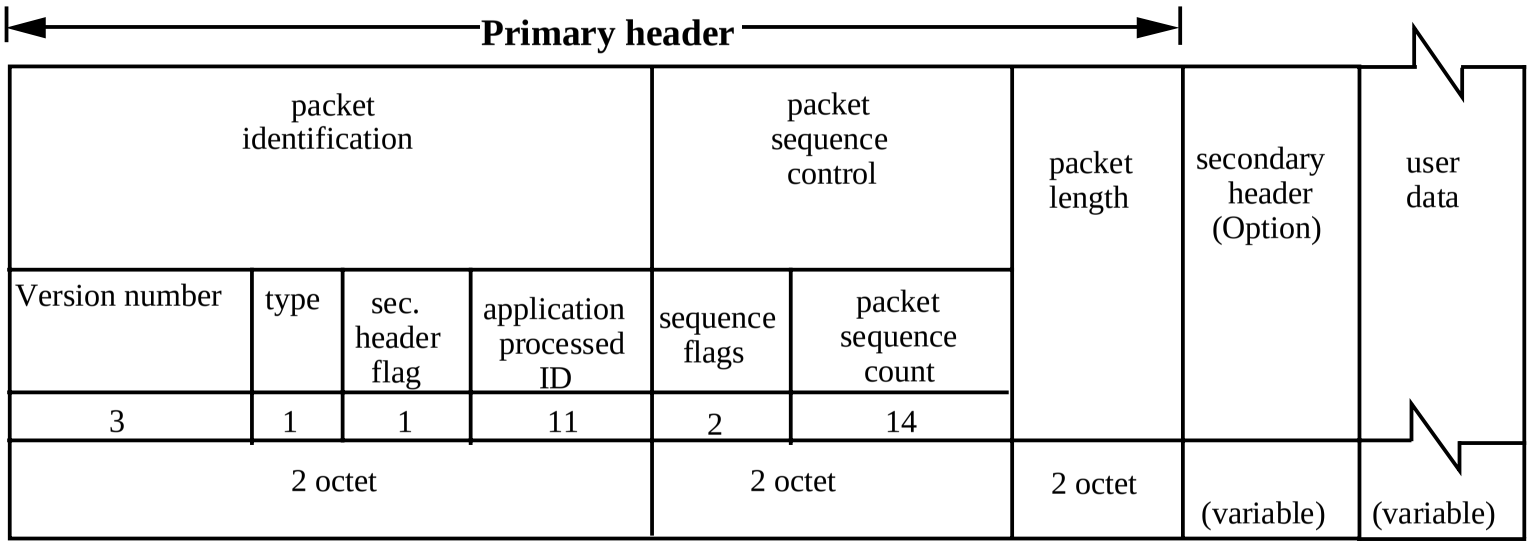
The following two types of service are applied to ADEOS-II/CCSDS packets:

(1) Path service
Data source: AMSR, GLI-1Km, SeaWinds, ILAS-II, DCS, VMS, DMS and TEDA - uses CCSDS path protocol data specification: Version-1 CCSDS packet (CP_PDU).

(2) Capsule service
Data source: Housekeeping telemetry, POLDER - uses CCSDS path protocol data specification: Version-1 CCSDS packet (E_PDU).

2. ADEOS-II/CCSDS structure

Fig.A2-1 shows the ADEOS-II/CCSDS structure and source packet description.



(1) The secondary header is optional use in CCSDS, but EOC suggests to record satellite time and PCD data for ADEOS-II.

(2) The encoding of the Sequence Flags for the Packets service are as follows.

00= P_SDU contains a continuation segment of User Data.
01= P_SDU contains the first segment of User Data.
10= P_SDU contains the last segment of User Data.
11= P_SDU contains unsegmented User Data.
***P_SDU: Packet service data unit.**

Figure A2-1 The CCSDS packet construction

Appendix 3 - Mission Instruments Operation Characteristics

1. MDR Operation Characteristic

The ADEOS-II S/C carries three MDRs. All ADEOS-II mission data (except GLI 250m) are multiplied and recorded on MDR.

