

EGSOWG 5

(ERS National & Foreign
Ground Station Operators
Working Group Meeting)

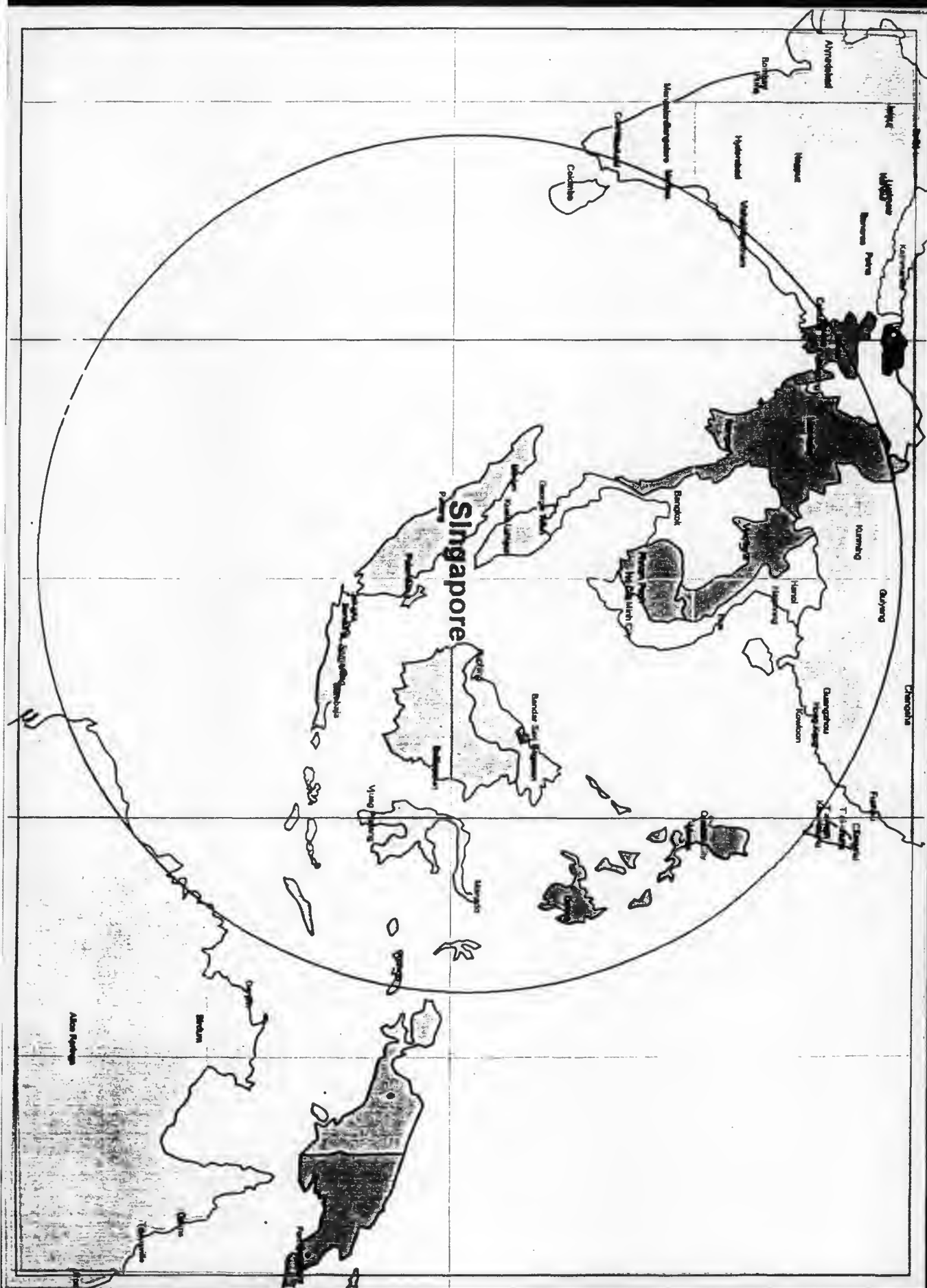
Toulouse

14 - 15 December 1995

This document contains copies of the viewgraphs used in each presentation, the list of attendees, action items, and a copy of the ESA ERS Documentation available.

This document is published by the ERS Facilities Operations Section of the ERS Exploitation Division of ESA/ESRIN.

ESA12



Antenna Location

- Latitude --- $1^{\circ}17'30''$ N
- Longitude --- $103^{\circ}47'00''$ E
- Visibility circle includes
 - » Myanmar, Thailand, Laos, Vietnam, Kampuchea, the Philippines, Malaysia, Brunei, Indonesai, Singapore, Sri Lanka, southern part of China, part of Bangladesh, part of northwest coast of Australia

Ground Station Facilities

- Data processing system (cont.)
 - » throughput --- more than 10 SAR scenes and 25 SPOT scenes in one 8-hour shift
 - » products --- SPOT levels 0, 1A, 1B, 2A, 2B, 3 (not tested), SPOTView (early next year), in CAP format; ERS RAW, SLC, U16, PRI
 - » media --- Exabyte, CD-ROM, CCT, QIC, 4mm DAT

Ground Station Facilities

- Ground station management
 - » Production Control Module software based on INGRES database system
- Data processing system
 - » four-CPU Silicon Graphics Challenge server networked to INDIGO and INDY workstations
 - » UNIX operating system

Ground Station Facilities

- Tracking antenna
 - » G/T about 35 dB/K
 - » X-band 8-8.45 GHz
 - » two channels with data rate 170 Mb/s each
 - » two HDDRs
 - » 13-metre reflector disc
 - » 7-degree tilt axis

Project Milestones

- October 1994 --- Critical design review.
- June 1995 --- Installation of ground station facilities.
- September 1995 --- Began reception of SPOT and ERS data.

Project Milestones

- Late 1992 ---- Funding for CRISP approved.
- May 1993 --- Called tender for ground station facilities.
- August 1993 --- Tender closed.
- April 1994 --- Award of tender.
- July 1994 --- Preliminary design review.

Centre for Remote Imaging,
Sensing and Processing (CRISP)
National University of Singapore

Hock LIM



ERS-1 & 2 Status Update

- ERS-1 & 2 SAR Reception, Archiving and Processing continuing at current levels to March 31, 1996.
- Anticipate ERS-1 & 2 operations to continue at reduced level following RADARSAT commissioning.



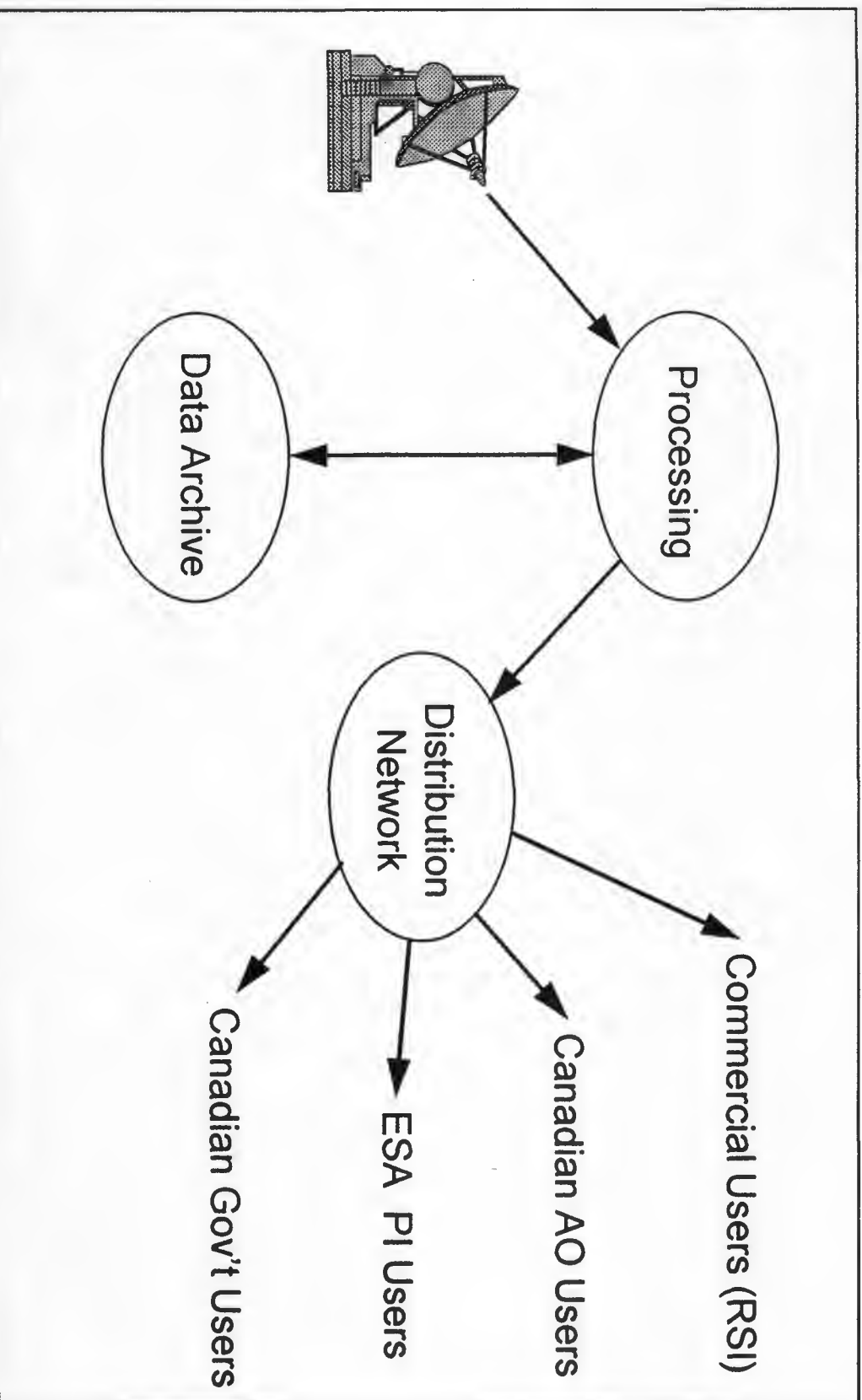
ERS-1 & 2 Data Distribution in Canada

- CCRS responsible for distribution of all data received at GSS and PASS for National and Canadian AO users.
- CCRS in conjunction with ESA responsible for distribution of Canadian data to ESA AO Pls.
- CCRS has an arrangement with RADARSAT International Inc. for the Distribution of Canadian data to commercial users.
- CCRS provides data to ERSC through RSI.



ERS-1 & 2

Data Distribution in Canada





ERS-1 & 2 SAR Production

	RAW	SGF	SGC	SLC	SSG	SPG	MLD	SLD	ITN-SGC
ERS-1	347	294	7	33	5	3	308	0	2903
ERS-2	33	1	0	13	0	0	8	0	0

- RAW
 - SGF
 - SGC
 - SLC
 - SSG
 - SPG
 - MLD
 - SLD
- Raw signal data
 - Fine resolution (25m), Geo-referenced
 - Coarse resolution (100 m), Geo-referenced
 - Single Look Complex
 - Systematically Geocoded
 - Precision Geocoded
 - Multi-Look Detected
 - Single Look Detected

- ITN
 - Image Transfer Network to Ice Centre - T1 Link



ERS-1 & 2 SAR Reception and Processing

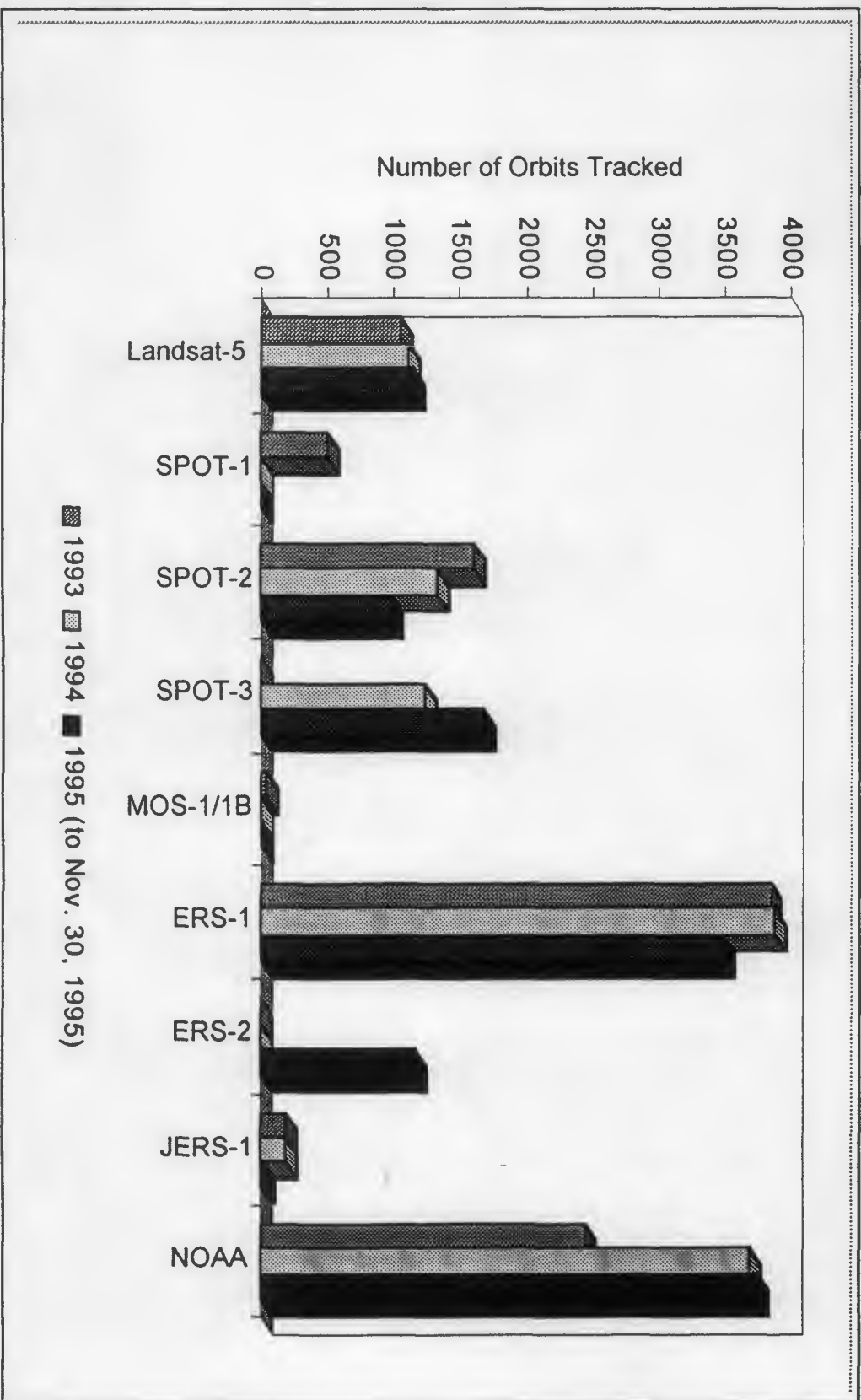
<i>Orbits Received</i>	<i>1994</i>	<i>to Nov 30, 1995</i>
PASS	1531	1665
GSS	1122	1130
Total	2653	2795

<i>Scenes Processed</i>	<i>1994</i>	<i>to Nov 30, 1995</i>
RSI	141	153
ESA PI's	451	431
Paying Gov't	10	19
CCRS Internal	334	454
Other Paying	48	0
Ice Centre	1,770	2,903
Total	2754	3960

<i>Data to ESA</i>	<i>1994</i>	<i>to Nov 30, 1995</i>
HDDTs	71	64

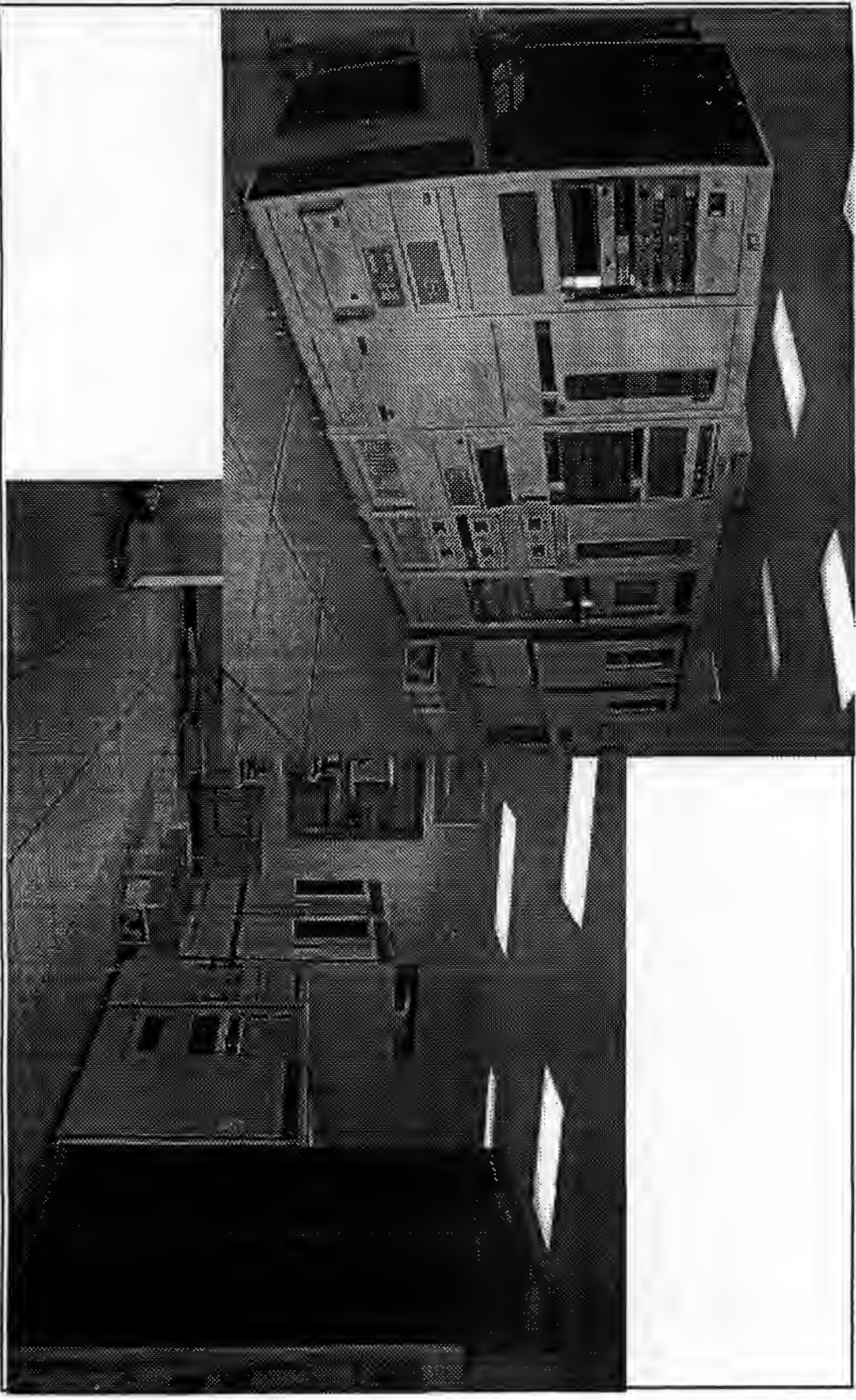


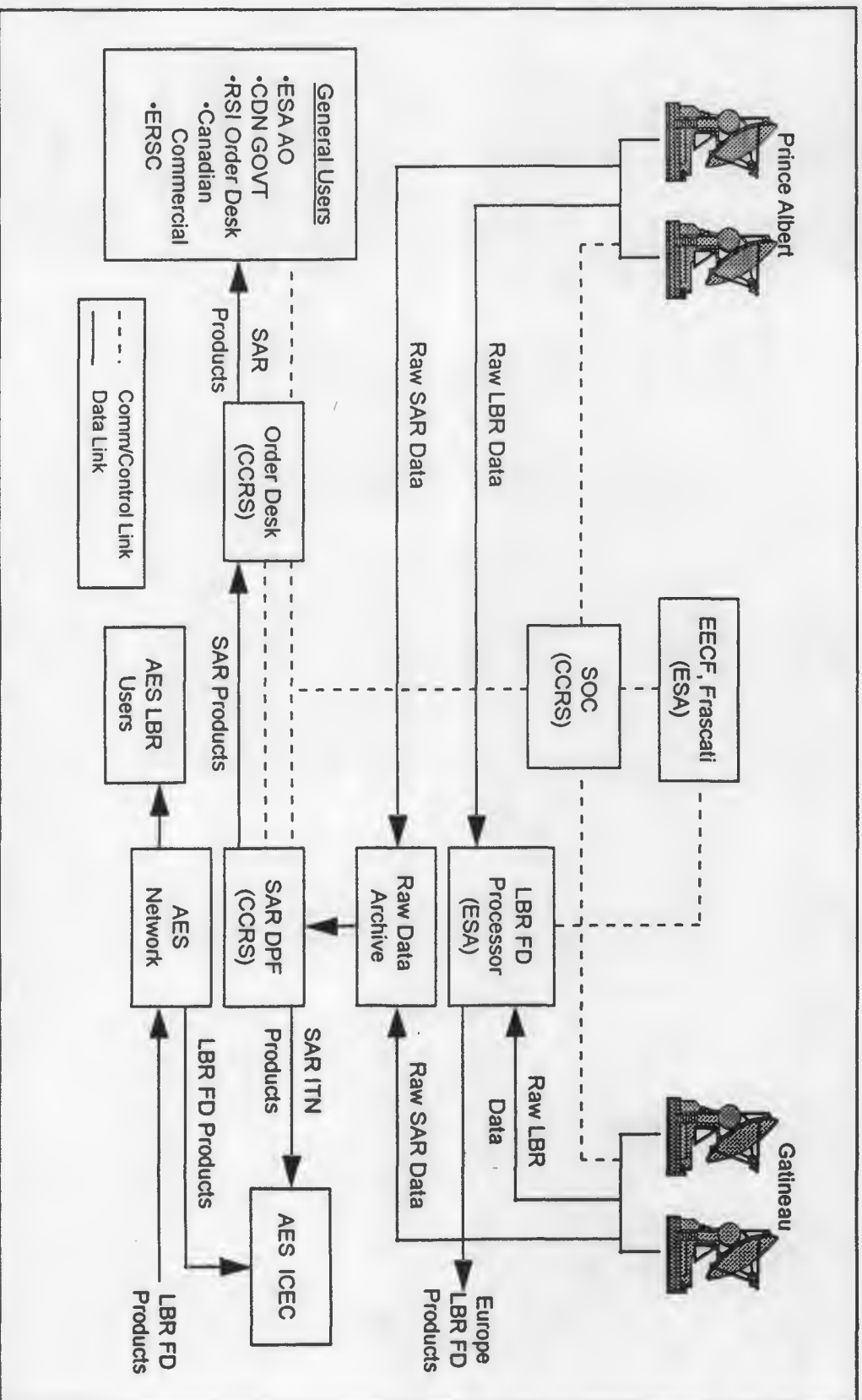
Reception at Prince Albert and Gatineau Stations





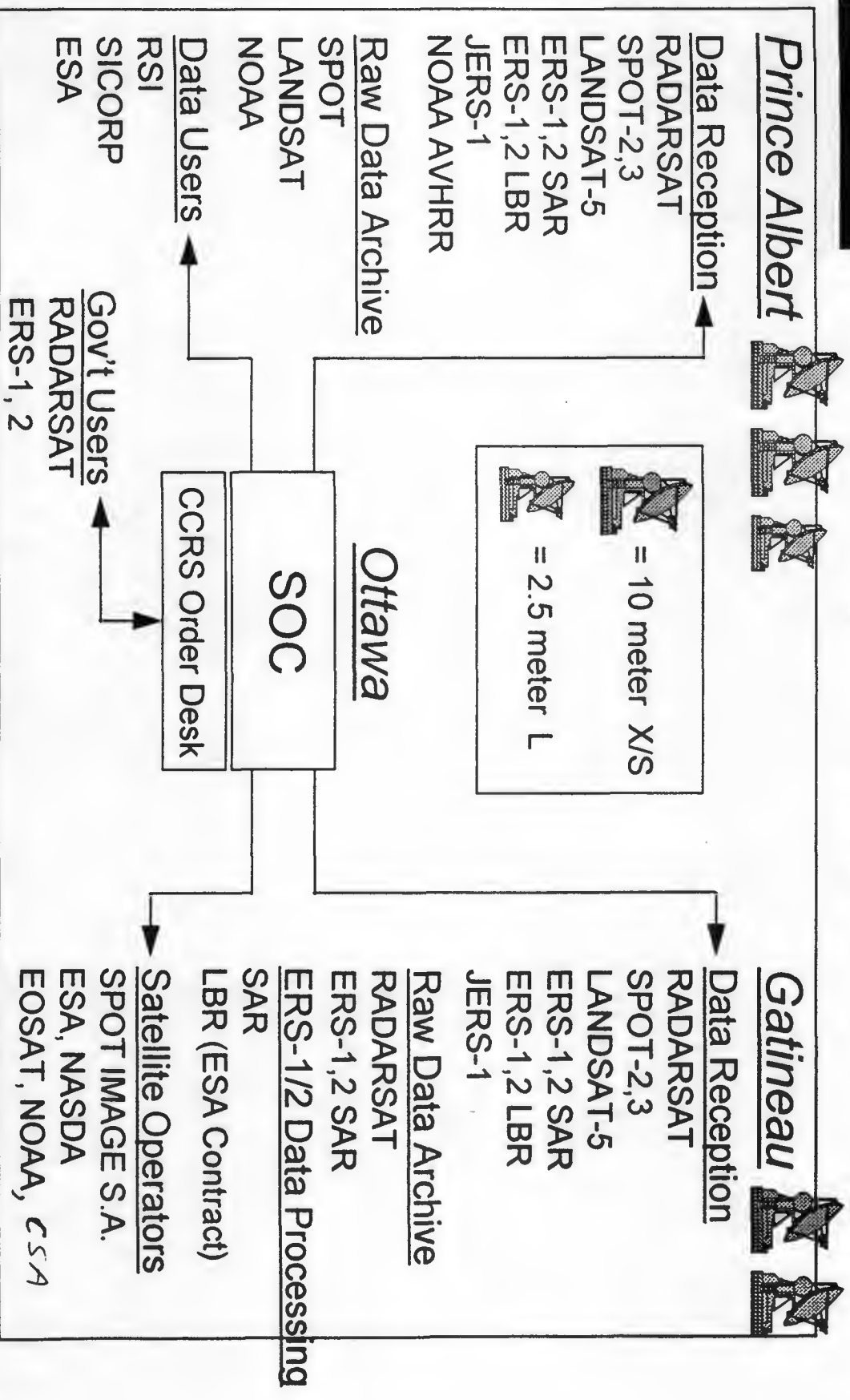
ERS SARDPF







Ground System Overview





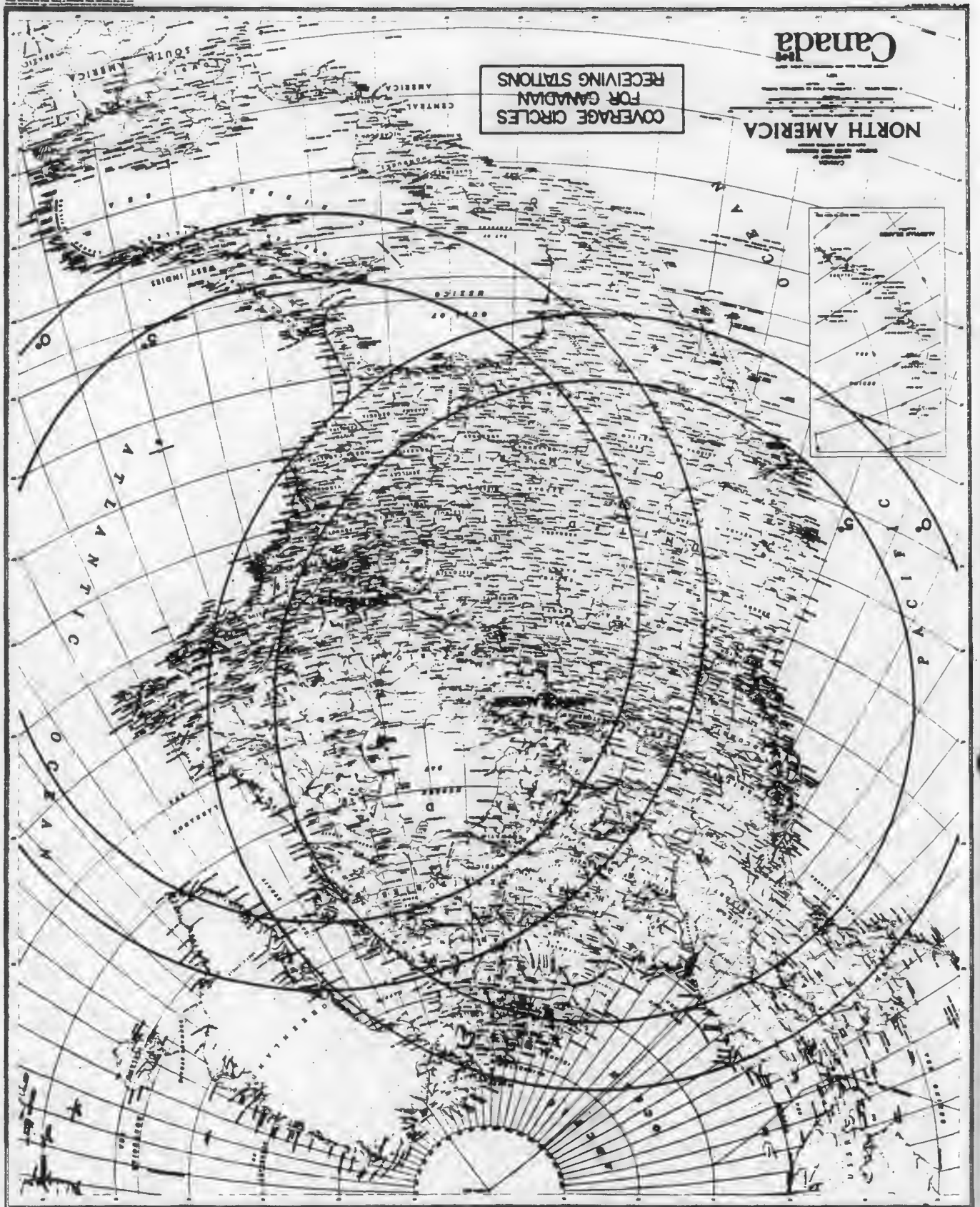
Gatineau Satellite Station

- ☐ Established in 1985 for SPOT Data Reception
- ☐ Provides full Eastern and Central Canada coverage
- ☐ Primary reception, archiving and processing facility for ERS-1/2 SAR data



Prince Albert Satellite Station

- ☐ Established in 1972 for ERTS (LANDSAT) data reception, archiving and processing. SPOT capability added in 1986
- ☐ Provides full Western and Central Canada coverage
- ☐ Primary reception and archive facility for LandSat, SPOT and NOAA AVHRR data





CCRS GROUND SYSTEM OVERVIEW

☐ Gatineau Satellite Station
Cantley, Quebec

☐ Prince Albert Satellite Station
Prince Albert, Saskatchewan

☐ Satellite Operations Centre
Ottawa, Ontario



ERS National and Foreign Stations Operators Working Group

Toulouse, France

14–15, December

1995

ASF Points of Contact



- **ASF Project Director - Mr. Carl Wales**
 - Telephone (907) 474-7848, FAX (907) 474-5567
 - cwales@iias.images.alaska.edu
- **ASF Operations Manager - Mr. Richard Harding**
 - Telephone (907) 474-5976, FAX (907) 474-5195
 - rdharding@iias.images.alaska.edu
- **Mission Planning Manager - Ms. Greta Reynolds**
 - Telephone (907) 474-7869, FAX (907) 474-5195
 - greyolds@santa.asf.alaska.edu
- **Control Center Supervisor - Mr. Marc Forbes**
 - Telephone (907) 474-7255, FAX (907) 474-5195
 - marc@santa.asf.alaska.edu
- **ASF Control Room**
 - Telephone (907) 474-7850, FAX (907) 474-5195
 - acsoper@santa.asf.alaska.edu



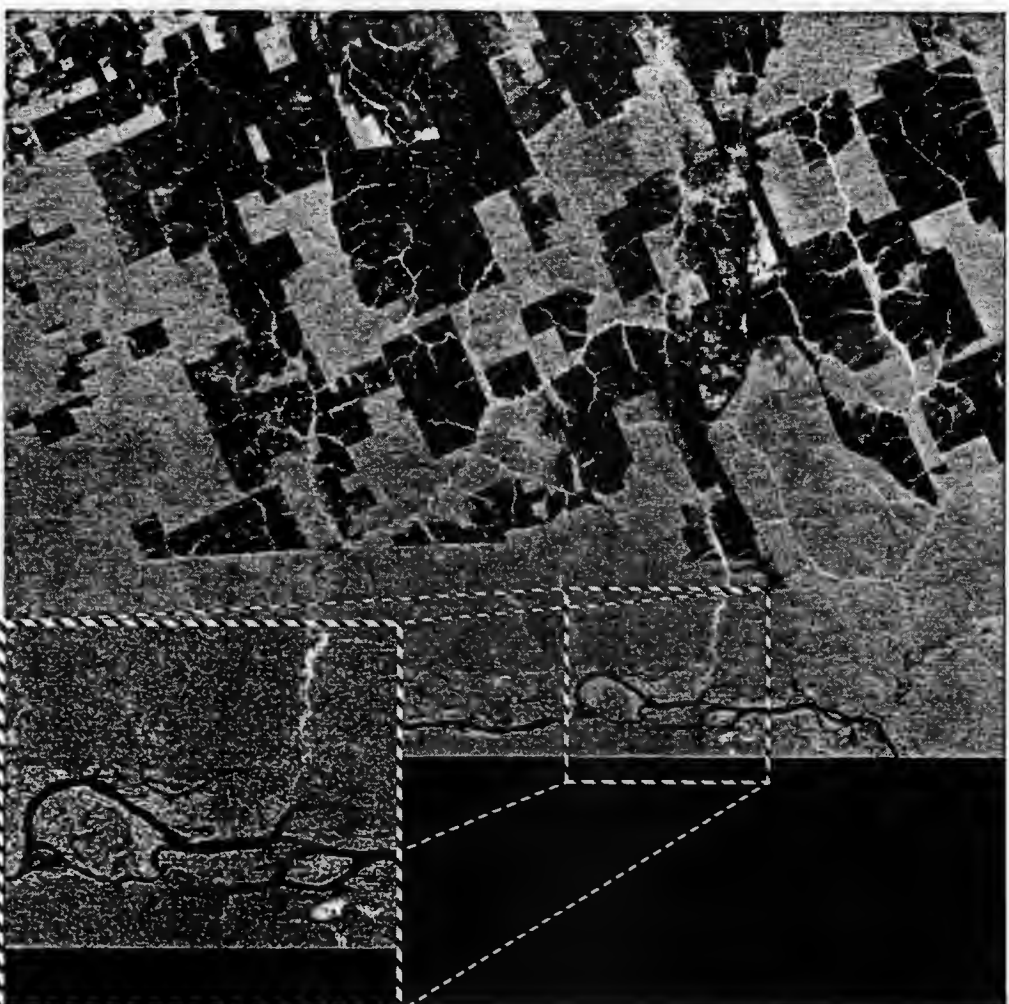
Note: Santa e-mail address will change approximately March '96



RW-H-travel

Sample Invalid Image

JERS-1 Amazon



Calibration / Validation Responsibilities



- Develop direction on CALVAL imagery calibration project
 - Write ASF SAR Processor calibration plans for all satellites
 - Recruit, plan work and supervise student intern positions
- Provide technical direction for Calibration array setup
 - Install and maintain Calibration arrays
 - design, build and install precision corner reflectors
- Validate/regression test SPS system
 - Select and order data products
 - Process data products for CALVAL
 - Periodically validate ASF products
 - Establish methods and software
- Participate in SPS and PVS system upgrade development project
 - Upgrade existing calibration workstation to handle Complex data



Homepage Highlights

<http://www.asf.alaska.edu>

- ASF SAR Research Bibliography V 1.1
- SAR Analysis Software Tools
- ERS-1 SAR Image Sampler
- ASF's EOSDIS Guide Documents
- Sample Images of Each Data Set
- Calibration Documents
- SAR Image of the Month



Total SAR Data Distributed



- SAR Products (scenes) Aug '91 to Nov '95
 - 1,284 Reprocessing (500 Full-res / 509 Lo-res)
 - 4,756 Full-res
 - 37,669 Lo-res
 - 91 Geocoded Full-res
 - 20,102 Geocoded Lo-res
 - 30 Computer Compatible Signal Data
 - 927 Complex Data



ASF Projects / Users



- **Approved Projects**

– NASA -	137
• AO -	24
• Other -	60
• NRA -	53
– ESA -	43
• INT -	1
• PIPOR -	19
• ALASKA -	23

- **Approved Users: 180**



User Services Responsibilities



- Track product orders placed by users
 - Replace or fix orders that fall out of system
- Train new users in DAAC interface via V0 IMS
- Review and analyze new user proposals to ensure that user's requirements can be met within spacecraft and project constraints
- Create and maintain ASF Guide documents and Home page
- Generate statistical information for ASF weekly and monthly reports
- Participate in educational and SAR community outreach programs to expose potential new users to available products
- Provide tours, briefings and demonstrations to outside individuals and groups



Archive

• Working Signal Tapes	1513 cassettes*
• Master Signal Tapes	1241 cassettes*
• ERS-1	62408 minutes (49,146GB)
• ERS-2	1172 minutes (923GB)

**As of 30 Nov 1995. Average growth of ASF archive is
~1.0M Byte/sec*



ERS-2 Processing Summary

- Oct '95 - Nov '95
 - 2 Datatakes processed
 - 10.7 Minutes of ERS-2 SAR data processed
 - 48 Scenes delivered to archive
- 3.5 % of ERS-2 signal data has been processed



ERS-1 Processing Summary

- Aug '91 - 30 Nov '95
 - 5,020 Datatakes processed
 - 27,758 Minutes of ERS-1 SAR data processed
 - 120,351 Scenes delivered to the archive
- 40.55% of ERS-1 signal data has been processed



ERS-2 Acquisition Summary

ERS-2 acquisition program began 1 October 1995

243	Passes scheduled for acquisition Oct '95 - 30 Nov '95
2	Passes lost 1 Oct '95 - 30 Nov '95
99.18%	Overall success ratio
1172.3	Minutes of SAR data delivered to archive Oct '95- 30 Nov '95
923	Gbytes of data delivered to archive Oct '95 - 30 Nov '95
19.22	Minutes of data per day average overall



ERS-1 Acquisition Summary

ERS-1 acquisition program began 8 August 1991

12,379	Passes scheduled for acquisition Aug '91 - 30 Nov '95
52	Passes lost Aug '91 - 30 Nov '95
99.58%	Overall success ratio
62,408	Minutes of SAR data delivered to archive Aug '91 - 30 Nov '95
49,146	Gbytes of data delivered to archive Aug '91 - 30 Nov '95
39.15	Minutes of data per day average overall



Production Responsibilities

- Operate the Receiving Ground Station (RGS) to obtain data from SAR satellites
- Operate the SAR Processor System (SPS) to process signal data into images
- Operate the Post Processor (PP) to fill user requests for full-resolution data
- Operate the Archive and Catalog System (ACS) to fill user orders
- Ship and receive tapes from flight agencies
- Order and maintain an inventory of Control Room consumables
- Compile and update Control Room procedures manuals
- Provide back-up support to other ASF groups (MPS and statistics)

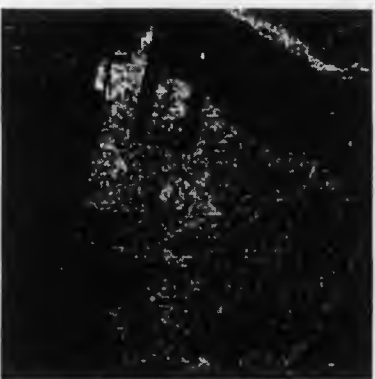


Mission Planning Responsibilities

- Interact with all Flight Agencies for acquisition tasking
- Create data acquisition schedules and work with users to provide optimum coverage
- Provide conflict analysis / resolution and set scheduling priorities for numerous projects and multiple spacecraft
- Generate WOS for ingestion by the RGS 365 days per year
- Analyze new upgrade system capabilities and provide feedback to JPL through TIM participation



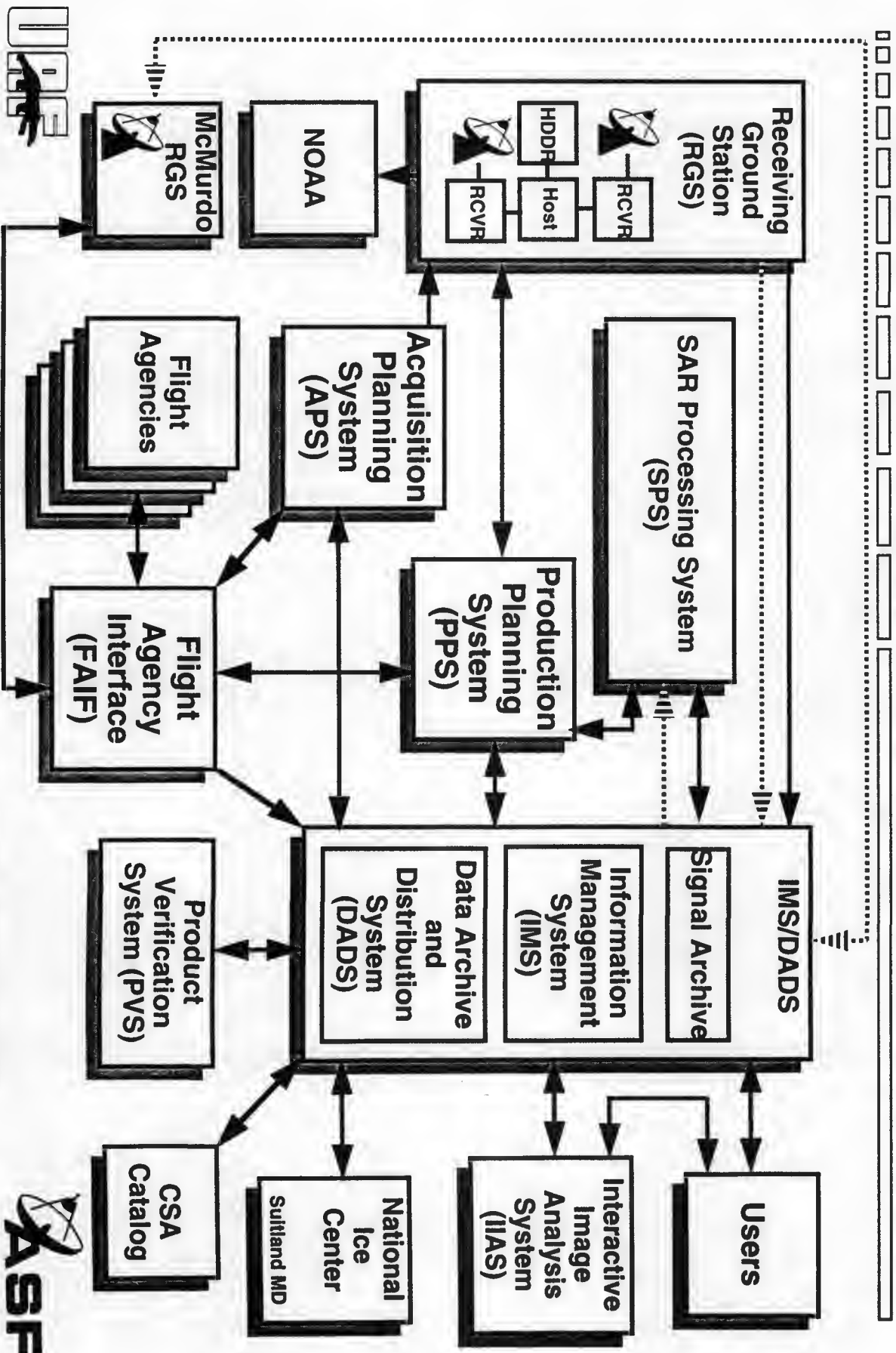
SAR Applications



- **Science**

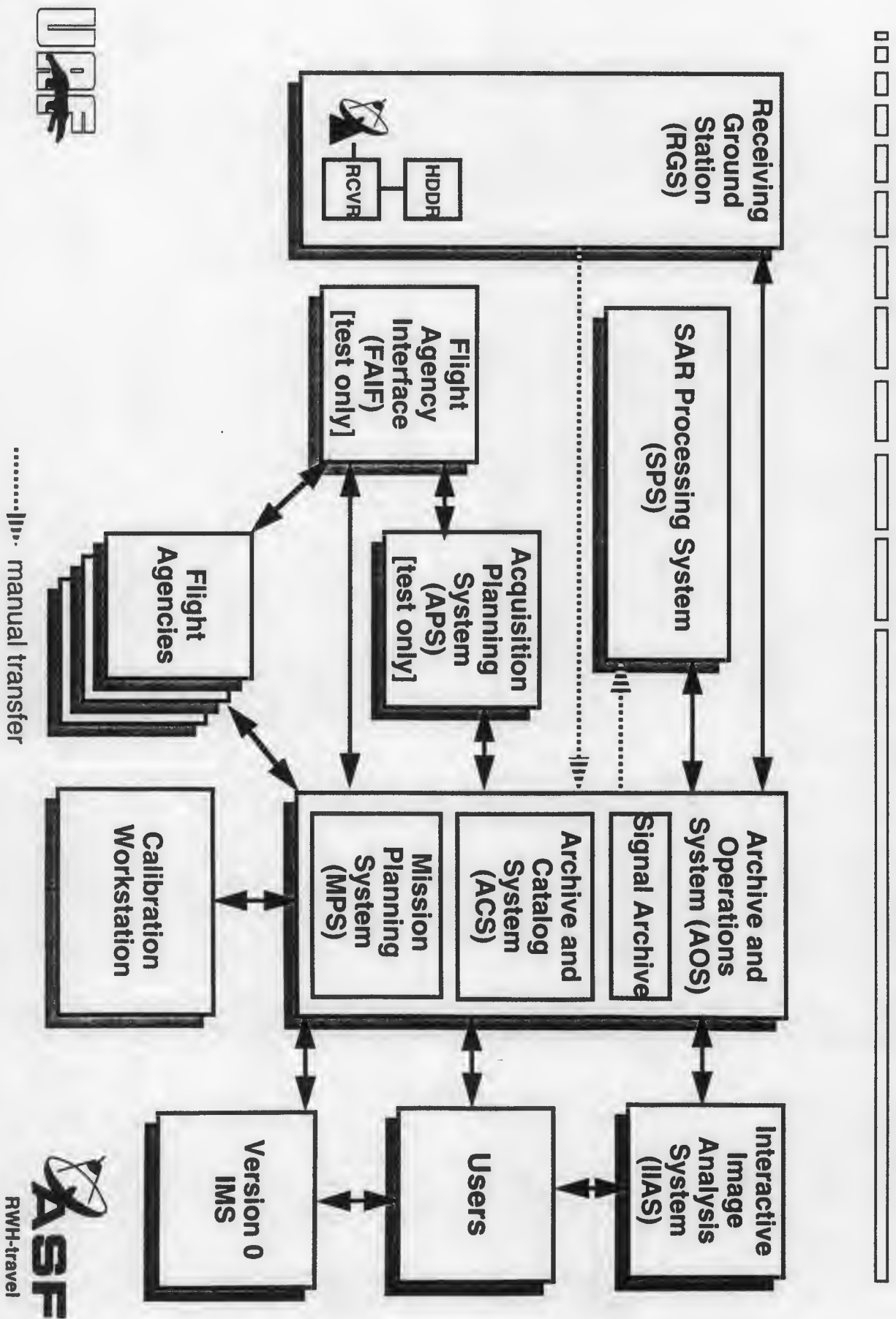
- Sea ice thickness
- Forest biomass
- Fire extent & damage
- Freeze up dates
- Glacial movement
- Wave spectra
- Hydrology

Functional Diagram - ASF Next Year



..... manual transfer

Functional Diagram - ASF Today



..... manual transfer



Current Operations

- ERS-1, ERS-2 and JERS-1 full Ops
- RADARSAT launched 4 Nov
 - Commissioning through May 96
- Operations Center
 - 18 hours per day now
 - 24 hours per day next year
- 11m antenna system being installed now
- Near-real-time support to National Ice Center
- McMurdo support
 - Processing
 - NIC Quicklook
 - TDRS link
- JPL development of new ASF subsystems
 - Phased implementation into FY97



Overview



- **NASA sponsored ground station**
- **International MOAs**
- **NIC near-real-time operational support**
- **Polar scientific research support**
- **Acquire, process, distribute and archive SAR**
 - Primary point-of-contact for US RADARSAT data needs
 - Primary point-of-contact for ASF ERS in-mask data needs
 - Up to 24 hour-per-day operations
 - 10m and 11m will back each other up
- **One of world's foremost SAR processing facilities**
 - Calibrated processors meet strict science requirements
 - Single purpose parallel processor - Cray speeds
 - New IBM SP-2s for RADARSAT ScansAR - three with 24 nodes



ASF Station Mask



J. Crossfield JPL



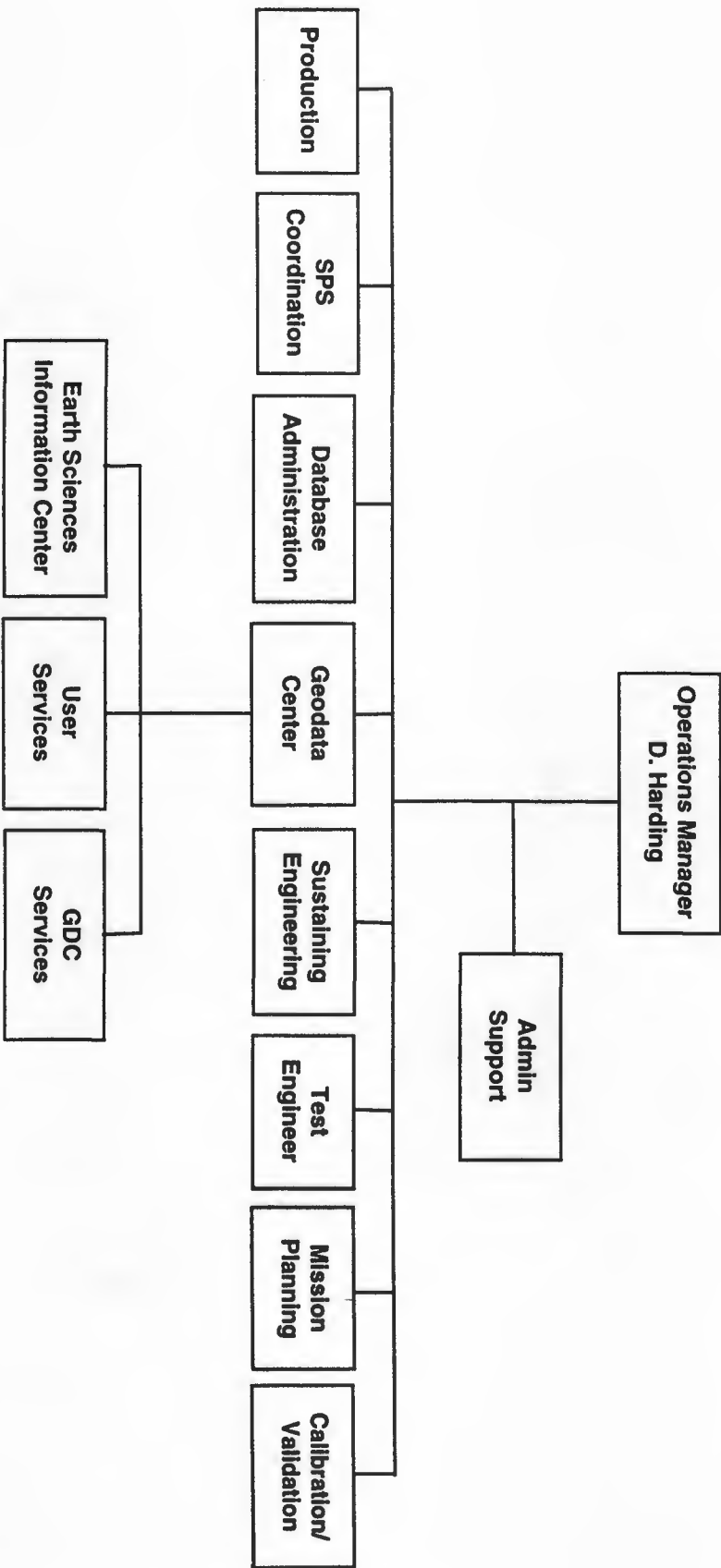
Why University of Alaska Fairbanks?



- Support satellites in polar orbit
 - Location, location, location
- Global interest in Arctic research
 - Geophysical Institute
 - International Arctic Research Center
- Relative low cost
- Technology transfer



Operations Division





Alaska SAR Facility

Overview

Richard W. Harding

ASF Operations Manager





ACRES

Future developments

- **New SAR processing system to be purchased in 1996, evaluation of tenders in progress**
- **Full range of products to be offered**
- **Radarsat reception under consideration**

Presenter: Laurie Oliver

ESOWG 5 Meeting



ACRES

Processing Highlights

- ISO 9002 Quality Accreditation renewed
- Transcription from Optical tape to HDDT proven; to allow data transfer to ESRIN

Presenter: Laurie Oliver

ESOWG 5 Meeting

Australian Centre for Remote Sensing
ACRES is a Business Unit of AUSLIG





ACRES

Tasmanian Earth Resources Satellite Station - TERSS

- Managed by a consortium of organisations of which ACRES is a member
- Data reception onto RAID and transfer to exabyte
- Data processing and archiving at ACRES

Presenter: Laurie Oliver

ESOWG 5 Meeting





ACRES

Acquisition Developments

- TERSS operational - primarily for ERS-1 & 2 - Oceanographic applications
- Transcription from HDDT to Optical Tape for long term archive in progress
- ERS-1 & 2 tandem campaign underway for complete cover of Australia

Presenter: Laurie Oliver

Australian Centre for Remote Sensing
ACRES is a Business Unit of AUSLIG

ESOWG 5 Meeting





ACRES

Role of ACRES

- Reception, archiving and processing of earth resources satellite imagery, mainly Landsat, SPOT & ERS SAR
- Dissemination of products through a network of distributors
- Value-added processing
- Consultancy services

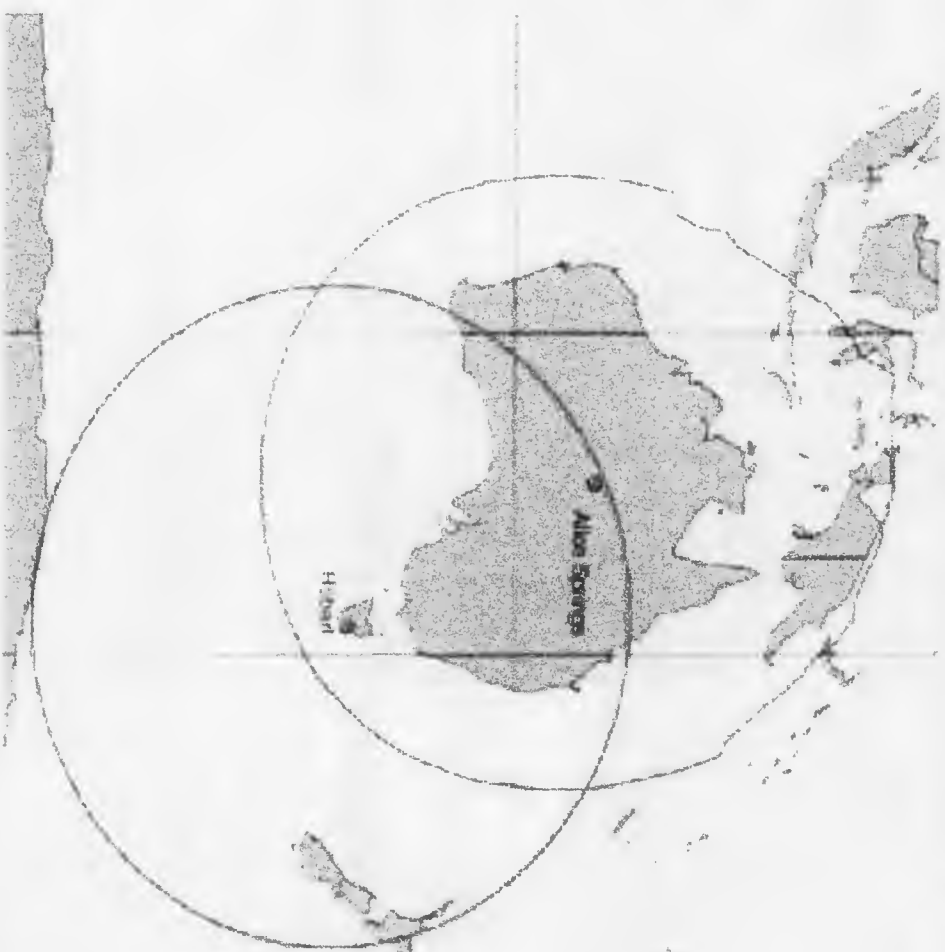
Presenter: Laurie Oliver

ESOWG 5 Meeting



ACRES

Australian Centre for Remote Sensing



Presenter: Laurie Oliver

Australian Centre for Remote Sensing
ACRES is a Business Unit of AUSLIG

ESOWG 5 Meeting





Help

The Edit View Go Bookmarks Options Directory



Location: <http://gds.eas.nyu.edu:80/ERS-2/BA7/BA7000000007>

What's New What's Cool Handbook Net Search Net Directory Newsgroups



User: WWW-Anonymous

The ESA ERS-1 and ERS-2 Online Server

Please find below two series of software tools that you can download onto your own PC now. The former will allow you checking which has been or what will be the ESA satellite coverage. The latter are necessary to be able to read the different satellite products made available online or offline to you (see also ERS services). As a third point you will find products available online

• 1. Obtain the ERS-1 and ERS-2 satellite earth coverage

- ☐ Earth Remote Sensing swath coverage software - DESO
- ☐ Global Activity Plan (GAP)
- ☐ List of Orbits for the SAR sensor

• 2. Obtain programs for reading satellite products tapes

- ☐ for SAR (Synthetic Aperture Radar) products
 - ☐ SAR Reference Coverage CD Raw Format Converter
 - ☐ SAR CEOS Format Tape Reader Software
 - ☐ SAR PRI (precision image) product reader
 - ☐ SAR RAW (unstacked raw data) product reader
 - ☐ SAR SLC (single look complex) product reader
- ☐ for LBR (low Bu Rate) products
 - ☐ LBR CEOS Format tape reader software
 - ☐ Radar Altimeter Ocean product software - OPRHD
 - ☐ Radar Altimeter Waveform product software - WAPREAD

• 3. Obtain products

[URL images](#)

The ERS online Server

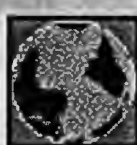
All documents



Newsletters



Forthcoming Events



Latest Remote Sensing Images



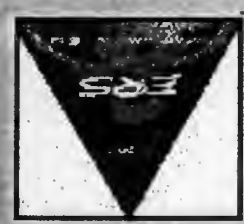
Earth Remote Sensing Mission News



What's New

Please note that the ERS User Services phone and fax numbers changed since Monday, 30 October 1995

WARNING!



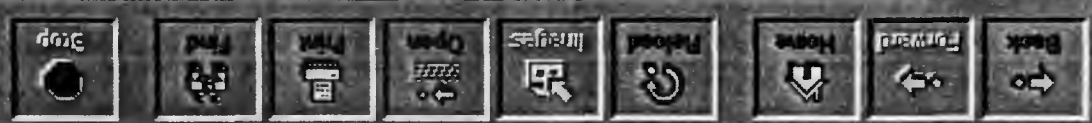
Special ERS-2



Hot News & Hot Line

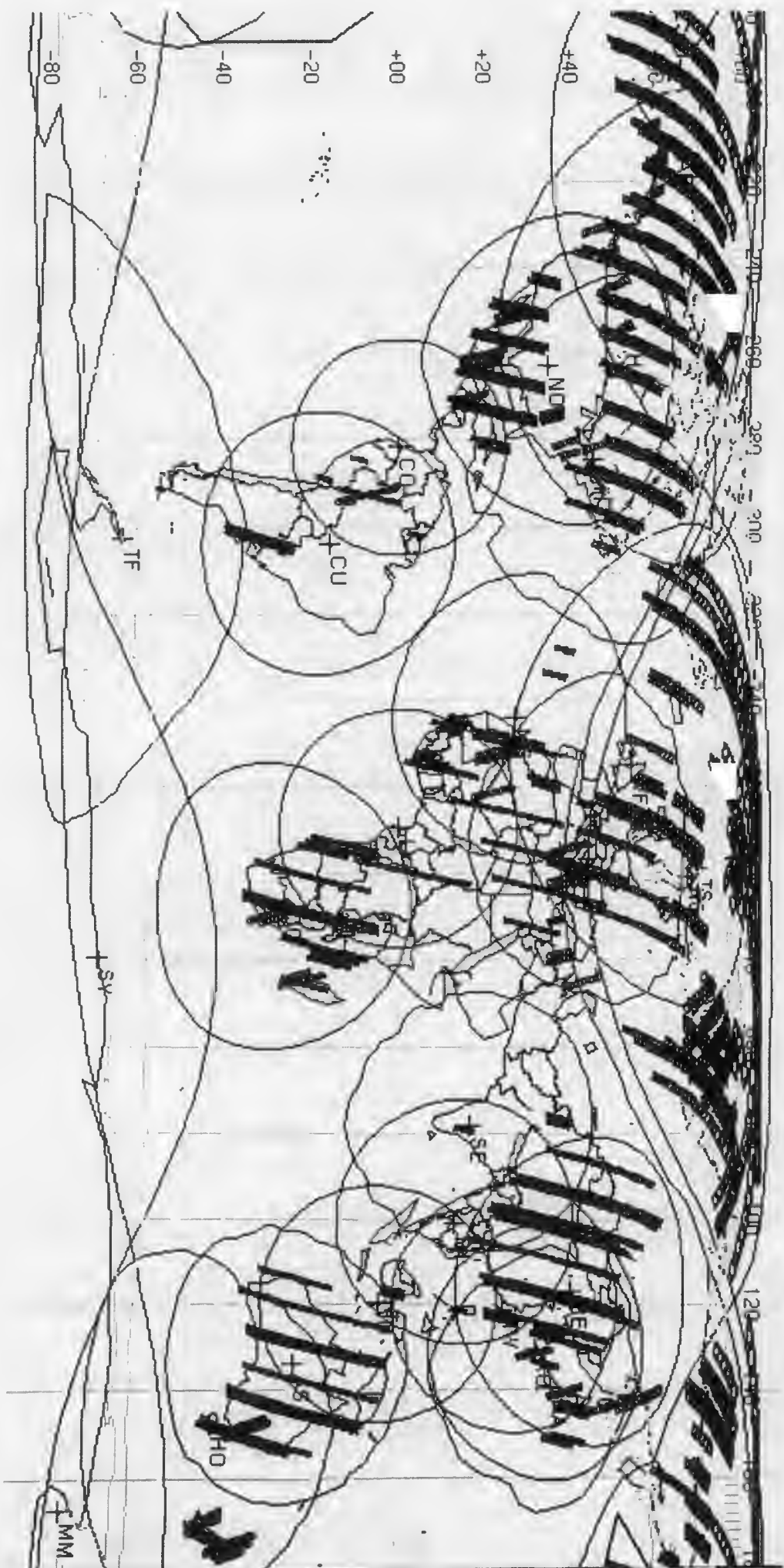
What's New What's Cool Handbook Net Search Net Directory Newsgroups

Location: <http://services.earth.nasa.gov/hotnews.htm>



File Edit View Go Bookmarks Options Directory

N



> Sat: E1, Sensor: SAR, Orb: 23137 (18-DEC-1995) to 23236 (25-DEC-1995) :Production for all GS / Acquisition

[Home Page](#)

[newsletters](#)

[forthcoming events](#)

[latest earth remote sensing images](#)

[special ERS-2](#)

- [ERS-1/ERS-2's Ups & Downs](#)
- [ERS-1/ERS-2 Weekly Planning](#)
- [ERS-1 Ground Stations Availability](#)

Earth Remote Sensing Mission News



[What's New](#) [What's Cool](#) [Handbook](#) [Net Search](#) [Net Directory](#) [Newsgroups](#)

Location: <http://services.eslin.esa.it/current.htm>



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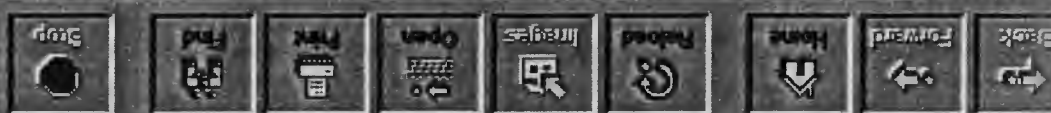
N



File Edit View Go Bookmarks Options Directory Help

Netscape Earth Remote Sensing User Services

Location: <http://services.esrin.esa.it/>



What's New What's Cool Handbook Net Search Net Directory Newsgroups



Welcome to the ESA-ESRIN Earth Remote Sensing User Services.



Special ERS-2



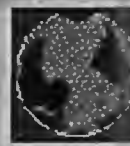
Guide and Directory Service



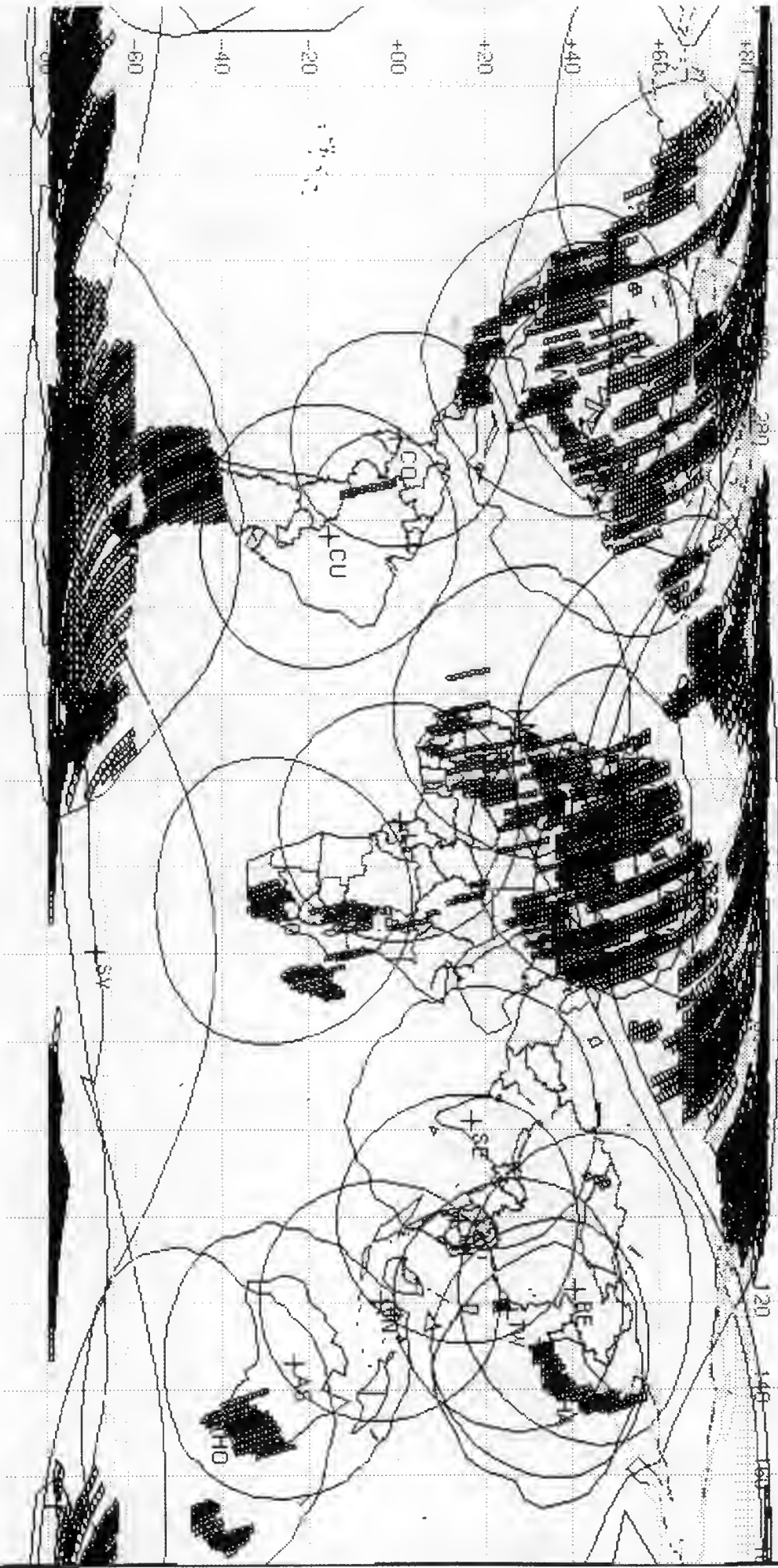
Hot News & Hot Line

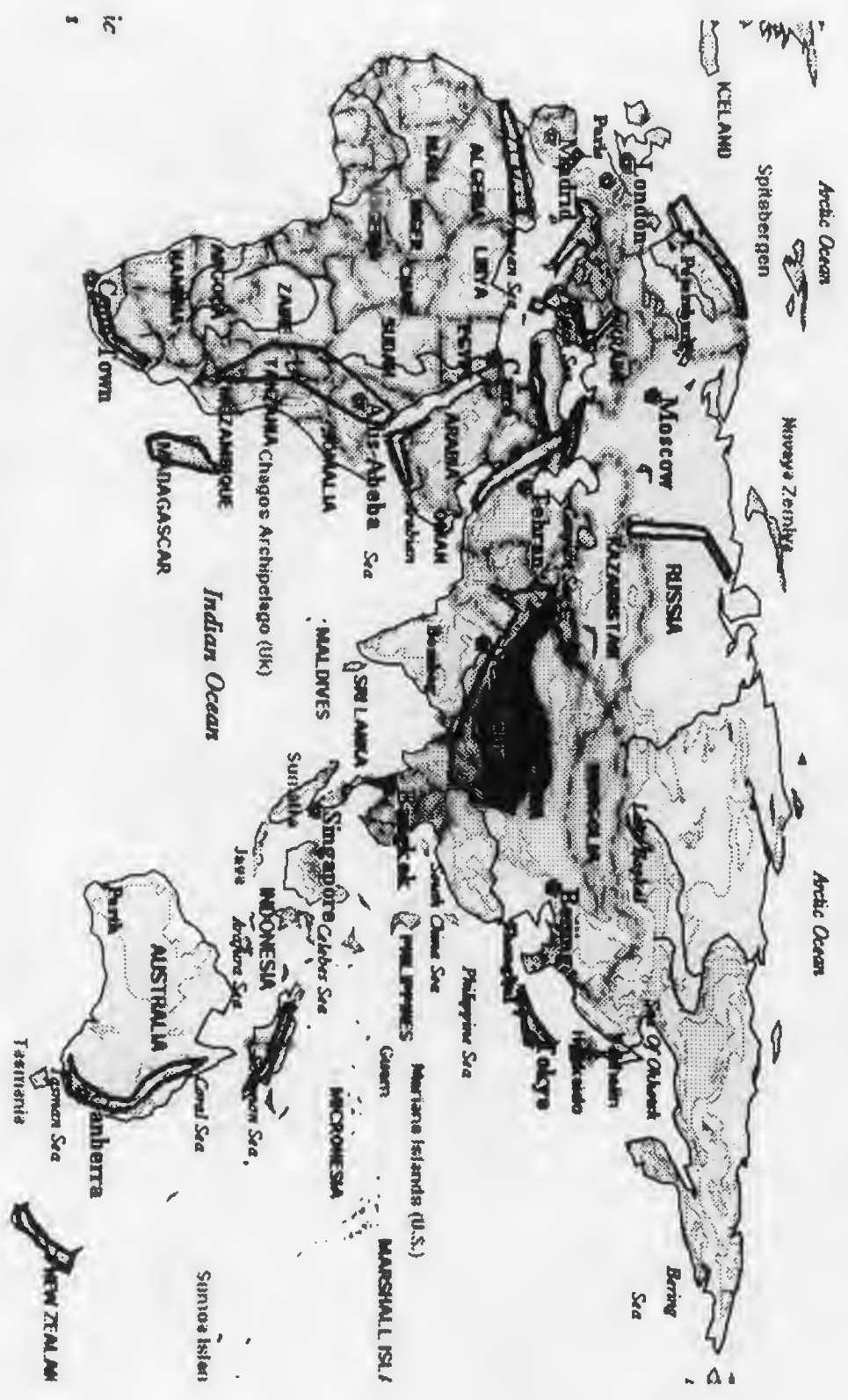


Remote Sensing Images



Satellite Products & User Services





Arctic Ocean

Svalbard

ICELAND

London

Paris

Madrid

Algeria

Libya

Tunisia

Sudan

Egypt

Somalia

Kenya

Uganda

Rwanda

Burundi

Congo

Zaire

Angola

Namibia

South Africa

Madagascar

Indian Ocean

Chagos Archipelago (UK)

Maldives

Sri Lanka

Arctic Ocean

Moscow

RUSSIA

KAZAKHSTAN

Uzbekistan

Tajikistan

Kyrgyzstan

China

India

Philippines

Indonesia

Malaysia

Singapore

Brunei

East Timor

Timor-Leste

Myanmar

Thailand

Laos

Vietnam

Cambodia

Siem Reap

Phnom Penh

Yangon

Nay Pyi Taw

Manila

Quezon City

Arctic Ocean

Barrow

Utqiagvik

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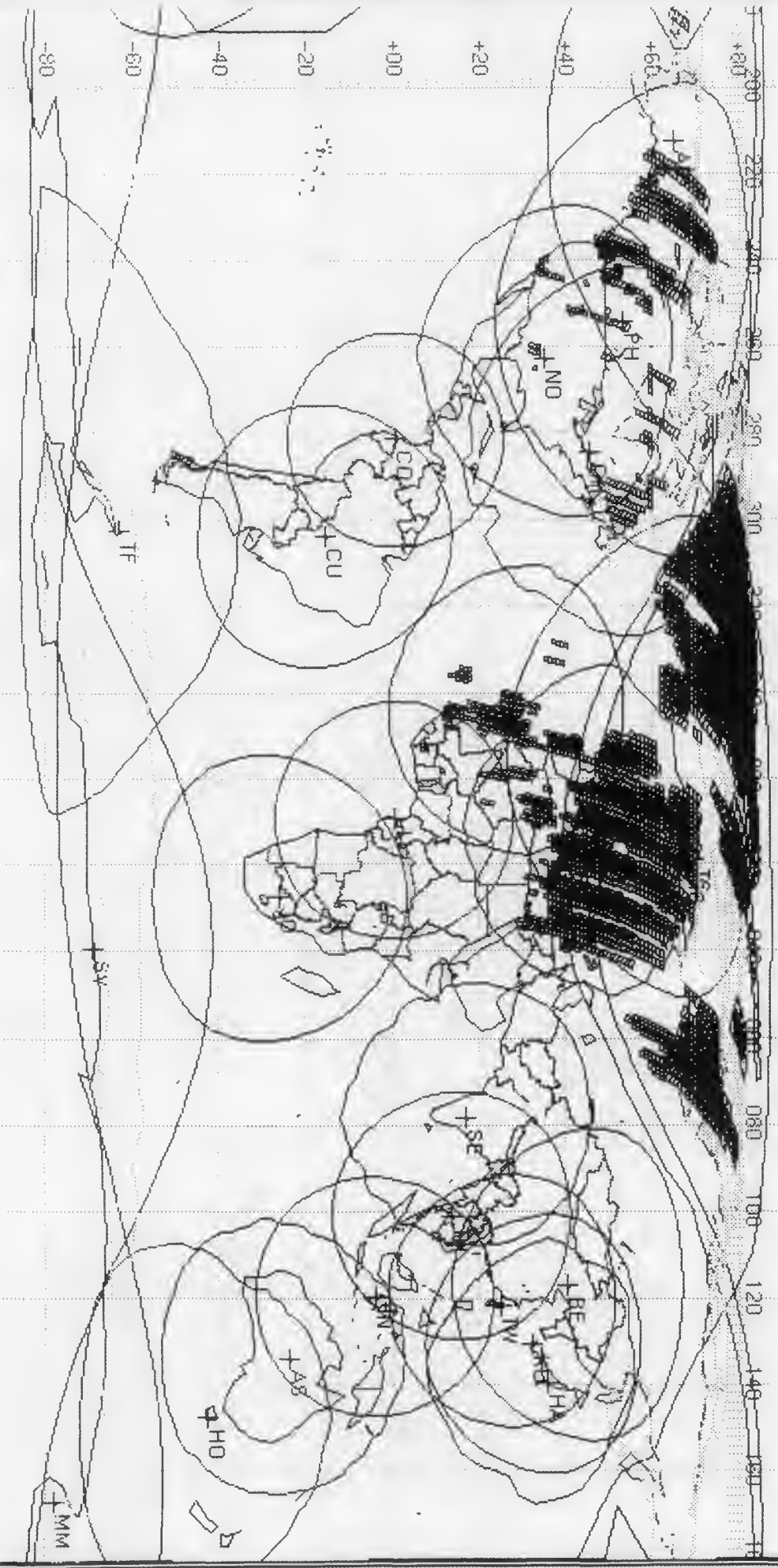
Barter Island

Wheeler Island

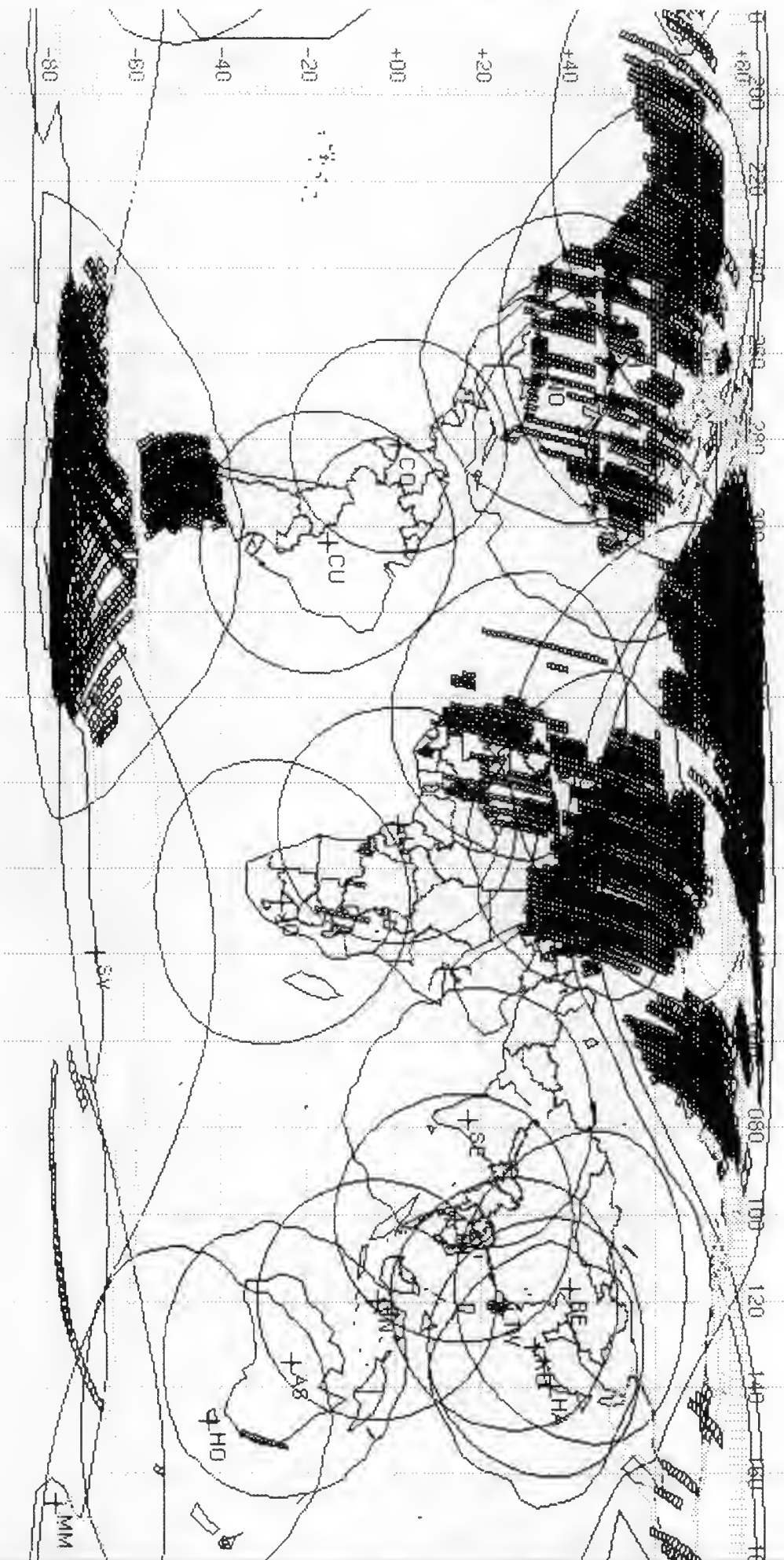
Barrow

America

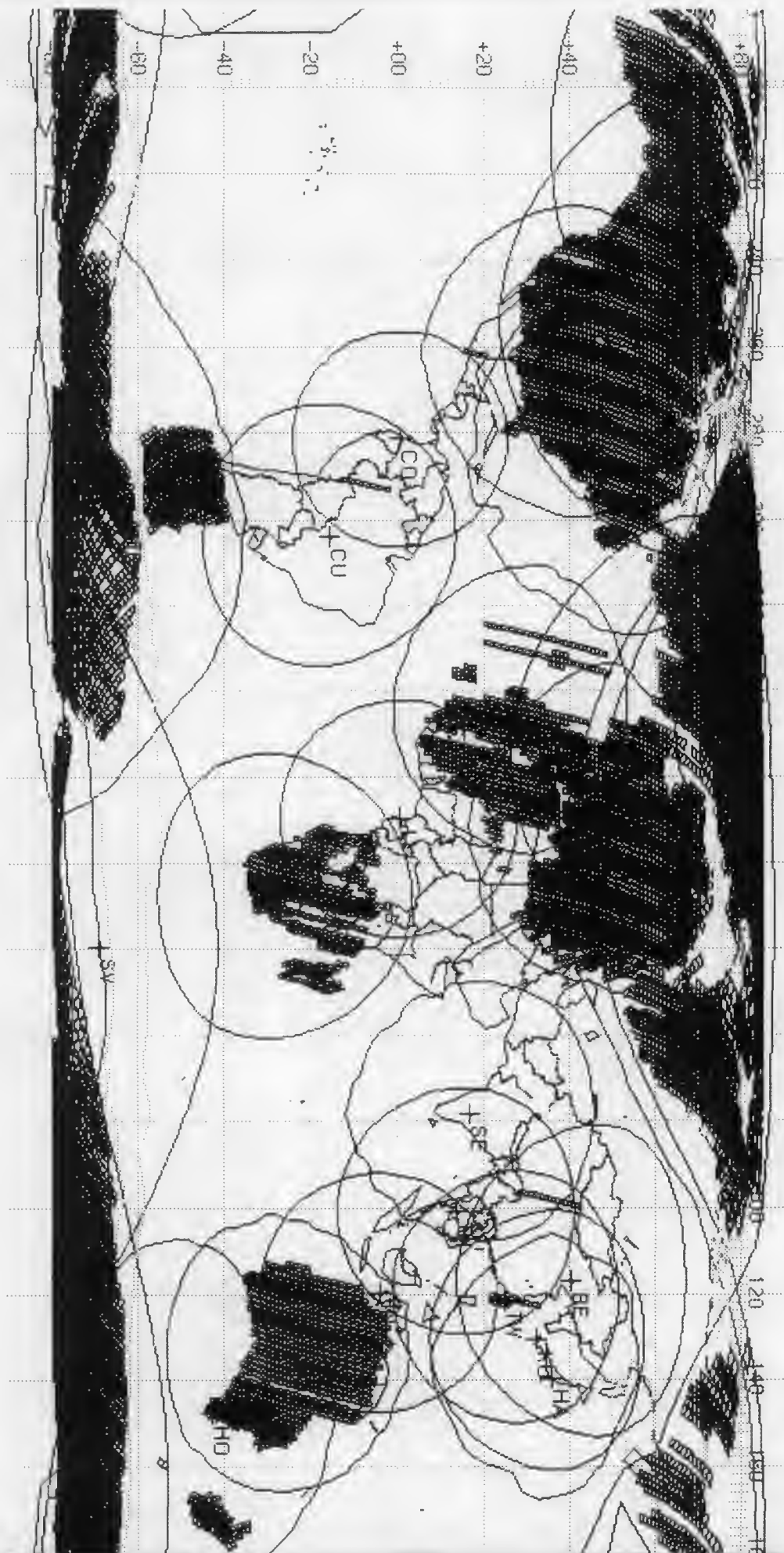




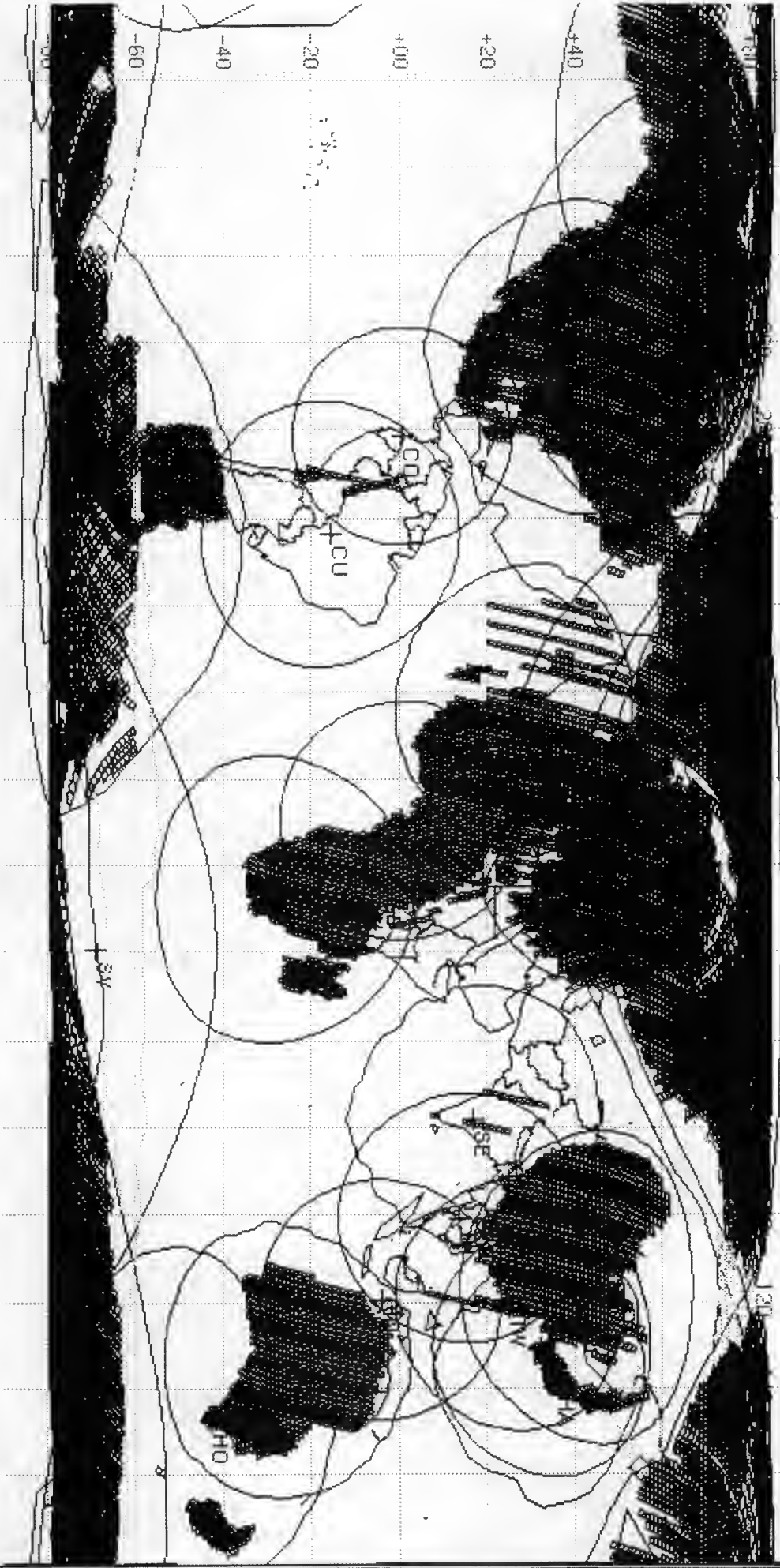
FOUR ERS-1/2 PAIR OR MORE ACQUIRED/PLANNED



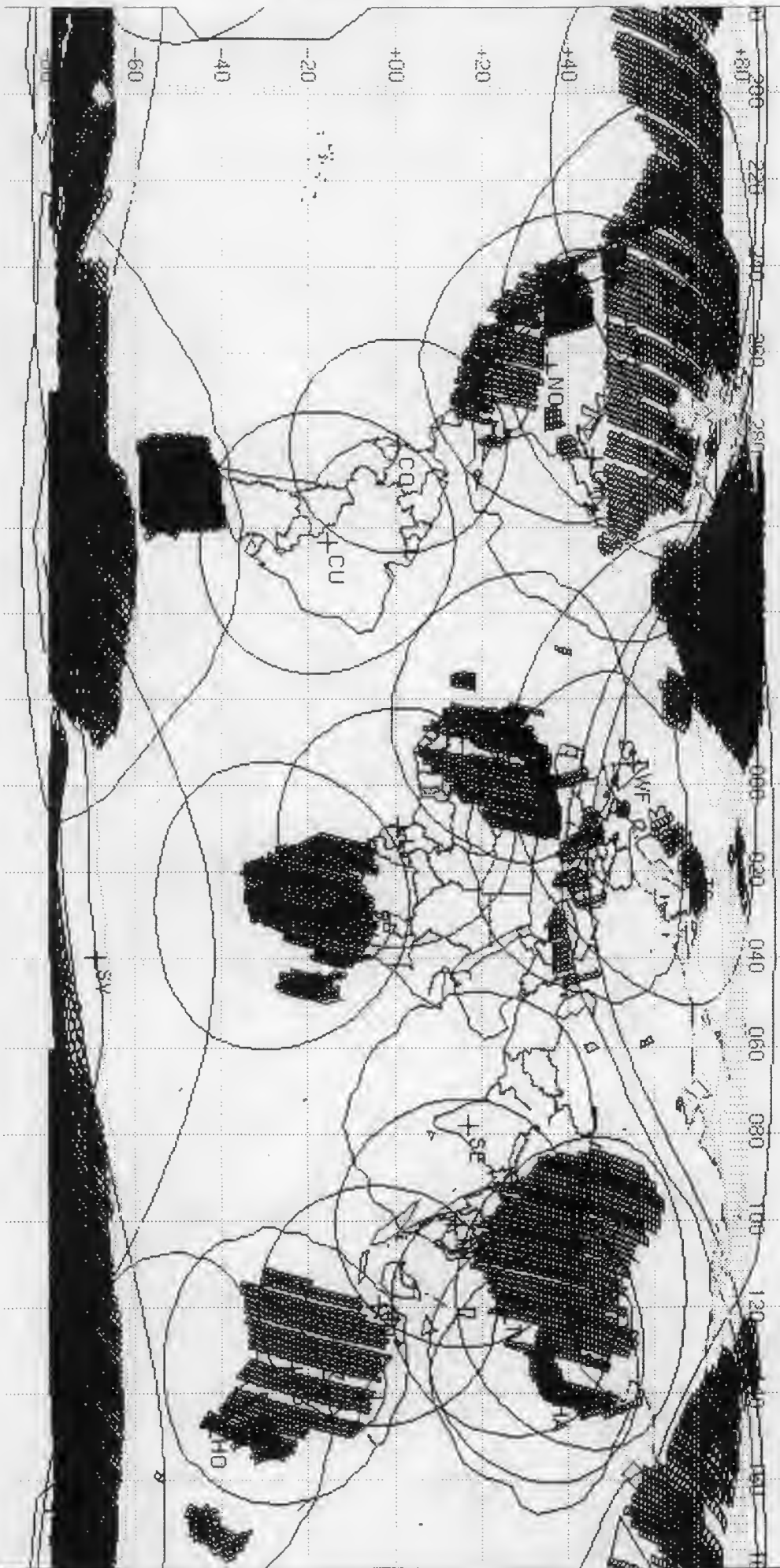
> THREE ERS-1/2 PAIR OR MORE ACQUIRED/PLANNED