(1) Instruments Specification

a) Recording Speed = 6Mbps
b) Reproducing Speed = 60Mbps
c) Recording Capacity = 9 Gbyte (72 Gbits)
d) Recording Data Contents : CCSDS Formatted Multiplexed Data

(2) Operation Pattern

a) Three MDRs Operation pattern
Three MDRs will be used for normal MDR operation on orbit. this plan should be able to operate all MDRs.

- Three MDRs will be operate by rotation.
- All data will be reproduced in reverse order.
- In case of one of three MDR anomaly, the operation pattern will be shifted to two MDRs operation pattern.
- If the downlink of MDR reproduced data is not available during the following orbit, because of some downlink limitations, the recording will continue one more orbit. The MDR is able to record Multiplexed data during 200 minutes (MAX).
- Overlap time between the two MDRs should be within 8 min.

Figure A3-1 shows a example of MDR Operation Pattern in this Plan.

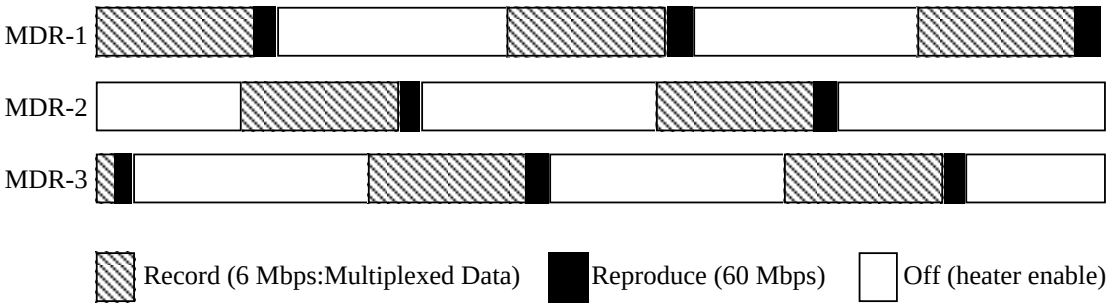


Figure A3-1 Three MDR Operation Pattern

b) Two MDRs Operation pattern
Two of three MDRs will be used for backup MDR operation on orbit.

- When one MDR is operated in a reproducing mode, the other is in a recording mode for an orbit.
- Recording and reproducing operations will be performed orbit by orbit basically. (in the two MDRs operation case, maximum recording time is 106 min.)
- The MDR reproduce is typically planned once a orbit.

- The third unit will be kept in stand-by mode for normal operation. In case of operation mode units anomaly, it will be changed.
- All data will be reproduced in reverse order.
- Overlap time between the two MDRs should be within 8 min.

Figure A3-2 shows a example of MDR Operation Pattern in this Plan.