TWO ERS-1/2 PAIR OR MORE ACQUIRED/PLANNED

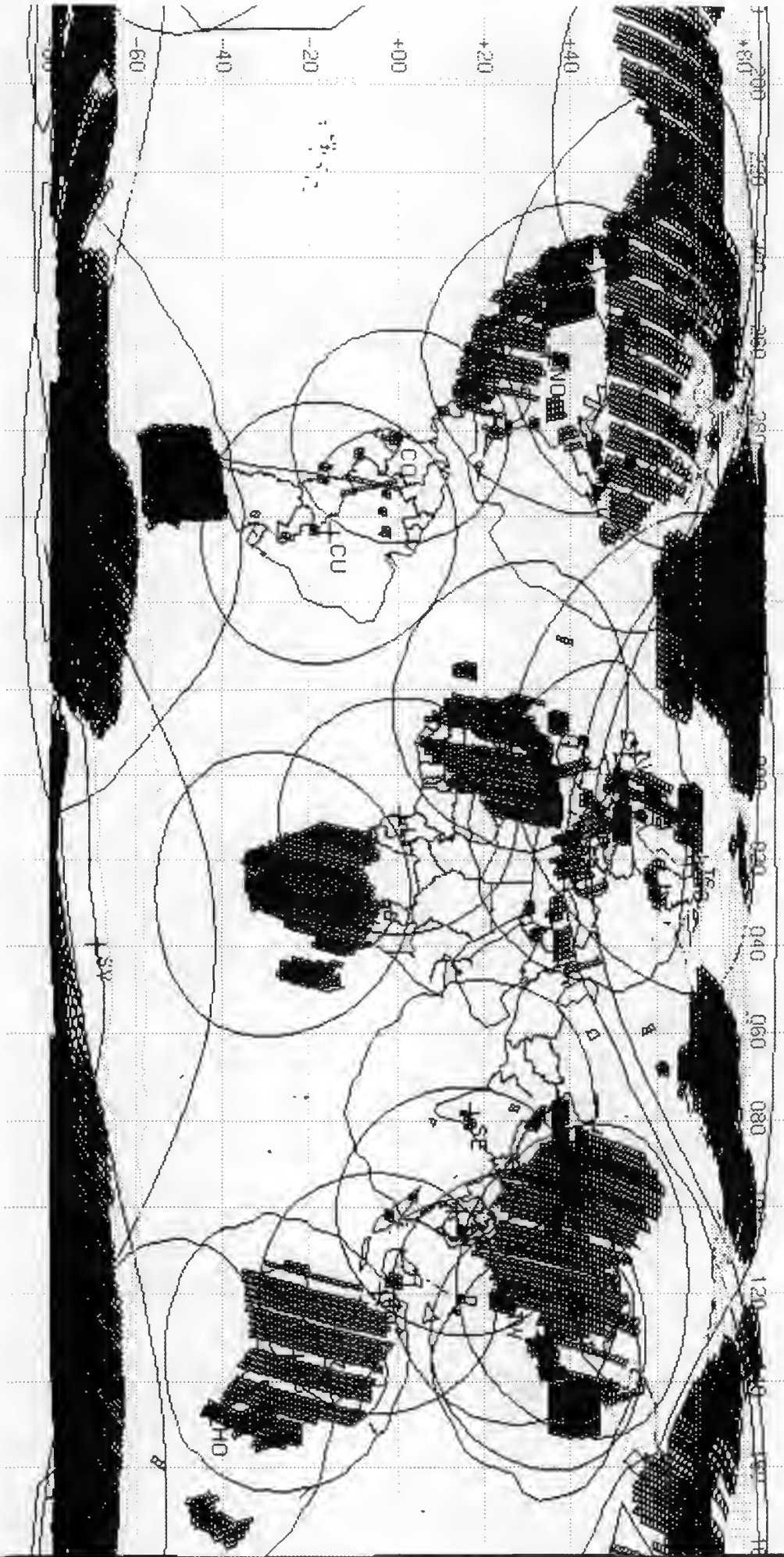


ONE ERS-1/2 PAIR OR MORE ACQUIRED/PLANNED



> ERS-2 planned acquisition Jan-Apr-96

>



ACQUISITION STRATEGY FOR GLOBAL 'TANDEM' MAPPING

(West and Central Europe are not mentioned in the table - will be planned whenever resources are available)

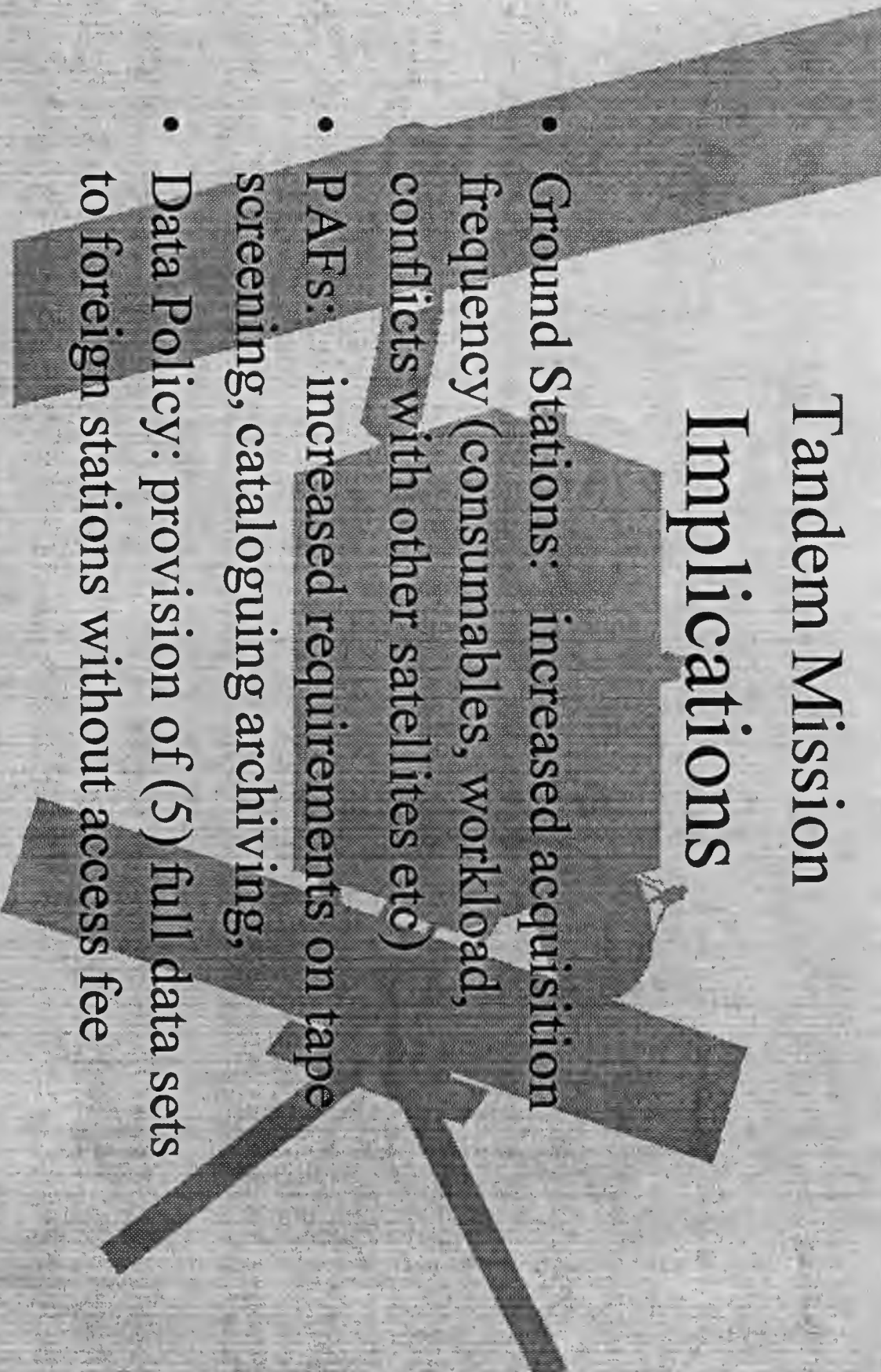
E1/E2 cycles	150/5	151/6	152/7	153/8*	154/9*	155/10	156/11
start of cycles	01/02-Oct-95	05/06-Nov-95	10/11-Dec-95	14/15-Jan-96	18/19-Feb-96	24/25-Mar-96	28/29-Apr-96
EUROPE							
Greenland+	1 full coverage		1 full coverage	1 full coverage			
Iceland							
NORTH AMERICA							
Alaska	desc. cov.	all desc. passes	all desc. passes				all desc. passes
Prince Albert,	desc. cov.	all desc. passes	all desc. passes				all desc. passes
Gatineau							
SOUTH AND MIDDLE AMERICA							
Cotopaxi							
Cuiba							
Norman			all desc. passes	all desc. passes		all desc. passes	
AFRICA							
Maspalomas	desc. passes	all desc. passes				all desc. passes	
Libreville		all desc. passes	passes			all desc. passes	all desc. passes
Johannesburg	start 20/11	all desc. passes	all desc. passes	all desc. passes			
ASIA							
Hyderabad			all desc. passes				all desc. passes
Singapore(TH,IN)							
Beijing, Taiwan			all desc. passes	all desc. passes		all desc. passes	
AUSTRALIA							
Alice Springs, Hobart		all desc. passes	all desc. passes				all desc. passes
ANTARCTICA							
O'Higgins	full	cov.		full coverage	full coverage		
McMurdo				full coverage	full coverage	full coverage	

* polar acquisition cycles with change of satellite inclination

all desc. passes no final confirmation from stations received

E2 amendment to E1 MoU not finalized

esa



Tandem Mission Implications

- Ground Stations: increased acquisition frequency (consumables, workload, conflicts with other satellites etc)
- PAFs: increased requirements on tape screening, cataloguing archiving,
- Data Policy: provision of (5) full data sets to foreign stations without access fee



Tandem Mission Implementation

- Acquisition user requests accepted for ERS-1 or ERS-1/2 pairs only (not for ERS-2)
- ERS-1/2 baseline planning focussed on full station coverages

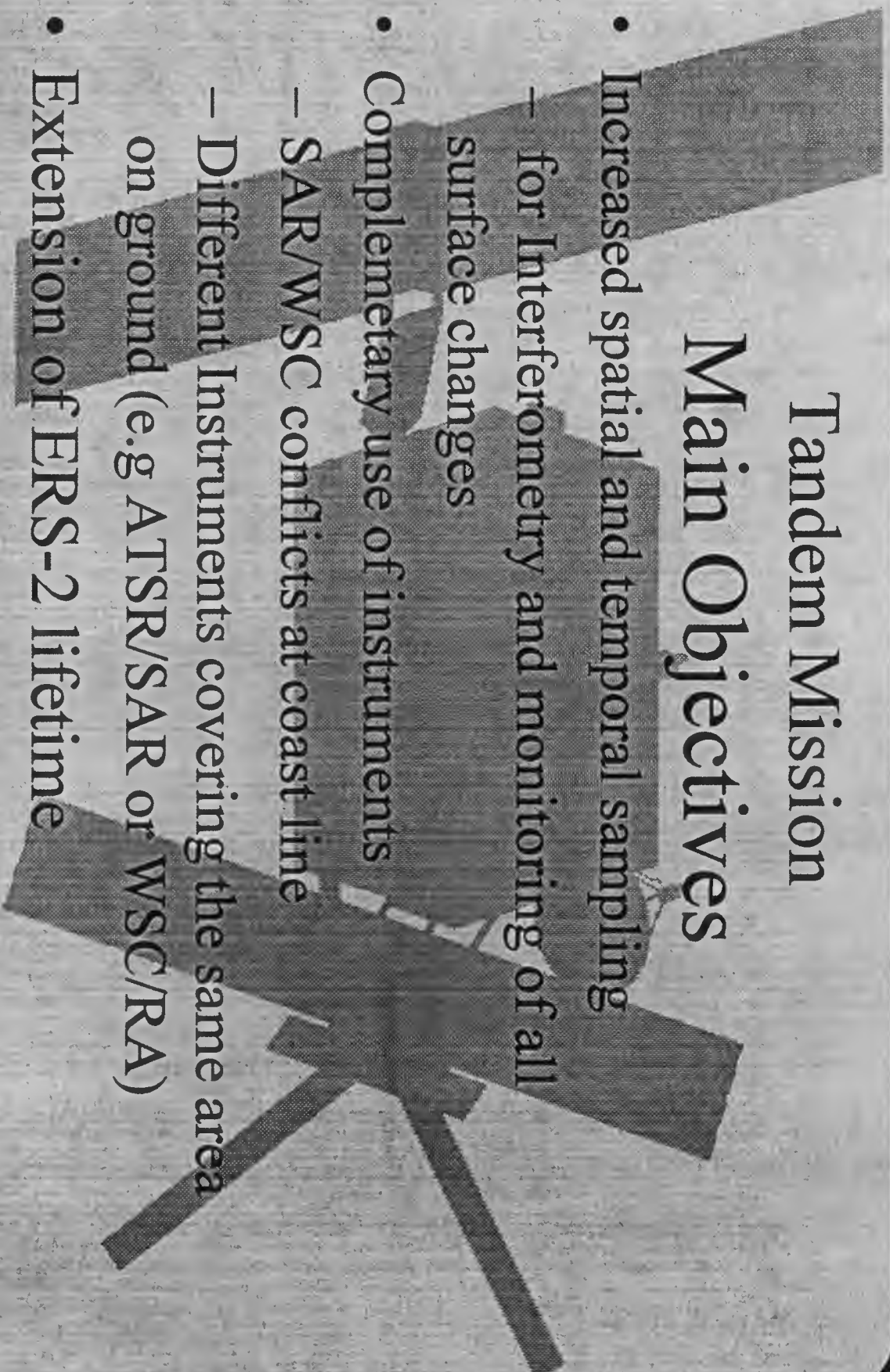
(Detailed Planning prepared by DEX-Mission Planner)

- (Detailed Planning prepared by DEX-Mission Planner)

Tandem Mission

Operational Requirements

- Orbit Maintenance:
 - max. across track separation E1/E2 80m to 250m
 - deadband at high latitudes 400 m
 - deadband at the equator 1000 m
 - orbit crossings in high latitudes
 - dedicated high latitude campaign with across track separation of about 120m at high latitudes



Tandem Mission

Main Objectives

- Increased spatial and temporal sampling
 - for Interferometry and monitoring of all surface changes
- Complementary use of instruments
 - SAR/WSC conflicts at coast line
 - Different Instruments covering the same area on ground (e.g. ATSR/SAR or WSC/RA)
- Extension of ERS-2 lifetime

ERS-2 Acquired and Planned SAR Frames vs. Ground Station

GROUND STATIONS	PHASE A
Alice Springs	3691
Bangkok	0
Beijing	2077
Cotopaxi	358
Cuiaba	192
Fairbanks	8407
Hatoyama	0
Hobart	2117
Hyderabad	425
Johannesburg	2621
Kamamoto	0
Norman	899
McMurdo	7075
Parepare	0
Syowa	0
Taiwan	180
Total Foreign Stations	28042
GRAND TOTAL	123961

ERS-2 Acquired and Planned SAR Frames vs. Ground Station

GROUND STATIONS	PHASE A
FUCINO	15722
KIRUNA	29771
MASPALOMAS	6061
TOTAL ESA STATIONS	51554
Aussaguel	0
Gatineau	6358
Libreville	1517
O'Higgins	10924
Prince-Albert	9852
Tromsø (*)	12246
WestFreugh	3468
TOTAL NATIONAL STATIONS	44365

ERS-1 Acquired and Planned SAR Frames vs. Ground Station

GROUND STATIONS	PHASE A	PHASE B	RTM	PHASE C	PHASE D	PHASE E	PHASE F	PHASE G	TOTAL
Alice Springs	2027	607	0	9606	128	561	986	6716	20631
Bangkok				2875	376	2001	567	39	5858
Beijing				691	0	0	49	5749	6489
Cotopaxi	108	290	68	4734	204	459	310	1123	7296
Qinaba	311	269	153	12303	48	1362	673	1531	16640
Fairbanks	13947	16696	136	70716	15012	22337	31842	32911	203597
Hatoyama	2181	489	0	9619	780	1283	1679	4066	19987
Hobart								2905	2905
Hyderabad	2048	878	0	15676	44	637	373	4596	24242
Johannesburg					206	1868	0	2889	4963
Kumamoto	2737	145	0	3363	1388	1970	2370	4408	16341
Norman								862	862
McMurdo								7052	7052
Papapae				513	891	30	1058	4017	6499
Syowa	1291	889	0	1240	328	915	401	182	5246
Taiwan				794	59	490	145	1684	3172
Total Foreign Stations	24650	20263	357	132020	19434	33903	40453	80700	351780
GRAND TOTAL	112033	88608	3027	460985	84325	123517	124141	256276	1254912

ERS-1 Acquired and Planned SAR Frames vs. Ground Station

GROUND STATIONS	PHASE A	PHASE B	RIM	PHASE C	PHASE D	PHASE E	PHASE F	PHASE G	TOTAL
FUNO	8894	3545	689	36411	5189	11207	8256	18706	92577
KRLWA	23876	19634	910	81768	22535	22947	22453	42743	238866
MAGPALOMAS	3714	670	174	13841	882	3366	2133	7507	32247
TOTAL ES STATIONS	36184	23849	1753	132120	28576	37510	32842	68865	361690
Aussequel	3912	0	0	931	0	0	0	0	4843
Galneal	6668	6222	560	41775	4574	10366	7760	18674	97189
Librairie						2066	0	1537	3603
OHiggins	514	4742	0	11070	5892	0	2788	10998	36004
Pinos-Albat	11408	8230	357	61504	4703	15047	15214	26753	143276
Tromsø (*)	18658	16675	0	71551	19719	20842	19003	37770	204118
West Fraugh	10139	8667	0	10114	1427	5193	6081	10888	52409
TOTAL NATIONAL STATIONS	51199	44495	917	198945	36315	54104	50846	106620	541442

eesa

TAPES FROM FOREIGN STATIONS

Last rec. tapes	1994 1995								Last open req.	Orbits at PAFs	Orbits		Delta days
	Quarters										curr. req.d		
	1.	2.	3.	4.	1.	2.	3.	4.					
Alaska									none	65		7	
Alice Springs									none	265		62	
Beijing									none	4		7	
Cotopaxi									Nov 95	254	22	9	
Cuiaba									Dec 95	327	58	11	
Hatoyama									none	98		36	
Hyderabad									stop	148	15	134	
Johannesburg									none	111		5	
Kumamoto									none	59		42	
Parepare									Oct 95	2	20		
Syowa									none	25		37	
Taiwan									none	16		6	

• Cuiaba and Cotopaxi sending original tapes/cass. (as of 12- Dec-1995)

• Bangkok station cannot copy tapes (production at station)

STATION REPORTING / SERVICE

- ▶ Not all stations systematically acquiring data as planned
- ▶ Not all stations reporting in time and/or as required (e.g.: acquisition result for each scheduled orbit, unavailability periods, etc.)
- ▶ On-line and off-line catalogues based on such reports, therefore the catalogues are only as reliable as station reporting, causing:
 - product ordering might result in data not available (lost acquisition not reported)
 - available data might not be visible through the catalogue
- ▶ Not all stations shipping HDDTs to ESA as promptly as required
- ▶ Not all stations providing a reliable service to the local users

ACQUISITION REQUEST PROCESSING FLOW



ERS User Services: ERS-1/2 Missions

ACQUISITION REQUESTS

- ▶ **Should be sent at least one month before the event**
 - the long planning loop and security margins require time
- ▶ **Should be sent to the ERS Order Desk by the station**
 - planning can be performed only if a station is willing and available to acquire the data
- ▶ **Should clearly indicate the associated campaign (when it exists)**
 - planning priority will be increased (increasing acquisition probability)
- ▶ **Could indicate the concerned user (or sent in parallel by the user)**
 - permits to inform end user when planning is not possible

ERS User Services: ERS-1/2 Missions

US **ERS** SERVICES



PLANNING RULES

▶ **Planning Priorities (descending order):**

- Calibration/Validation requirements
- Commercial requests
- User Requests from Participating Countries
- User Requests from non Participating Countries
- Background Mission

▶ **Major Constraints:**

- SAR must be activated: < 12 minutes in total per orbit, < 10 minutes in a segment, < 4 minutes during ascending passes
- LBR instruments have priority over SAR during ascending passes (night)
- SAR can be planned only in visibility of a ground station
- ground station must be available (working and no conflict with other missions)

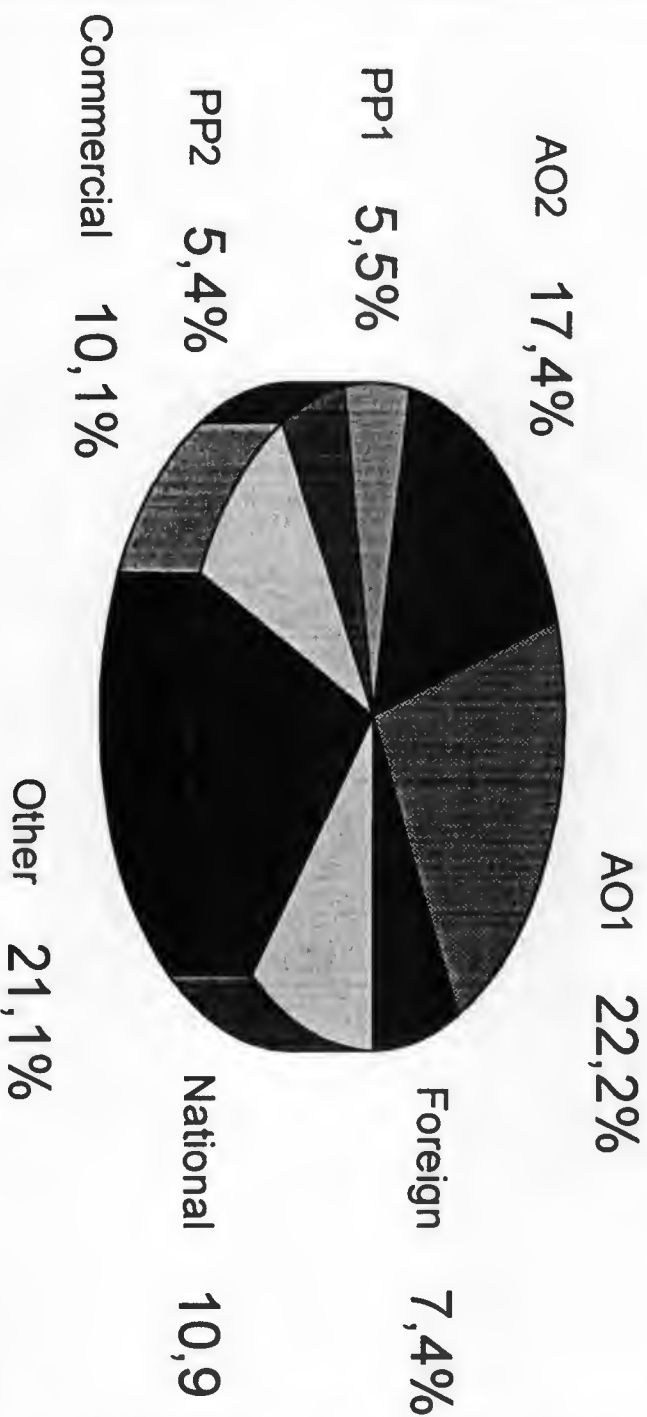
▶ **Once planned, all efforts are done to avoid de-planning (conflicts)**

PLANNING LOOP

▸ Mission Planning

- performed in close cooperation with MMCC at ESOC
- implemented through file exchange:
 - Payload Exploitation Plan (PEP) files to ESOC
 - Detailed Mission Operation Plan (DMOP) files to ESRIN
- large "security" PEPs sent at least one month ahead
- limited update PEPs sent weekly
- small PEPs sent for planning emergencies or last minute changes (up to 3 working days in advance)

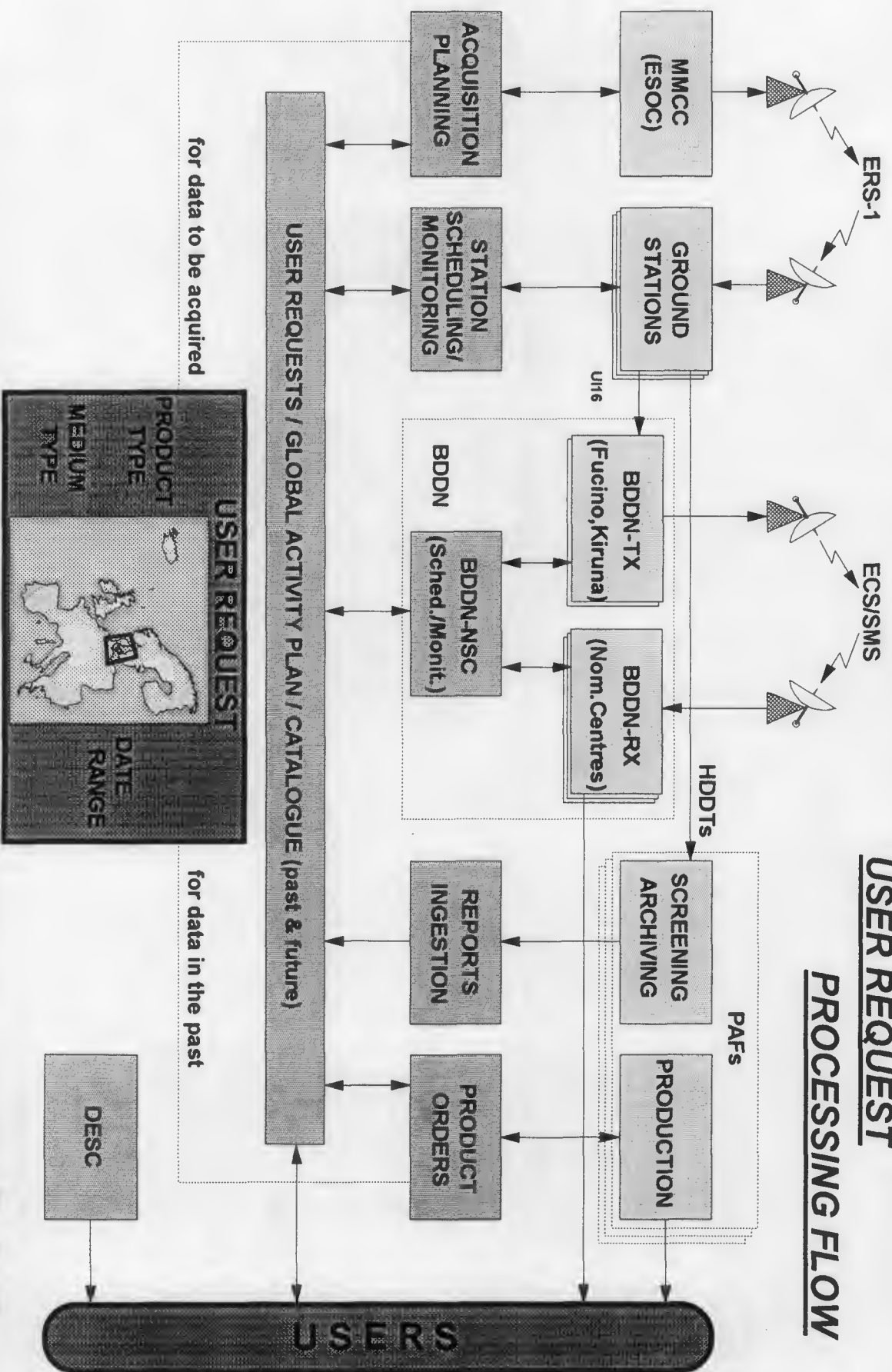
USER REQUESTS per USER CATEGORY



USER CATEGORY	NO. OF USER REQ.s
Foreign	1247
AO1	3767
AO2	2949
PP1	931
PP2	917
Commercial	1717
Other	3568
National	1851
TOTAL	16947

From mission start to Sep 29, 1995

USER REQUEST PROCESSING FLOW



US **ERS** SERVICES

ERS User Services: ERS-1/2 Missions

ON-LINE SERVICES (cont.)

■ On-line Server

▸ contains:

- Quick Look OPR Products (QLOPR - daily)
- DESCW and Update Files (weekly)
- Low Resolution Images (ULIR - daily) and DELI software
- INSAR Listings (for Interferometry)
- GAP
- Restituted Orbit Files (limited access)
- Regional LBR Service (on request; also via Internet and ISDN)

■ On-Line Documentation

▸ IRS database:

- contains about 30000 documents on Remote Sensing
- accessible via IRS and WWW

ON-LINE SERVICES

■ CUS

▸ permits:

- browsing of Framed or Global Products' Catalogues for SAR and LBR
- User Request entry and Status verification
- Global Activity Plan (GAP) browsing

▸ catalogues updated from planning information, station acquisition reports, archiving reports and manual corrections

▸ accessible via X.25 and VT200

■ GDS / WWW

▸ contains information, documents, images, animations, list of access points, etc.

▸ permits transfer of files via FTP

▸ accessible via major Wide Area Networks and public domain clients

ERS User Services: ERS-1/2 Missions

US **ERS** SERVICES



DOCUMENTATION

SOFTWARE PACKAGES

DISPLAY ERS-1 SAR COVERAGE (DESC) SOFTWARE (v 1.53) (Diskette)
DESCW SOFTWARE VERSION 1.2 (2X Diskette)
CEOS READER SOFTWARE PROGRAM FOR LOW BIT RATE PRODUCTS - UNIX
CEOS READER SOFTWARE PROGRAM FOR SAR PRODUCTS - UNIX
CEOS READER SOFTWARE PROGRAM FOR SAR PRODUCTS - UNIX (EXABYTE)

CD-ROMs

*THE ERS-1 SAR REFERENCE COVERAGE CD-ROM
*THE CD GUIDE TO ERS-1
*AVHRR CD-BROWSER
*SAR INTERFEROMETRY ORBIT LISTINGS - Dates of interest to be stated when ordering

*Available via Internet <http://services.esrin.esa.it>

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E-mail Address:
Mailing Address:
Name:
Organisation:
Address:
Town:
Zip Code:
Tel no: fax no:
Project Code:
Date:

ERS USER SERVICES/HELPPDESK

DOCUMENTATION

GENERAL

ESA-SP-1146
ESA-SP-1148
ESA-SP-1149
ESA-SP-1176/1
ESA-BR-109

ERS-1 SYSTEM
ERS-1 USER HANDBOOK
ESA ERS-1 PRODUCT SPECIFICATIONS
NEW VIEWS OF THE EARTH
LAND AND SEA ERS-1 APPLICATIONS
REPORT ON DESCOPING STRATEGY
EARTH OBSERVATION QUARTERLY (BACK ISSUES 39 TO 47)
DESCO INFORMATION ANNEX

SAR

ERS-1 SAR PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX A ERS-1 SAR, RAW CCT and EXABYTE
ANNEX B ERS-1 SAR FDC CCT and EXABYTE
ANNEX C ERS-1 SAR SLC CCT and EXABYTE
ANNEX D ERS-1 SAR PRI CCT and EXABYTE
ANNEX E ERS-1 SAR GEC CCT and EXABYTE
ANNEX F ERS-1 SAR GTC CCT and EXABYTE
INTERFACé SPECIFICATION FOR THE INGESTION OF USER SUPPLIED INFORMATION FOR GTCO3/GTCO4
ERS-1 SAR LOW RESOLUTION PRODUCT SPECIFICATION
AN ASSESSMENT OF SAR LOW RESOLUTION IMAGERY
ERS-1 SAR RADIO-METRIC CALIBRATION / ERS-1 SAR PRODUCTS VALIDATION*
ERS-1 SAR CALIBRATION DERIVATION OF BACKSCATTERING COEFF. SIGMA 0 IN ERS-1 SAR PRI PRODUCTS
ERS-1 INTERFEROMIC BASELINE ALGORITHM VERIFICATION
CEOS ANNOTATIONS STRUCTURE FOR ESA ERS-1 SAR PRODUCTS

LOW BIT RATE

CEX/E/92-10-002
CEX/E/93-01-002
C-EX-MUT-A21-01-CN
ERS-1 EPO-GS-0506
ERS-1 EPO-GS-5902 1
ERS-1 EPO-GS-5902 2
ERS-1 EPO-GS-5902 3
ERS-1 EPO-GS-5902 4
ERS-1 EPO-GS-5902 5
ERS-1 EPO-GS-5902 6
ERS-D-IF-22000
ERS-TN-ESA-GS-0207
ERS-TN-DPE-OM-GS01
ERS-TN-DPE-OM-GS02
RA UNAVAILABILITY PERIODS SINCE LAUNCH
ATSR UNAVAILABILITY PERIODS SINCE LAUNCH
ALTIMETER PRODUCTS USER MANUAL
ERS-1 LBR PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX A ERS-1 ALT RAW PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX B ERS-1 ALT FDC PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX D ERS-1 ALT OPB PRODUCTS CCT FORMAT SPECIFICATIONS
ERS-1 WSC FDC PRODUCT CCT FORMAT SPECIFICATIONS
ERS-1 WSC DWP PRODUCT CCT FORMAT SPECIFICATIONS
ERS-1 SWM FDC PRODUCT CCT FORMAT
CMOD3 MODEL DESCRIPTION
CMOD4 MODEL DESCRIPTION
A 1ST EVALUATION OF ERS-1 ALT OCEAN PRODUCTS
INFORMATION CONCERNING THE 2ND RELEASE OF ERS-1 ALT OPB02 PRODUCTS
INFORMATION CONCERNING THE 4TH RELEASE OF ERS-1 ALT OPB02 PRODUCTS
ERS-1 D-PAF GLOBAL PRODUCTS MANUAL (ORB PRU/PRC ALT EGM/QLOPR/SSHQ/SSHOG/ETOP)
INTERFACE SPECIFICATION DOCUMENT OF THE GOME DATA PROCESSOR
PRODUCT SPECIFICATION DOCUMENT OF THE GOME DATA PROCESSOR

SPECIAL OFF-LINE SERVICES

■ Documentation

- Preparation and maintenance of documents, promotional material, articles
- Updating of GDS / WWW information pages
- Preparation of CD-ROMs
(ERS-1 Guide, SAR Reference Coverage, ERS Spaceborn Radar Imagery)

■ Off-line Tools

- Preparation and maintenance of PC software packages:
DESCW (multi-mission PC tool for ERS-1/2, Landsat and JERS-1)
DELI (PC tool for UILR image display)
CEOS Format Reader (PC tool for SAR and LBR)

USER SERVICES

■ ERS Help Desk

- Interaction with all users for enquiries and complaints
- Distribution of documentation, tools, promotional material
- Performed in cooperation with the commercial partner

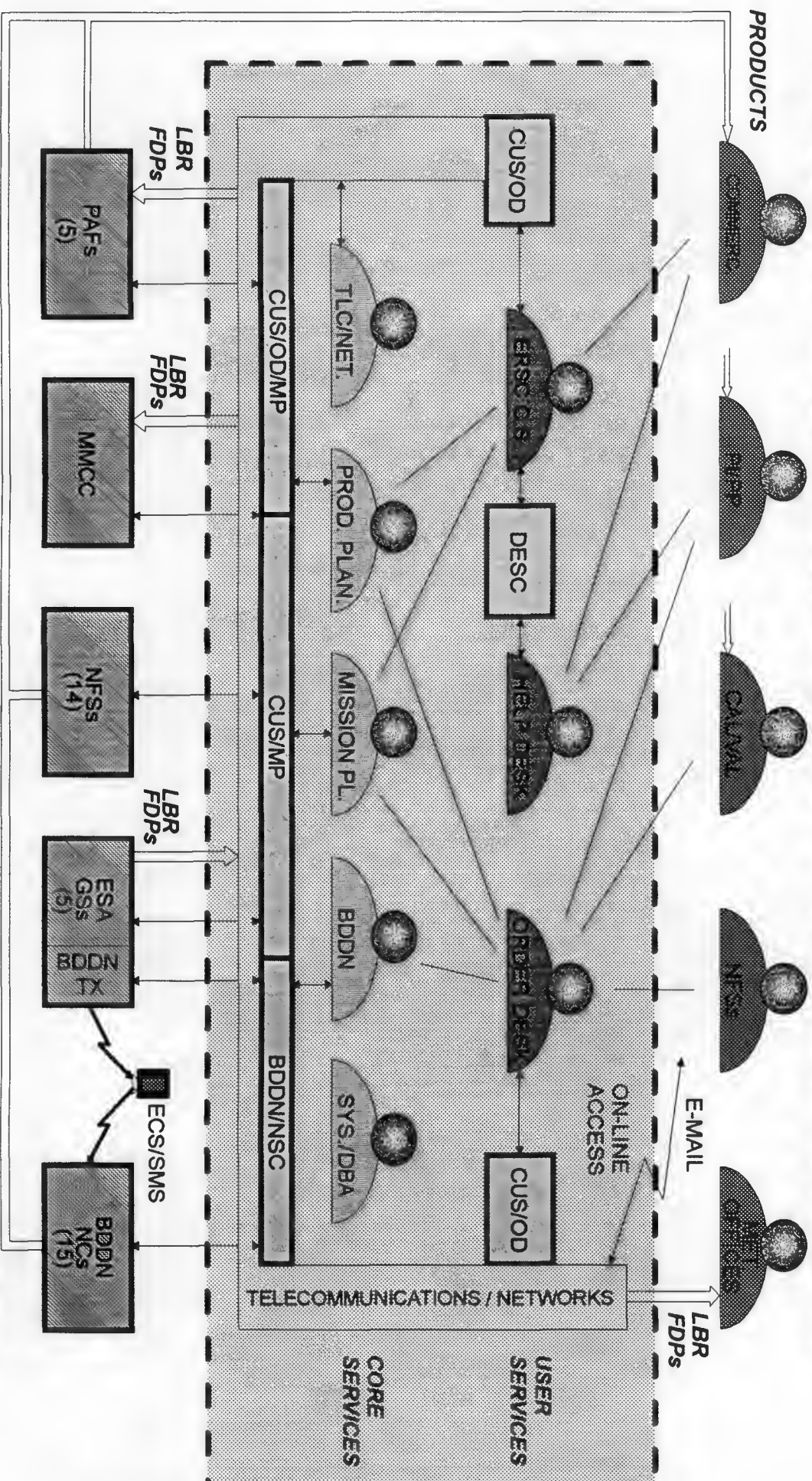
■ ERS Order Desk

- Interaction with PI/PP and ESA users for User Request definition and status reporting
- Handling of User Requests for Framed and Global Products
- Under direct ESA control

■ ERSC Customer Service

- Deals with commercial users from promotion to order handling
- Provided by the commercial partner

ERS USER SERVICES ORGANISATION



FUNCTIONS

▪ USER SERVICES:

- ▶ **USER INTERFACE (PIs, PPs, Commercial users, National & Foreign Stations)**
 - for help and order handling

▪ CORE SERVICES:

▶ **MISSION PLANNING and GROUND STATIONS' SCHEDULING**

- Input: User Requests, Baseline Acquisition Needs, Rules, Reports
- Output: Instruments' Activity, Stations' Schedules, Catalogue Updates

▶ **PRODUCTION PLANNING and MONITORING**

- Input: User Requests, Rules, Reports
- Output: Products (SAR and LBR), Media Shipment, Catalogue Updates

▶ **FDPS' DISSEMINATION and FILES' ROUTING**

- Input: SAR User Requests, Dissemination Rules, Products, Files
- Output: SAR FDPS (via BDDN) and LBR FDPS (via land lines) to Nominated Centres, Monitor / Control files (via land lines) to facilities

▶ **DOCUMENTATION**

- Prepare / maintain documents, promotional material, articles
- Update GDS / WWW information pages

DATA HANDLING CO-ORDINATION

	Fucino	Mas- palomas	Kiruna	Gatineau/ Pt. Albert	O'Higgins	Tromsø	ESRN	D PAF	F PAF	I PAF	UK PAF
ERS-1/2 SAR	RF	RF	RF		R		P	AP		AP	AP
ERS-1/2 LBR	(R)	RF	RF	RF		RF	P	AP	AP	AP	AP
Landsat	RAP	R	RAP				P				
JERS-1 SAR	RAP				R	RAP	P	AP			
JERS-1 Optical	RAP		RAP		R		P	AP			
SPOT		RAP									
Tiros		RAP				RAP	AP	RAP			
MOS	RA	RAP	RA								

Notes:

Tiros data are received also from:

Cairo, Dundee, La Reunion, Manila, Nairobi,
Niamey, Pretoria, Scansano, Terranova Bay
and archived and processed also at:
Dundee, Scansano

A = data Archiving

F = Fast delivery production

P = off-line Production

R = data Reception

HANDLED MISSIONS

Third Party Missions

- ▶ **Running:** Landsat, JERS-1, MOS, Tiros, SPOT
- ▶ **Old Experiments:** SEASAT, HCMM, NIMBUS, CZCS, Metric Camera

ERS-1 **ERS-2**

- | | | |
|--|---|---|
| ▸ SAR | X | X |
| ▸ LBR: | | |
| - Scatterometer, Wave, Radar Altimeter | X | X |
| - ATSR | X | |
| - ATSR-2, PRARE, GOME | | X |

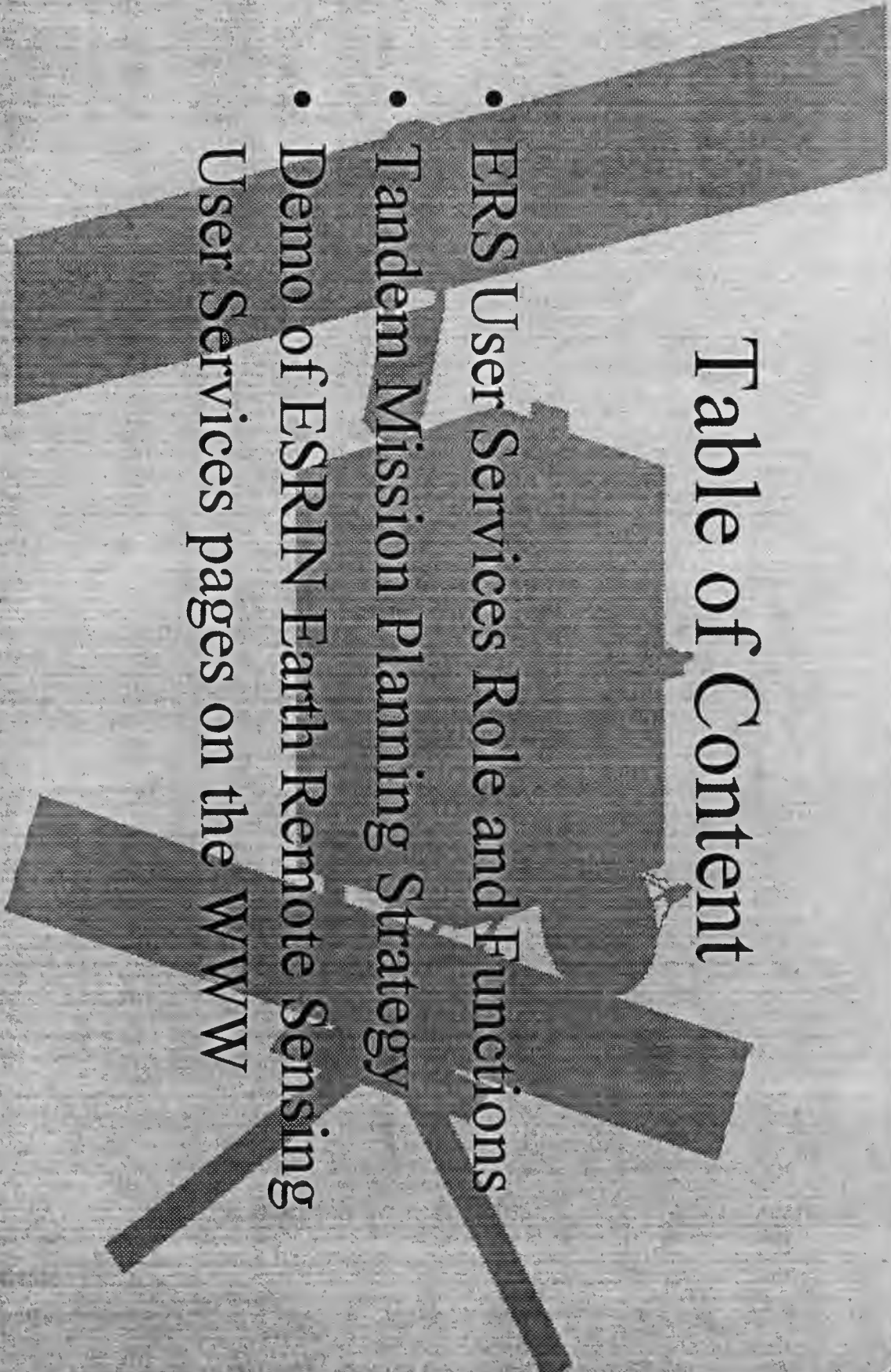


Table of Content

- ERS User Services Role and Functions
- Tandem Mission Planning Strategy
- Demo of ESRIN Earth Remote Sensing User Services pages on the WWW



ESRIN ERS User Services

ERS National & Foreign Stations Operators
Working Group Meeting

Toulouse, 14-15 December 1995

Simon Jutz ESA/ESRIN



esa

Conclusion

New stations coming up:

- German transportable in Ouzbekistan, Neustrelitz (tbc)
- Kenya (University Roma) and Pakistan (tbc)

What to improve for a better service:

- SAR Worldwide Catalogue (to update quickly after the pass)
- Tape delivery time very important for the end users (it's important for the reliability of the mission vis-a-vis the user)
- Media tracking not reliable (it's important to keep informed the user and refer to him about the situation)

How to improve (proposition):

- Set up new operational procedure for media tracking
- To use RAW data on CCT/EXA as product exchange between the NFSs and ESA instead of telemetry on HDDT
- To better use networks and communication lines available
- Esrin intends to install beginning of 96 four Pegasus recorders (one in Esrin, and three in Ecuador, Brazil and India)

Documentation & Tools

- Descw available on line
- ERS system
- ERS-1/2 sat. to ground segment int. spec.
- EECF-NFS Interface spec.
- SAR Data Quality Assessment and Rectification
- ESA Methodology for Calibration constant
- SAR products spec.
- CEOS format Documentation available for the NFS interested in
- CEOS reading software available on line

ESA WorldWideWeb accessible - <http://services.esrin.esa.it>

Technical support (communication lines)

• New connection with NFS based on TCP/IP:

Station	Protocol Type of Transport	Initiator of the connection	Status
Beijing	TCP/IP Public Internet	Station	Done
Alaska	TCP/IP Over X-25	ESA & Station	In Progress
Tromso	TCP/IP Private IP link	ESA & Station	Done
Singapore	TCP/IP Over X-25	Singapore	Done

Of course DECnet and FTAM transfer protocols remain supported by Esrin

ESA recommendation:

FTP Over TCP/IP

due to the fact that Internet is not reliable we recommend:

- to use a reliable transport (ex. TCP/IP over X-25)
- or to use a private IP link (ex. Link outsourced by BT)

Technical support (Communication lines)

ESA

NES

Predicted orbit
Preliminary schedule
Acquisition schedule
Time correlation

Reception of the report



(The data flow is bidirectional)



Reception Schedule

Acquisition report
Extracted data report
Unavailability report
Production report
Monthly report

Stations Validated

ERS-1

- Fairbanks
- Gatineau & Prince-Albert
- Tromsø
- Aussaguel
- Hyderabad
- Alice-Springs
- Bangkok

ERS-2 On board gain have been decreased (less power)

Do not invert the two antenna pattern

A new SAR processor has to be validated

Validation of NTS SAR products

The station processes ESA reference data set (Flevoland)...

Parameters to verify:

- Spatial resolution (range & azimuth)
- Peak sidelobe ratio (range & azimuth)
- Integrated sidelobe ratio
- Ambiguity ratio (azimuth)

(the ambiguity ratio should be measured from an appropriated image in which the ambiguity corresponding to one transponder appears over a very low backscatter area)

- Radiometric resolution
- Absolute localisation accuracy
- Some information proving that the processor behaves linearly would also be interesting (using synthetic point targets)

In addition, the processor should use:

- SWST bias of 6265 nsec. both for ERS-1/2
- Antenna Pattern correction (for PRI)

Validation of NFS SAR products

Responsibilities:

- Foreign Station: Demonstrate SAR Product Quality
- Esrin: Endorse SAR products for release

Deliverables to ESA:

- Information about the SAR processor
- Detailed SAR products specifications
- Detailed Validation procedures and results
- Samples products on exa/cct and on slides (with annotations)

Deliverables from ESA:

- Methodology to describe how the calibration constant is calculated
- Antenna pattern correction for ERS-1 and ERS-2
- Definition of the parameters to be verified

(SAR data quality Assessment and Rectification done by GEC-Marconi Research Centre under ESA contract)

Technical support (Station verification)

- **Ground station validation** - to ensure that the station is capable of properly acquiring, recording and archiving SAR Raw data - (antenna tracking capability, data acquisition test, recorders compatibility)
- **Products validation** - ensure that the station is capable of generating SAR products compatible with ESA products.

Part V = Comments

Part IV = Tape Shipment

Sat id = ERS-1 or ERS-2
Status = C for Copy, O for Original

Sat Id.	Orbit no.	Start/Stop date & time	Tape Id.	Status
------------	--------------	---------------------------	-------------	--------

Acquisition & Recording =

SAR Processor =

Data Production =

Data Distribution =

Equipment & Consumables =

Others =

By =	Report Date =
------	---------------

Please send this Monthly report to =
J-C. Bigot NFS coordinator & S. Jutz Mission Planner at ESA/ESSRIN, Via Galileo Galilei, I-00044 - Frascati
Fax no. +39.6.94180-632 and 280

Part III - Commercial Data Distribution

(Code X and E) =

Product type (or Station equivalent)	To ERSC distributor (Code E)	To Users in Station's Distribution Area* (Code X)	To Research Users* in distribution area (Code X)	(Code X and E) =		
				Quantity	Royalty	Total

Product type (or Station equivalent)	To ERSC distributor (Code E)	To Users in Station's Distribution Area* (Code X)	To Research Users* in distribution area (Code X)	(Code X and E) =		
				Quantity	Royalty	Total
RAW (Raw data)	N/A	x200	x100			
LRES (Low Resolution)	N/A	x100	x100			
LRES	N/A	x50	x25			
FD (Fast Delivery)	N/A	x200	x100			
FD	N/A	x80	x40			
FD (Precision Image)	N/A	x200	x100			
PRI	N/A	x180	x90			
SLC (Single Look Complex Quarter Scene)	N/A	x200	x100			
GEC (Geocoded)	N/A	x200	x100			
GEC	N/A	x240	x120			
GTC (Terrain Corrected)	N/A	x200	x100			
GTC	N/A	x400	x200			
Grand Total						

* In case of sale of Digital and corresponding photographic product, the royalty is only applicable for the digital data.
Note: data distribution invoiced quarterly

Part II = Production

Production =

Use	No of Users	Product type and number of product	Total
I			
X			
C			
E			

Code 1 = to NFS internal use (Tests, National Pl's agreed by ESA, product validation, etc.)

Code X = to NFS external use (Commercial users inside the country)

Code C = to ESA internal use (PI/PP, PR, campaigns, etc.)

Code E = to ESA external use (ERSC distributor)

ESA PI's production (Code C) and National PI's agreed by ESA (Code I) =

PI's User Id	User name	Proposal Id	Product type	Orbit No. or Start Date/Time of Scene	Quantity of Products

Part I = Acquisition

Status = C for Conflicts with other missions
F for Fully acquired
P for Partially acquired
L for Lost

7 of 107

ERS-1	Status	
ERS-2	Status	

Data Access =

No. of Scenes requested by Station	Access Fee/Scene (ECU)	Total (ECU)
		x 160

Note: Station will be invoiced quarterly

ERS Monthly Report

Ground Station =

Reporting

We would like to change for a new reporting procedure which should be more efficient both for you and for us...

Only two reports from NFS to ESRIN :!(instead of 4)

Acquisition reports - still at max. two days after the acquisition confirming or denying the acquisition... (so important to update the SAR worldwide catalogue !)

It's the only mean by which users have knowledge of what has been acquired by your station!). Thanks for them...

and...

A Monthly Report - on acquisition, production, commercial data distribution, tape shipment and general comments from NFS activities...

Tape Shipment

Procedure:

- Acknowledgment from NFS when Tape shipment request
- Fax to keep Esrin informed when the shipment is done
- Standard labelling system

SAR products characteristics

Product name	SAR.RAW	SAR.SLC	SAR.PRI	SAR.GEC	SAR.GTC
Product identification	Raw Annotated Data	Single Complex Look Image	Precision Image	Geocoded Ellipsoid Corrected	Geocoded Terrain Corrected
Input data	SD, Orbit	SD, Orbit	SD, Orbit	PRI	PRI, GEC
Number of looks	N/A	1	3	3	3
Spatial Resolution R/A (m)	N/A	<10/<10	<25/<22	<30 for E/N	<30 for E/N
Location Accuracy R/A	N/A	<2 res. cells	<2 res. cells	approx. 150m E/N	approx. 150m E/N
Geometric presentation	SR/A	SR/A	GR/A	UTM/UPS	UTM/UPS
Output pixel in range (m)	8	8	12.5	12.5 (eastings)	12.5 (eastings)
Output pixel in azimuth (m)	4	4	12.5	12.5 (northings)	12.5 (northings)
Number of Pixels in x (number of pixel per line)	5616	8000	8000	9100-12000 (eastings)	9100-12000 (eastings)
Number of Pixels in y (number of line)	28000	14000-16000	8100-8400	9100-12000 (northings)	9100-12000 (northings)
Bits per Pixel or Sample	8/8	16/16	16	16	16
Amount of Data (Mbytes)	ca. 300	ca. 150	ca. 130	165-290	165-290
Area covered (km x km)	100x110	50x(55-66)	100x102.5	100x100	100x100
Calibration	none	none	yes	yes	yes
Medium for distribution	CCT, EXA	CCT, EXA	CCT/E/XA/ film/Print	CCT/E/XA/film/ Print	CCT/E/XA/film/ Print

(R - Ground Range)
 SR - Slant Range
 N/A - Not Applicable
 SD - Signal Data
 R/A - Range Azimuth
 I/N - Easting Northing
 X - Range or Longitude
 Y - Azimuth or Latitude

NFS SAR production at ESA PAFs

For Selected ESA PI's the station should directly generate products or send the HDDTs to ESA for further processing

Despite a lot of efforts, some difficulties remain:

- Some stations not equipped to generate products
- Very limited production capability at some stations
- Difficulty to apply practically the agreement on production
- After requesting specific tapes some stations answer with a 'Data not acquired'
- Shipment of tapes to a PAF for processing takes too much time
- In some cases data is recorded on incompatible medium

NFS SAR production at ESA PAFs

- What:

SAR.RAW, SLC, PRI, GEC, GTC in ESA CEOS standard format

- Where:

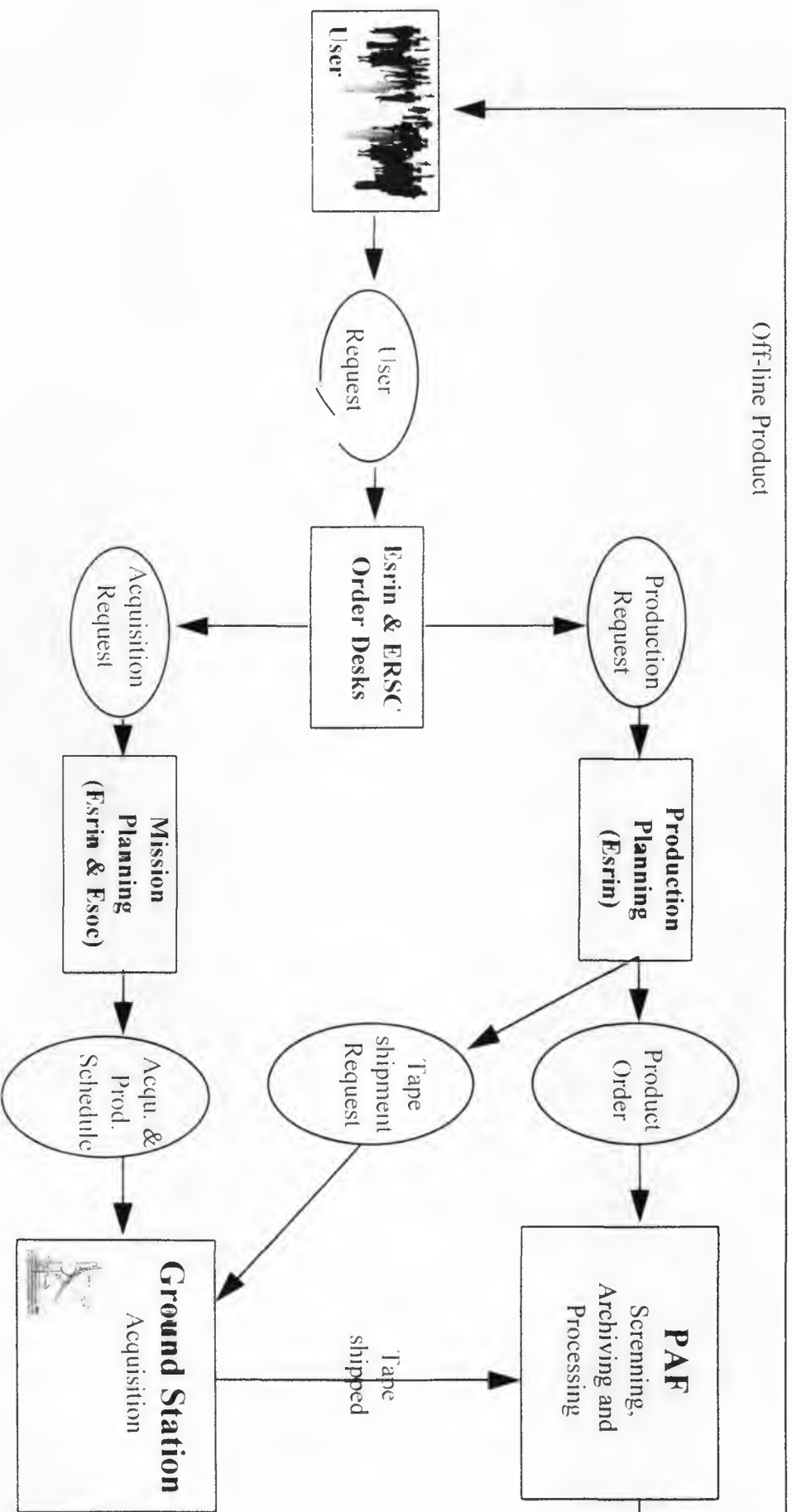
1- UK-PAF: (EDS-Scicon & later VMP 5.2 on Dec-Alpha)
West Freugh

2- Esrin Ref. Chain: (VMP 5.2 on Dec-Alpha, BKK on SGI Onyx)
Ecuador, Japan, Alaska, Alice Springs and Hobart
China, Indonesia, Israel, Saudi-Arabia

3- D-PAF: (VMP 4.2 on Vax and later 5.2 on Dec-Alpha)
All the others

- Future plan: to screen, produce QL and make available on the
WorldWideWeb the NFS QL archived at Esrin Ref. Chain.

Mission & Production Planning



Processing flow for user requests for SAR products

NFS general status

- **25 stations worldwide:**

21 stations with ERS-1 MOU signed for ERS-1

4 stations without MOU signed for ERS-1

14 stations with ERS-2 MOU signed

- Acquisition & recording problems for some stations

- SAR worldwide Catalogue update under improvement

- Tape shipment delivery very slow for some stations

- Rejection during production still important

but the overall situation is improving slowly...

Changes since last NFS meeting in 93

New satellite & mission:

- ERS-2 launch in April 1995
- Approval of Tandem mission using ERS-1/2

New Foreign stations:

China - Beijing,
Australia - Hobart,
Indonesia - Pare-Pare,
Israel - Tel-Aviv,
Saudi-Arabia - Riyadh,
South-Africa - Johannesburg,
Taiwan - Chung-Li,
Thailand - Bangkok,
Singapore and Libreville (Transportable)

New technologies:

- New recorders at Esrin for compatibility improvements
- Communication tools - Netscape - for ESRIN Home page

NFS dedicated team

Operational stations interfaces at ESRIN...

For What ...

- **COORDINATION AND TECHNICAL SUPPORT**

- Operational Procedures,
- Reporting,
- General questions,
- Technical assistance,
- Communication interfaces,
- Products validation & SAR calibration
- Upgrades, future developments, etc.

- **MISSION & PRODUCTION PLANNING**

- Station scheduling
- Definition and implementation of ESA baseline missions
- Planning of user requests
- Tape Shipment

To Whom to Address ...

- Jean-Charles BIGOT - NFS coordinator

Tel: +39-6-94.180.635,
Fax: +39-6-94.180.632,
e-mail: jcbigot@mail.esrin.esa.it

- Simon JUTZ - Mission and Production Planner

Tel: +39-6-94.180.735
Fax: +39-6-94.180.621
email: sjutz@mail.esrin.esa.it

NFS management at ESA

Just to let you remember ...

*Mission aspects
Data Policy
Agreements
International cooperation*

ESA/HQ

*ERS mission
management office
G. Duchossois
International affairs
J. Arets*

*Operations management
Day-to-day interfaces
Mission planning
Activities monitoring*

ESRIN - DEX/E - M. Albani

*Facilities Operation Section
V. Beruti
User Services Section
S. D'Elia
Mission Coordination & Product
Assurance Section
P. Lecomte
Data Utilization Section
G. Paci*

ESA/NFS cooperation items objectives

- ***TO REPORT*** both on ERS mission status (ESA) and on Stations activities status (NFS)
- ***TO SHARE*** technical and operational experiences
- ***TO EXPLORE*** solutions to common problem
- ***TO STRENGTHEN*** our interfaces

NFS management presentation

What are we going to discuss together ...

ESA/NFS cooperation items objectives

NFS management at ESA

- NFS dedicated team at ESRLN for operational stations interfaces

Changes since last NFS meeting in 1993

NFS general status

NFS operational procedures for:

- Mission Planning & Production planning
- NFS SAR production at ESA PAFs
- SAR Products characteristics
- Tape shipment
- Reporting procedure (new monthly report)
- Technical support for validation of SAR products from NFS
- Technical support for communication links interfaces
- Documentation & tools

Conclusion

ERS National & Foreign Station management

14 December 1995 - 14h00

by:

Jean-Charles Bigot

NIFS coordinator

Earth Remote Sensing exploitation division

ESA/ESRIN, Italy



1995 ERS Stations Operators Working Group 14-15 December 1995

Overview of ERS sales : ERS Consortium

- Among all ERS products, sales of SAR.PRI are the most important.
- For commercial land applications, sales concern mainly **mapping and geology / oil & mineral exploration**.
- For commercial marine applications, sales concern mainly **sea state climatology and offshore oil & gas exploration**.
- The ERS-1 and ERS-2 **Tandem Mission** is a good opportunity to produce large altimetric databases using SAR interferometry, and map coverages in tropical regions.

=> foreseen increase in demands for SAR **RAW**, **SLC** and **GEC** full scene products.



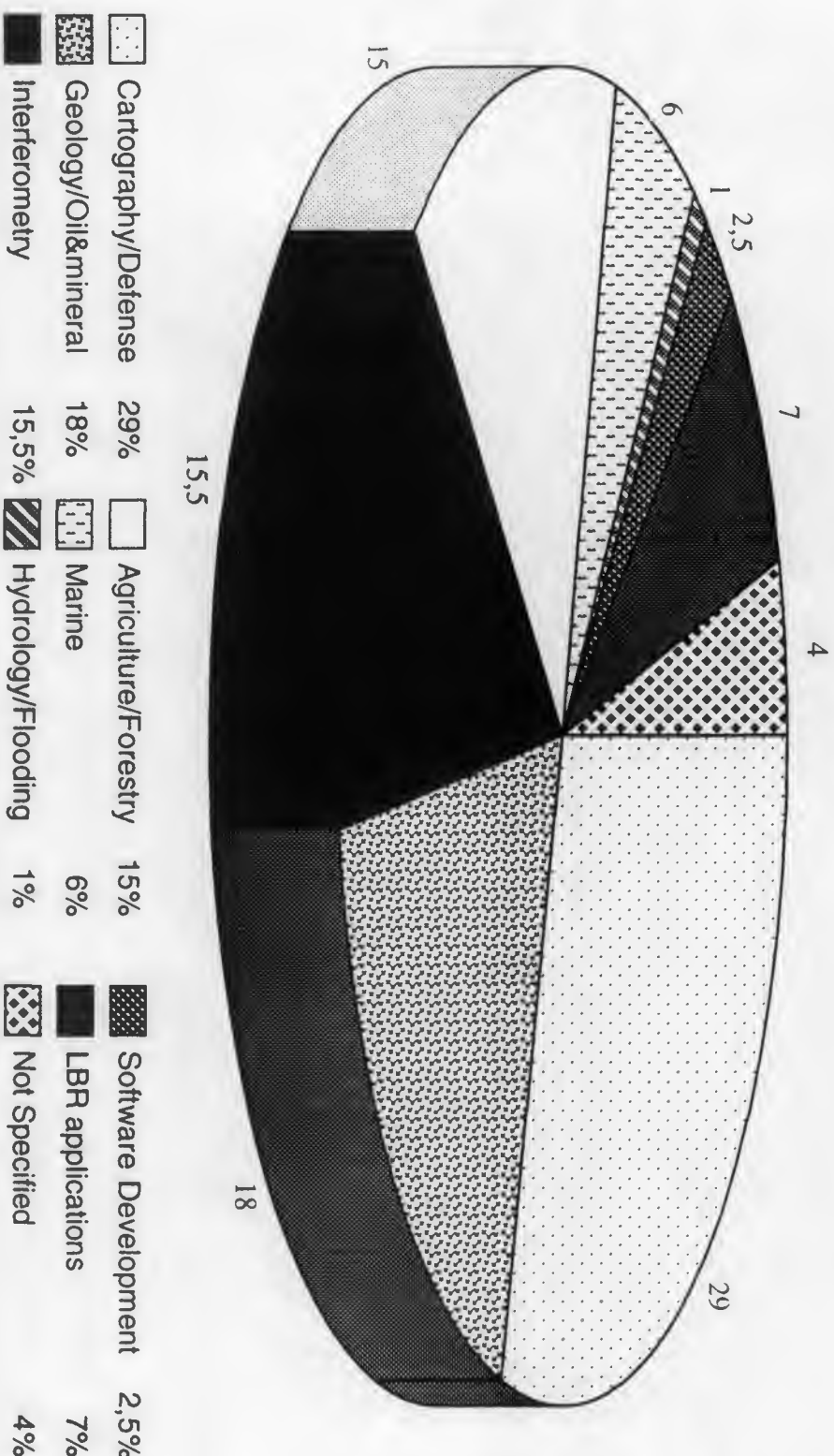
1995 ERS Stations Operators Working Group 14-15 December 1995

Overview of ERS sales : Spot Image

- ERS sales have **doubled** each year.
- Important increase in ERS data requests from Asia and from South America.
- Significant increase in orders for data archived and processed in Foreign Stations.

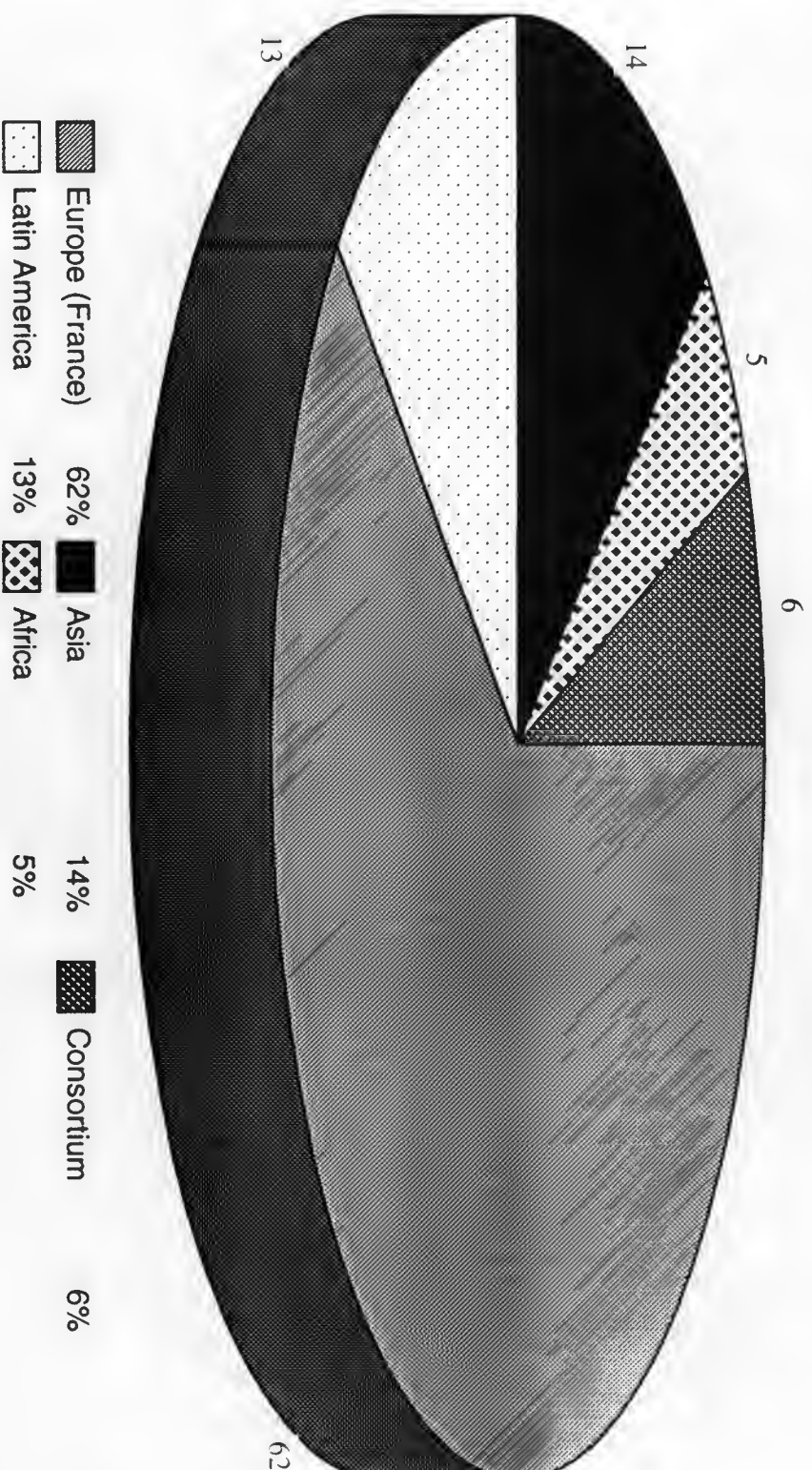
1995 ERS Stations Operators Working Group 14-15 December 1995

Spot Image ERS Sales 1995: Breakdown per Application



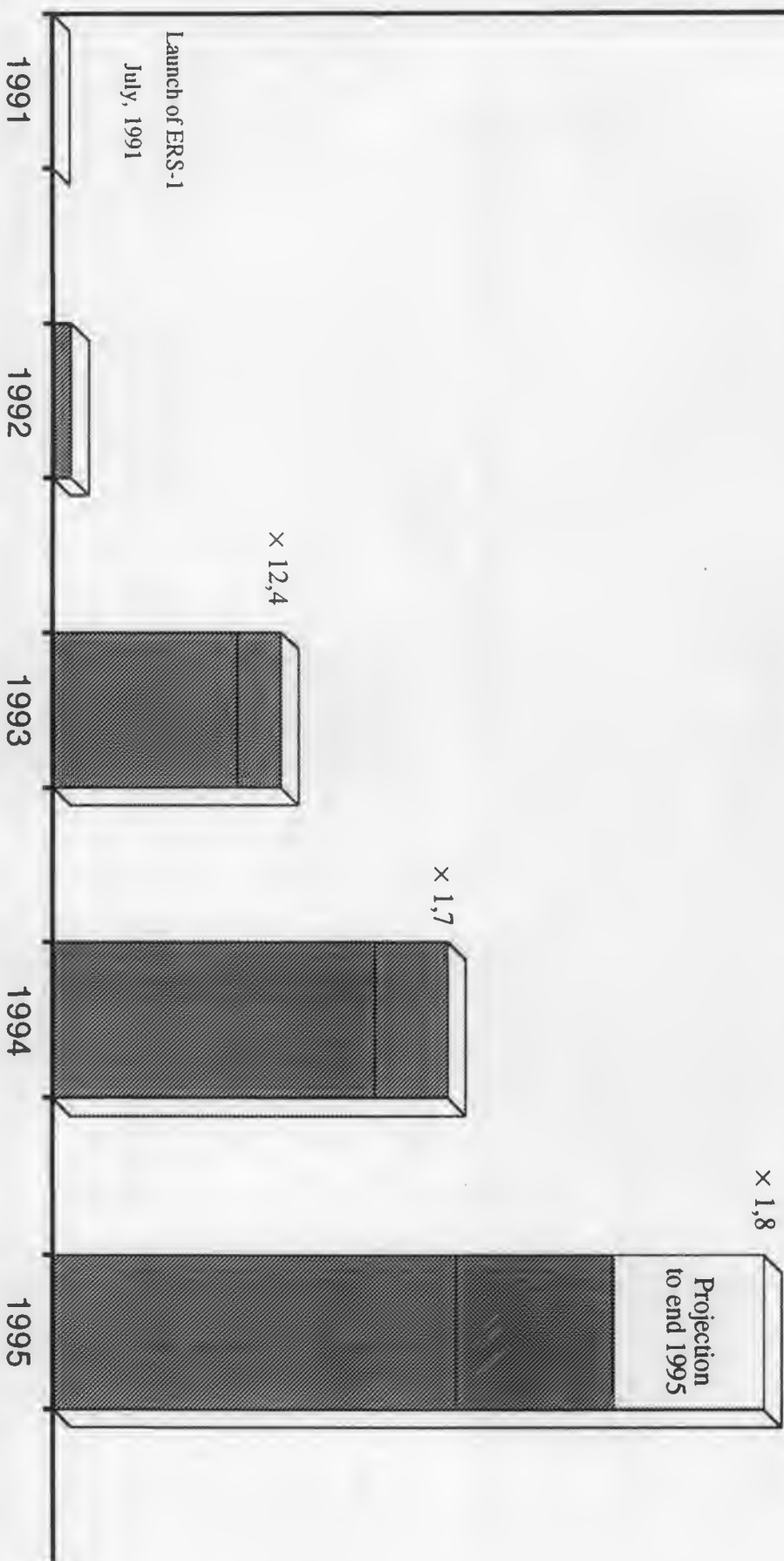
1995 ERS Stations Operators Working Group 14-15 December 1995

Spot Image ERS Sales 1995: Breakdown per Geographic Zone



1995 ERS Stations Operators Working Group 14-15 December 1995

Spot Image ERS Sales : Progression since 1991





1995 ERS Stations Operators Working Group 14-15 December 1995

ERS Consortium organization

- The ERS Consortium deals with customer orders, and markets ERS products.
- ERS data is acquired by ESA stations and National & Foreign Receiving Stations.
- ERS products are generated by ESA (PAF centres) and National & Foreign Stations.

1995 ERS Stations Operators Working Group 14-15 December 1995

ERS Consortium Structure

Eurimage

Europe*, North Africa, Middle East

Radarsat International

USA and Canada

Spot Image

Rest of the World

(*In France, Spot Image is sub-distributor to Eurimage)

2nd ERS Applications Workshop

250 Participants, 80 Presentations, 8 Demonstrations, 35 Posters
with the Applications ranging from

*Agriculture, Landuse, Forestry, Environment, Geology and
Mapping to Sea Surface Features, Sea Ice, Shiprouting, Winds,
Waves, Gravity Fields, Bathymetry and Coastal Application
and Mapping.*

Plenary Session and Round Table Discussion

Documentation on ERS achievements

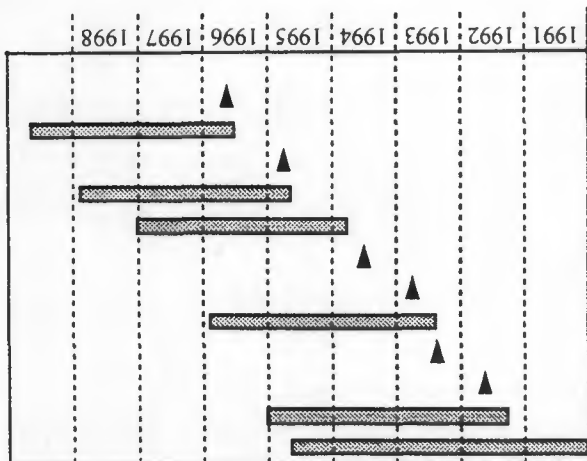
ESA has undertaken the preparation of a series of documents presenting highlights from the full range of achievements of the ERS-1 Mission:

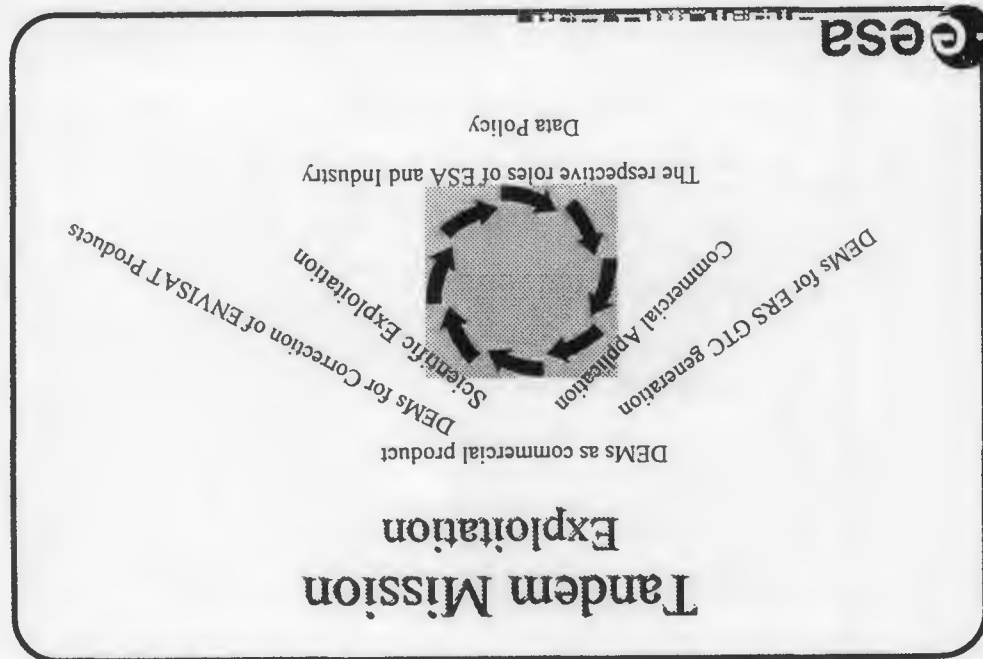
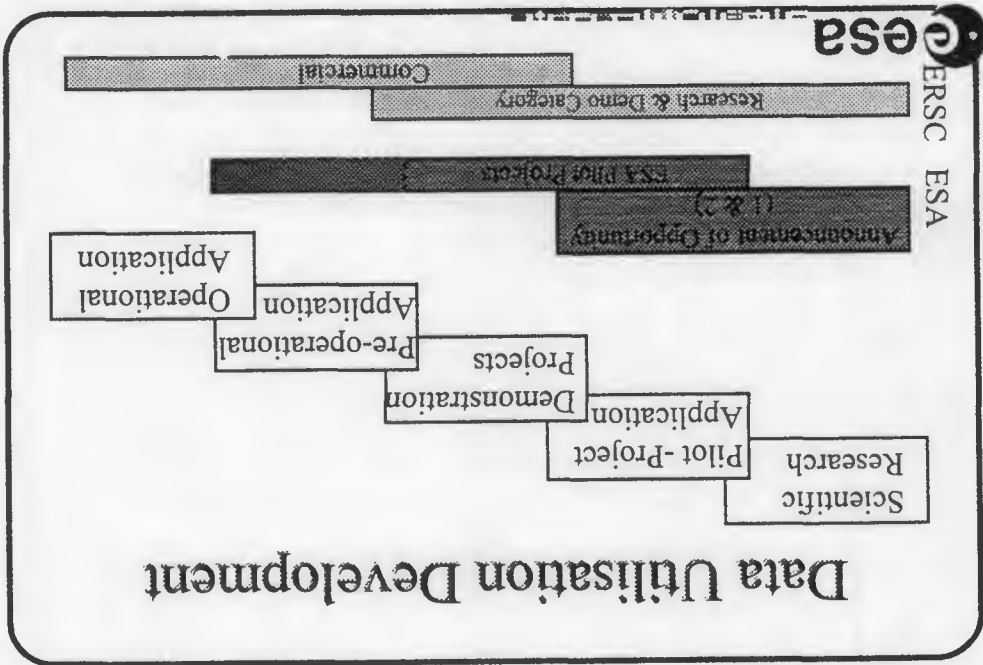
- Scientific achievements of ERS-1 (ESA-SP-1176/L, April 1995)
- Operational application achievements of ERS-1 (ESA-SP-1176/II, available shortly)
- Engineering and industrial achievements of ERS-1 (in preparation)

ERS Data Utilisation

- Scientific Research
- 2 Announcements of Opportunity issued in
 - May 1986: 270 Principal Investigators
 - results presented at the first two ERS-1 symposia in Cannes (Nov. 1992): 450 participants, 150 presentations
 - Hamburg (Oct. 1993): 700 participants, 270 presentations
 - Dec. 1993: 430 proposals received from 38 countries and 4 International Organisations (340 have been selected)
- Application Demonstration and Operational Utilisation
 - 150 projects selected worldwide in 1989 and 1993
 - results presented at Pilot Project Workshop in Toledo in June 1994: 220 participants, 100 presentations

ESA Data Utilisation Efforts





Evaluation of SAR Interferometry with 2 satellites

- During Commissioning Phase Interferograms using data from both satellites have been successfully generated within ESA
- products (not validated) over selected test sites have been distributed to Fringe users participating in the validation who also confirm the feasibility of the methodology
- Accuracy and some corrections (e.g. antenna mispointing) are under investigation in further detail and evtlly corrected

Tandem Mission Operational Requirements

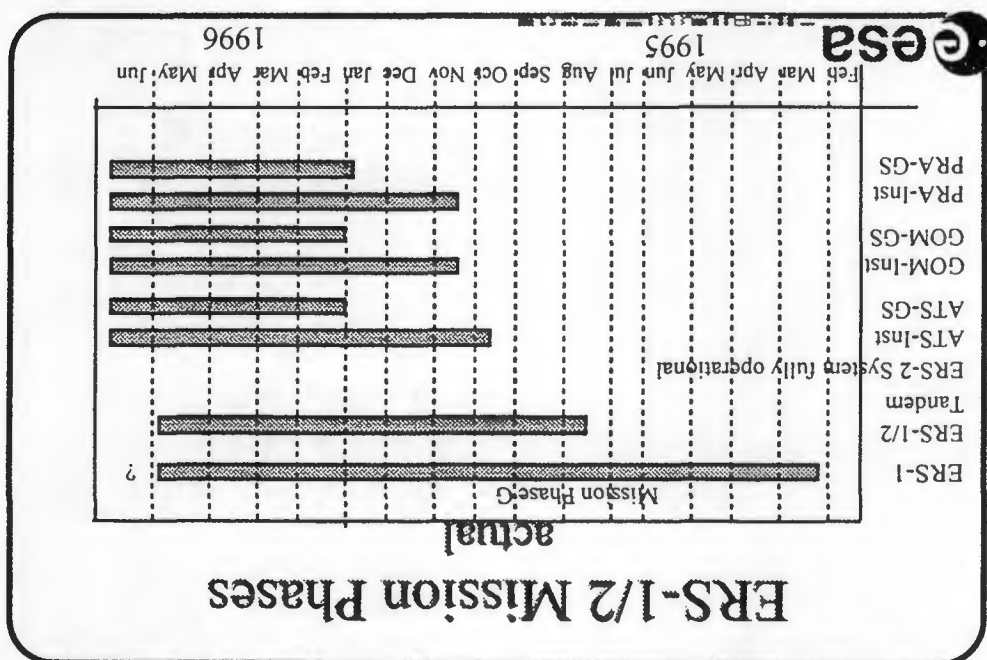
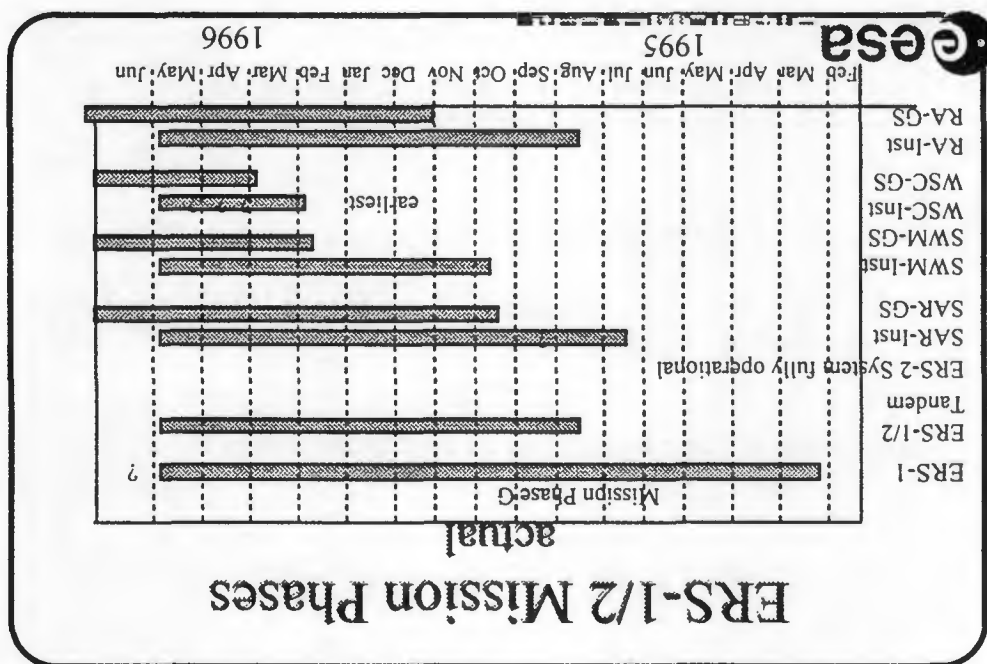
- Orbit Maintenance:
 - max. across track separation E1/E2 80m to 250m
 - deadband at high latitudes 400 m
 - deadband at the equator 1000 m
 - orbit crossings in high latitudes
 - dedicated high latitude campaign with across track separation of about 120m at high latitudes

Tandem Mission Operational Requirements

- Frequency of Acquisitions
 - about 5 SAR acquisitions/global land surface area (e.g. 2 ERS-1, 3 ERS-2)
 - also ascending acquisition pairs for areas with steep slopes (reduction of layover effected areas)

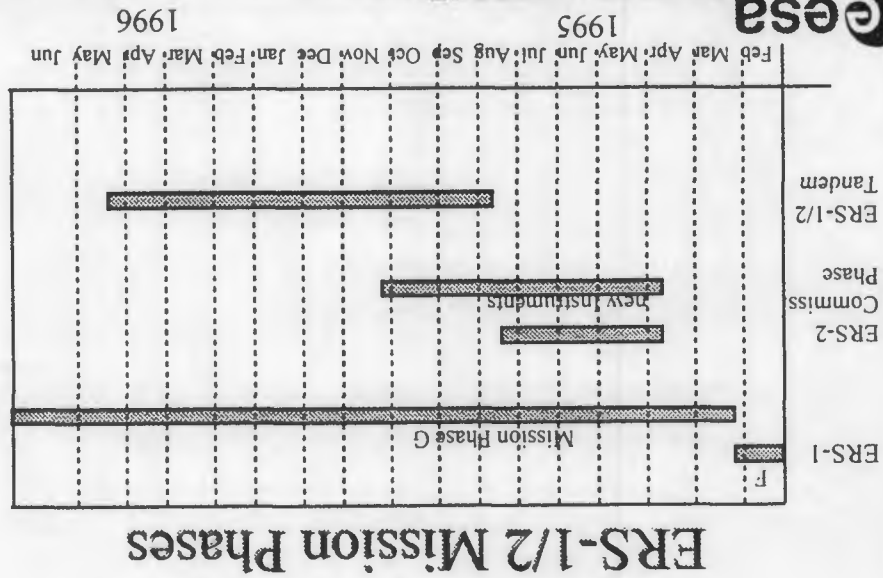
Tandem Mission Orbit Scenario

- 1 day offset of the same track between ERS-1 and ERS-2
 - ERS-1 is first
 - 30 min offset in the same orbital plane
- optional: 8 day offset of the same track between ERS-1 and ERS-2
 - implementation tbc (e.g. at the end of the nominal tandem phase)



Tandem Mission Main Objectives

- Increased spatial and temporal sampling
 - for Interferometry and monitoring of all surface changes
- Complementary use of instruments
 - SAR/WSC conflicts at coast line
 - Different Instruments covering the same area on ground (e.g. ATSR/SAR or WSC/RA)
- Extension of ERS-2 lifetime till Envisat launch



ERS-2 Status

Wind Scatterometer (2)

- a work-around solution was designed, validated and successfully tested
- Commissioning of the ERS-2 Wind Scatterometer is ready to start!