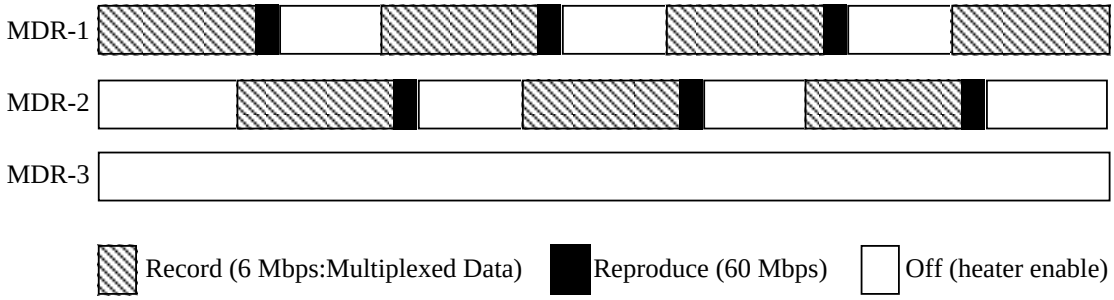
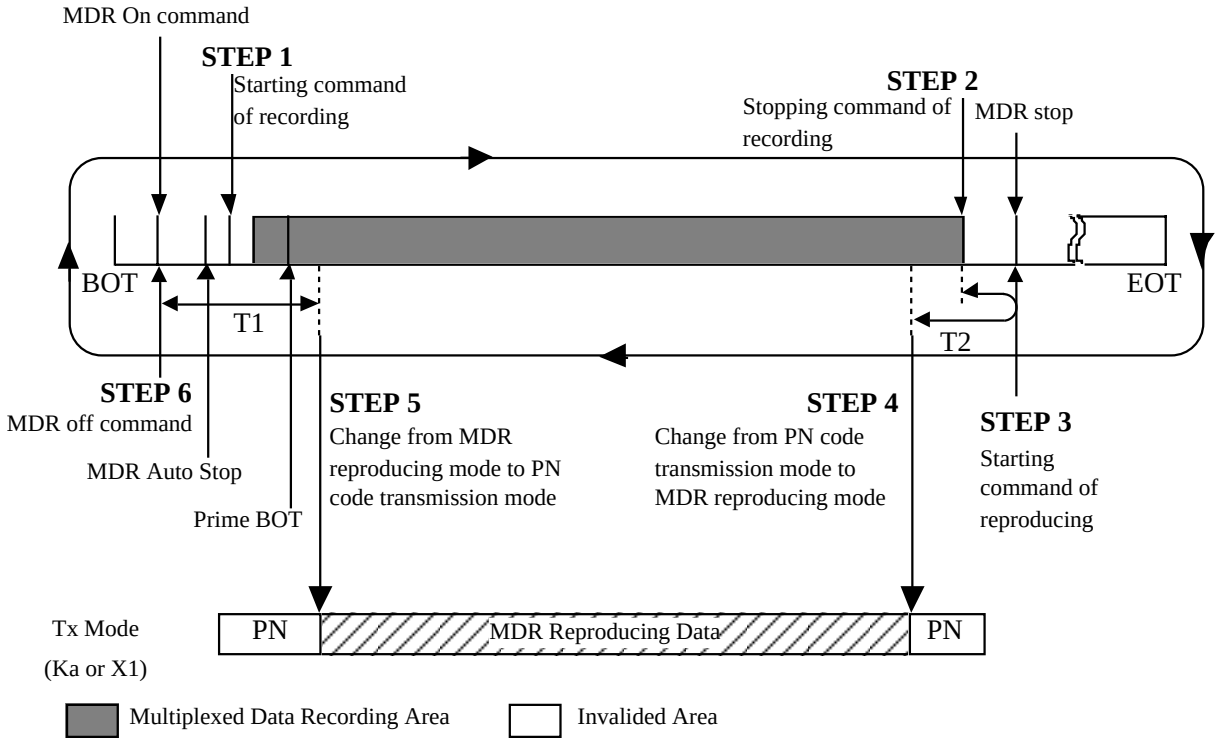


Figure A3-2 Two MDR Operation Pattern

(3) MDR Recording / Reproducing Method

Figure A3-3 shows the recording and reproducing method of MDRs.