ERS-2 Status

Wind Scatterometer (1)

- switch-on of the ERS-2 Wind Scatterometer in May 1995 was unsuccessful: triggering of the receiver overload protection
- an extensive investigation campaign was set-up: on-ground unit and engineering model testing, in-orbit tests, ...
- nominal Wind Scatterometer service continues to be provided by ERS-1

- GOME calibration operation successfully finished, geophysical validation on-going since end July 1995
- PRARE commissioning on-going
- ATSR-2 commissioning on-going

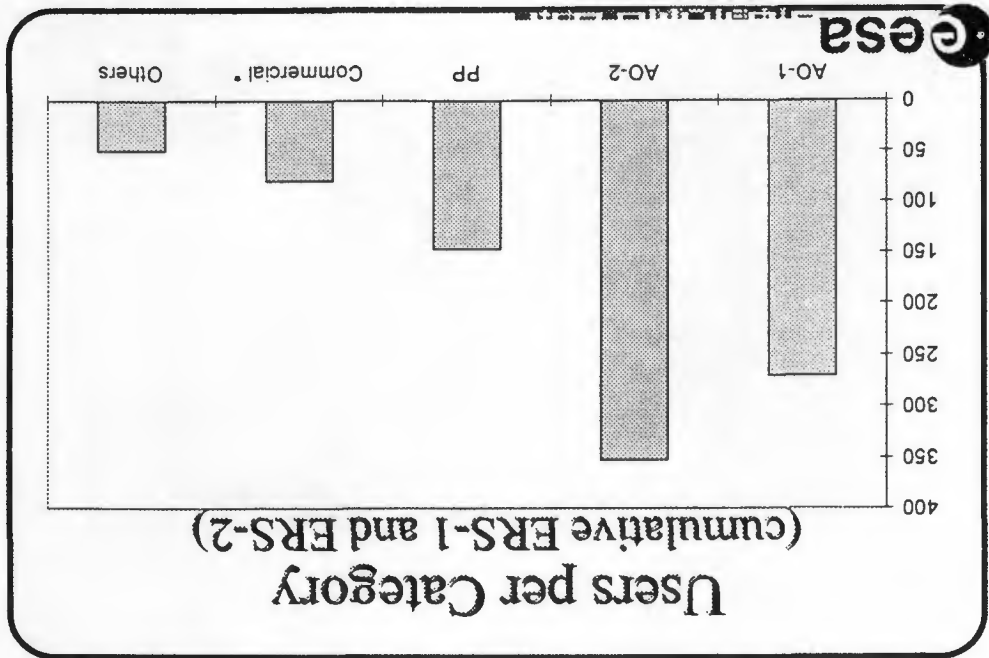
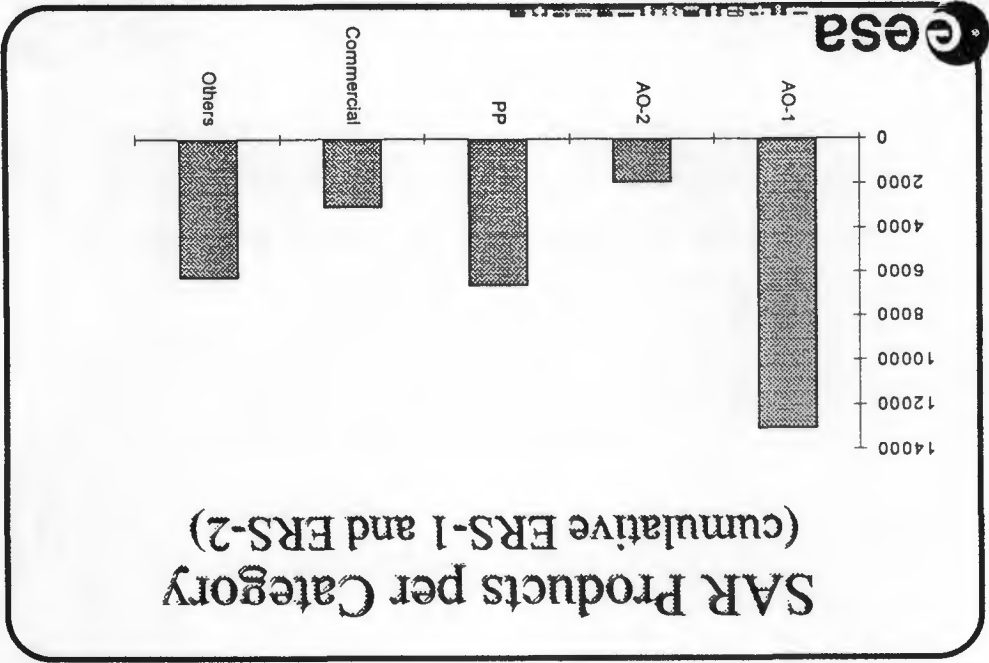
ERS-2 Status

new instruments (ATSR, GOME, PRARE)

- the ERS-2 Radar Altimeter (and Microwave Radiometer) has been successfully commissioned (August 1995) by cross-calibration with ERS-1
- SAR (image and wave mode) commissioning (on-ground transponders, tropical rain forest overflights) was completed in September 1995

ERS-2 Status

commissioning phase results



- ERS-1 ground segment has been upgraded for dual operations during ERS-2 Commissioning Phase and during Tandem Phase
 - separate ERS-1 and ERS-2 operation planning
 - separate acquisition chains at the ground stations
 - rehosting of the Low Rate Data Processing Facility
 - full Fast Delivery service limited to one satellite

Ground Segment



ERS Acquisition Stations

ERS-1 Status

- Since 19 March 1995, ERS-1 is back to the 35-day orbit : a stable orbit configuration which enables consolidation of the results of the multidisciplinary phase

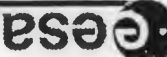
ERS-1 Status

- After 4.5 years in orbit, all ERS-1 instruments are still in operation during the geodetic Phase (two interleaved 168-day repeat cycles April'94-March'95) global marine geoid and gravity fields have been determined with an unprecedented resolution/accuracy

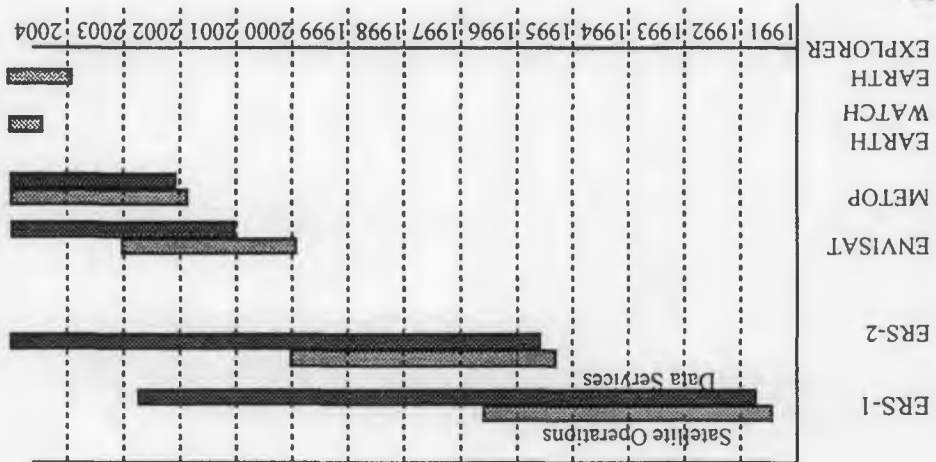
ERS NFS Operators Working Group Meeting

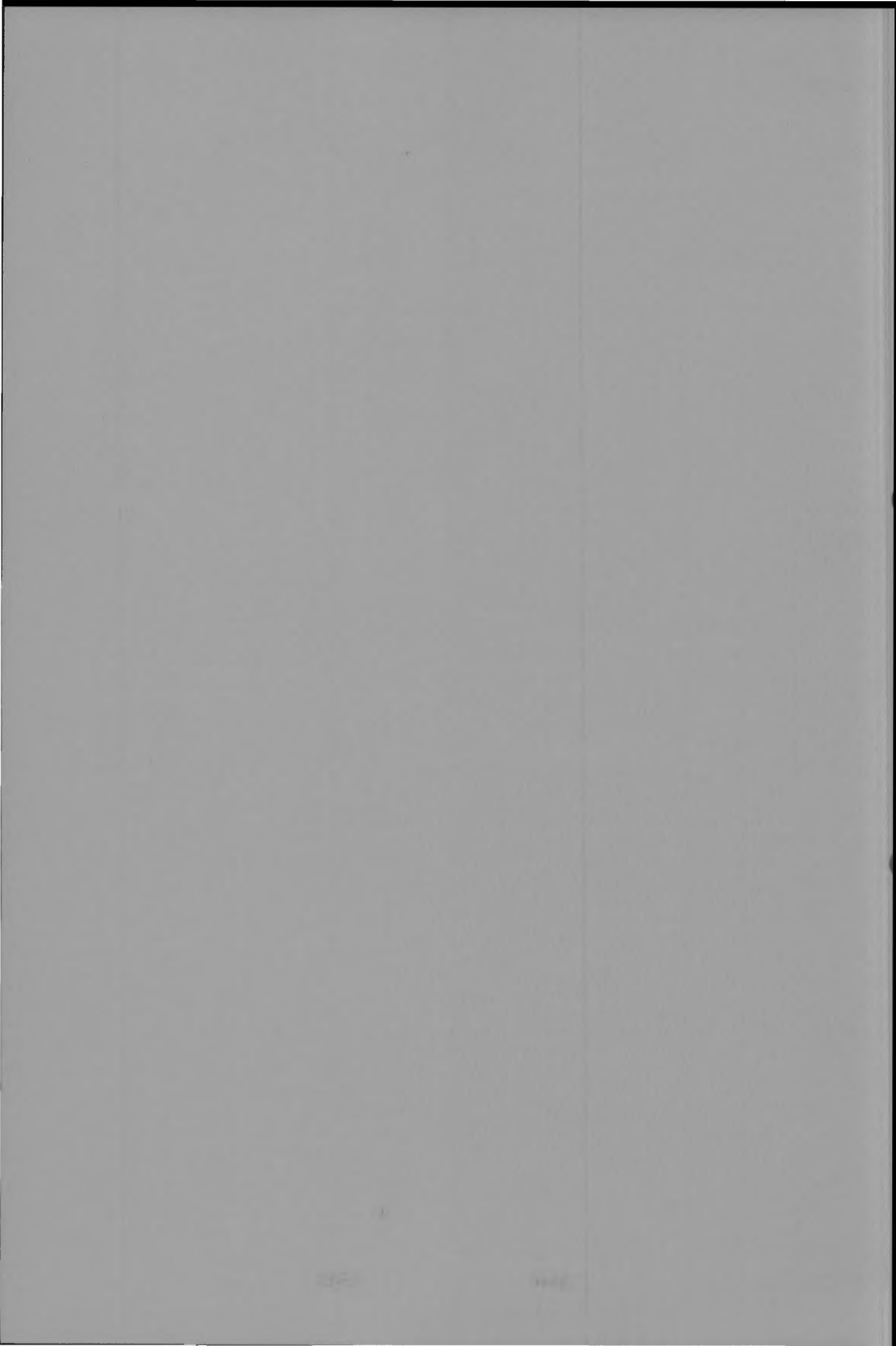
SpotImage
Toulouse, 14 - 15 December 1998

G. Duchossois
H/Mission Management Office



ESA Earth Observation Polar Missions





ERS-1/2 PRODUCT CONTROL SERVICE ESRIN

MAIN TASKS:

- **QUALITY CONTROL OF FD PRODUCTS**
- **LONG LOOP SENSOR ASSESSMENT**
- **SUPPORT TO VALIDATION OF PRODUCTS GENERATED BY NATIONAL AND FOREIGN STATIONS**
- **EVOLUTION OF PRODUCTS AND SERVICES TO SATISFY USER REQUIREMENTS**

ERS-1/2 LBR DATA DISSEMINATION TO FOREIGN STATIONS

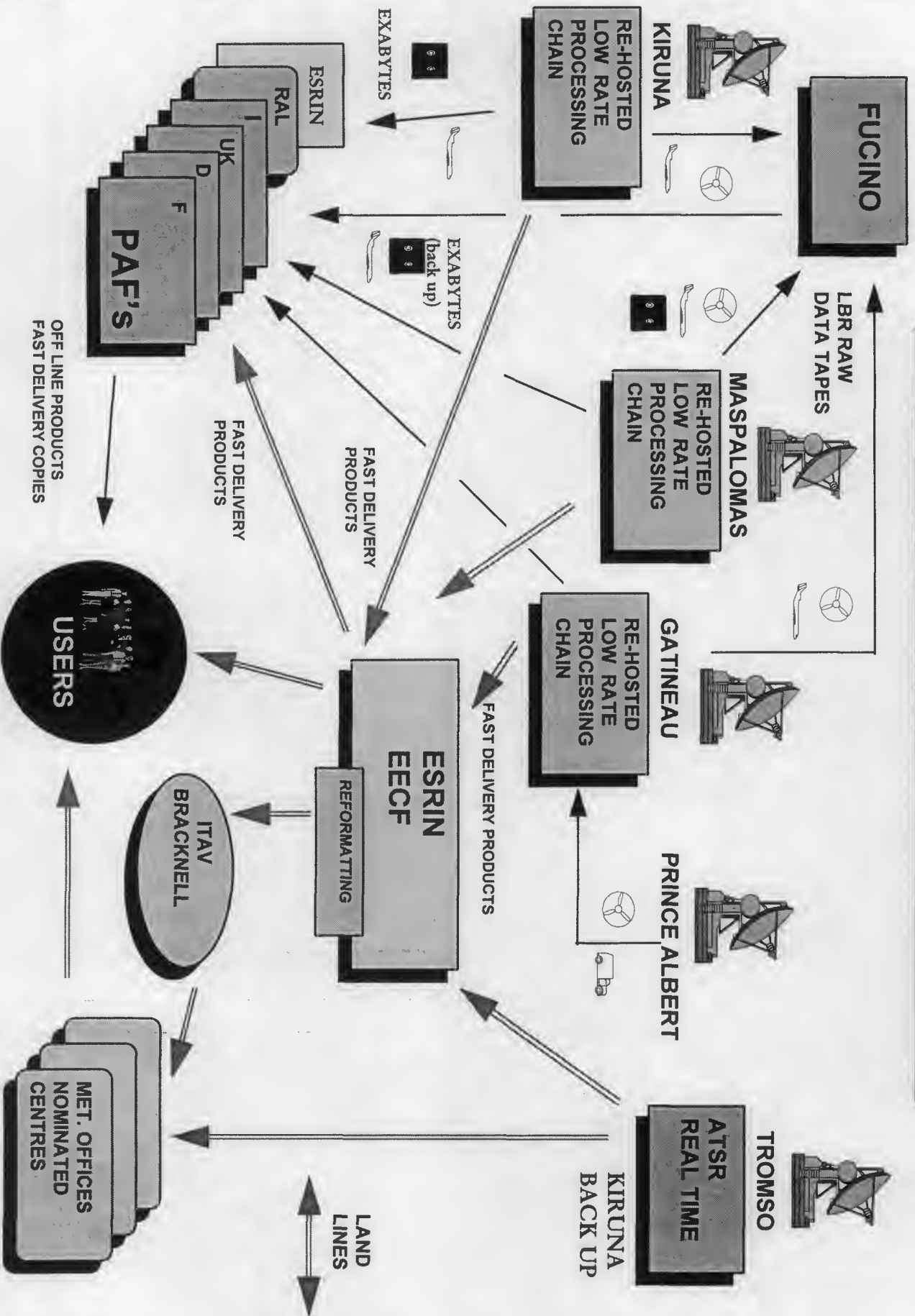
→ LBR FAST DELIVERY PRODUCTS ARE ROUTINELY DISTRIBUTED TO:

- JAPAN (NASDA)
- SOUTH AFRICA
- WORDL METEOROLOGICAL OFFICES (NOAA, AUSTRALIA, INDIA, UK, ECMWF, FRANCE, JAPAN)
- METEOMER (FRANCE)

→ REQUESTS FROM OTHER STATIONS UNDER EVALUATION

ERS-1/2 LBR DATA DISSEMINATION

- ↳ LBR FAST DELIVERY PRODUCTS ARE ROUTINELY DISTRIBUTED TO METEOROLOGICAL OFFICES OF PARTICIPATING STATES (AND NOAA) VIA THE GLOBAL TELECOMMUNICATION SYSTEM (GTS) IN A FORMAT SPECIFIED BY THE WORLD METEOROLOGICAL OFFICE
- ↳ 25000 LBR FD PRODUCTS PER MONTH ARE INJECTED IN THE GTS WITHIN AN AVERAGE DELAY FROM SENSING OF 2 HOURS 40 MINUTES FOR EACH SATELLITE



ERS-1/2 LBR DATA ACQUISITION

→ GLOBAL DATA DUMPED FROM ON BOARD TAPE RECORDER ARE
ACQUIRED ONLY BY THE ESA STATIONS OF KIRUNA, MASPALOMAS,
GATINEAU, PRINCE ALBERT, FUCINO (as back up), TROMSOE (for
the ATSR Real Time products distribution)

PROBLEM AREA

- **TAPE RECORDERS INCOMPATIBILITY (BEING SOLVED)**
- **LOCAL PROBLEMS (CUSTOMS, DIFFICULTY TO PROCURE TAPES, LOCAL LAWS, ETC.)**
- **CONFLICTS WITH OTHER MISSIONS**
- **LACK OF TIMELY REPORTING**

ERS-1/2 WORLD STATIONS COVERAGE AREA



as of 03 Apr 95

STATISTICS OF NFS PRODUCTS (October 95)

Station	ESA PI/PP and intern. use	Commercial	TOTAL
NORWAY	9259	5948	15207
ALASKA	33653	10	33663
CANADA	3326	543	3869
INDIA	205	51	256
AUSTRALIA	373	84	457
BRASIL	260	52	312
JAPAN	1150	1	1151
SOUTH AFRICA		10	10
TAIWAN		85	85
INDONESIA		45	45
TOTAL	48226	6829	55055

FOREIGN STATIONS PRODUCTION SITES

→ SITES WHERE SAR DATA FROM FOREIGN STATIONS ARE DOWNLOADED:

Station	Site	Recorder Current Future
● COTOPAXI (ECUADOR) ● HIDERABAD (INDIA) ● ALICE SPRINGS, HOBART (AUSTRALIA) ● HATOYAMA (JAPAN) ● KUMAMOTO (JAPAN, Tokai University) ● SYOWA, ANTARCTICA (Polar Instit., JAPAN) ● FAIRBANKS (USA) ● CUIABA (BRASIL) ● PRETORIA (SOUTH AFRICA) ● TAPEH RS RESEARCH ● PARE PARE (INDONESIA) ● NORMAN (USA) ● RSGS BEIJING ● MCMURDO (ANTARCTICA, USA) ● NAIROBI (KENIA, TELOS) ● TEL AVIV (ISRAEL) ● RIYADH (SAUDI ARABIA) ● SINGAPORE ● BANGKOK (THAILAND)	ESRIN D-PAF/ESRIN ESRIN ESRIN ESRIN ESRIN ESRIN ESRIN D-PAF/ESRIN D-PAF/ESRIN D-PAF D-PAF ESRIN D-PAF/ESRIN ESRIN - - ESRIN ESRIN ESRIN ESRIN D-PAF	DCRSi HD96a P&G MDR HD96b HD96b HD96b HD96b DCRSi HD96a HD96a HD96a HD96a DCRSi PEGASUS P&G1/2 DCRSi HD96a PEGASUS HD96a HD96a
		Pegasus Pegasus Creo Dir1000 Dir1000 Dir1000 Dir1000 Pegasus Pegasus Pegasus Pegasus Pegasus Dir1000 Dir1000 Dir1000 Dir1000 Dir1000 Dir1000 Dir1000 Dir1000 Dir1000

ERS-1/2 SAR NON ESA STATIONS

STATIONS WITH NO ERS-1 MOU SIGNED:

- TEL AVIV (ISRAEL)
- RIYADH (SAUDI ARABIA)
- SINGAPORE
- PAKISTAN
- BANGKOK (THAILAND)

(PLANNED)

ERS-1/2 SAR NON ESA STATIONS

FOREIGN STATIONS WITH ERS-1 MOU SIGNED:

- COTOPAXI (ECUADOR)
- HIDERABAD (INDIA)
- ALICE SPRINGS, HOBART (AUSTRALIA)
- HATYAMA (JAPAN)
- KUMAMOTO (JAPAN, Tokai University)
- SYOWA, ANTARCTICA (Polar Instit., JAPAN)
- FAIRBANKS (USA)
- CUIABA (BRASIL)
- PRETORIA (SOUTH AFRICA)
- TAIPEH RS RESEARCH
- PARE PARE (INDONESIA)
- NORMAN (USA)
- RSGS BEIJING
- MCMURDO (ANTARCTICA, USA)
- NAIROBI (KENIA, TELEOS)

ERS-1/2 SAR NON ESA STATIONS

→ NATIONAL STATIONS:

- TROMSOE (N)
- WESTFREUGH (UK)
- GATINEAU (CND)
- PRINCE ALBERT (CND)
- O'HIGGINS (D, ANTARCTICA, campaign only)
- LIBREVILLE (D, GABON, campaign only)
- NEUSTRELITZ (D)
- AUSSAGUEL (F, campaign only)

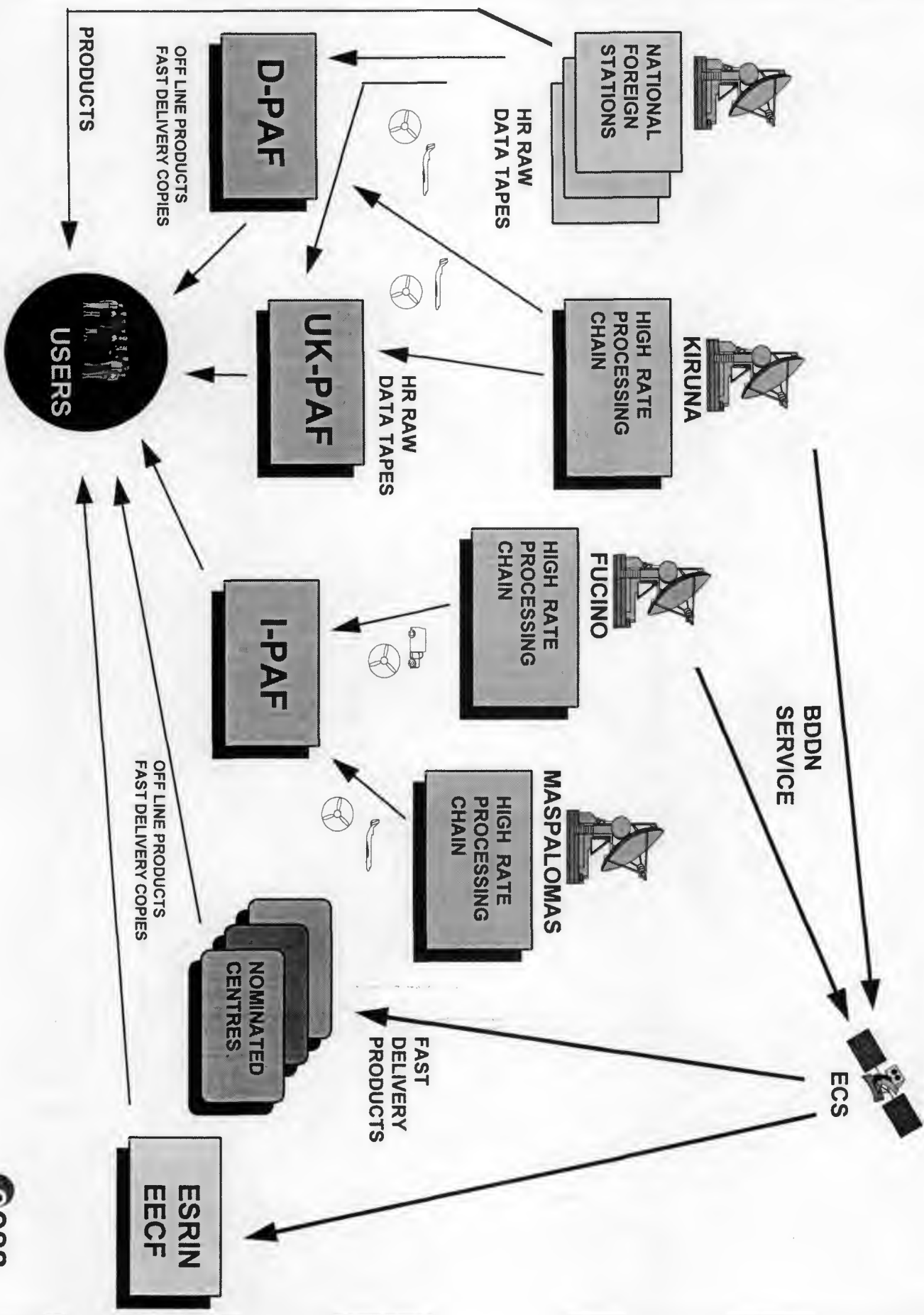
ERS-1 SAR ADDITIONAL COVERAGE

- **ESA HAS ACCESS TO THE DATA ACQUIRED BY STATIONS OF PARTICIPATING STATES ("NATIONAL") AND NON PARTICIPATING STATES ("FOREIGN") WITH THE AIM OF ENLARGING THE COVERAGE AND PROVIDING DATA TO PRINCIPAL INVESTIGATORS AND PILOT PROJECTS**
- **THE MEMORANDUM OF UNDERSTANDING WITH THE NFS STATIONS FORESEES THE ACQUISITION ON A BEST WILL BASIS OF DATA FOR**
ESA
 - **ESA IS RECHARGED FOR THE CONSUMABLES AND SHIPMENT COST**

ESA ERS1/2 SAR VALIDATED PRODUCTS

	D-PAF	UK-PAF	I-PAF	ESRIN (BACK UP)
PRI	X	X	X	X
RAW	X	X	X	X
SLCF		X		
SLCQ	X		X	X
GEC	X	X	X	
GTC	X			
GTM(*)	PLANNED			

(*) GTM= GEOCODED IMAGE WITH USER SUPPLIED DEM



FOREIGN STATIONS PRODUCTION SITES

→ SITES WHERE SAR DATA FROM FOREIGN STATIONS ARE DOWNLOADED:

Station	Site	Recorder Current Future
● COTOPAXI (ECUADOR)	ESRIN	DCRSi
● HIDERABAD (INDIA)	D-PAF/ESRIN	HD96a Pegasus
● ALICE SPRINGS, HOBART (AUSTRALIA)	ESRIN	P&G MDR Creo
● HATOYAMA (JAPAN)	ESRIN	HD96b Dir1000
● KUMAMOTO (JAPAN, Tokai University)	ESRIN	HD96b Dir1000
● SYOWA, ANTARCTICA (Polar Instit., JAPAN)	ESRIN	HD96b Dir1000
● FAIRBANKS (USA)	ESRIN	DCRSi
● CUIABA (BRASIL)	D-PAF/ESRIN	HD96a Pegasus
● PRETORIA (SOUTH AFRICA)	D-PAF	HD96a
● TAIPEH RS RESEARCH	D-PAF	HD96a
● PARE PARE (INDONESIA)	ESRIN	DCRSi
● NORMAN (USA)	D-PAF/ESRIN	PEGASUS
● RSGS BEIJING	ESRIN	P&G1/2
● MCMURDO (ANTARCTICA, USA)	-	-
● NAIROBI (KENIA, TELES)	-	-
● TEL AVIV (ISRAEL)	ESRIN	DCRSi
● RIYADH (SAUDI ARABIA)	ESRIN	HD96a
● SINGAPORE	ESRIN	PEGASUS Dir1000
● BANGKOK (THAILAND)	D-PAF	HD96a

ERS-1/2 SAR NON ESA STATIONS

STATIONS WITH NO ERS-1 MOU SIGNED:

- TEL AVIV (ISRAEL)
- RIYADH (SAUDI ARABIA)
- SINGAPORE
- PAKISTAN
- BANGKOK (THAILAND)

(PLANNED)

ERS-1/2 SAR NON ESA STATIONS

FOREIGN STATIONS WITH ERS-1 MOU SIGNED:

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- FAIRBANKS (USA)
- CUIABA (BRASIL)
- PRETORIA (SOUTH AFRICA)
- TAIPEH RS RESEARCH
- PARE PARE (INDONESIA)
- NORMAN (USA)
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- NAIROBI (KENIA, TELEOS)

ERS-1/2 SAR NON ESA STATIONS

→ NATIONAL STATIONS:

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- O'HIGGINS (D, ANTARCTICA, campaign only)
- LIBREVILLE (D, GABON, campaign only)
- NEUSTRELITZ (D)
- AUSSAGUEL (F, campaign only)

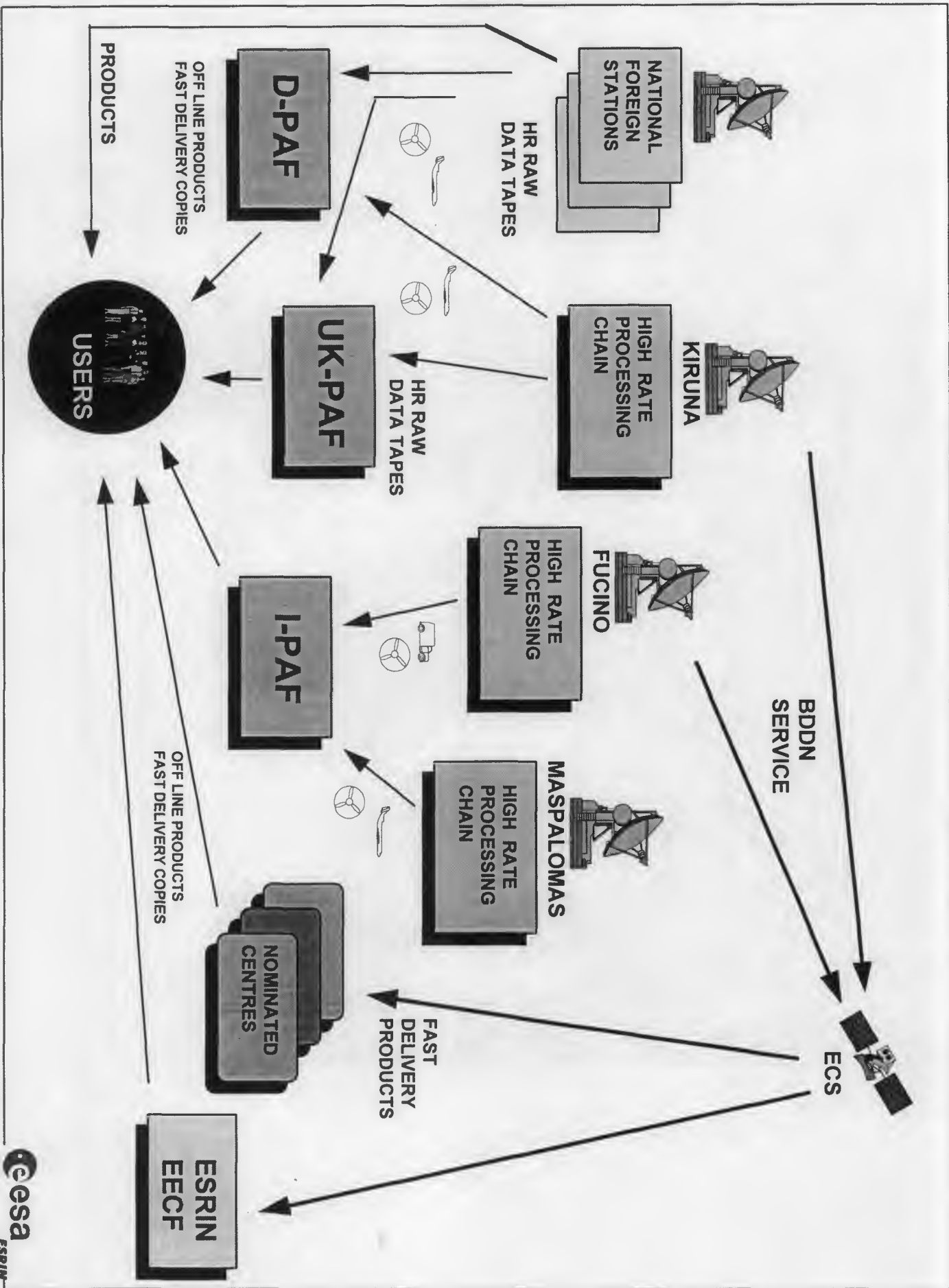
ERS-1 SAR ADDITIONAL COVERAGE

- **ESA HAS ACCESS TO THE DATA ACQUIRED BY STATIONS OF PARTICIPATING STATES ("NATIONAL") AND NON PARTICIPATING STATES ("FOREIGN") WITH THE AIM OF ENLARGING THE COVERAGE AND PROVIDING DATA TO PRINCIPAL INVESTIGATORS AND PILOT PROJECTS**
- **THE MEMORANDUM OF UNDERSTANDING WITH THE NFS STATIONS FORESEES THE ACQUISITION ON A BEST WILL BASIS OF DATA FOR ESA**
 - **ESA IS RECHARGED FOR THE CONSUMABLES AND SHIPMENT COST**

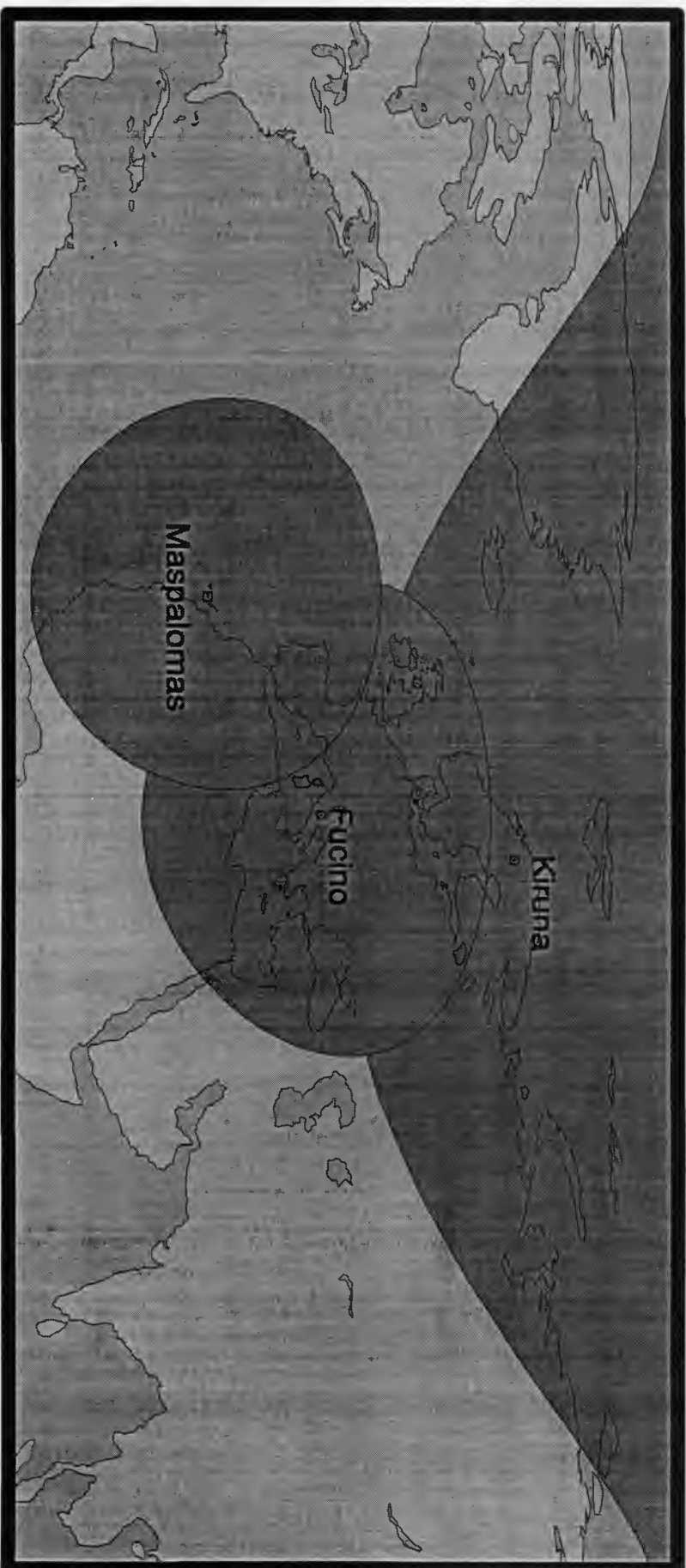
ESA ERS1/2 SAR VALIDATED PRODUCTS

	D-PAF	UK-PAF	I-PAF	ESRIN (BACK UP)
PRI	X	X	X	X
RAW	X	X	X	X
SLCF		X		
SLCQ	X		X	X
GEC	X	X	X	
GTC	X			
GTM(*)	PLANNED			

(*) GTM= GEOCODED IMAGE WITH USER SUPPLIED DEM



ESA SAR STATIONS COVERAGE



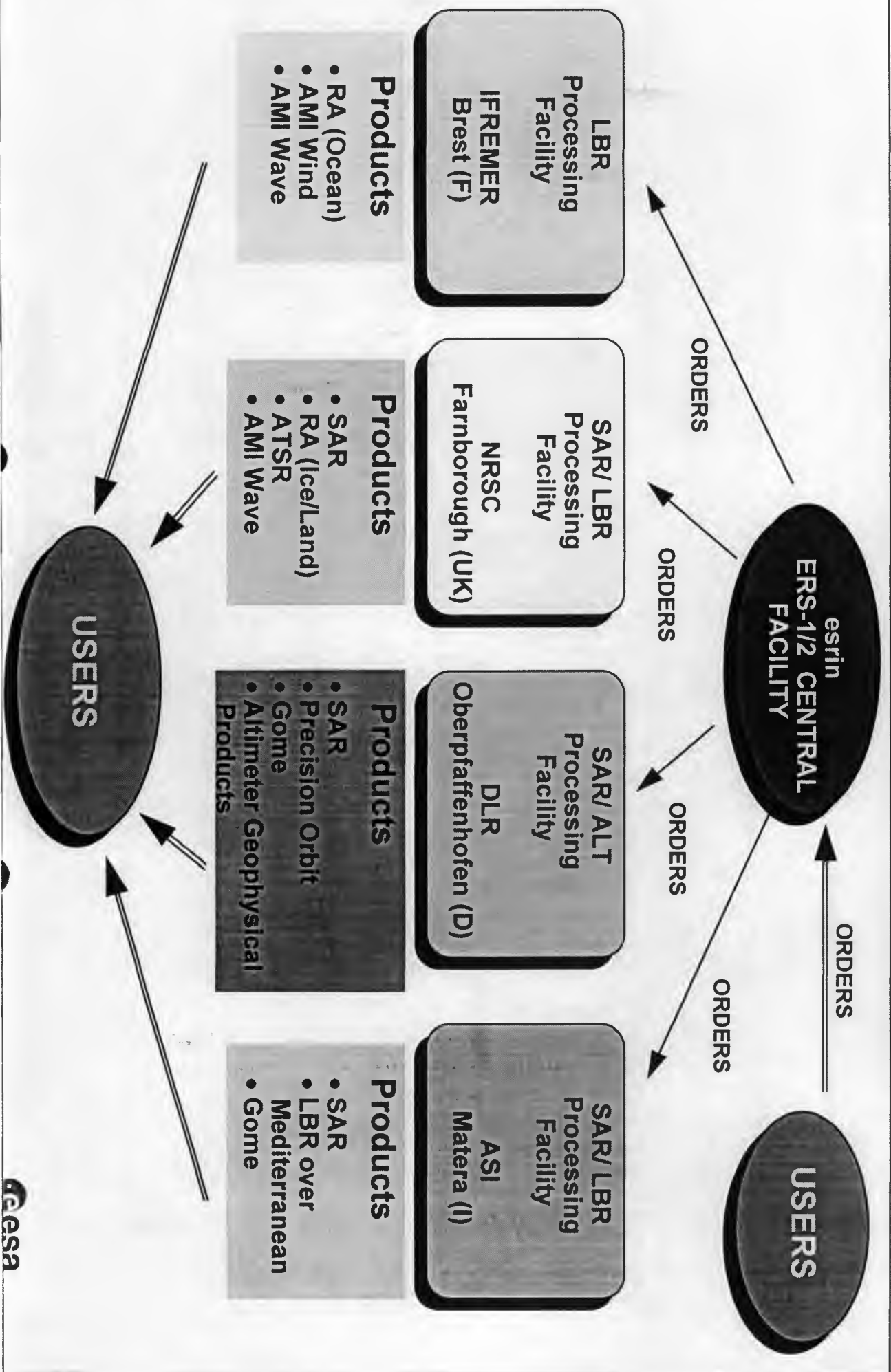
ERS-1/2 SAR MISSION

→ THE ESA OBJECTIVE OF REGIONAL ACQUISITION IS ACHIEVED THROUGH THE STATIONS OF:

- KIRUNA (SALMJAERVJ) (S) (Main station used for TT&C)
- FUCINO (I)
- MASPALOMAS (E)

WITH AN ACQUISITION SUCCESS RATE HIGHER THAN 98%

ERS-1/2 PAYLOAD DATA PRODUCTION SCHEME



OVERALL ERS-1/2 GROUND SEGMENT SCHEME

RAW DATA AND FD
PRODUCTS FROM
STATIONS

GROUND STATIONS

SALMIJAERVI



FUCINO

MASPALOMAS

TROMSO

GATINEAU

PRINCE ALBERT



NATIONAL
FOREIGN
STATIONS



MISSION
MANAGEMENT
CONTROL CENTRE
(ESOC)

ERS1/2
CENTRAL FACILITY
EECF
(ESRIN)



PROCESSING
AND
ARCHIVING
FACILITIES



- D-PAF
- F-PAF
- I-PAF
- UK-PAF

FAST DELIVERY PRODUCTS

OFF LINE PRODUCTS

USERS



ERS-1/2 GROUND SEGMENT ROLE

→ Ensure GLOBAL LBR MISSION WITH EMPHASIS ON OCEAN APPLICATION

→ Ensure REGIONAL SAR SERVICE OVER EUROPE

→ Ensure ACCESS TO SAR DATA TO NATIONAL AND FOREIGN STATIONS

ERS-2 INSTRUMENTS

ESA instruments:

- AMI: - ACTIVE MICROWAVE INSTRUMENT
 - IMAGE MODE
 - WIND MODE
 - WAVE MODE
- RA: - RADAR ALTIMETER
 - ICE OR OCEAN MODE
- GOME: - GLOBAL OZONE MONITORING EXPERIMENT
- LASER REFLECTOR

AO instruments:

- ATSR : - ALONG TRAK SCANNING RADIOMETER
 - VISIBLE AND INFRARED RADIOMETER
 - MICROWAVE SOUNDER
- PRARE

ERS-1 INSTRUMENTS

ESA instruments:

- AMI: - ACTIVE MICROWAVE INSTRUMENT
 - IMAGE MODE
 - WIND MODE
 - WAVE MODE

- RA: - RADAR ALTIMETER
 - ICE OR OCEAN MODE

- LASER REFLECTOR

AO instruments:

- ATSR: - ALONG TRAK SCANNING RADIOMETER
 - INFRARED RADIOMETER
 - MICROWAVE SOUNDER

- PRARE

EUROPEAN SPACE AGENCY

ERS-1 and ERS-2 GROUND SEGMENT STATUS (end November 1995)

ESOWG 5,
Toulouse, France
14-15 December 1995

- 21 REICH M., UNIVERSITY OF STUTTGART
(HARTL P., GÜTH S., KLAEDTKE H.G., PALUBINSKAS G., WÖRZ K.)
Landuse classification of agricultural fields with multitemporal ERS SAR data and optical remote sensing data - Some results of the PASTA project
- 22 RUDANT J.P., UNIVERSITE PIERRE ET MARIE CURIE
(BALTZER F., TONYE J.P.)
Apport des images SAR ERS-1 aux etudes littorales dans la region de Douala au Cameroun
- 23 RUDANT J.P., UNIVERSITE PIERRE ET MARIE CURIE
(BALTZER F., DEROIN J.P., FROMARD F., HOFF M., LOINTIER M., MAITRE H., MARINELLI L., MOUGIN F., PENICAND C.)
Cartography general et thematique en context tropical humides exemples en Guyane francaise
- 24 RUDDICK K.G., MUMM
(MOENS J.B.)
ERS-1 SAR detection of river plume fronts with application to the Rhine-Meuse plume
- 25 TONON M., IGN ESPACE
(SYLVANDER S.)
Map coverage of French Guyana by space triangulation of ERS images
- 26 VENCATASAWMY C.P., UNIVERSITY OF SHEFFIELD
(CLARK C.)
Methods of interpreting ERS-1 images for landform and lineaments mapping
- 27 VERHOEYE J., UNIV. GENT, DEP. WATER AND FOREST MANAGEMENT
(DE ROOVER B.)
Research capabilities of ERS SAR for monitoring of land use changes in the Neotropics - First Results
- 28 VERHOEVEN R.W.M.E., Wageningen Radar Surveys
(DE BOER R.J.)
Synergetic Applications of ERS-1 SAR
- 29 WANG Y., ITC
(KOOPMANS B.N., POHL C.)
The 1995 flood in the Netherlands monitored from space - a multi-sensor approach
- 30 WOODING M.G., REMOTE SENSING APPLICATIONS CONSULTANTS
(BROWN R.E., BATTS A.J., LOH KOK FOOK, KU MOHD NOH, LAILI NORDIN)
Complementary use of ERS SAR and optical data for land cover mapping in Johor, Malaysia
- 31 YESOU H., SERTIT
(MEYER C., DE FRAIPONT P.)
Evaluation of ERS-1 SAR data for set-aside lands monitoring radiometric and textural approaches

POSTERS

(Elizabeth Windsor)

- 1 BENTAMY A., IFREMER
(QUEFFEULOU P., QUILFEN Y., KATSAROS K.)
Wind field from scatterometer, altimeter and special sensor
microwave/imager
- 2 BLANCE F., CLS ARGOS
(GELL L.)
Marine Geoid and geodynamics of the Arctic Ocean as revealed by ERS
radar altimetry
- 3 CARROU A., CISI INGENIERIE
(RABAUTE T.)
Use of ERS data for crop identification
- 4 DERON J.P., BRGM
(SIMONIN A., LEGENDRE D.)
Backscattering and surface roughness their potential use for geological
mapping of arid areas with the ERS-1 radar, Atar site, Mauritania
- 6 HARMS J., SCOT CONSEIL
(PUYOU LASCASSIES P., COOL R., HARWARD G., CORVI M., APPIANI E.,
ADDISON C., STEPHENS B.)
Pulsar Supporting ERS-SAR data classification and understanding
- 7 HE M.X.
(GUAN L.)
Preliminary study on the Kuroshio and mesoscale oceanic processes by ERS-
1 data
- 8 JASKOLLA F., DASA, DORNIER
Coastal Zone Monitoring in Tamil Nadu State, India - preliminary results
- 9 JASKOLLA F., DASA, DORNIER
Ship Routing
- 10 LABROUSSE D., INRIA
(BERTHOD M.)
SAR Interferometry: A multigrad Markovian approach to phase unwrapping

- 11 MELIS M., SPACE ENGINEERING S.R.L.
(PIAZZO L., LAUR H.)
SAR image processing techniques evaluation and tuning to different
applications
- 12 MILNES M., LOGICA
(VYAS S.P., STEVEN M.D.)
Use of ERS SAR for sugar beet yield prediction
- 13 NASCIMENTO I., LAURIF
(RUDANT J.P.)
Apports des images SPOT et ERS-1 a l'elaboration de Schema directeur
d'aménagement - l'exemple de Brasilia
- 14 NIEUWENHUIS G., DLO STARING CENTRE
Monitoring agricultural crops with ERS-1 and JERS-1 multi-temporal SAR
data and crop growth modeling
- 15 OPRESCU N., T.U. OF CIVIL ENGINEERING BUCAREST
(BRAESCU C., PETRICA A., SERBAN F., VAIS M.)
Complex use of radar and optical and IR remote sensing data for specific
applications on the Danube delta, the continental platform of the Black Sea
and the seismic zone Vrancea
- 16 OVIDIO F., M.U.M.M.
(BIDLOT J.R., VAN DEN EYNDE D., LUO W., MONBALIU J.)
ERS-1 data assimilation in a second generation wave model for the North
Sea
- 17 POHL C., ITC
(VAN GENDEREN J.L.)
Multitemporal SAR and fused ERS-1 SAR / SPOT XS image maps of
Indonesia.
- 18 POULIQUEN S., IFREMER
ERS processing at French PAF, Cersat
- 19 PRESS N., NIGEL PRESS ASSOCIATES
(LAWRENCE G., MILSOM J., MACKLIN T.)
Offshore Basin Screening Using ERS-1 - all that slicks isn't oil
- 20 PROTHEROE M., CRAY SYSTEMS
The use of remotely sensed information for coastal habitat monitoring and
protection

DEMOS

(Mountbatten Lounge)

- 1 DE GRANDI F., JRC ISPRA
(MALINGREAU J.P., LEYSEN M., NEZRY E.)
Central Africa Mosaic Project Using ERS SAR data on a continental scale
- 2 GRAVES A., MATRA MARCONI SPACE
(ROGERS C., SAWYER G.)
THE RAIDS SYSTEM - On-line Access to ERS SAR Data
- 3 GUERRE L.F., SPOT IMAGE
(DEMARGNE L.)
Development of ERS SAR Applications at Spot Image: Present and Future
- 4 JOLLY W. G., SATELLITE OBSERVING SYSTEMS
Marine gravity for off-shore oil exploration (GRAVSAT)
- 5 LASNIER P., METEOMER
(HAJJI H., LOEUL S., BONICEL D.)
Use of ATSR data for monitoring the Antarctic convergence zone
- 6 LASNIER P., METEOMER
(HAJJI H., LOEUL S., BONICEL D.)
Contribution of ERS data to CLIOSat project
- 7 MURFITT P., LASER SCAN LTD
Forest compartment mapping from SAR data.
- 8 SOWTER A., NRSC
(BRELFSTAFF G., DAVISON M.J.)
The operational use of ERS-1 SAR data for the control of area based arable and forage subsidies in the UK

COAST continued

Friday

(Mountain View)

- 1

KOOPMANS B. N., ITC

(WANG Y.)

Satellite Radar as operational remote sensing tool for mapping coast tidal areas.
- 2

MASON D.C., UNIVERSITY OF READING

(DAVENPORT I.J., FLATHER R.A., ROBINSON G.J.)

Potential for using ERS data for constructing and monitoring inter-tidal digital elevation models for coastal zone management
- 3

ROSENTHAL W., GKSS RESEARCH CENTER

(LEHNER S.)

Meteo-marine parameters with ERS SAR

CONCLUSION PLENARY SESSION

(Mountain View)

Summary reports on the different Sessions:

JENSEN, W., ESA/ESRIN/DEX

Prospects for operational ERS Applications. Is the value adding industry ready for the challenge

Round Table:

DUCHOSSOIS, G. (ESA/DY),

HOWES, S. (ESYS),

JENSEN, W. (ESA/DEX),

HIRSCHFELD A. (SPOT/IMAGE)

MALINGREAU J.P. (JRC, EUROPEAN UNION)

SKROVSETH, P.E. (NORWEGIAN SPACE CENTRE),

WENSINK, H. (ARGOSS BV/DELFT HYDRAULICS),

Summary and Conclusion:

DUCHOSSOIS, G. (ESA/DY)

MAPPING

Friday

(Mountain View)

- 2

RUDANT J.P., UNIVERSITE PIERRE ET MARIE CURIE

(BALTZER F., DEKON J.P., FROMARD F., HOFF M., LOINTIER M., MAITRE H., MARINELLI L., MOUGIN F., PENICAND C.)

Cartographie generale et thematique en contexte tropical humide exemples en Guyane Francaise
- 3

TONON M., IGN ESPACE

(SYLVANDER S.)

Map coverage of French Guyana by space triangulation of ERS images
- 4

TUPIN F., ECOLE NATIONALE SUPERIEURE DE TELECOM.

(MAITRE H., GOUINAUD C., NICOLAS J.M.)

Extraction of man-made structure from ERS-1 route networks and urban areas

COAST

(Mountbatten)

- 17 WENSINK H., ARGOS BV/DELFT HYDRAULICS
(CALCOEN C.J., DE VALK C.F., HESSELMANS G.H.F.M.)
Operational uses of remote sensing data to support coastal and offshore applications
- 18 MOHD I.S. M., UNIV TEKNOLOGI MALAYSIA
(AHMAD S., HOEKMAN D., GREIDANUS H.)
Applications of ERS-1 SAR for deriving coastal zone information
- 19 PONIMAN A., BAKOSURTANAL
(SOEJOETI Z., SISWANDONO, NUR M., BAMBAN WAHYU S., ASCHBACHER J., WISMANN V.)
Application of Multitemporal ERS-1 SAR data for coastal zone monitoring
- 20 KRAMER O., GEOSCAN
(LOHMANN P.)
Algae Monitoring of the Wadden Sea using ERS SAR data in an operational environment
- 21 SANDVEN S., NANSEN ENVIRONMENTAL REMOTE SENSING CENTER
(JOHANNESSEN O.M., SAMUEL P.)
COASTWATCH SAR Monitoring of coastal circulation and wind field features

- 8 PROFETI G., FLORENCE UNIV.
(MACINTOSH H.)
The use of ERS SAR data to manage flood emergencies at the smaller scale
- 9 OBERSTADLER R., GAF
(HÖNSCH H., HUTT D.)
Assessment of the mapping capabilities of ERS-1 SAR data for flood mapping: an experience in Germany
- 10 AMADORE L., A., PAGASA
(PINEDA A.L., HILARIO F.G., CRUZ O.D., PERALTA M.F.)
Application of ERS-1 SAR data in flood hazard assessment of fluvial and coastal environments

GEOLOGY/DEM

(Mountain)

- 11 CHOROWICZ J., UNIVERSITE PET M. CURIE
(CHALAH C., CHOTIN P., DORBATH L., MERING C., VICNETE J.C.)
Mapping of active faults related to seismic hazards. Example of the Atacama fault zone, Chile
- 12 CORNET Y., UNIVERSITE DE LIEGE
(OZER P.)
The contribution of ERS-1 SAR data in Neotectonics
- 13 LOIZZO R., ASI, CENTRO DI GEODESIA SPAZIALE
(ANTONINETTI M., PAPALEPORE M., PIERI P., SYLOS LABINI G.)
ERS-1 geological applications
- 14 RENOUEAU L., ISTAR
(PERLAND F.)
High accuracy DEM from INSAR ERS data
- 15 MARINELLI L., GEOIMAGE
(LAURORE L.)
Relief restitution by radargrammetry
- 16 ROSSI M., CNES
(MASSONET D.)
Giving an operational status to interferometric ERS applications

- 9 LASNIER P., METEOMER
(HAJI H., LOEUL S., BONICEL D.)
Use of ATSR data for monitoring the Antarctic convergence zone

- 10 THOMAS M., UNIVERSITY OF HANNOVER
(ROTH R.)
Monitoring of lead formation and energy exchange in the Weddel Sea

SHIP ROUTING

- 11 JOHANNESSEN O.M., NANSSEN ENVIRONMENTAL REMOTE SENSING
CENTER
(SANDVEN S., MELENTYEV V.V.)
ICEWATCH Ice SAR Monitoring of the Northern Sea Route
- 12 LEHNER S., DLR
(HASSELMANN K., BRUNS. T.)
Test of a new onboard ship routing system
- 13 FREMBGEN U., DORNIER GmbH
Marketing aspects for an operational onboard ship routing system
- 14 HEIMBACH P., MAX-PLANCK IN.FUER METEO
(HASSELMANN S., BRÜNING C., HASSELMANN K.)
The use of ERS SAR wave mode spectra for wind/wave assimilation into WAM and for statistical and dynamical comparison
- 15 BAUER E., INSITUUT FÜR MEERESKUNDE
(HASSELMANN S., HASSELMANN K.)
An operational wave forecast system using wind and wave data
- 16 PARTINGTON K.C., GEC-MARCONI RESEARCH CENTRE
(HODSON W., REES W.G., GRAVES A., LARSEN M.)
Ship routing with near real-time ERS-1 derived ice charts
- 17 HÅKANSSON B., SMHI
Potentials of SAR for sea ice ship routing based on experiences obtained with ERS-1 SAR in the Baltic Sea

Thursday

ENVIRONMENT/HAZARD/HYDROLOGY

(Mountain)

- 1 NORMAND M., CEMAGREF
(COGNARD A.L., LOUMAGNE C., OTTLE C., VIDAL-MADIAR D., VIDAL A., IMBERTI M.C.)
Soil moisture and hydrological modeling using radar and optical remote sensing - a case study in Brittany, France
- 2 FELLAH K., SERTIT
(BESNUS Y., MEYER C., DE FRAIPONT P.)
Multi-temporal SAR data in hydrological and agro-environmental applications
- 3 ACHACHE J., INSTITUT DE PHYSIQUE DU GLOBE DE PARIS
(FRUNEAU B., DELACOURT C.)
Applicability of SAR Interferometry for operational monitoring of landslides
- 4 BROWN R.E., REMOTE SENSING APPLICATIONS CONSULTANTS
(SLATER J., WOODING M.G.)
The use of ERS-1 SAR for monitoring of environmentally sensitive areas in England
- 5 PARLOW E., MCR LABORATORY
(SCHERER D., BEHA H.D.)
Urban climatological parameters derived from multi-sensor satellite data of ERS-1 and Landsat TM
- 6 LOPEZ E. D., UNIVERSITY OF THE PHILIPPINES
(CHOROWICZ J., PARROT J.F., RUDANT J.P., GARCIA F., CORPUZ E.G., VINLUAN R.J.N.)
Mount Pinatubo environmental degradation assessment using ERS-1 SAR data
- 7 CALABRESI G., ESA/ESRIN/DEXED
(LICHTENEGGER J.)
The use of ERS data for Flood Monitoring an overall assessment

FLOODING

(Mountain)

Thursday

SEA SURFACE FEATURES

(Mountain)

- 1 PEDERSEN J.P., TROMSØ SATELLITE STATION
(SELJELV L.G., STRØM G., WAHL T., SKØELV Å., ANDERSEN J.H., FOLLUM O.A.)
Oil spill detection by use of ERS SAR data - From R&D towards pre-operational early warning detection service.
- 2 JOHANNESSEN O.M., NANSSEN ENVIRONMENTAL REMOTE SENSING CENTER
SAR surveillance of ocean surface slicks
- 3 SKØELV Å., NORWEGIAN DEFENSE RESEARCH ESTABLISHMENT
(WAHL T.)
ERS detection of soft and hard target at sea what can be operationalised
- 4 GILL R.S., DMI
(POUL N., VALBUR H.)
The use of ERS SAR images in the operational mapping of sea ice in the Cape Farewell waters
- 5 HERLAND E., VTT/SPACE TECHNOLOGY
Experiences and conclusions of operational ice monitoring with ERS-1 SAR
- 6 SIMILA M., INST. MARINE RESEARCH
SAR Image classification according to the ice deformation
- 7 EZRATY R., IFREMER
(GOHIN F., BRYERE P., MARONI C., CAVANIE A.)
Determination of sea ice extent and ice types using the AMI wind, Antarctica, 1992 to 1995
- 8 THIEL K.H., UNIVERSITÄT STUTTGART
(HARTL P., WU X.)
Monitoring the Ice Movements with ERS SAR Interferometry in the Antarctic Region

SEA/ICE

(Mountain)

- 7 NIEUWENHUIS G.J.A., DLO Staring Centre
Monitoring agricultural crops with ERS-1 and JERS-1 multi-temporal SAR data and crop growth modeling
 - 8 WOODING M.G., REMOTE SENSING APPLICATIONS CONSULTANTS
(BROWN R.E., BATTS A.J., LOH KOK FOOK, KU MOHD NOH, LAILI NORDIN)
Complementary use of ERS SAR and optical data for land cover mapping in Johor, Malaysia
 - 9 HARMS J., SCOT CONSEIL
(BERGQUIST K.)
The use of ERS SAR data for the management of renewable resources
 - 10 SOWTER A., NRSC
(BRELFSTAFF G., DAVISON M.J.)
The operational use of ERS-1 SAR data for the control of area based arable and forage subsidies in the UK
 - 11 KARNCHANASUTHAM S., RCAR OAE, MINISTRY OF AGRICULTURE
(PONGSRIHADULCHAI A.)
Rice mapping and crop growth monitoring with ERS SAR data
- ### FORESTRY
- (Moulinbutter)
- 12 KEIL M., DLR
(SCALES D., WINTER R., KUX H., DOS SANTOS J.R.)
Tropical rain forest investigation in Brazil using multi-temporal ERS-1 SAR data
 - 13 KUNTZ S., KAYSER-THREDE
(STRECK C., SIEGERT F.)
Multitemporal Evaluation of ERS-SAR data for Monitoring Deforestation in Tropical Rainforest
 - 14 DE GRANDI F., JRC ISPRA
(MALINGREAU J.P., LEYSEN M., NEZRY E.)
Central Africa Mosaic Project Using ERS SAR data on a continental scale
 - 15 TOMPPA E., F.R.I.
(HALLIKAINEN M., MIKKEL P., HENTTONEN H., KATILA M., VEIJANEN A., PULLAINEN J., HYYPPÄ J.)
Application of ERS SAR data in large area forest inventory

- 8 ROQUET H., ECMWF / METEO-FRANCE
(GAFFARD C.)
Routine processing of ERS-1 scatterometer data at ECMWF
 - 9 DOMBROWSKY E., SHOM / CMO / BRESM
(BAHUREL P., DEMEY P., DOULOU H., CASSE V.)
SOAP 93 Real time assimilation of altimeter data in the Azores current from 1992 to 1995 - oceanographic results
 - 10 LASNIER P., METEOMER
(HAJJI H., LOEUL S., BONICEL D.)
Contribution of ERS data to CLIOSat project
- ### GEOID / GRAVITY / BATHYMETRY
- (G.T. Baker)
- 11 BLANC F., CLS ARGOS, GELLIL, IFREMER
Marine Geoid and geodynamics of the Arctic Ocean as revealed by ERS radar altimetry
 - 12 JOLLY W. G., SATELLITE OBSERVING SYSTEMS
Marine gravity for off-shore oil exploration (GRAVSAT)
 - 13 BIEGERT E.K., PECTEN INTERN. COMPANY
(BAKER R.N., SAILOR R.V., SCHAUDT K.E., MACDONALD I.R., TAPLEY B., SHUM C.K., AMOS J., BERRY J.L., HESS J.)
GOSAP Gulf off-shore satellite applications project
 - 14 PRESS N., NIGEL PRESS ASSOCIATES
(LAWRENCE G., MILSOM J., MACKLIN T.)
Offshore Basin Screening Using ERS-1 - all that slicks isn't oil
 - 15 VAN DE VELDE L., UNIVERSITY OF GENT
(CASPAR A., VERNEMMEN C.)
Detection of sea bottom topography with ERS SAR PRI Images on the Belgium continental platform by analyzing the sea surface characteristics, caused by the meteo-marine conditions on the sea bottom morphology on the moment of the satellite passage
 - 16 CORNET Y., UNIVERSITE DE LIEGE
The interests and limits of ERS-1 SAR data for the bathymetric and topographic cartography of shallow waters, sea bottom and tidal flats

Wednesday

INTRODUCTION

Welcome address by:

EMILIANI L. (Director Observation of the Earth and the Environment, ESA),
DAVIS D. (Director General, BNSC)
DUCHOSSOIS G. (Head Earth Observation Mission Management Office, ESA)

AGRICULTURE / LANDUSE

(Mounibatten)

- 1 LICHTENEGGER J., ESA/ESRIN/DEX/ED
(RÉMONDIÈRE S.)
The use of ERS data for agriculture and land use: an overall assessment
- 2 LEMOINE G., SYNOPTICS, INTEGRATED REMOTE SENSING AND GIS APPLICATIONS
(DE GROOF II., VAN LEEUWEN II.)
Monitoring agricultural land preparation activities with ERS-1 to complement and advance early season crop acreage estimates in the framework of the MARS project
- 3 NEZRY E., JRC/IRSA
(GENOVESE G., SOLAAS G.A., REMONDIÈRE S.)
ERS based early estimation of crop areas in Europe during the winter 1994/1995
- 4 KATTENBORN G., UNIVERSITÄT STUTTGART
(KLAEDTKE II.G., PALUBINSKAS G., GÜTH S.)
Classification of main crop types of the test site Seville with multitemporal ERS SAR PRI images in the framework of the MARS project
- 5 HARMS J., SCOT CONSEIL
(RABAUTE T., PUYOU LASCASSIES P., LE TOAN T., RIBBES F., MARSOEDI M., MUBEKTI M.)
Assessment of rice using ERS-1 SAR data the SAR1 project
- 6 ASCHBACHER J., JRC
(PONGSRIHADULCHAI A., KARNCHANASUTHAM S., RODPRON C., PAUDYAL D.R., LE TOAN T.)
ERS SAR data for rice crop mapping and monitoring

Wednesday

WINDS / WAVES / METEOCEAN

(E. Tude)

- 1 PACI G., ESA/ESRIN/DEX/ED
The operational use of ERS data for sea state parameters: an overall assessment
- 2 QUEFFEULOU P., IFREMER (Presented by Le Muer D., METEO-FRANCE)
(ELFOUHAILY T., LEFEVRE J.M.)
Remote sensing of wind and waves over the western Mediterranean Sea
- 3 LE MEUR D., METEO-FRANCE
(ROQUET II., LEFEVRE J.M.)
Use of ERS-1 wind and wave data for numerical prediction at Meteo-France
- 4 CARTER D., SATELLITE OBSERVING SYSTEMS
(COTTON P.D.)
Applications of wave statistics estimated from altimeter data
- 5 OCAMPO-TORRES F.J., CICESE
(MARTINEZ DIAZ DE LEON A., ROBINSON I.S.)
Usefulness of ERS data for wave modeling
- 6 VOORRIJS A.C., KNMI
(KOMEN G.J.)
Assimilation of ERS SAR wave spectra in an operational regional wave model
- 7 BREIVIK L.A., DNMI
(REISTAD M., SUNDE J.)
Application of ocean surface wind and wave information from ERS in atmosphere and ocean monitoring and numerical forecast



ERS APPLICATIONS WORKSHOP 1995
PRELIMINARY PROGRAMME
Queen Elizabeth II Conference Centre

Wednesday 06-Dec-95	
Time	Mounbatten Elizabeth Tudor
9.00	Registration
9.30	Introduction Opening
	Coffee Break
11.00	
11.20	
11.40	Agriculture Winds/ Waves
12.00	Landuse Metocean
12.20	
12.40	
13.00	Lunch Break
13.20	
13.40	
14.00	
14.20	
14.40	Agriculture Winds/ Waves
15.00	Landuse Metocean
15.20	
15.40	Coffee Break
16.00	Coffee Break
16.20	Geoid/ Gravity/
16.40	
17.00	Forestry Bathymetry
17.20	
17.40	
18.30	Reception hosted by BNSC

Thursday 07-Dec-95	
Time	Mounbatten Westminster
9.00	
9.20	
9.40	Environment Sea Surface Features
10.00	Hazards Coffee Break
10.20	Hydrology
10.40	
11.00	Coffee Break
11.20	
11.40	Flooding Sea Ice
12.00	
12.20	
12.40	
13.00	Lunch Break
13.20	
13.40	
14.00	
14.20	Geology/ Ship Routeing
14.40	DEM
15.00	
15.20	Coffee Break
15.40	
16.00	Coffee Break
16.20	Ship Routeing
16.40	Coast-1
17.00	
17.20	
17.40	
18.00	

Friday 08-Dec-95	
Time	Mounbatten Westminster
9.00	
9.20	
9.40	Coast-2 Mapping
10.00	Coffee Break
10.20	
10.40	Session
11.00	Summaries
11.20	Appl. Prospects
11.30	
11.50	
12.10	Round Table
12.30	
12.50	Conclusion
13.10	End of Mtg

Posters will be on display throughout the proceedings in the Elizabeth Windsor Lounge

Demonstrations will be held in the Mounbatten Lounge

NAME	COMPANY	COUNTRY	TELEPHONE	FAX
DE BOER ROBERT	Wageningen Radar Surveys	NETHERLANDS	31 83 70 22860	31 83 70 26029
JOHANNESSEN J.	ESA/ESTEC	NETHERLANDS	31 715656565	31 715656040
KOOPMANS B.N.	ITC	NETHERLANDS	31-53-874444	31 53 874336
LEMOINE G.	SYNOPTICS	NETHERLANDS	31-317 42 69 36	31-317 42 57 05
NIEUWENHUIS G.	REMOTE SENSING	NETHERLANDS	31837074319	31837024812
NOSSIN J.J.	ITC	NETHERLANDS	31 19534874224	31 19535874336
POHL C.	ITC	NETHERLANDS	31 53 874248	31 53 874400
RAST M.	ESA/ESTEC	NETHERLANDS	31 715656565	31 715656040
VERHOEVEN W	WAGENINGEN RADAR	NETHERLANDS	31 83 70 22860	31 83 70 26029
VOORRIPS A.C.	KNMI	NETHERLANDS	31 30 20667	31 30 210407
VOSKUIJ R.P.G.A.	I.T.C.	NETHERLANDS	31 53 4874 336	31 53 4874 290
WANG Y.	ITC	NETHERLANDS	31-53-874444	31 53 874336
WENSINK H.	DELFT HYDRAULICS	NETHERLANDS	31 5274 2922	31 527 242016
BERN T.I.	OCEANOR	NORWAY	47 73 52 50 50	47 73 525033
BREIVIK L.A.	DNMI	NORWAY	47-552-97-288	47 55 200050
LEEK R.	NJOS	NORWAY	47 64949700	47 64949786
PEDERSEN J.P.	T.S.S.	NORWAY	47-77 68 48 17	47-77 65 78 68
SANDVEN S.	NANSEN	NORWAY	47 5 297288	47 55 200050
SKOELV A.	N.D.R.	NORWAY	47-63 80 74 72	47-63 80 72 12
STROM G.D.	N.S.C.	NORWAY	47 22 523800	47-22-522397
AMADORE L.T.	PAGASA	PHILIPPINES	63 292227813	63 292229291
LOPEZ E.D.	UNIV. PHILIPPINES	PHILIPPINES	63 2 920 5301	63 2 922 4714
DABROWSKA	INS OF GEODESY AND CART.	POLAND	48 22 27 03 28	48 22 270328
GRUSZCZYNSKA M	INS OF GEODESY AND CART.	POLAND	48 22 270328	48 22 270328
PETTI M.	ORSTOM	REUNION	262 29 56 29	262 284879
MANUEL V.	ROMANIAN OIL CORP.	ROMANIA	4 01 6597140	40 1 650 4222
OPRESCU N.	T.U. OF CIVIL ENGINEERING	ROMANIA	40 1 312 8793	34 1 677 7228
BONNET F.	W.E.U.	SPAIN	34 1 677 7759	46 11 170207
HAKANSSON B.	SMHI	SWEDEN	46 11 15 83 85	46 11 17 02 07
MOBERG M.	SMHI	SWEDEN	46 11 15 83 18	41 1 632 1251
DRAGOS L.	ETH ZURICH	SWITZERLAND	41 1 632 4261	41 61 272 69 23
PARLOW E.	MCR LABORATORY	SWITZERLAND	41 61 272 64 80	66 2 524 5598
KARNCHANASUTHAM	AGRICULTURAL ECONOMICS	THAILAND	66 2 524 5598	66 2 524559677
SCHUMANN R.	A.T.T.	THAILAND	66 2 524 5598	44 1487 773381
BAKER J.R.	BNSC	UK	44 1487 773381	44 1734 869450
BIDLOT J.R.	ECMWF	UK	44 1734 869450	44 1491 692424
BIGIN D.S.	INSTITUTE OF HYDROLOGY	UK	44 1491 838800	44 1491 692424
BLYTH K.	INSTITUTE OF HYDROLOGY	UK	44 1491 838800	44 171 215 0790
BOALCH C.	BNSC	UK	44 171 215 0790	44 1252 392659
BOHANE A.	RADARSAT INT.	UK	44 1252 394884	44 1252375016
BRIGGS S.A.	NERC/BNSC	UK	44 1487 773381	44 420 561388
BROWN R.E.	REM SENS APPL CONSULT	UK	44 1 420 561377	44-1703 59 3059
CABRAL A.P.	UNIV OF SOUTHAMPTON	UK	44 170359 30 26	44 14834 28691
CARTER D.J.T.	S.O.S.	UK	44 14 834212 13	44 114 282 4292
CAVES R.	UNIVERSITY OF SHEFFIELD	UK	44 114 282 4260	44 1252362066
CONWAY J.	NRSC	UK	44 1252362066	44 1703 596411
COTTON D.	S.O.S.	UK	44 1703 596411	44-1718215387
DAVIS D.	BNSC	UK	44 171 215 0790	44 582 461 773
DAVISON M.	VEGA SPACE SYSTEMS	UK	44 582 461 678	44 171 873 2287
DRAKE N.A.	KING'S COLLEGE	UK	44 171 873 2798	44 1420561388
FLETCHER P	ECMWF	UK	44 1420561377	44 1734 499732
GAFFARD	ECMWF	UK	44 1734 499732	44-1705 674468
GRAVES A.	MATRA MARCONI SPACE	UK	44-1705 674468	441734499000
HANSEN B.	ECMWF	UK	441734499000	44 171257 5056
HESS J.	UNIVERSITY OF ABERDEEN	UK	44 1932 570 536	44 1483 304545
HOWES S.	ESYS	UK	44 1483 304545	

NAME	COMPANY	COUNTRY	TELEPHONE	FAX
POULIQUEN S.	IFREMER	FRANCE	33 98 22 44 92	34 98 22 45 33
RENOUARD L.	ISTAR	FRANCE	33 93 95 81 23	33 93958329
ROQUET H.	METEOFRANCE	FRANCE	33-61 07 94 92	
ROSSI M.	CNES	FRANCE	33-61 07 94 92	
ROUZE M.	CNES	FRANCE	33 6128 1540	33 61273167
RUDANT J.P.	UNIVERSITE P.M. CURIE	FRANCE	33 1 44275087	33-61-274013
TONON M.	IGN ESPACE	FRANCE	33-62-19 18 18	33-61-750317
URDIROZ A.	SPOT IMAGE	FRANCE	33 62194146	33 62194051
YESOU H.	SERTTI	FRANCE	33 88 65 52 00	33 88 655199
ALPERS W.	UNIV. OF HAMBURG	GERMANY	49 40 4123 5432	49 40 4123 5713
BAUER E.	INST FUR MEERESKUNDE	GERMANY	49 40 4123 65 18	49 40 4123 5713
FREMBGEN U.	DORNIER GmbH	GERMANY	49 7545 85732	49 7545 82206
GUTH S.	STUTTART UNIVERSITY	GERMANY	49 711 121 3412	49 711 1212755
HEIMBACH P.	MAX-PLANCK INS	GERMANY	49 4041173 377	49 40 411733298
JASKOLLA F.	DASA, DORNIER	GERMANY	49 7545 89 965	49 7545 82 687
KATTENBORN G.	STUTTART UNIVERSITY	GERMANY	49 711 121 3412	49 711 121 2755
KEIL M.	DLR	GERMANY	49 8153 28 1377	49 8153 28 1445
KIRCHHOF W.	DLR	GERMANY	49-8153 28 2331	49 8153 281444
KLADTKE H-G.	STUTTART UNIVERSITY	GERMANY	49 711 121 3412	49 711 1212755
KRAEMER O.	GEOSCAN GmbH	GERMANY	49 5121 15 09 0	495121 76 90 15
KUNTZ S.	KAYSER-THREDE	GERMANY	49 89 724 950	49 89 72495291
LEHNER S.	DLR	GERMANY	49 81 532828 95	49 15328281445
OBERSTADLER R.	GAF	GERMANY	49 89 1215 280	49 89 1233 148
PULS J	DLR-GSOC	GERMANY	49 711 121 3413	49 711 121 2755
REICH M.	STUTTART UNIVERSITY	GERMANY	49 711 121 3413	49 711 121 2755
RITTER P.	DARA	GERMANY	49 228 447 579	49 228 447 700
ROSENTHAL W.	GKSS RESEARCH CENTER	GERMANY	49-4152 87 15 6	49-4152 87 1516
SCHMIDT K.	DARA	GERMANY	49 711 121 3401	49-228-447714
THIEL K.H.	STUTTART UNIVERSITY	GERMANY	49 711 121 3401	49 711 121 2755
THOMAS M.	UNI. OF HANNOVER	GERMANY	49 511 762 4413	49 511 7624418
PONTMAN A.	BAKOSURTANAL	INDONESIA	62 21 875 2062	62 21 8752064
ASCHBACHER J.	JRC	ITALY	39 332 785968	39 332 785461
BENVENISTE J.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
CALABRESI G.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
COULSON S.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
CULTURI E.	DATAMAT	ITALY	39 6 60271	39 6 50511407
DE BELIS C.	DATAMAT	ITALY	39 6 60271	39 6 50511407
DE GRANDI F.	JRC ISPra	ITALY	39 332 789089	39 332 785469
DE GROOF H.	JRC ISPra	ITALY	39 332 785048	39 332 785 469
FAVARD	JRC ISPra	ITALY	39 332 785968	39 332 785461
DI DOMENICO L.	EURIMAGE	ITALY	39 6 941 6109	39 6 941 80751
DOHERTY M.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
FEA M.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
JENSEN W.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
LICHTENEGGER J.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
LOIZZO R.	A.S.I.	ITALY	39-835-377 222	39-835-339 005
MALINGREAU JP.	JRC	ITALY	39 03320789830	39 332 789830
MELIS M.	SPACE ENGINEERING	ITALY	39 6 225 95227	39 6 769 015
NEZRY E.	JRC/IRSA	ITALY	39-332-78 54 49	39-332-78 90 74
PACI G.	ESA/ESRIN	ITALY	39 6 941 801	39 6 941 80280
PROFETI G.	Florence Univ.	ITALY	39-574-602520	39-574-602515
SYLOS-LABINI G.	A.S.I.	ITALY	39 835 377 201	39 835 339 005
TAKASHI N.	EARTH REMOTE SENSING	JAPAN	81 3 3533 9380	81 3 3533 9383
MOHD I.S.M.	UNIV TEKNOLOGI MALAYSIA	MALAYSIA	607 560 2969	607 556 6163
OCAIMPO-TORRES	CICESE	MEXICO	52 617 4 5050	52 617 4 4848
ATTEMA E.	ESA/ESTEC	NETHERLANDS	31 715656565	31 715656040
BORGEAUD M.	ESA/ESTEC	NETHERLANDS	31 715656565	31 715656040
BUNNIK N.	BCRS	NETHERLANDS	31-15-618962	

PARTICIPANTS TO THE ERS APPLICATIONS WORKSHOP LONDON, 6-8 DECEMBER 1995

NAME	COMPANY	COUNTRY	TELEPHONE	FAX
BERGER J.	ZAMG - OGD	AUSTRIA	43-136 44 32501	43-1- 37 70 25
CORNET Y.	UNIVERSITE DE LIEGE	BELGIUM	32 41 66 53 35	32 41 66 57 00
OSTERRIETH A.	OSTC	BELGIUM	32 2 238 35 66	32 2 230 59 12
OVIDIO F.	M.U.M.M.	BELGIUM	32 2 773 2130	32 2 770 69 72
RUDDICK K.G.	MUMM OF NORTH SEA	BELGIUM	32 2 773 2131	32 2 770 69 72
VAN DE VELDE L.	LAB PHYSICAL GEOGRAPHY	BELGIUM	32 92 64 46 36	32 92 64 49 70
VERHOEYE J.	UNIVERSITY OF GENT	BELGIUM	32-9 26 46 111	32-9 264 6240
VERNEMMEN C.	LAB PHYSICAL GEOGRAPHY	BELGIUM	32 92 64 47 59	32 92 64 49 70
TONYE E.	CAMEROUN	BELGIUM	237-22 4547	237-23 18 41
GUAN L.	OCEAN UNI OF QINGDAO	CHINA	86-532-2879301	86-532 2879301
HE MING XIA	OCEAN UNI OF QINGDAO	CHINA	86-532-2879301	86-532 2879301
GILL R.S.	DANISH MET. INST	DENMARK	45 39 15 73 42	45 39 15 73 00
NIELSEN P.	D.M.I.	DENMARK	45 39 15 73 42	45 39 15 73 00
SOLVSTEEN C.	ROYAL DANISH ADMIN OFFICE	DENMARK	45 39 15 73 47	45 39 15 73 00
GROVVAL H.	INST. MARINE RESEARCH	DENMARK	45 32 96 12 88	45 31 57 47 70
HERLAND E.	INST. MARINE RESEARCH	FINLAND	358 0 613941	358 0 613944 94
HERLAND E.	VTT/SPACE TECHNOLOGY	FINLAND	358 0 456 47 99	358 0 456 44 96
KUITTINEN RISTO	FINNISH GEODETIC INST	FINLAND	358-0295553 05	358-02955 52 00
SIMILA M.	INST. MARINE RESEARCH	FINLAND	358 0 613941	358 0 613944 94
TOMPO E.	F.F.R.I.	FINLAND	358 0 613941	358 0 613944 94
ACHACHE J.	INST. DE PHYSIQUE DU GLOBE	FRANCE	33 1 44 27 24 48	33 1 44 27 33 73
BAHUREL	CMO/BRESM/GRGS	FRANCE	33 61 33 29 14	33 61 33 29 16
BENTAMY A.	IFREMER	FRANCE	33 9822 44 12	33 98224545
BLANC F.	CLS ARGOS	FRANCE	33 613947 68	33 61 751014
BRUZZI S.	ESA/HQ	FRANCE	33 153697654	33 153697560
BUTHAUD	CNES	FRANCE	33-1-44 76 7569	33-1-44 76 7850
CARROU A.	CISI INGENIERIE	FRANCE	33 61 17 66 66	33 61 54 84 15
CHEVREL M.	CNES/DP/CME	FRANCE	33-1 44 76 75 17	33-1 44 76 78 68
CHOROWICZ J.	UNI. P. ET M. CURIE	FRANCE	33 1 43 26 82 46	33 1 44275085
COUSTERE M.	MATRA CAP SYSTEMES	FRANCE	33 134637331	33134637666
DEMARGNE L.	SPOTIMAGE	FRANCE	33 62194202	33 62194053
DERON J.P.	BRGM	FRANCE	33 38643434	33 38643518
DOLUH.	CMO/BRESM/GRGS	FRANCE	61 33 29 27	33 61 33 29 16
DOMBROWSKY E.	CLS	FRANCE	33982224299	33 62 14 06 10
EZRATY R.	IFREMER	FRANCE	33 88 65 51 95	33 88 65 51 99
FELLAH K.	SERTT	FRANCE	33 61 176666	33 61348415
FISSE G.	CISI	FRANCE	33 98 22 4227	33 98 224549
GELI L.	IFREMER	FRANCE	33 62 194166	33 62 194053
GUERRE L.F.	SPOTIMAGE	FRANCE	94 45 66 11	33 94 45 68 23
HAMM H.	METEOMER	FRANCE	33 61.394600	33 61394610
HARMS J.	SCOT CONSEIL	FRANCE	33 62194091	33 62194053
HIRSCHFELD A.	SPOT IMAGE	FRANCE	33-93 65 76 23	33-93 65 76 43
LABROUSSE D.	INRA	FRANCE	33 94 45 66 11	33 94456823
LASNIER P.	METEOMER	FRANCE	33 61 07 82 95	33 61 07 82 09
LE MEUR D.	METEO-FRANCE	FRANCE	33 94 45 66 11	33 94456823
LOEUL	METEOMER	FRANCE	33 94 45 66 11	33 94456823
MAITRE H.	ECOLE NATIONALE TELECOM.	FRANCE	33-1 4581 76 55	33-1 45 81 3794
MANGIN A.	CNES	FRANCE	33 1 4476 7535	33 1 4476 7868
MARINELLI L.	GEOMAGE	FRANCE	33-93 00 40 00	33-93 00 40 01
MARTIN P.	ESA/HQ	FRANCE	33 153697654	33 153697560
NASCIMENTO I.	IAURIF	FRANCE	33 1 4043 7984	33 1 4043 7602
NORMAND M.	CEMAGREF	FRANCE	33 40 96 60 54	33 40 96 61 99
ORJOL E.	ESA/HQ	FRANCE	33 153697654	33 153697560

Active + EE

Fixed to About

100 KECU/year
(~ 600 scenes)

No Limit in Active

1
- Royalty for use of
data

ACCESS TO SPACECRAFT

- Allowed to ESA, National and Foreign Stations (NFSs)
- MOU required for NFSs
- Standard MOU (approved by Delegate Bodies):
 - ▶ **National Stations**
 - free access
 - can distribute in their country
 - provide service to ESA at ESA request
 - pay royalty for sales to users from non-participating states
 - ESA pays for services required
 - ▶ **Foreign Stations**
 - pay 160 ECU/scene
 - same
 - same
 - same
 - same

ACCESS POLICY (cont.)

- ▶ **Cat. B: Research and Demonstration Usage (not covered by AO/PP)**
 - Pay the cost of fulfilling the request (order handling + product generation)
- ▶ **Cat. C: Meteorological Organisations**
 - National Meteorological Offices (WMO members), EUMETSAT, ECMWF
 - Receive LBR FDPs free of charge
- ▶ **Cat. D: Public Utility Entities**
 - Organis. of Participating States providing operational services for public utility
 - Receive LBR and SAR (FD and low res.) products at cost of fulfilling the request
- ▶ **Cat. E: Commercial Users**
 - Pay the full price

ACCESS POLICY

- Covered by Data Policy PB-EO(90)57 rev 6
- Price List for SAR and LBR is approved by PB-EO
yearly and on the basis of Commercial distributor input
- Users in 5 categories:
 - **Cat. A: Internal use**
 - CALVAL, commissioning, sensor performance, promotion, user training, AO PIs, Pilot Projects approved by participants, AO instrument providers
 - receive data free of charge

Status of the MOUs

Ground Station Operator	Station	ERS-1 Agreement	ERS-2 Agreement
Agence Francaise de l'Espace, CNES, Australian Centre for Remote Sensing, ACRES The Chinese Academy of Science National Research Council of Thailand, NRCT National Central University of Taiwan CLIRSEN, Ecuador INPE, Brazil National Aeronautics and Space Administration, NASA, USA Department of Energy, Mines and Resources of Canada National Aeronautics and Space Development Agency, NASDA, Japan National Remote Sensing Agency of India CSIR of South-Africa Deutsche Forschungsanstalt für Luft- und Raumfahrt, DLR, Germany EOSAT, USA Indonesian National Institute of Aeronautics and Space, LAPAN Saudi Arabian National Center for Science and Technology, KACST National University of Singapore, NUS Israel Space Agency, ISA Norwegian Space Centre, NSC British National Space Centre, BNSC	Aussaguel (TO) Alice Springs (AS) Hobart (HO) Beijing (BE) Bangkok (TH) Chung-Li (TW) Cotopaxi (CO) Cuiaba (CU) Fairbanks (AF) Mac-Murdo (MM) Gatineau (GH) Prince-Albert (PH) Hatoyama (HA), Kumamoto (KU), Syowa (SY) Hyderabad (SE) Johannesburg (JO) O'Higgins (TF), Libreville (LJ), Neustrelitz Norman (NO) Pare-Pare (IN) Ryadh (SA) Singapore (SG) Tel-Aviv (IR) Tromsø (TS) West-Freugh (WF)	21 Nov. 91 26 Aug. 91 02 May 95 10 May 94 29 Nov. 91 16 Nov. 93 14 Jan. 86 05 Aug. 91 20 June 91 26 June 91 10 March 94 19 Oct. 95 26 Janv. 95 01 Feb. 95 19 July 91 30 Aug. 91	19 Sept. 95 17 Nov. 95 25 Aug. 95 28 Aug. 95 10 Aug. 95 05 Oct. 95 31 Aug. 95 19 Oct. 95 24 Aug. 95 25 Sept. 95

Agenda

15 Dec. 95

09:00	National & Foreign Stations presentations (cont'd) Update on Station characteristics Station Operations Acquisition, Archiving, Processing Cataloguing, Reporting, User services, Products description I/F to EECF Problem areas	NFS representative
10:30	Coffee	
10:45	Open Discussions Recording & Archiving Data distribution Latest developments	V. Beruti ESA
11:45	Review Action Items	V. Beruti ESA
12:00	Closing address	M. Albani ESA
12:15	Lunch	
14:15	Ad-hoc meeting between ESA staffs and NFS representatives on specific topics as required Ground Station / EECF Interface Product Distribution Validation and verification	
17:15	Adjourn	

Agenda

14 Dec. 95

09:00	Registration		
09:30	Welcome	M. Albani	ESA
	Agenda Review	V. Beruti	ESA
10:15	ERS-1/2 Mission Status	G. Duchossois	ESA
10:30	ERS-1/2 Tandem Mission scenario	G. Duchossois	ESA
10:45	Results of the 2nd ERS Applications Workshop in London	G. Duchossois	ESA
11:00	Coffee		
11:15	ERS-1/2 Ground Segment	V. Beruti	ESA
11:30	ERS-C Consortium presentation	J. Mouysset	S.I
11:45	ESA - NFS MOU Status	M. Albani	ESA
12:00	Lunch		
14:00	NFS management	J.C. Bigot	ESA
	NFS team interfaces, Operational procedures for: Mission Planning, Acquisition & Recording, Production planning, User Services, Telecom Interfaces, Reporting procedure, Products validation and verification		
14:30	ERS-1/2 User Services	S. Juz	ESA
	ESRIN World Wide Web services presentation Documentation & tools		
14:45	National & Foreign Stations presentations	NFS representative	
	Update on Station characteristics Station Operations Acquisition, Archiving, Processing Cataloguing, Reporting, User services, Products description Data distribution (internal use, ESA Pls, Commercial sales) I/F to EECF Problem areas		
16:00	Coffee		
16:15	National & Foreign Stations presentations (cont'd)	NFS representative	
18:00	Adjourn		

Action Items List **5th ERS National & Foreign Station Operators Working** **Group meeting - Toulouse 14-15 Dec. 95**

<i>Action Item</i>	<i>Description</i>	<i>Responsible</i>	<i>Status</i>
1	To distribute the London Workshop on SAR applications proceedings with the handouts of the 5th ESOWG meeting to all NFS.	ESA/ESRIN	
2	Monthly Report template to be distributed to all NFS for end of the year.	ESA/ESRIN	done
3	NFS to report timely according to the new monthly report from January 96.	NFS	
4	Validation of NFS SAR products set of documents to be distributed to all NFS with Antenna pattern correction files for ERS-1 and ERS-2 and with Methodology to calculate the K Cste.	ESA/ESRIN	
5	NFS to provide their position concerning the new Access Fee proposal (by M. Albani during the meeting) : annual acquisition fee (100 KAU) or continuation of the current scheme.	NFS	
6	Questionnaire about station characteristics to be send to ESA/ESRIN.	CU, LI & TF, NO, IN, SA, SG	
7	Provide NFS-EECF Interface specifications document to NASDA.	ESA/ESRIN	
8	Investigation on ASF copied tapes readability (Should be clarified before MM tandem data copying starts).	ESA/ESRIN	
9	Indonesian DCRSI cassette given to ESA to be validated and IN asks for report and printout of 1 processed scene.	ESA/ESRIN	
10	To send the list of PI's to serve in each country (direct production interface). This is not applicable to National stations.	ESA/ESRIN	
11	Singapore Pegasus cassette given to ESA for validation.	ESA/ESRIN	
12	Data copying during tandem mission: Station to send copy of the acquired passes at the end of each cycle.	NFS concerned	
13	Calibration K for VMP SAR processor to be given to all NFS equipped with MDA SARPS processor.	ESA/ESRIN	
14	To investigate with the problem that SG had with the SAR processing (drift).	ESA/ESRIN	
15	Deliver the viewgraph presented by VB on SAR performance.	ESA/ESRIN	
16	To establish a working group composed of Japan, Canada, USA (Alaska), Singapore on utilisation of SONY D1 recorder and for exchange on level 0 ccf data.	NFS/ESRIN	
17	Alaska to give more details on the new optical tape recorder technology (compatible with IBM 35mm tape).	ASF	
18	ESA to invite the NFS stations to the future SAR applications workshops.	ESA/ESRIN	

EGSOWG 5

Attendees:

<i>Establishment</i>	<i>Attendee</i>
DLR Germany	Klaus Reiniger
China Remote Sensing Satellite Ground Station China	LI Shilei
China Remote Sensing Satellite Ground Station China	LI An
Centre for Space & Remote Sensing Research, Taiwan	A.J. Chen
Centre for Space & Remote Sensing Research, Taiwan	K.S. Chen
SAC CSIR S.Africa	Renier Balt
SAC CSIR S.Africa	Ike Marais
DRA Great Britain	Mike Pearson
DRA Great Britain	Mike Lloyd
ASF USA	Greta Reynolds
ASF USA	Marc Forbes
ASF USA	Dick Harding
ACRES Australia	Laurie Oliver
CCRS Canada	Tom Feehan
CCRS Canada	Ian Press
NASDA Japan	Takao Fukuda
RESTEC Japan	Tomoaki Endo
RESTEC Japan	Takeki Matsui
Tromso Satellite Station Norway	Jens Skoglund
TRIC Japan	Haruhisa Shimoda
CLIRSEN Ecuador	Filemon Valencia
INPE Brazil	Paolo Serra
LAPAN Indonesia	Ignazio Loiola Arisdio
LAPAN Indonesia	Mokobombang Nurdinsyah
CRISP Singapore	Hock Lim
ISA Israel	Shmaryaho Aviad
ISA Israel	David Atzmon
ESA HQ	G. Duchossois
ESA ESRIN	M. Albani
ESA ESRIN	V. Beruti
ESA ESRIN	H. Barker
ESA ESRIN	J.C. Bigot
ESA ESRIN	S. Jutz
ESRIN	E. Ippolito

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EGSOWG 5

LIST OF EXTERNAL MEETING ATTENDEES

LIST OF ACTION ITEMS

VIEWGRAPH PRESENTATIONS

ANNEX 1: ESA ESRIN Documentation booking form

ANNEX 2: NASDA Document: Format Spec for ERS Level 0

EGSOWG 5

(ERS National & Foreign
Ground Station Operators
Working Group Meeting)
Toulouse
14 - 15 December 1995

This document contains copies of the viewgraphs used in each presentation, the list of attendees, action items, and a copy of the ESA ERS Documentation available.

This document is published by the ERS Facilities Operations Section of the ERS Exploitation Division of ESA/ESRIN.

File Edit View Go Bookmarks Options Directory

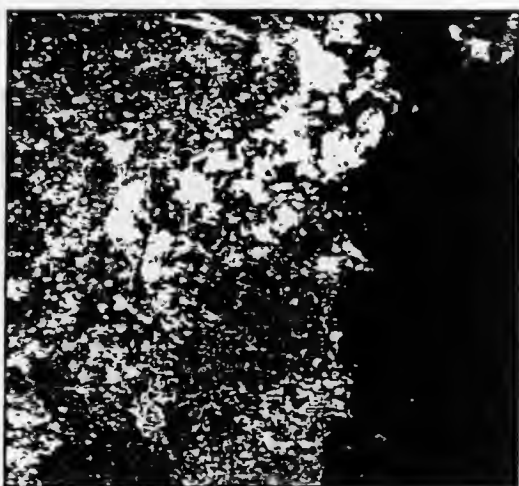
Help



Location: http://137.132.32.52/cgi-bin/spot_bin/spot_detail

CRISP - SPOT Quicklook Search

Scene ID : 32733429508150333041X



[Quicklook][Location Map]



K-J : 273342 Date : 950815 Time : 033304
SPOT No: 3 HRV : 1 Mode : X

Latitude/longitude
Scene Centre : + 4.0067/+103.3137

Upper Left -- Right : + 4.3153/+103.0931 -- + 4.2295/+103.6478
Lower Left -- Right : + 3.7845/+102.9751 -- + 3.6986/+103.5294

Scene Orient : 008.6 Incident Angle : -12.4
Sun Azimuth : 65.5 Sun Elevation : +63.7
Cloud Cover : CDDCCCCC Max : D Avg : C Snow Cover : 00000000
Scene Quality: EEER Avg : E

✓ Prev scene : 273341 ✓ Next scene : 273343

To choose Prev/Next scene in segment,

Select scene, then press :

Document: Done.