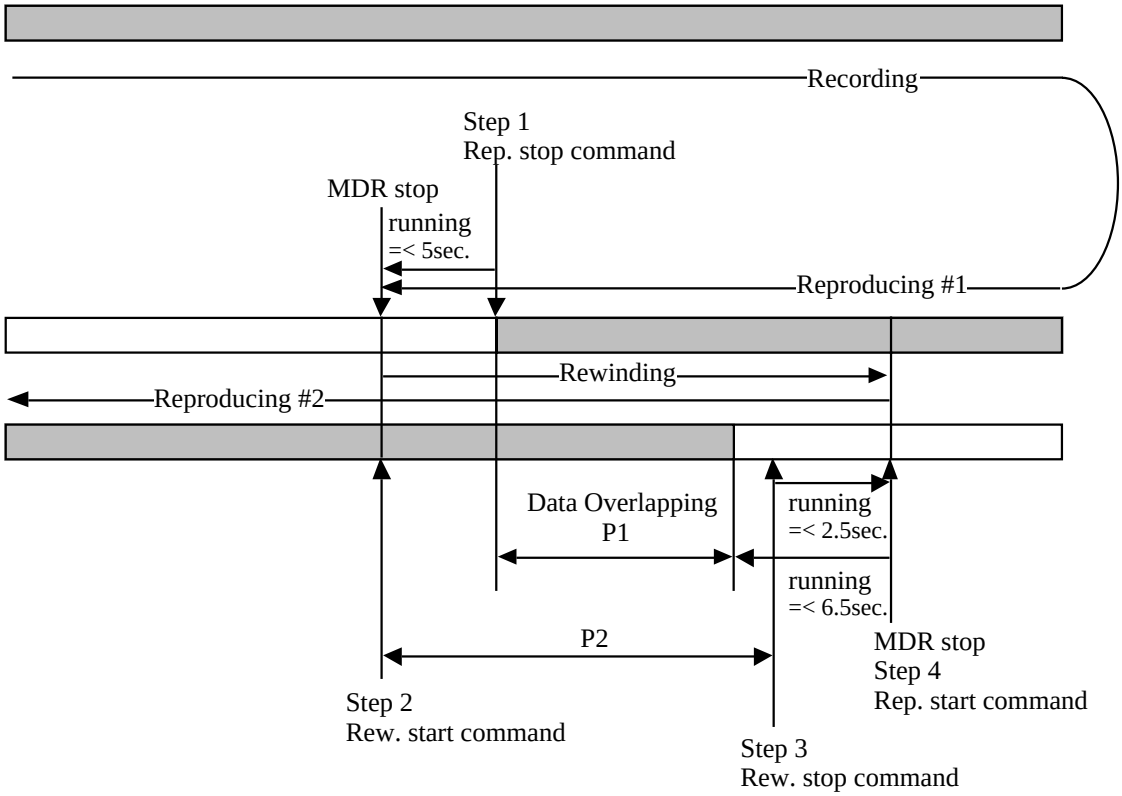


T1 : Time from MDR/PN mode transition to MDR off =15 sec.
T2 : Time from Rec. stop command to PN/MDR mode transition after Rep. start = 17 sec.

Figure A3-3 MDR Recording / Reproducing Method

(4) Rewind Operation

In Mode2, MDR data may be divided into two parts due to the restriction of visible time at each ground station in its reproducing. When the MDR data will be divided, rewind operation will be applied for MDR.
The operation pattern is shown in figure A3-4.



P1 (data overlapping time) = about 80 sec. (recording time)
P2 (rewinding time) = 10 sec.

Figure A3-4 MDR Rewind Operation

2. AMSR Operation

(1) AMSR collects data globally.
(2) AMSR operates continuously.
(3) AMSR operates in parallel with the other sensors.
(4) AMSR data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.

3. GLI Operation

(1) GLI (1Km mode) collects data globally.
(2) GLI (1Km mode) operates continuously. All bands operate in day time; middle and thermal infrared region (MTIR) bands operate in night time.
(3) GLI transmits coarse resolution data (6 km mode), which local users can receive and analyze in real time. Coarse resolution data is transmitted directly using UHF band DTL.
(4) GLI (1Km mode) operates in parallel with the other sensors.

(5) GLI (1Km mode) data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.
(6) GLI (250m mode) operates only in day time and observe land area. Observation data is transmitted to EOC in real time by way of DRTS. Also, direct transmission (real time) to Ground Stations is available. Moreover, GLI (250m mode) data is recorded on ODR and playback data is transmitted to EOC by way of DRTS, or to Ground Stations directly.