File Edit View Go Bookmarks Options Directory

Help



Back



Home



Reload



Open



Print



Find



Stop



Location: http://137.132.32.52/cgi-bin/spot_bin/spotgeo

Coordinates of Selected Location : 15.450000 108.599998

SPOT Quicklook Search Results

SPOT	K-J	Date	Time	HRV	Mode	Cen_Lat	Cen_Long	Incid	Cl_Cover
2	278319	950813	031012	1	X	+15.5164	+108.4146	-29.6	CDCDDDCD
2	278319	950813	031009	1	P	+15.5163	+108.4256	-29.6	CDCDBDCE

Select

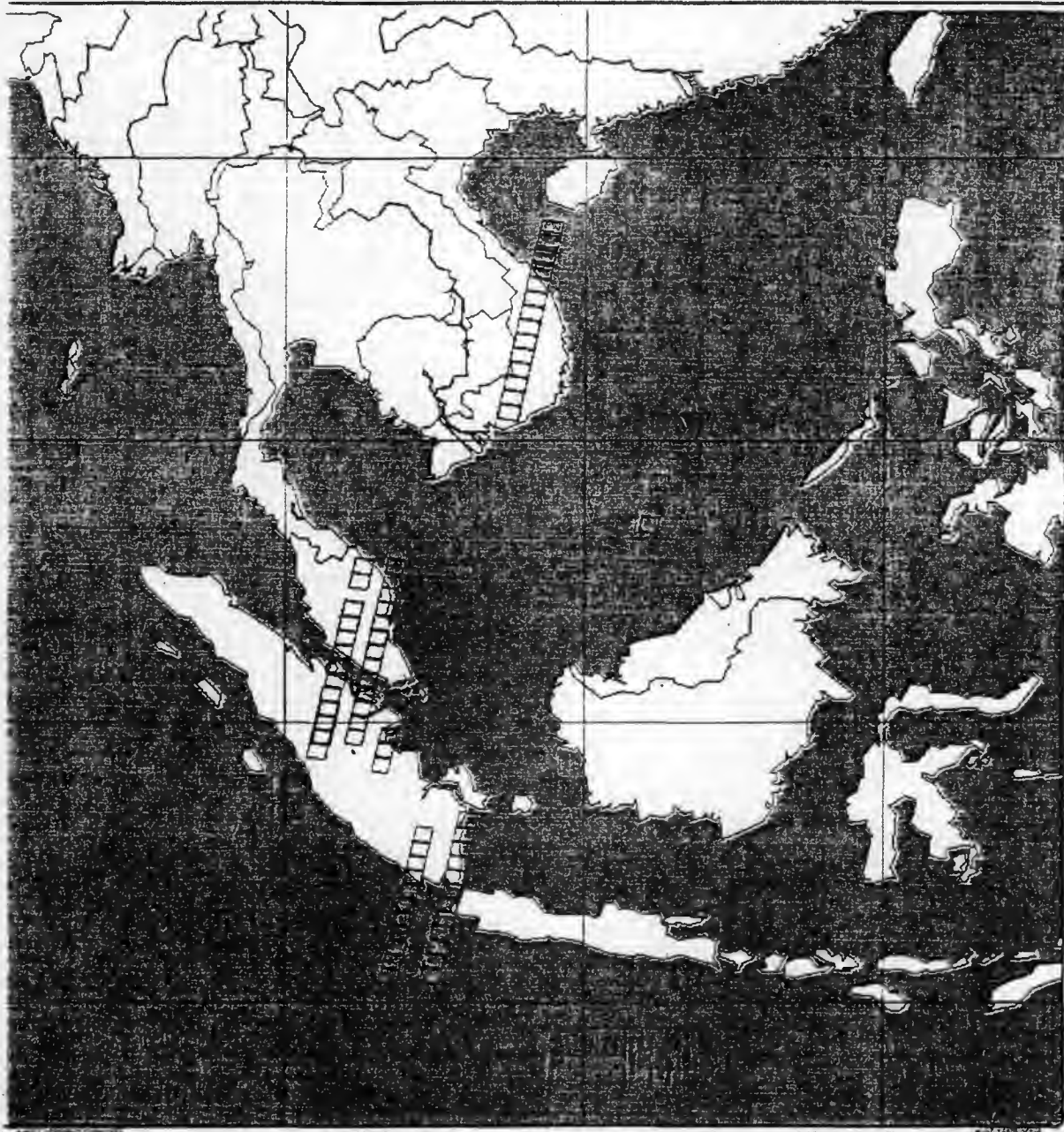
Number of results returned = 2

File Edit View Go Bookmarks Options Directory

Help



Location: http://137.132.32.52/cgi-bin/spot_bin/spotgeo



File Edit View Go Bookmarks Options Directory Help



Location: http://www.crisp.nus.sg/crisp_ql/spotgeo.html

CRISP - SPOT Quicklook Browse

Geographical Location of Search Area (in decimal degrees)

Top Left -- Latitude Longitude

Bottom Right -- Latitude Longitude

Search Period

Starting Date Ending Date
YYMMDD YYMMDD

Spectral Mode

Incidence Angle

Average & Cloud Cover

Form of results to return :

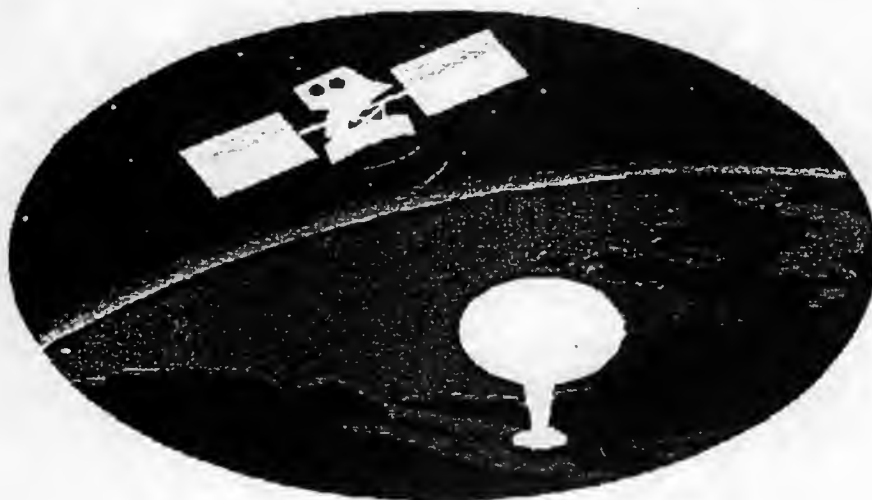
Maximum number of results to return:

File Edit View Go Bookmarks Options Directory

Help



Location: <http://www.crisp.nus.sg/>



WELCOME to CRISP

Centre for Remote Imaging, Sensing and Processing
National University of Singapore



About CRISP



Station Overview



Research



Staff

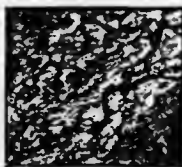


Spore Links



Other Links

[Station Overview](#) | [Research](#) | [Staff](#) | [Spore Links](#) | [Other Links](#)

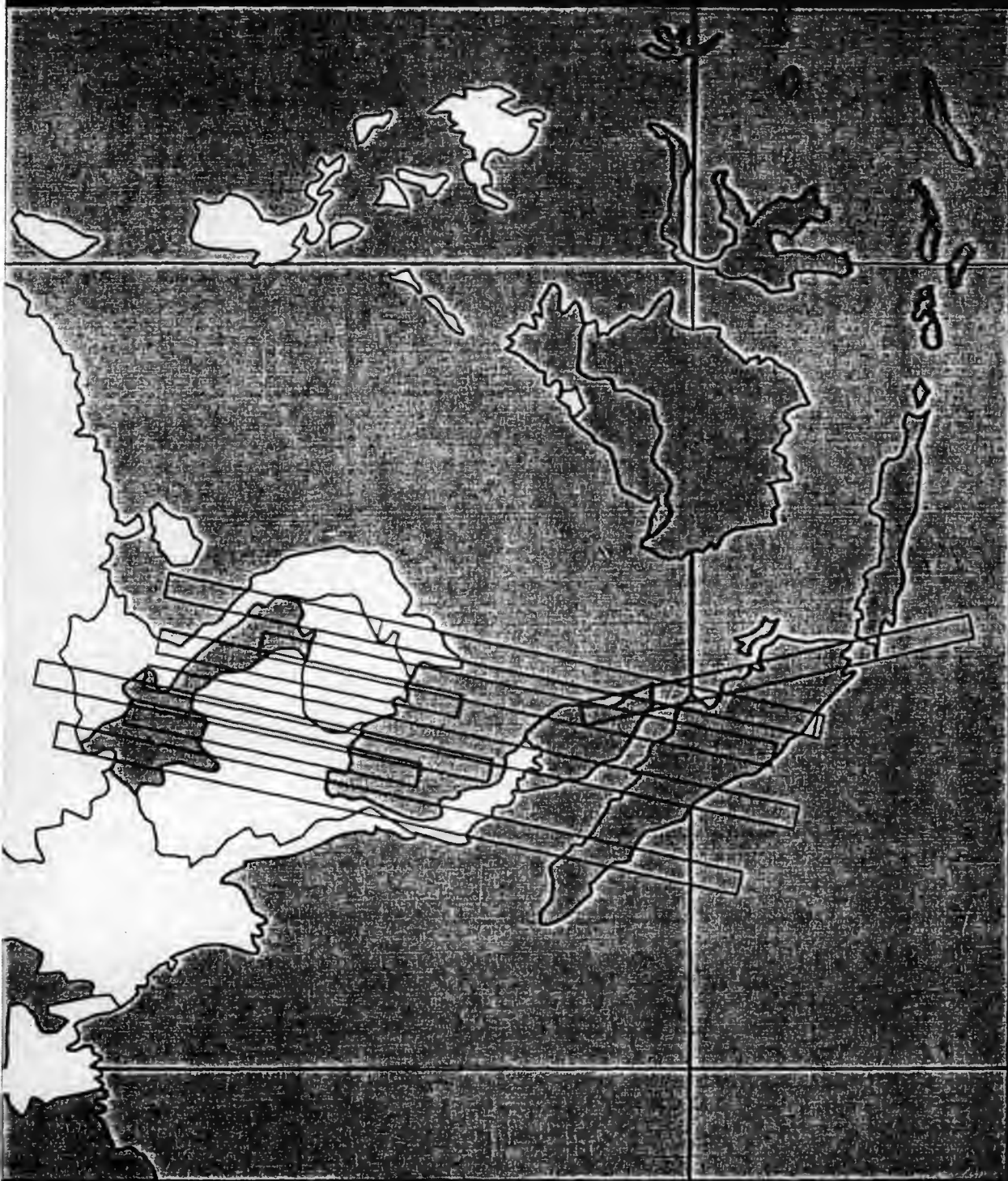


Ground Station Quicklook Browse

Document: Done.

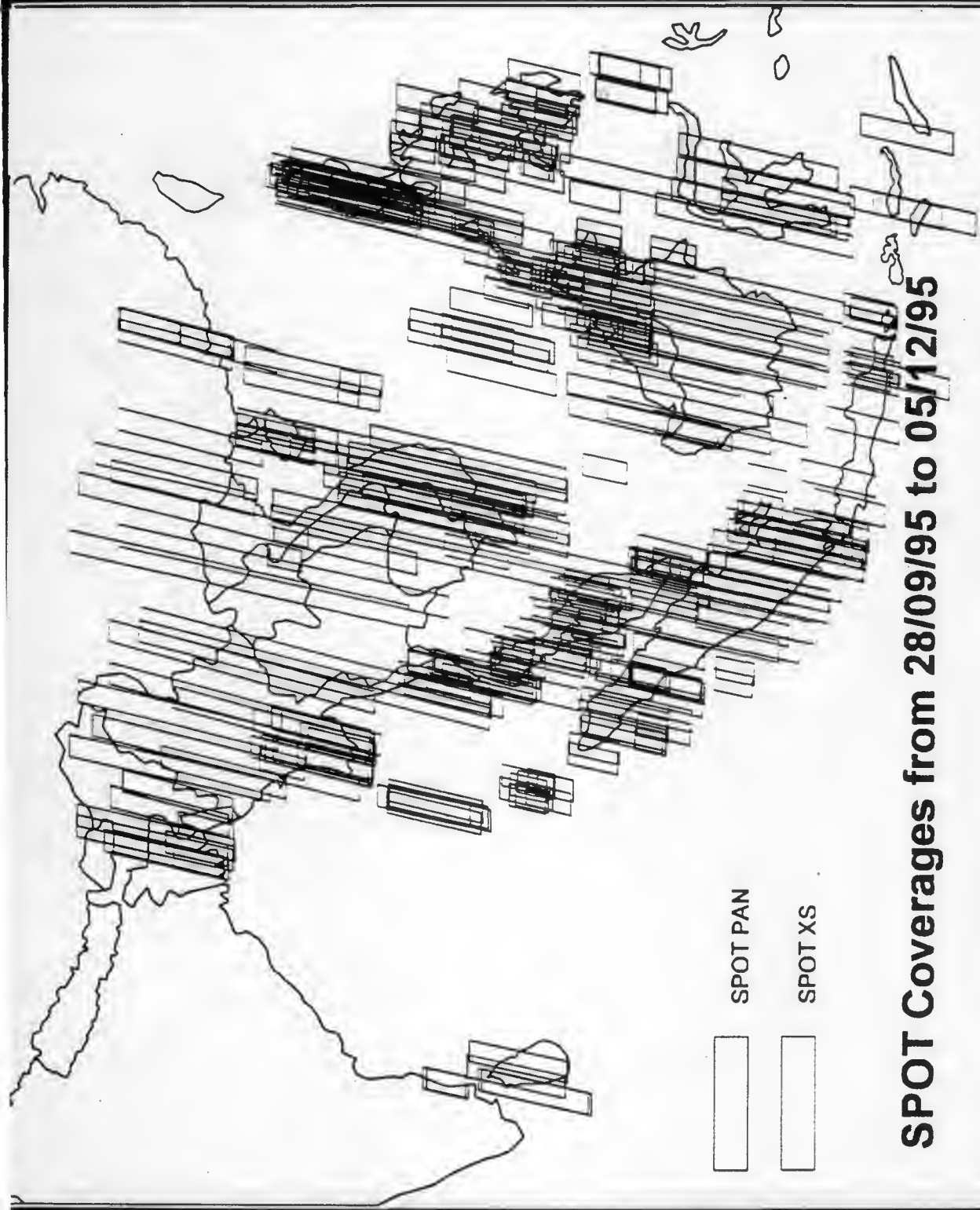
Catalog-Browse Systems

- Information available:
 - » catalog of available scenes
 - » quick look images with location maps
- World Wide Web
 - <http://www.crisp.nus.sg>
- In-house system similar to the WWW system but with more up-to-date data
- Quick-look on hardcopy on request



ERS Archive

- Two passes granted by ESA for reception testing on 2 Sep and 12 Sep 1995.
- Some passes received on ESA's request for period 24 Sep--16 Oct 1995.
- Altogether about 55 minutes (about 200 scenes) of data archived.



SPOT Coverages from 28/09/95 to 05/12/95

SPOT Archive

- SPOT scenes acquired in period
28 Sep-30 Nov '95

- » Panchromatic

- » A -- 5, B -- 56, C -- 135, D -- 222, E -- 639,

- * -- 55 Sub-total -- 1112

- » Multispectral

- A -- 45, B -- 142, C -- 285, D -- 409, E -- 511,

- * -- 76 Sub-total -- 1468

CSIR PRESENTATION TO ESWOG

14 AND 15 DECEMBER, 1995

TOULOUSE, FRANCE

PRESENTED BY IKE MARAIS

ESWOG9508



STATION CHARACTERISTICS

- LOCATION: SOUTH 25.9°, EAST 27.7°
- ALTITUDE : 1530 METERS
- RECEIVE SYSTEM::
 - DATRON L/S/X 10 METER ANTENNA
 - DOWNCONVERTERS
 - TRACKING RECEIVERS
- RECEIVER/DEMODO:
 - EMP (ELECTRONIQUE MIDI PYRENNÉES)
 - CAN HANDLE SPOT, ERS, LANDSAT, RADARSAT, J-ERS DATA
- RECORDING SYSTEM
 - HONEYWELL HD96 FOR REALTIME
 - CREO OPTICAL TAPE FOR ARCHIVE

STATION CHARACTERISTICS (CONTINUED)

- PROCESSING SYSTEM:

- PROCURED FROM ADVANCED COMPUTER SYSTEMS,
- ROME, ITALY.

- CONFIGURED AS CLIENT/SERVER

- SILICON GRAPHICS INDY R4400
- SILICON GRAPHICS CHALLENGE L-SERIES

- QUICK LOOK/BROWSE SYSTEM SUPPORTED
- ONLY FOR IN-HOUSE USE AT PRESENT

STATION OPERATIONS

- TWO BUSINESS AREAS:
 - TT+C
 - GEO-INFORMATION PRODUCTS AND APPLICATIONS
- TT+C
 - PART OF CNES NETWORK
 - WILLING AND ABLE TO SUPPORT OTHER AGENCIES
- GEO-INFORMATION:
 - RECEIVE DATA FROM ERS, SPOT, LANDSAT, NOAA.
 - STANDARD RANGE OF PRODUCTS, PHOTO AND DIGITAL
 - PRODUCING VALUE-ADDED PRODUCTS
 - PROJECTS

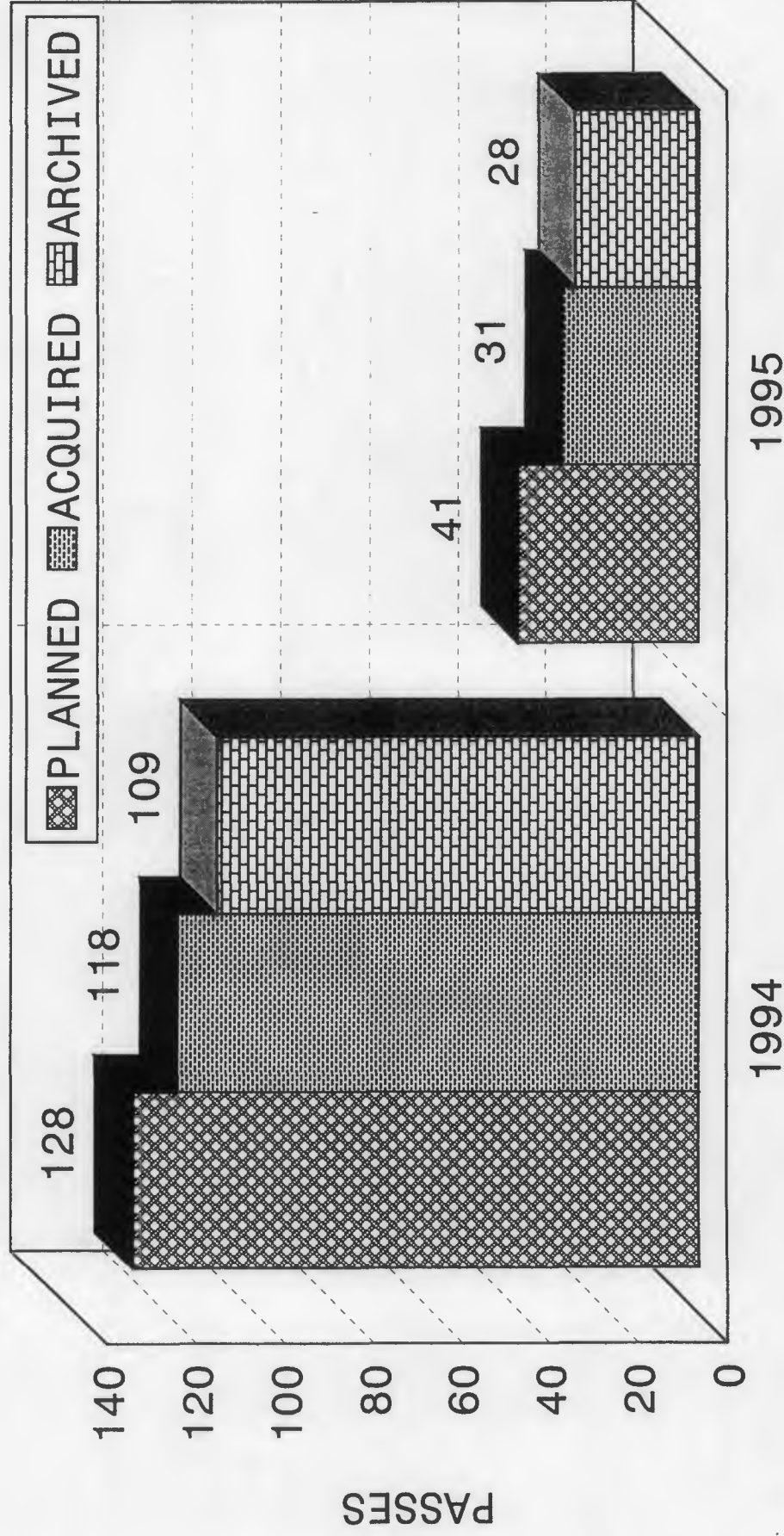
ERS SAR DATA ACQUISITION

- CUSTOMER DRIVEN
- ON REQUEST FROM ESRIN
- TAKING PART IN ERS-1/2 TANDEM MISSION

ESWOG9504

ACQUISITIONS

JANUARY, 1994 TO 31 OCTOBER, 1995



PROCESSING

- PRODUCTS:

- ANNOTATED RAW DATA (RAW)
- SINGLE LOOK COMPLEX (SLC)
- GEOCODED IMAGE (GEC)

- PROCESSING TIMES:

- RAW: 20 MINUTES
- SLC: 50 MINUTES
- GEC: 120 MINUTES

- INVENTORY:

- 160 MINUTES FOR A TEN MINUTE PASS



DISTRIBUTION/MARKETING

- SAC HAS EXCLUSIVE RIGHTS IN SOUTH AFRICA
- MARKET VIRTUALLY NON-EXISTENT - MUST BE DEVELOPED
- SAC COMMISSIONED MARKET STUDY
- PROSPECTS APPEAR GOOD FOR SALES IN:
 - AGRICULTURE (CROP DISCRIMINATION)
 - GEOLOGY
 - OIL POLLUTION
 - SHIP MONITORING
- RADAR BRIEF:
 - FOCUSED BRIEFING ON RADAR IMAGERY
 - TWO DAY BRIEFING ON 15 AND 16 FEBRUARY, 1996
 - UNDER AUSPICES OF SAC
 - SUPPORTED BY SPEAKERS FROM ESA, SPOT-IMAGE, NRSC, RSI

DLR GROUNDSTATIONS for EARTH OBSERVATION

Results of TRS Libreville station

total number of campains since installation : 2

LI 940701	18.07.94	25.08.94	186	170	--	--	91.2%
LI 951101	15.11.95	12.12.95	131*	120*	3	8	93.8%

planned campains 1995:

LI 950101	15.01.95	23.02.95					
LI 950302	23.03.95	02.06.95					

DLR GROUNDSTATIONS for EARTH OBSERVATION

Results of GARS O'Higgins station

total number of campains since launch of ERS-1: 9

	24.09.91	12.10.91	040	Testcampain		
TF 911001						
TF 920103	10.01.92	15.03.92	391	349	17	25 93.3%
TF 920701	01.07.92	31.07.92	243	204	38	1 99.5%
TF 921101	22.11.92	09.12.92	129	121	0	8 93.8%
TF 930102	10.01.93	24.02.93	205	173	2	6 85.6%
TF 930801	15.08.93	12.09.93	195	187	2	6 96.9%
TF 940103	20.01.94	20.03.94	414	400	11	3 99.3%
TF 950101	15.01.95	15.02.95	214	205	7	2 99.0%
TF 951002	15.10.95	20.11.95	446	418	14	5 96.8%

DLR GROUNDSTATIONS for EARTH OBSERVATION

Status 1995

Groundstations are applied to supply german national Users with data of regions with high scientific or public interest and to support ERS programme

Operational are presently

GARS located at O'Higgins, Antarctica
TRS located at Libreville, Gabon

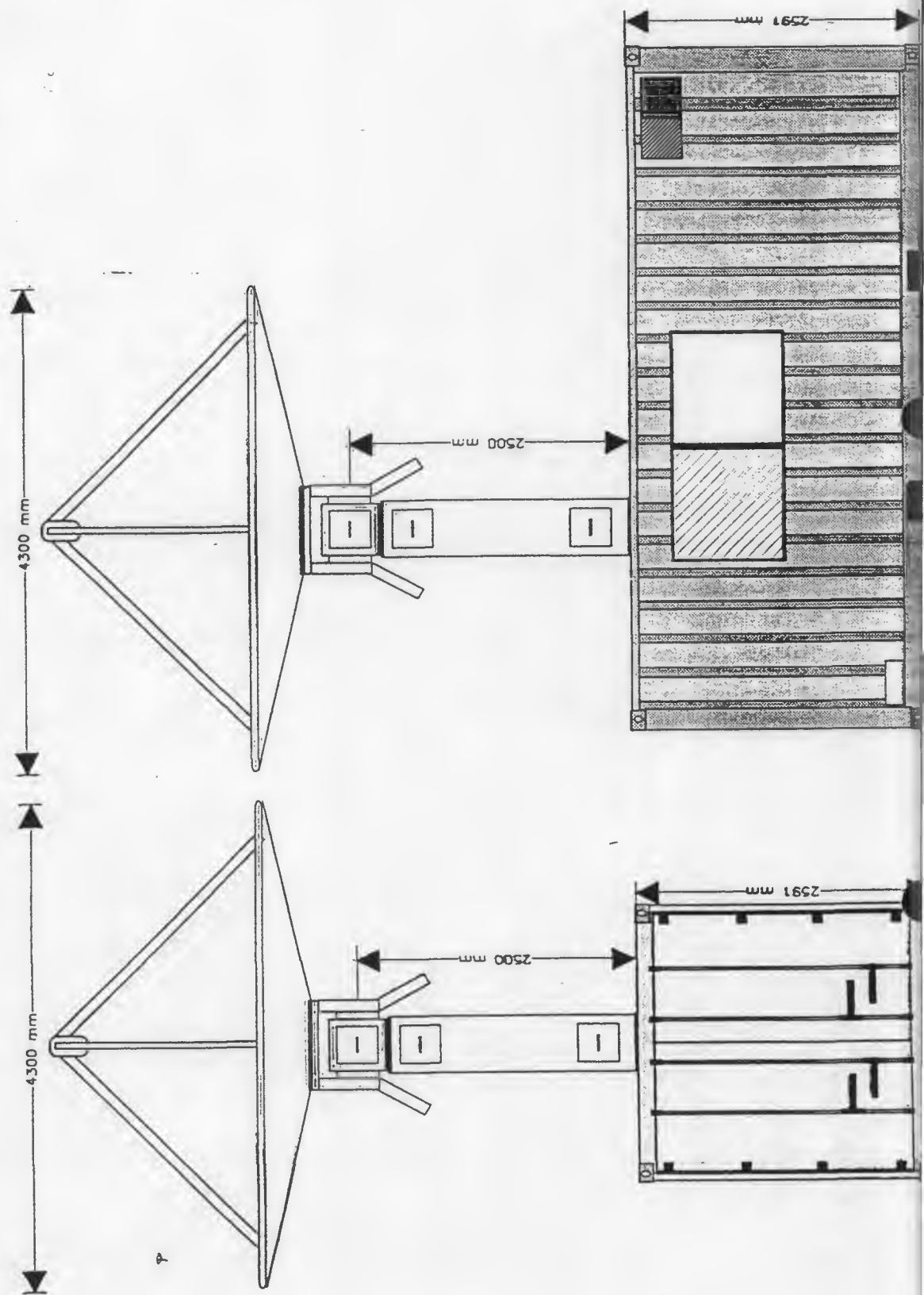
Under test is

NTZ located at Neustrelitz, Germany

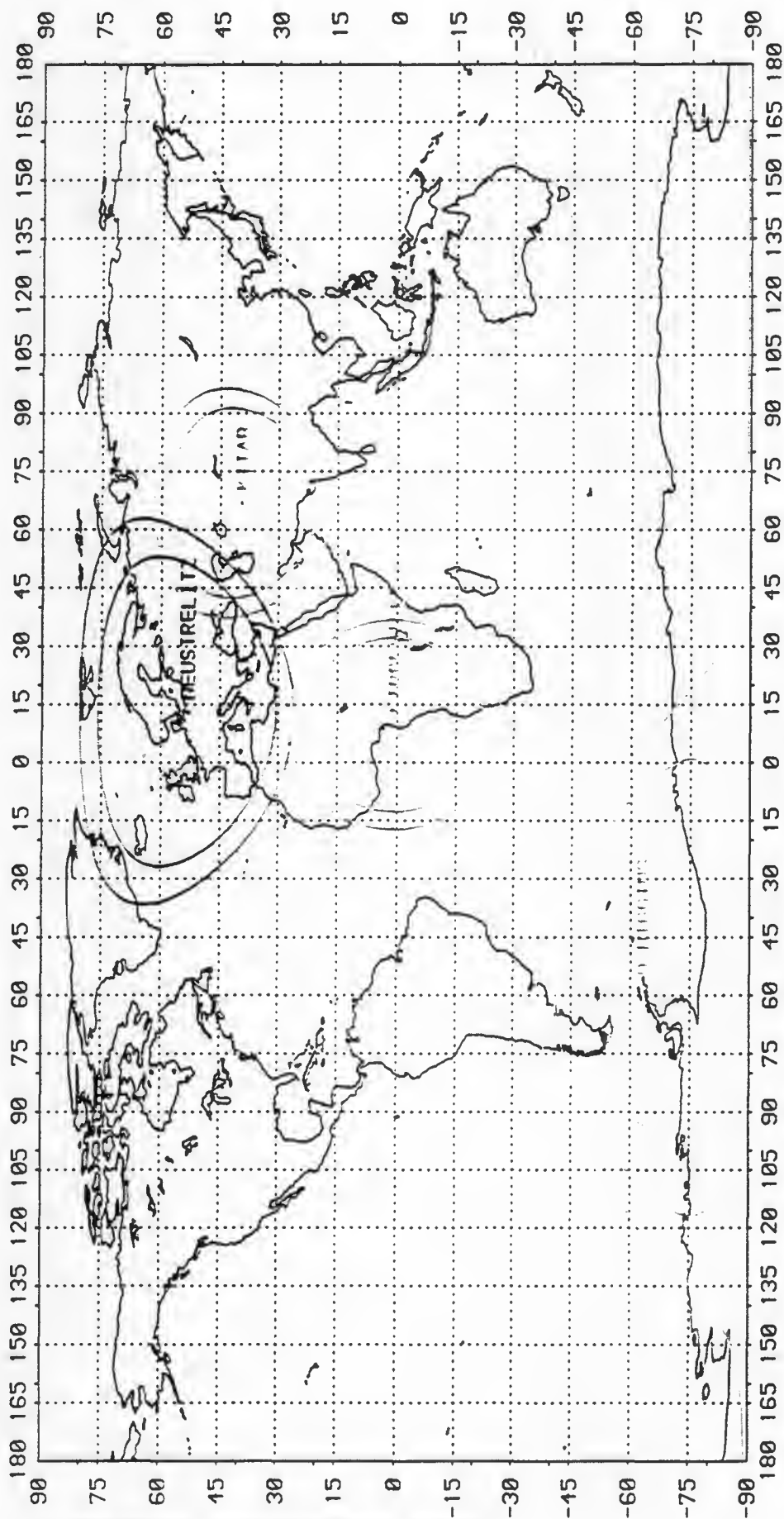
Under development is

Mobile Station to be first located at Kitab, Usbekistan

ERS Satellitenempfangsstation Container A



DLR-DFD X-Band Stations



DLR OBERPFAFFENHOFEN DEUTSCHES FERNERKUNDTUNGS DATENZENTRUM (DFD)
263 APR 95 8:2

Stations Neustrelitz, Libreville, O'Higgins - Visibility Circles 0.15 deg (ERS-1)
Mobile Groundstation In Kitab (Uzbekistan) - Visibility Circles 5.10 deg

WEST FREUGH SATELLITE GROUND STATION

**The United Kingdom's National Ground Station
for the reception and processing of data from ERS-1/2**



WEST FREUGH

FARNBOROUGH

DRA

THE GROUND STATION MISSION

To provide remote sensing satellite data products in support of DRA space research for customers.

To provide operational data products and information to users.

RECEPTION CAPABILITY

Reception of data from satellites transmitting between 8025 MHz and 8400 MHz as follows:

ERS-1/2:

High bit rate SAR

Low bit rate AMI Wind and Wave Modes

Along-Track Scanning Radiometer

Radar Altimeter

RADARSAT (shortly): SAR

DRA

ON-SITE DATA PROCESSING

Transcription of raw data to computer-compatible form

Processing of SAR data

Demultiplexing of ERS low rate data

ATSR data processing (shortly)

COMMUNICATIONS

Wide area network connection to Farnborough

Internet

X25

Telephone, fax, email

DRA

CURRENT DEVELOPMENTS - RAIDS

(RAPID Information Dissemination System)

Provides fast delivery of low resolution SAR images anywhere, within hours of reception from the satellite.

Images are downloaded via a telephone line to suitably equipped users (modem, PC and software required)

Collaborative project with Matra Marconi Space and National Remote Sensing Centre.

STATUS - In demonstration phase. Soon to become operational and available via Internet.

CURRENT DEVELOPMENTS - Environmental Monitoring

Oil slick, sea ice, ocean front and ship detection/tracking.

Collaborative project with Earth Observation Sciences.

STATUS - Demonstrations (processing currently at Farnborough).

CURRENT DEVELOPMENTS - ATSR

Provision of operational environmental information (eg sea surface temperatures).

STATUS - Demonstration early in 1996.

CURRENT DEVELOPMENTS - RADARSAT

Modifications:

Upgraded receiving system

Installation of direct data capture system

Installation of dedicated SAR data processor

Provision of data management and customer services facilities

Installation of high speed network for inter-system transfers and communications interface

DRA

STATION OPERATIONS

DRA management of the station is from Farnborough.

Day to day on-site operation is by contract staff.

1991 - 1994: Space Technology Systems.

3 October 1994 - date: Assessment Services (5-year contract).

DATA ACQUISITIONS
3 October 1994 - 30 September 1995

	ERS-1	ERS-2
No of passes tracked	2174	552
Data losses due to satellite	13	42
Data losses due to station	12	0
Station availability	99.6%	

DRA

PRODUCTS GENERATED
3 October 1994 - 30 September 1995

	RAW	PRI	RAIDS (SUB-SCENES)	STRIP (SCENES)
DRA	-	364	-	321
Demonstration	-	-	53	-
Other promotions	-	8	-	-
Sales	-	35	-	-
ESA	7	-	-	-

DRA

DATA ARCHIVE

ERS-1 SAR

8592 minutes

ERS-1 LBR

209 minutes

ERS-2 SAR

1057 minutes

Archive medium (for exclusive area) HDDT

Archive medium (for all other areas) Exabyte

Note During 1996 Exabyte will be adopted for all data.

DRA

DISADVANTAGES OF HDDT

Recorders expensive to maintain.

Labour intensive operations.

Tapes expensive to buy.

Large storage area required for archive.

Controlled environment required.

Transportation of tapes expensive and requires special packaging.

Customers can not read HDDTs.

Periodic worldwide shortages.

DRA

ADVANTAGES OF DIRECT DATA CAPTURE SYSTEM

Maintenance costs as for a high performance workstation.

Minimal effort required from operators.

Combines data capture and transcription functions, to provide computer compatible output.

Can be networked for fast, efficient transfers of data to processor.

Direct production of archive on preferred medium, eg low cost Exabyte.

DRA

LAPAN INDONESIA REMOTE SENSING GROUND STATION CURRENT STATUS

- LAPAN CONTINUOUSLY DEVELOP THE CAPABILITY OF DATA RECEIVING FACILITY IN PAREPARE AND DATA PROCESSING AND USER SERVICE FACILITY IN PEKAYON JAKARTA.
- LAPAN REMOTE SENSING GROUND STATION SYSTEM RECEIVE SATELLITE DATA FROM SATELLITES: SPOT, LANDSAT, ERS, JERS, NOAA AND GMS
- DATA ARCHIVING AND DATA DISTRIBUTION IS BEGUN IN MARCH 1994
- LAPAN IS ALSO PERFORMING REMOTE SENSING APPLICATION RESEARCH AND USER DEVELOPMENT

CURRENT DEVELOPMENT

- BUILDING THE CAPABILITY TO RECEIVE AND PROCESS JERS-1 DATA
 - DATA ACQUISITION FACILITY IN PAREPARE WITH NEW ANTENNA AND RECORDING SUBSYSTEM
 - DATA PROCESSING FACILITY IN PEKA YON JAKARTA
- INSTALLATION AND TEST IS FINISHED IN OCTOBER 1995
RECORDING OPERATION IS STARTED IN NOVEMBER 1995
- INTEGRATION OF MDA ACQUISITION SYSTEM AND NASDA ACQUISITION SYSTEM IS DONE TO ENHANCE RELIABILITY OF PAREPARE DATA ACQUISITION FACILITY.
- THE INTEGRATION IS SUCCESSFULLY DONE. THE JERS-1 ANTENNA SUBSYSTEM HAS BEEN SUCCESSFULLY USED TO RECEIVE SPOT-2, LANDSAT-5 AND ERS-1 DATA.
- LANDSAT QUICKLOOK BROWSE SYSTEM HAS BEEN BUILT. THE SYSTEM USED PC COMPUTER AS BASE PROCESSOR.

UTILIZATION OF ERS-1 DATA

- **EC-ASEAN PROJECT INDO-1 AND INDO-2 (LAND USE AND COASTAL ZONE MONITORING) 1993-1995.**
- **SARI PROJECT/BPPT (LAND USE, AGRICULTURE AND NATURAL RESOURCES) 1993-1995**
- **FUTURE APPLICATIONS**
 - * **THE EXTENTION OF EC-ASEAN PROJECT (INDO-1 AND INDO-2)**
 - * **FOREST MANAGEMENT IN INDONESIA 1996 (WAGENINGEN AGRICULTURE UNIVERSITY AND DEPARTMENT OF FORESTRY**

ERS-1 ACQUISITION SUMMARY 1993

ORBIT	GS	PA	ACQ_DATE	START_TIME	DURATION	FRAMES	RECORDED
11485	IN	IN	26-SEP-93	02:48:13	104544	5	RECORDED
11505		IN	27-SEP-93	13:10:29	57029	3	RECORDED
11513		IN	28-SEP-93	01:45:29	284772	14	RECORDED
11514		IN	28-SEP-93	03:26:04	91844	5	RECORDED
11527		IN	29-SEP-93	01:15:22	162054	8	RECORDED
11528		IN	29-SEP-93	02:54:43	127641	6	RECORDED
11548		IN	30-SEP-93	13:16:14	74587	4	RECORDED
12230		IN	17-NOV-93	03:54:47	23261	1	RECORDED
12459		IN	03-DEC-93	03:49:37	96335	5	RECORDED
TOTAL						51	

ERS-1 ACQUISITION SUMMARY 1994

ORBIT	GS	PA	ACQ_DATE	START_TIME	DURATION	FRAMES	RECORDED
12938		IN	05-JAN-94	02:50:02	35753	2	RECORDED
13196		IN	23-JAN-94	15:22:12	40941	2	RECORDED
13540		IN	16-PEB-94	15:21:59	46162	2	RECORDED
13626		IN	22-PEB-94	15:22:00	45392	2	RECORDED
16438		IN	06-SEP-94	15:22:50	67483	3	RECORDED
16790		IN	01-OCT-94	03:17:41	12275	1	RECORDED
16890		IN	08-OCT-94	02:24:44	187729	9	RECORDED
16948		IN	12-OCT-94	03:25:43	176612	9	RECORDED
16962		IN	13-OCT-94	02:52:07	140991	7	RECORDED
16976		IN	14-OCT-94	02:18:33	226971	11	RECORDED
16991		IN	15-OCT-94	03:20:18	177315	9	RECORDED
17005		IN	16-OCT-94	02:47:10	133712	7	RECORDED
17019		IN	17-OCT-94	02:10:27	204908	10	RECORDED
17034		IN	18-OCT-94	03:16:21	141693	7	RECORDED
17063		IN	20-OCT-94	03:45:29	101454	5	RECORDED
17120		IN	24-OCT-94	03:05:42	144605	7	RECORDED
17163		IN	27-OCT-94	03:01:23	129095	6	RECORDED
17177		IN	28-OCT-94	02:24:54	108687	5	RECORDED
17235		IN	01-NOV-94	03:22:27	212863	11	RECORDED
17249		IN	02-NOV-94	02:46:42	236626	12	RECORDED
17263		IN	03-NOV-94	02:12:43	201115	10	RECORDED
17278		IN	04-NOV-94	03:17:12	202336	10	RECORDED
17307		IN	06-NOV-94	03:48:56	88395	4	RECORDED
17350		IN	09-NOV-94	03:45:26	367071	18	RECORDED
17378		IN	11-NOV-94	02:34:14	70852	4	RECORDED
17615		IN	27-NOV-94	15:45:55	32168	2	RECORDED
17758		IN	07-DEC-94	14:53:57	53008	3	RECORDED
17766		IN	08-DEC-94	03:23:19	174803	9	RECORDED
17780		IN	09-DEC-94	02:51:19	122745	6	RECORDED
17787		IN	09-DEC-94	15:21:51	52822	3	RECORDED
17823		IN	12-DEC-94	02:48:28	41279	2	RECORDED
17860		IN	14-DEC-94	15:49:22	0	0	NOT RECORDED
TOTAL						199	

FIRST QUARTER 1995 ERS-1 ACQUISITION SUMMARY

ORBIT	GS	PA	ACQ_DATE	START_TIME	DURATION	FRAMES	RECORDED
18196	IN	IN	07-JAN-95	02:28:22	51184	3	RECORDED
18239		IN	10-JAN-95	02:24:37	230816	12	RECORDED
18253		IN	11-JAN-95	01:51:09	102095	5	RECORDED
18289		IN	13-JAN-95	14:54:33	51851	3	RECORDED
18296		IN	14-JAN-95	01:52:04	120692	6	RECORDED
18297		IN	14-JAN-95	03:25:50	152206	8	RECORDED
18340		IN	17-JAN-95	03:19:00	188805	9	RECORDED
18368		IN	19-JAN-95	02:07:59	103837	5	RECORDED
18454		IN	25-JAN-95	02:04:41	159551	8	RECORDED
18569		IN	02-FEB-95	02:25:48	69131	3	RECORDED
18576		IN	02-FEB-95	14:52:10	46878	2	RECORDED
18583		IN	03-FEB-95	01:48:58	49500	2	RECORDED
18584		IN	03-FEB-95	03:25:13	41487	2	RECORDED
18598		IN	04-FEB-95	02:45:25	16338	1	RECORDED
18655		IN	08-FEB-95	02:14:14	57055	3	RECORDED
18698		IN	11-FEB-95	02:00:14	96141	5	RECORDED
18741		IN	14-FEB-95	02:02:17	86391	4	RECORDED
18770		IN	16-FEB-95	02:24:24	53332	3	RECORDED
18828		IN	20-FEB-95	16:00:16	40648	2	RECORDED
18842		IN	21-FEB-95	02:52:34	42179	2	RECORDED
18863		IN	22-FEB-95	14:45:49	42679	2	RECORDED
18871		IN	23-FEB-95	03:24:01	50330	3	RECORDED
18877		IN	23-FEB-95	14:21:16	20687	1	RECORDED
18885		IN	24-FEB-95	02:47:05	41079	2	RECORDED
18899		IN	25-FEB-95	02:14:33	33524	2	RECORDED
18906		IN	25-FEB-95	14:40:25	65132	3	RECORDED
18942		IN	28-FEB-95	02:04:43	111996	6	RECORDED
18971		IN	02-MAR-95	02:33:52	174414	9	RECORDED
19028		IN	06-MAR-95	02:02:11	25603	1	RECORDED
19064		IN	08-MAR-95	14:58:05	41369	2	RECORDED
19071		IN	09-MAR-95	01:55:36	126260	6	RECORDED
19086		IN	10-MAR-95	02:55:12	119343	6	RECORDED
19100		IN	11-MAR-95	02:26:51	89328	4	RECORDED
19129		IN	13-MAR-95	02:45:56	251469	13	RECORDED
19143		IN	14-MAR-95	02:20:54	109318	5	RECORDED
19150		IN	14-MAR-95	14:43:23	171924	9	RECORDED
TOTAL						162	

SECOND QUARTER 1995 ERS-1 ACQUISITION SUMMARY

ORBIT	GS	PA	ACQ_DATE	START_TIME	DURATION	FRAMES	RECORDED
19465		IN	05-APR-95	14:27:44	49044	2	RECORDED
19544		IN	11-APR-95	02:13:35	130995	7	RECORDED
19551		IN	11-APR-95	14:38:47	63370	3	RECORDED
19587		IN	14-APR-95	02:20:42	0	0	NOT RECORDED
19594		IN	14-APR-95	14:44:53	0	0	NOT RECORDED
19595		IN	14-APR-95	14:49:40	0	0	NOT RECORDED
19602		IN	15-APR-95	03:22:54	0	0	NOT RECORDED
19616		IN	16-APR-95	02:51:47	0	0	NOT RECORDED
19630		IN	17-APR-95	02:26:28	0	0	NOT RECORDED
19638		IN	17-APR-95	14:55:25	0	0	NOT RECORDED
19644		IN	18-APR-95	14:55:25	0	0	NOT RECORDED
19645		IN	18-APR-95	01:53:51	0	0	NOT RECORDED
19673		IN	20-APR-95	03:29:40	0	0	NOT RECORDED
19687		IN	21-APR-95	01:53:04	0	0	NOT RECORDED
19716		IN	23-APR-95	02:29:40	0	0	NOT RECORDED
19730		IN	24-APR-95	02:05:21	0	0	NOT RECORDED
19737		IN	24-APR-95	14:30:32	0	0	NOT RECORDED
19773		IN	27-APR-95	02:04:03	0	0	NOT RECORDED
19780		IN	27-APR-95	14:36:17	0	0	NOT RECORDED
19816		IN	30-APR-95	02:16:51	0	0	NOT RECORDED
19823		IN	30-APR-95	14:42:02	0	0	NOT RECORDED
19845		IN	02-MAY-95	02:47:55	114462	6	RECORDED
19859		IN	03-MAY-95	02:23:36	0	0	NOT RECORDED
19866		IN	03-MAY-95	14:47:47	182279	9	RECORDED
19867		IN	03-MAY-95	14:52:33	0	0	NOT RECORDED
19873		IN	04-MAY-95	01:50:13	127285	6	RECORDED
19874		IN	04-MAY-95	03:25:32	99131	5	RECORDED
19916		IN	07-MAY-95	01:56:43	0	0	NOT RECORDED
19945		IN	09-MAY-95	02:25:16	0	0	NOT RECORDED
19959		IN	10-MAY-95	01:55:55	0	0	NOT RECORDED
19966		IN	10-MAY-95	14:28:10	0	0	NOT RECORDED
19988		IN	12-MAY-95	02:34:48	0	0	NOT RECORDED
20002		IN	13-MAY-95	02:01:11	306043	15	RECORDED
20003		IN	13-MAY-95	03:42:32	0	0	NOT RECORDED
20009		IN	13-MAY-95	14:33:25	0	0	NOT RECORDED
20045		IN	16-MAY-95	02:13:59	0	0	NOT RECORDED
20046		IN	16-MAY-95	03:47:17	0	0	NOT RECORDED
20052		IN	16-MAY-95	14:39:11	63361	3	RECORDED
20088		IN	19-MAY-95	02:20:46	0	0	NOT RECORDED
20095		IN	19-MAY-95	14:44:56	0	0	NOT RECORDED
20096		IN	19-MAY-95	14:49:43	0	0	NOT RECORDED
20103		IN	20-MAY-95	03:20:12	0	0	NOT RECORDED
20117		IN	21-MAY-95	02:50:51	0	0	NOT RECORDED
20131		IN	22-MAY-95	02:26:31	0	0	NOT RECORDED
20139		IN	22-MAY-95	14:55:29	39521	2	RECORDED
20145		IN	23-MAY-95	01:53:55	93737	5	RECORDED
20146		IN	23-MAY-95	03:25:42	174908	9	RECORDED
20174		IN	25-MAY-95	02:21:43	0	0	NOT RECORDED
20188		IN	26-MAY-95	01:53:08	0	0	NOT RECORDED
20217		IN	28-MAY-95	02:32:00	0	0	NOT RECORDED
20231		IN	29-MAY-95	02:05:25	0	0	NOT RECORDED
20238		IN	29-MAY-95	14:30:36	61590	3	RECORDED

20274	IN	01-JUN-95	02:04:08	0	0	NOT RECORDED
20275	IN	01-JUN-95	03:44:14	0	0	NOT RECORDED
20281	IN	01-JUN-95	14:36:21	62380	3	RECORDED
20303	IN	03-JUN-95	02:38:44	24635	1	RECORDED
20309	IN	03-JUN-95	13:36:08	0	0	NOT RECORDED
20317	IN	04-JUN-95	02:16:41	0	0	NOT RECORDED
20318	IN	04-JUN-95	03:51:44	0	0	NOT RECORDED
20324	IN	04-JUN-95	14:42:06	0	0	NOT RECORDED
20340	IN	05-JUN-95	15:57:23	0	0	NOT RECORDED
20346	IN	06-JUN-95	02:44:29	183093	9	RECORDED
20360	IN	07-JUN-95	02:23:41	94189	5	RECORDED
20367	IN	07-JUN-95	14:47:52	181520	9	RECORDED
20368	IN	07-JUN-95	14:52:38	0	0	NOT RECORDED
20374	IN	08-JUN-95	01:50:18	151848	8	RECORDED
20375	IN	08-JUN-95	03:23:52	160807	8	RECORDED
20389	IN	09-JUN-95	02:50:14	35520	2	RECORDED
20403	IN	10-JUN-95	02:18:52	164727	8	RECORDED
20417	IN	11-JUN-95	01:56:48	0	0	NOT RECORDED
20418	IN	11-JUN-95	03:28:36	0	0	NOT RECORDED
20446	IN	13-JUN-95	02:24:37	201044	10	RECORDED
20460	IN	14-JUN-95	01:56:01	259684	13	RECORDED
20467	IN	14-JUN-95	14:28:15	48378	2	RECORDED
20489	IN	16-JUN-95	02:34:53	200315	10	RECORDED
20503	IN	17-JUN-95	02:01:16	277142	14	RECORDED
20504	IN	17-JUN-95	03:40:51	121638	6	RECORDED
20510	IN	17-JUN-95	14:33:29	0	0	NOT RECORDED
20532	IN	19-JUN-95	02:35:52	0	0	NOT RECORDED
20538	IN	19-JUN-95	13:33:16	42544	2	RECORDED
20546	IN	20-JUN-95	02:14:02	61604	3	RECORDED
20547	IN	20-JUN-95	03:47:20	127261	6	RECORDED
20553	IN	20-JUN-95	14:39:14	0	0	NOT RECORDED
20575	IN	22-JUN-95	02:41:37	0	0	NOT RECORDED
20596	IN	23-JUN-95	14:44:59	175204	9	RECORDED
20597	IN	23-JUN-95	14:49:45	0	0	RECORDED
20604	IN	24-JUN-95	03:22:45	0	0	NOT RECORDED
20618	IN	25-JUN-95	02:47:21	0	0	NOT RECORDED
20640	IN	26-JUN-95	14:55:30	36554	2	RECORDED
20646	IN	27-JUN-95	01:53:56	46232	2	RECORDED
20647	IN	27-JUN-95	03:29:44	55183	3	RECORDED
20675	IN	29-JUN-95	02:21:43	193759	10	RECORDED
20689	IN	30-JUN-95	01:53:08	0	0	NOT RECORDED
TOTAL				221		