4. ILAS-II Operation

(1) ILAS-II operates at sunrise and sunset on each orbit.
(2) ILAS-II operates in parallel with the other sensors (except POLDER, TEDA and VMS).
(3) ILAS-II operation is prior to TEDA and VMS operation.
(3) ILAS-II data is packetized.
(4) ILAS-II data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.

5. SeaWinds Operation

(1) SeaWinds collects data globally.
(2) SeaWinds operates continuously.
(3) SeaWinds operates in parallel with the other sensors
(4) SeaWinds data is packetized.
(5) SeaWinds data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.

6. POLDER Operation

(1) POLDER collects data globally
(2) POLDER operates during the day (Sun zenith angle is less than 75 degrees).
(3) POLDER operates in parallel with the other sensors (except ILAS-II).
(4) POLDER data is packetized.
(5) POLDER data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.

7. VMS Operation

(1) VMS collects images of satellite and instrument according to the requirements from NASDA.
(2) The collected images are stored temporarily on its memory.
(3) The temporarily stored images are transferred to MDR at once per orbit without ILAS-II operation time, and recorded as packet data (with other sensor data).
(4) The high speed playback data of MDR is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.

8. DMS Operation

(1) DMS collects the data from body mount accelerometer, paddle mount accelerometer, paddle scroll monitor, paddle tension monitor and star tracker on ADEOS-II.
(2) DMS operates continuously.
(3) DMS operates in parallel with the other sensors
(4) DMS data is packetized.
(5) DMS data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.

9. TEDA Operation

(1) TEDA operates continuously without ILAS-II and VMS operational time.
(2) TEDA data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of DRTS. Also, direct transmission to Ground Stations is available.

10. DTL Operations

DTL operates in conjunction with GLI

11. DCS Operation

(1) DCS collects the data transmitted from DCP (Data Collection Platform).
(2) DCS operates continuously.
(3) DCS data is recorded on the MDR as packet data (with other sensor data), and high speed playback data is transmitted to EOC by way of ~~COMETS and~~ DRTS. Also, direct transmission (real time and playback) to Ground Stations is available.

12. ODR Operation

The ODR will be operated during the first half of the ADEOS-II Mission when power is at full capacity. Operation is the same as for the MDR, except only GLI-250m data is recorded and played back. However, multiplexed data recording and reproducing may be performed experimentally.

13. Bus Instruments Operation and Telemetry Data

(1) Operation of mission instruments in standard operation mode is performed by automatic operation of C&DH onboard control.
(2) Stored command operation is available, by switching from the automatic and autonomous operations.
(3) Standard operation during the day is to operate without supplemental battery power.
(4) Telemetry data is packetized. Telemetry data is composed of House Keeping data (HK) and PCD data, which includes attitude and GPS ephemeris data.

Appendix 4 - Data Acquisition Characteristics

Table A1-1 shows operation pattern and data transmitting mode.

Table A4-1 Mission Instruments Operation Pattern and Data Transmitting Mode (Tentative Plan)

Data Resource														Data Transmission			
														IOCS Subsystem		DT Subsystem	
														Q	I	X1	X3
Total (Mbps)	GLI 1 km	GLI 250m	AMSR	SeaWinds	POLDER	ILAS | II	TEDA	DCS	DMS	VMS	MDR Reproduce	ODR Reproduce	Day Time/ Night Time	By way of DRTS (Mbps) UQPSK		Direct Transmission (Mbps)	
6	ON		ON	ON			ON	ON	ON	ON			Night Time				
	ON		ON	ON	ON	ON	ON	ON	ON	ON			Day Time	-	-	-	6
6+60	ON	**ON**	ON	ON	ON	ON	ON	ON	ON	ON			Day Time	60	6	60	6
	ON		ON	ON	ON	ON	ON	ON	ON	ON	**ON**						
	ON		ON	ON	ON	ON	ON	ON	ON	ON		**ON**					
	ON		ON	ON			ON	ON	ON	ON	**ON**		Night Time				
	ON		ON	ON			ON	ON	ON	ON		**ON**					
6+60+60	ON	**ON**	ON	ON	ON	ON	ON	ON	ON	ON	**ON**		Day Time	60	6	60	-
	ON	**ON**	ON	ON	ON	ON	ON	ON	ON	ON		**ON**					
6+6+ 60+60	ON	**ON**	ON	ON	ON	ON	ON	ON	ON	ON	**ON**		Day Time	60	6	60	6
	ON	**ON**	ON	ON	ON	ON	ON	ON	ON	ON		**ON**					

Note: 1."ON" and "**ON**" on a line are simultaneously operational.
2. ON ; 6 Mbps multiplexed transmission
ON ; 60 Mbps transmission
In case that GLI 250m and MDR or ODR are simultaneously operational, different transmission subsystems are used for each data transmission.
3. IOCS subsystem and DT subsystem are able to simultaneously operate.
(The simultaneous operation can be performed within electrical power budget.)
4. 6 Mbps multiplexed data includes HK telemetry data.
5. GLI 250m data includes HK telemetry data.
6. ILAS-II and POLDER must not operate in the same time.
7. One of IOCS and DT is operational for 60+6Mbps transmission
8. ILAS-II, TEDA and VMS must not operate in the same time.
(operation priority : ILAS-II > VMS > TEDA)
9. ILAS-II operates at sunrise and sunset of satellite on each orbit.

Appendix 5 - List of Acronyms

ADEOS-II	Advanced Earth Observing Satellite - II
AMSR	Advanced Microwave Scanning Radiometer
CCSDS	Consultative Committee for Space Data Systems
CEOS	Committee On Earth Observation Satellites
CLS	Collect Localisation Satellites
CNES	Centre National d'Etudes Spatiales
DCS	Data Collection System
DDMS	Data Distribution and Management Subsystem
DMS	Dynamics Monitoring System
DRTS	Data Relay and Tracking Satellite
EOC	Earth Observation Center
EOIS	Earth Observation Data and Information System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data and Information System
FAX	Facsimile Message
GLI	Global Imager
GPS	Global Positioning Satellite
GSFC	Goddard Space Flight Center
IEOS	International Earth Observing System
ILAS-II	Improved Limb Atmospheric Spectrometer-II
IOCS	Inter-orbit Communication System
IRD	Interface Requirements Document
JPL	Jet Propulsion Laboratory
MDR	Mission Data Recorder
MOIP	Mission Operations Implementation Plan
MOU	Memorandum Of Understanding
MRT	Mission Real Time
MTTRS	Mean Time To Restore Service
NASA	National Aeronautics And Space Administration
NASDA	National Space Development Agency
NSCAT	NASA-JPL Scatterometer On ADEOS
NGN	NASA/NOAA Ground Network
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
OSDPD	Office of Satellite Data Processing and Distribution
PO.DAAC	Physical Oceanography Distributed Active Archive Center
POLDER	Polarization and Directionality of the Earth's Reflectances
QQC	Quality, Quantity, Continuity
SeaWinds	NASA-JPL Scatterometer On ADEOS-II
SeaPAC	SeaWinds Processing and Analysis Center
SITE	System Integration and Test Building
SOOH	Spacecraft Orbital Operations Handbook
TACC	Tracking And Control Center
TACS	Tracking And Control Station
TBD	To Be Determined
TCP/IP	Transmission Control Protocol/Internet Protocol
TKSC	Tsukuba Space Center
UHF	Ultra High Frequency
USB	Unified S-Band
UTC	Coordinated Universal Time
VMS	Visual Monitoring System
WFF	Wallops Flight Facility