THIRD QUARTER 1995 ERS-1 ACQUISITION SUMMARY

ORBIT	GS	PA	ACQ_DATE	START_TIME	DURATION	FRAMES	RECORDED
20718		IN	02-JUL-95	02:32:00	0	0	NOT RECORDED
20732		IN	03-JUL-95	01:58:53	0	0	NOT RECORDED
20775		IN	06-JUL-95	02:04:08	0	0	NOT RECORDED
20776		IN	06-JUL-95	03:44:14	0	0	NOT RECORDED
20782		IN	06-JUL-95	14:36:22	62935	3	RECORDED
20797		IN	07-JUL-95	14:11:17	34649	2	RECORDED
20803		IN	08-JUL-95	01:03:41	0	0	NOT RECORDED
20818		IN	09-JUL-95	02:16:57	0	0	NOT RECORDED
20819		IN	09-JUL-95	03:51:45	0	0	NOT RECORDED
20825		IN	09-JUL-95	14:42:07	0	0	NOT RECORDED
20841		IN	10-JUL-95	15:57:24	0	0	NOT RECORDED
20846		IN	11-JUL-95	01:08:56	92511	5	RECORDED
20847		IN	11-JUL-95	02:44:30	179401	9	RECORDED
20861		IN	12-JUL-95	02:13:23	0	0	NOT RECORDED
20868		IN	12-JUL-95	14:47:54	180105	9	RECORDED
20869		IN	12-JUL-95	14:52:40	0	0	RECORDED
20875		IN	13-JUL-95	01:49:49	162918	8	RECORDED
20876		IN	13-JUL-95	03:25:38	109890	5	RECORDED
20919		IN	16-JUL-95	03:33:10	0	0	NOT RECORDED
20947		IN	18-JUL-95	02:24:39	0	0	NOT RECORDED
20961		IN	19-JUL-95	01:56:03	254333	13	RECORDED
20968		IN	19-JUL-95	14:28:17	49811	2	RECORDED
20990		IN	21-JUL-95	02:35:11	199057	10	RECORDED
21004		IN	22-JUL-95	02:01:18	205592	10	RECORDED
21011		IN	22-JUL-95	14:33:32	0	0	NOT RECORDED
21033		IN	24-JUL-95	02:35:54	0	0	NOT RECORDED
21047		IN	25-JUL-95	02:07:03	325735	16	RECORDED
21048		IN	25-JUL-95	03:48:39	92732	5	RECORDED
21054		IN	25-JUL-95	14:39:17	62460	3	RECORDED
21075		IN	27-JUL-95	01:07:20	40079	2	RECORDED
21076		IN	27-JUL-95	02:41:40	34483	2	RECORDED
21097		IN	28-JUL-95	14:45:02	0	0	NOT RECORDED
21119		IN	30-JUL-95	02:47:24	0	0	NOT RECORDED
21147		IN	01-AUG-95	01:47:42	214449	11	RECORDED
21148		IN	01-AUG-95	03:28:33	108139	5	RECORDED
21176		IN	03-AUG-95	02:21:47	190154	10	RECORDED
21190		IN	04-AUG-95	01:53:27	224949	11	RECORDED
21204		IN	05-AUG-95	01:26:36	0	0	NOT RECORDED
21219		IN	06-AUG-95	02:27:32	0	0	NOT RECORDED
21233		IN	07-AUG-95	02:05:29	0	0	NOT RECORDED
21240		IN	07-AUG-95	14:30:39	0	0	NOT RECORDED
21261		IN	09-AUG-95	00:58:59	68081	3	RECORDED
21276		IN	10-AUG-95	02:04:11	0	0	NOT RECORDED
21283		IN	10-AUG-95	14:36:24	0	0	NOT RECORDED
21304		IN	12-AUG-95	01:03:28	0	0	NOT RECORDED
21305		IN	12-AUG-95	02:38:47	0	0	NOT RECORDED
21320		IN	13-AUG-95	03:50:46	0	0	NOT RECORDED
21326		IN	13-AUG-95	14:42:09	0	0	NOT RECORDED
21348		IN	15-AUG-95	02:44:31	71168	4	RECORDED
21376		IN	17-AUG-95	01:48:50	33827	2	RECORDED
21377		IN	17-AUG-95	03:27:25	28377	1	RECORDED
21391		IN	18-AUG-95	02:50:16	22181	1	RECORDED
21419		IN	20-AUG-95	01:53:18	219564	11	RECORDED
21420		IN	20-AUG-95	03:30:53	131395	7	RECORDED
21433		IN	21-AUG-95	01:20:26	0	0	NOT RECORDED
21434		IN	21-AUG-95	03:00:01	0	0	NOT RECORDED
21462		IN	23-AUG-95	01:56:02	262335	13	RECORDED
21463		IN	23-AUG-95	03:37:38	65431	3	RECORDED
21469		IN	23-AUG-95	14:28:16	34774	2	RECORDED
21476		IN	24-AUG-95	01:26:11	128547	6	RECORDED

21491		IN	25-AUG-95	02:35:09	184255	9	RECORDED
21505		IN	26-AUG-95	02:01:16	0	0	NOT RECORDED
21506		IN	26-AUG-95	03:43:22	42730	2	RECORDED
21512		IN	26-AUG-95	14:33:30	0	0	NOT RECORDED
21533		IN	28-AUG-95	01:01:03	72074	4	RECORDED
21534		IN	28-AUG-95	02:35:52	29271	1	RECORDED
21548		IN	29-AUG-95	02:07:01	262173	13	RECORDED
21549		IN	29-AUG-95	03:47:21	65784	3	RECORDED
21555		IN	29-AUG-95	14:39:14	51329	3	RECORDED
21562		IN	30-AUG-95	01:37:38	117356	6	RECORDED
21563		IN	30-AUG-95	03:13:43	213411	11	RECORDED
21576		IN	31-AUG-95	01:06:17	143785	7	RECORDED
21577		IN	31-AUG-95	02:41:37	24073	1	RECORDED
21591		IN	01-SEP-95	02:12:00	202919	10	RECORDED
21598		IN	01-SEP-95	14:44:58	38591	2	RECORDED
21605		IN	02-SEP-95	01:43:09	146405	7	RECORDED
21606		IN	02-SEP-95	03:21:13	138346	7	RECORDED
21619		IN	03-SEP-95	01:12:01	198124	10	RECORDED
21620		IN	03-SEP-95	02:47:20	24774	1	RECORDED
21634		IN	04-SEP-95	02:18:14	251720	13	RECORDED
21648		IN	05-SEP-95	01:48:53	228478	11	RECORDED
21649		IN	05-SEP-95	03:25:43	0	0	NOT RECORDED
21662		IN	06-SEP-95	01:17:30	107243	5	RECORDED
21677		IN	07-SEP-95	02:21:42	223464	11	RECORDED
21691		IN	08-SEP-95	01:53:23	249469	12	RECORDED
21692		IN	08-SEP-95	03:34:44	69890	3	RECORDED
21705		IN	09-SEP-95	01:23:16	102240	5	RECORDED
21706		IN	09-SEP-95	03:05:53	24774	1	RECORDED
21720		IN	10-SEP-95	02:27:28	223167	11	RECORDED
21734		IN	11-SEP-95	02:00:08	279324	14	RECORDED
21735		IN	11-SEP-95	03:38:58	152020	8	RECORDED
21741		IN	11-SEP-95	14:30:36	60134	3	RECORDED
21748		IN	12-SEP-95	01:29:02	185057	9	RECORDED
21756		IN	12-SEP-95	15:41:36	136556	7	RECORDED
21757		IN	12-SEP-95	15:44:22	0	0	RECORDED
21762		IN	13-SEP-95	00:58:56	158799	8	RECORDED
21763		IN	13-SEP-95	02:37:01	226227	11	RECORDED
21777		IN	14-SEP-95	02:04:08	262824	13	RECORDED
21791		IN	15-SEP-95	01:34:47	126313	6	RECORDED
21792		IN	15-SEP-95	03:15:08	84426	4	RECORDED
21805		IN	16-SEP-95	01:03:25	106914	5	RECORDED
21820		IN	17-SEP-95	02:08:23	221827	11	RECORDED
21821		IN	17-SEP-95	03:51:44	46430	2	RECORDED
21827		IN	17-SEP-95	14:42:07	61796	3	RECORDED
21834		IN	18-SEP-95	01:40:18	120102	6	RECORDED
21835		IN	18-SEP-95	03:18:22	153480	8	RECORDED
21848		IN	19-SEP-95	01:09:11	0	0	NOT RECORDED
21849		IN	19-SEP-95	02:48:31	108842	5	RECORDED
21877		IN	21-SEP-95	01:46:03	238964	12	RECORDED
21878		IN	21-SEP-95	03:24:08	141204	7	RECORDED
21891		IN	22-SEP-95	01:14:41	0	0	NOT RECORDED
21892		IN	22-SEP-95	02:54:16	0	0	NOT RECORDED
21906		IN	23-SEP-95	02:23:10	0	0	NOT RECORDED
21920		IN	24-SEP-95	01:51:48	0	0	NOT RECORDED
21921		IN	24-SEP-95	03:28:37	0	0	NOT RECORDED
21949		IN	26-SEP-95	02:24:38	0	0	NOT RECORDED
21963		IN	27-SEP-95	02:02:35	0	0	NOT RECORDED
21964		IN	27-SEP-95	03:34:37	0	0	NOT RECORDED
21970		IN	27-SEP-95	14:28:17	0	0	NOT RECORDED
21992		IN	29-SEP-95	02:30:24	0	0	NOT RECORDED
22006		IN	30-SEP-95	02:08:20	0	0	NOT RECORDED
22007		IN	30-SEP-95	03:40:53	0	0	NOT RECORDED
TOTAL						510	

FOURTH QUARTER 1995 ERS-1 ACQUISITION SUMMARY

ORBIT	GS	PA	ACQ_DATE	START_TIME	DURATION	FRAMES	RECORDED
22013		IN	30-OCT-95	14:33:31	0	0	NOT RECORDED
22035		IN	02-OCT-95	02:35:54	0	0	NOT RECORDED
22049		IN	03-OCT-95	02:14:05	0	0	NOT RECORDED
22050		IN	03-OCT-95	03:47:08	0	0	NOT RECORDED
22056		IN	03-OCT-95	14:39:16	0	0	NOT RECORDED
22077		IN	05-OCT-95	01:07:20	0	0	NOT RECORDED
22078		IN	05-OCT-95	02:41:40	0	0	NOT RECORDED
22092		IN	06-OCT-95	02:11:18	0	0	NOT RECORDED
22093		IN	06-OCT-95	03:53:55	0	0	NOT RECORDED
22099		IN	06-OCT-95	14:45:01	0	0	NOT RECORDED
22107		IN	07-OCT-95	03:19:47	0	0	NOT RECORDED
22121		IN	08-OCT-95	02:47:24	0	0	NOT RECORDED
22150		IN	10-OCT-95	03:25:47	0	0	NOT RECORDED
22178		IN	12-OCT-95	02:22:33	0	0	NOT RECORDED
22192		IN	13-OCT-95	01:59:44	0	0	NOT RECORDED
22193		IN	13-OCT-95	03:31:47	0	0	NOT RECORDED
22221		IN	15-OCT-95	02:32:19	0	0	NOT RECORDED
22235		IN	16-OCT-95	02:05:29	0	0	NOT RECORDED
22236		IN	16-OCT-95	03:37:47	0	0	NOT RECORDED
22242		IN	16-OCT-95	14:30:40	0	0	NOT RECORDED
22278		IN	19-OCT-95	02:11:14	0	0	NOT RECORDED
22279		IN	19-OCT-95	03:45:02	0	0	NOT RECORDED
22285		IN	19-OCT-95	14:36:25	0	0	NOT RECORDED
22321		IN	22-OCT-95	02:16:59	0	0	NOT RECORDED
22322		IN	22-OCT-95	03:51:47	0	0	NOT RECORDED
22328		IN	22-OCT-95	14:42:09	0	0	NOT RECORDED
22329		IN	22-OCT-95	14:51:43	0	0	NOT RECORDED
22336		IN	23-OCT-95	03:16:39	0	0	NOT RECORDED
22349		IN	24-OCT-95	01:10:13	0	0	NOT RECORDED
22350		IN	24-OCT-95	02:44:32	0	0	NOT RECORDED
22379		IN	26-OCT-95	03:24:09	0	0	NOT RECORDED
22386		IN	26-OCT-95	14:26:21	0	0	NOT RECORDED
22393		IN	27-OCT-95	02:50:16	0	0	NOT RECORDED
22422		IN	29-OCT-95	03:28:38	0	0	NOT RECORDED
22429		IN	29-OCT-95	14:31:35	0	0	NOT RECORDED
22450		IN	31-OCT-95	02:24:38	0	0	NOT RECORDED
22464		IN	01-NOV-95	02:02:34	0	0	NOT RECORDED
22493		IN	03-NOV-95	02:35:10	0	0	NOT RECORDED
22507		IN	04-NOV-95	02:08:18	0	0	NOT RECORDED
22535		IN	06-NOV-95	01:01:48	0	0	NOT RECORDED
22543		IN	06-NOV-95	15:15:23	37526	2	RECORDED
22550		IN	07-NOV-95	02:11:47	0	0	NOT RECORDED
22551		IN	07-NOV-95	03:48:51	39129	2	RECORDED
22564		IN	08-NOV-95	01:38:39	226838	11	RECORDED
22578		IN	09-NOV-95	01:07:17	0	0	NOT RECORDED
22593		IN	10-NOV-95	02:11:15	0	0	N/A
22607		IN	11-NOV-95	01:44:09	0	0	N/A
22621		IN	12-NOV-95	01:13:02	0	0	N/A
22622		IN	12-NOV-95	02:54:23	0	0	N/A
22636		IN	13-NOV-95	02:25:32	0	0	N/A
22650		IN	14-NOV-95	01:50:08	0	0	N/A
22651		IN	14-NOV-95	03:25:42	0	0	N/A
22658		IN	14-NOV-95	14:27:22	0	0	N/A
22664		IN	15-NOV-95	01:18:46	0	0	N/A
22679		IN	16-NOV-95	02:21:42	0	0	N/A
22693		IN	17-NOV-95	01:55:53	0	0	N/A
22707		IN	18-NOV-95	01:24:31	0	0	N/A
TOTAL						15	
GRAND TOTAL						547	



NASDA

NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

1995 ERS National & Foreign Stations Operators Working Group

Japanese Report ERS National & Foreign Stations Operators Working Group

December 14-15, 1995

Toulouse, France

Takao Fukuda

EOC/NASDA

Tel. +81-492-98-1235

Fax. +81-492-98-1001

e-mail: FUKUDA@nsaeoc.eoc.nasda.go.jp



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- ERS-1 Status
 - Present Status
 - ERS-1 Acquisition Policy
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 - ADEOS Overview
 - EOIS Overview



NASDA

NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

1995 ERS National & Foreign Stations Operators Working Group

Present Status

Foreign Satellites

■ ERS-1

■ SPOT-2, (3)

SPOT-1, 2, 3

■ LANDSAT-5

LANDSAT-2, 3, 4, 5

Japanese Satellites

■ MOS-1b

MOS-1,1b

■ JERS-1

Facility Status

Data Reception

Processing and Archiving

Data Reception

Processing and Archiving

Data Reception

Processing and Archiving

Facility Status

Data Reception

Processing and Archiving

Data Reception

Processing and Archiving



ERS-1 Status

■ ERS-1 operation policy

- Acquisition Priority conflicting with other satellites
 1. JERS-1
 2. ERS-1
 3. MOS-1b
- In case of operation conflict at Hatoyama, NASDA requests to Tokai University (Kumamoto) to receive ERS-1 data.



ERS-1 Status

■ Topics

- Oil outflow in Shikotan island
- The stranded accident of an oil tanker off Korea on Jul. 23, 1995
- The earthquake in Sagami Bay
(continuous receiving to get Interferometry)

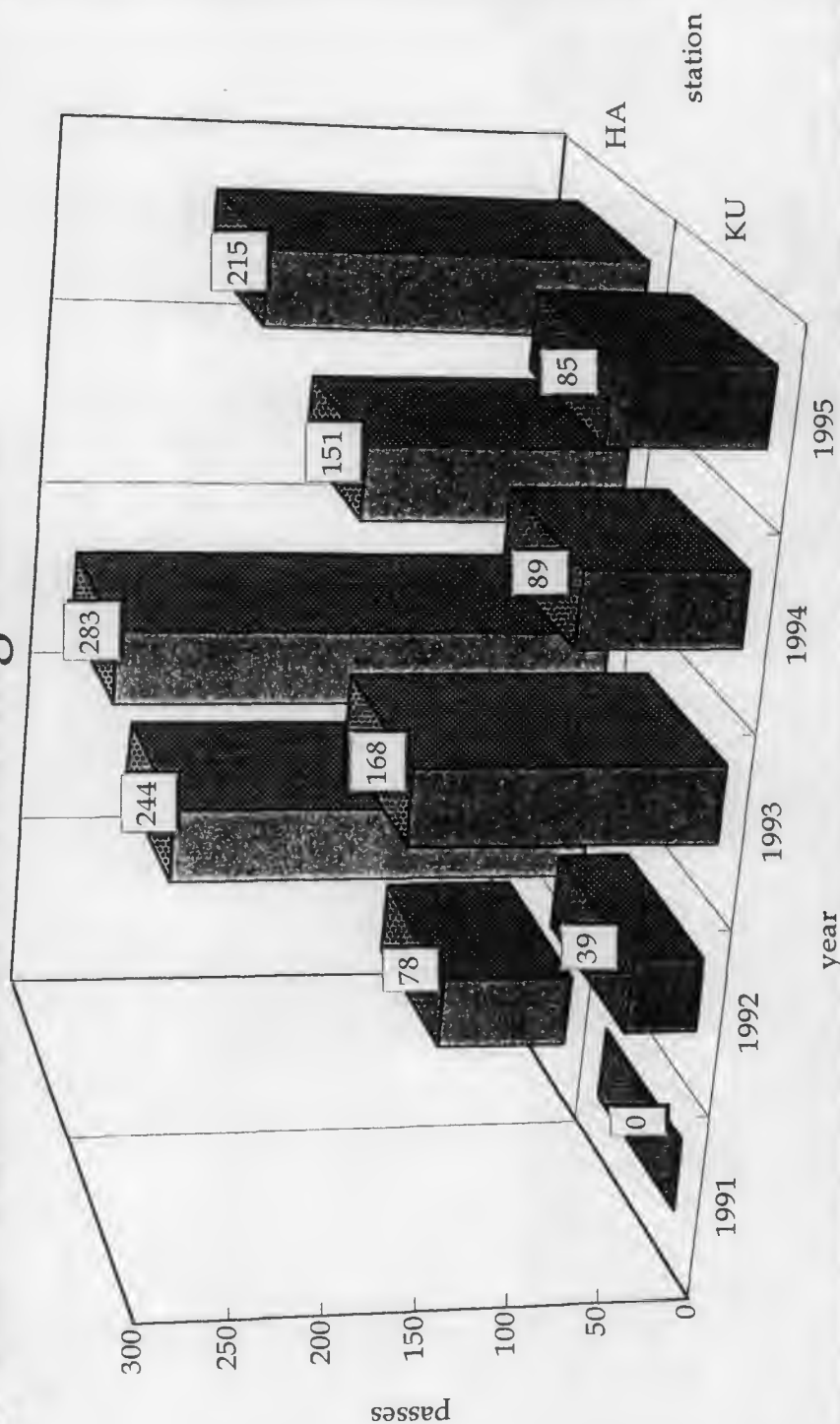


NASDA
NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

1995 ERS National & Foreign Stations Operators Working Group

ERS-1 Status

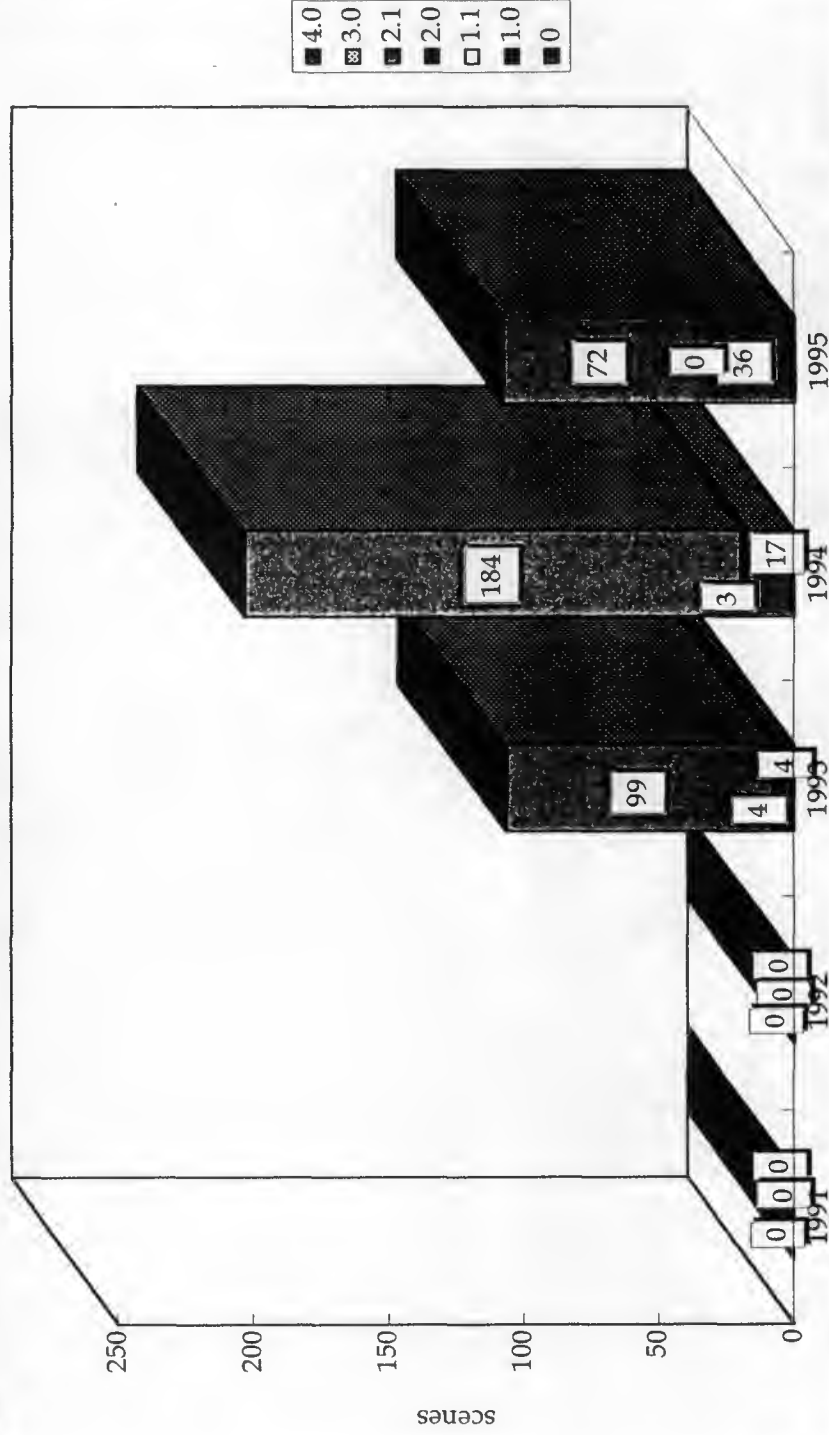
■ The Number of Archiving Passes





ERS-1 Status

■ The Number of Processing AMI



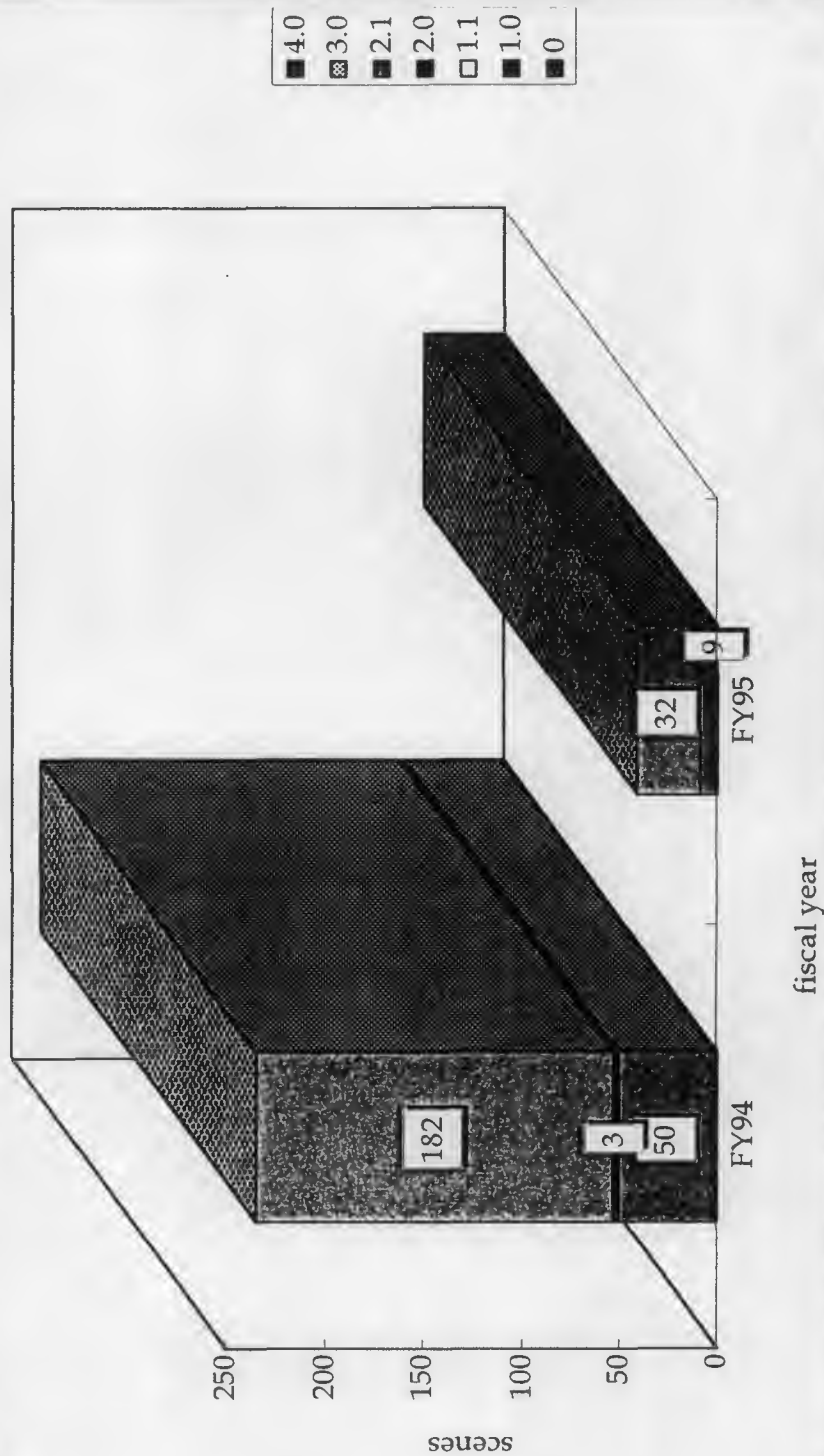


NASDA
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1995 ERS National & Foreign Stations Operators Working Group

ERS-1 Data Distribution

AMI Data(CCCT)





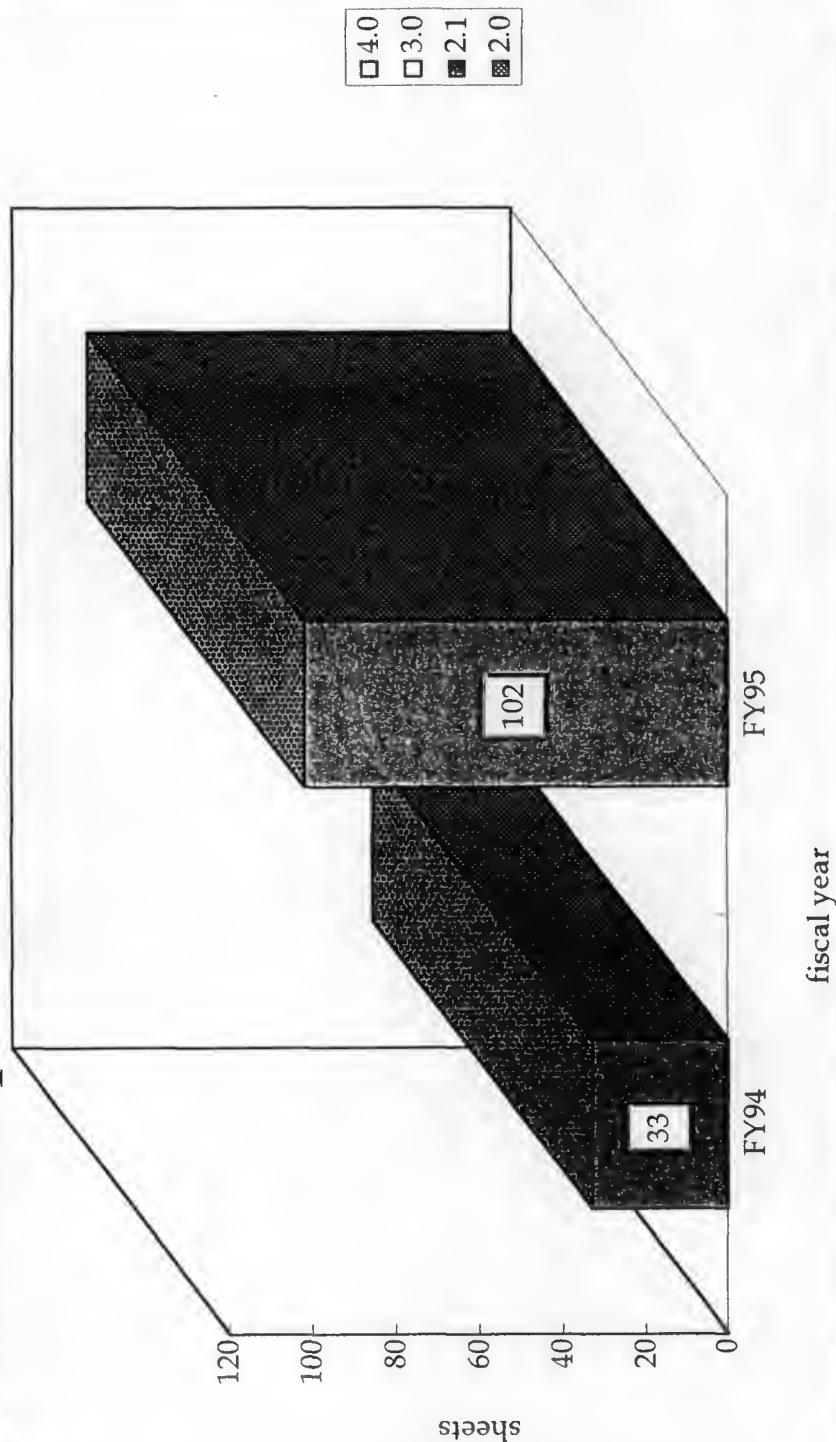
NASDA

NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

1995 ERS National & Foreign Stations Operators Working Group

ERS-1 Data Distribution

■ AMI Data(photo)





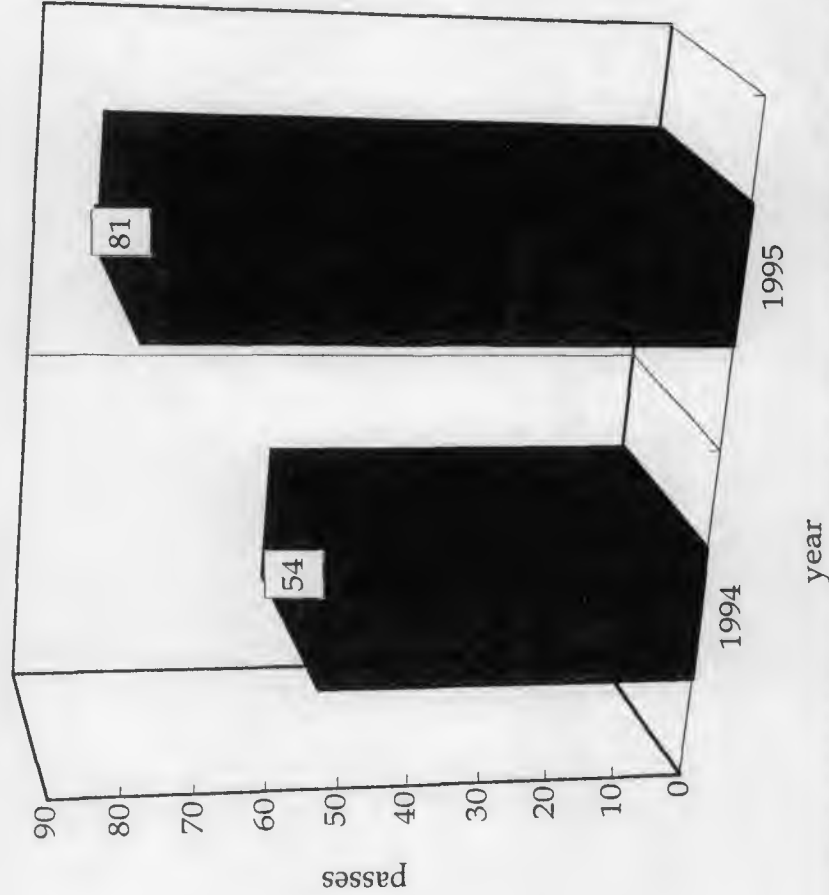
NASDA
NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

1995 ERS National & Foreign Stations Operators Working Group

ERS-1 Data Distribution

-HDDT copy to ESA-

(as of 29 November, 1995)





NASDA

NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

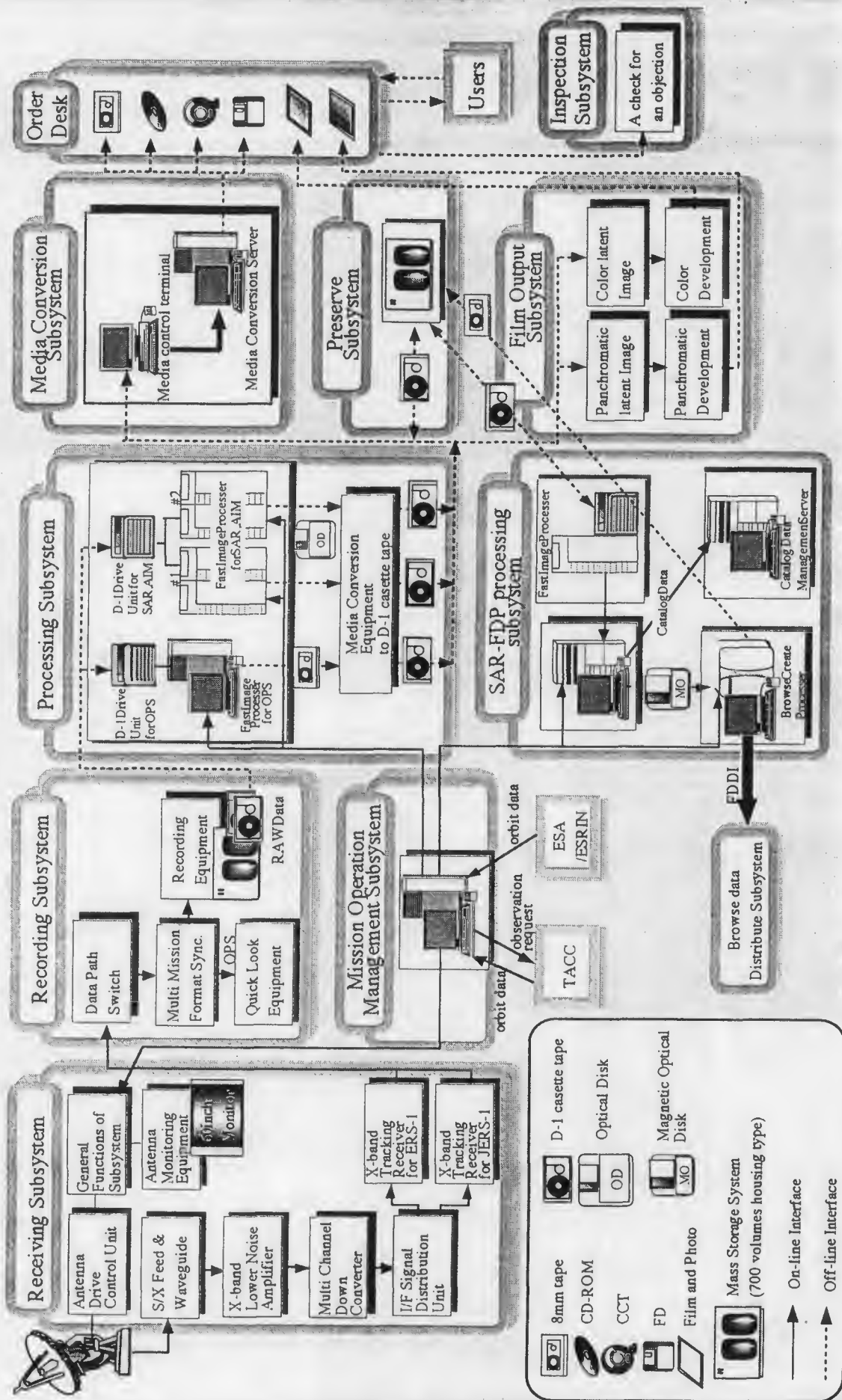
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ERS-2 Status

- ESA and NASDA are now negotiating of conclude the new MOU for acquiring and distributing ERS-2 data.
- NASDA will acquire and distribute ERS-2 data after some upgrading of ground system.

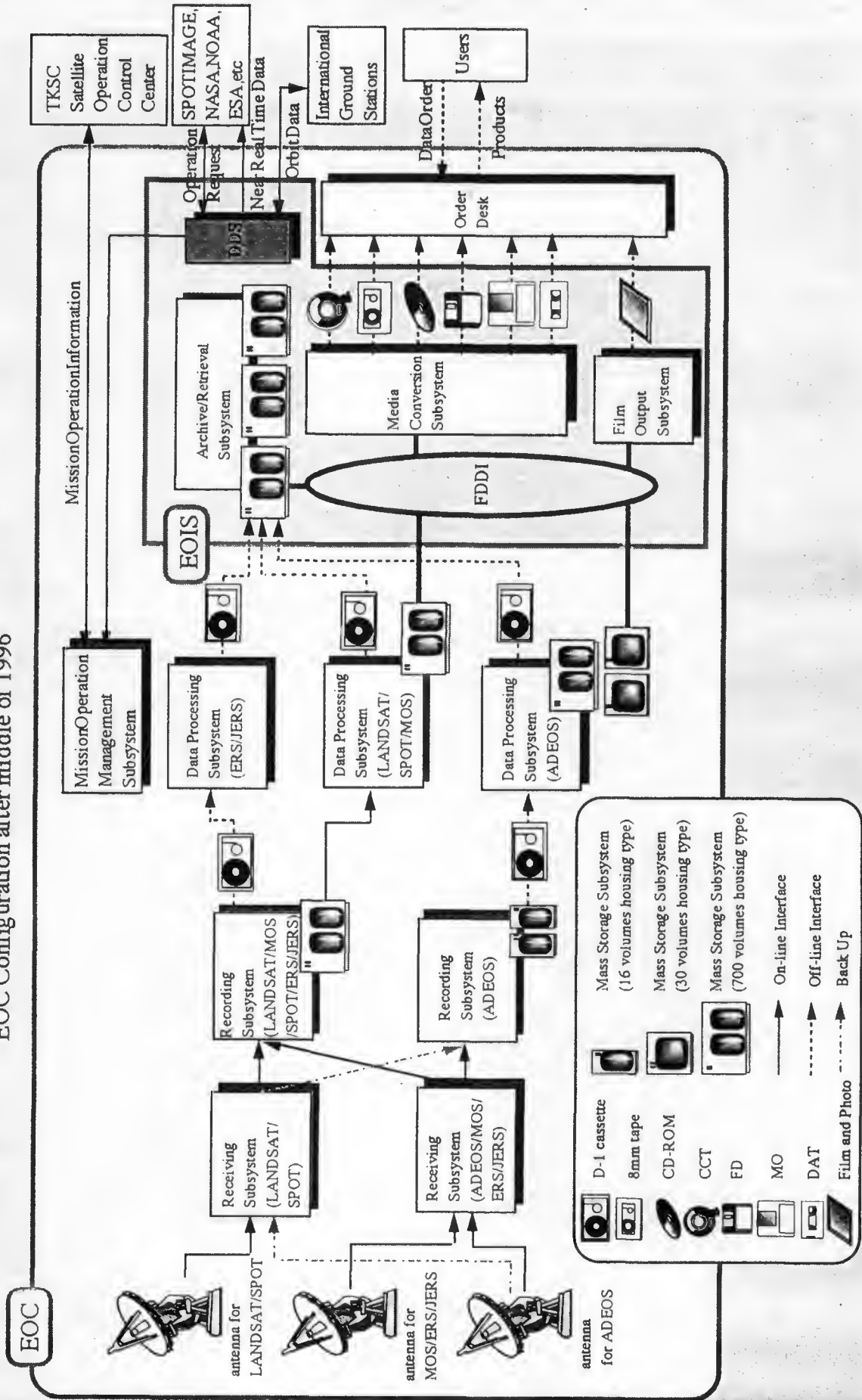


1995 ERS National & Foreign Stations Operators Working Group JERS-1, ERS-1 Data Flow after middle of 1996



1995 ERS National & Foreign Stations Operators Working Group

EOC Configuration after middle of 1996



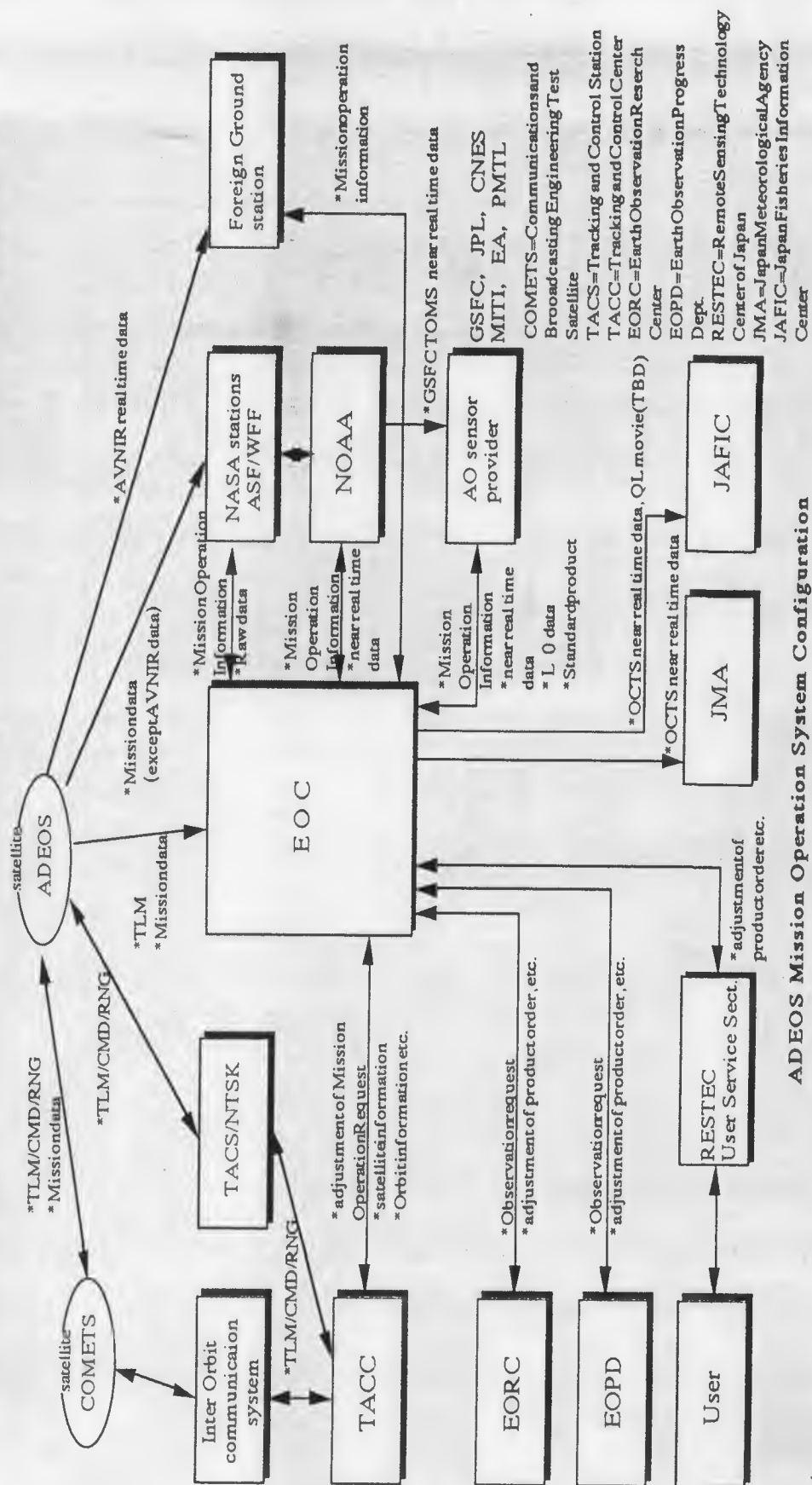


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1995 ERS National & Foreign Stations Operators Working Group

ADEOS Overview



ADEOS Overview

■ ADEOS Science Mission Objectives & Requirements

- To make Global Dataset to monitor the Global Change of the Earth's Environment
- To acquire Regional Data for AVNIR on demand basis
- To provide NSCAT, TOMS and OCTS processed data on a Near Real-Time basis



NASDA

NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

1995 ERS National & Foreign Stations Operators Working Group

ADEOS Overview

■ Mission Instruments

AVNIR	Advanced Visible and Near Infrared Radiometer	NASDA
OCTS	Ocean Color and Temperature Scanner	NASDA
POLDER	Polarization and Directionality of the Earth's Reflectance	CNES
IMG	Interferometric Monitor for Greenhouse Gases	MITI
ILAS	Improved Limb Atmospheric Spectrometer	EA
NSCAT	NASA Scatterometer	JPL
TOMS	Total Ozone Mapping Spectrometer	GSFC
RIS	Retroreflector in Space	EA



ADEOS Overview

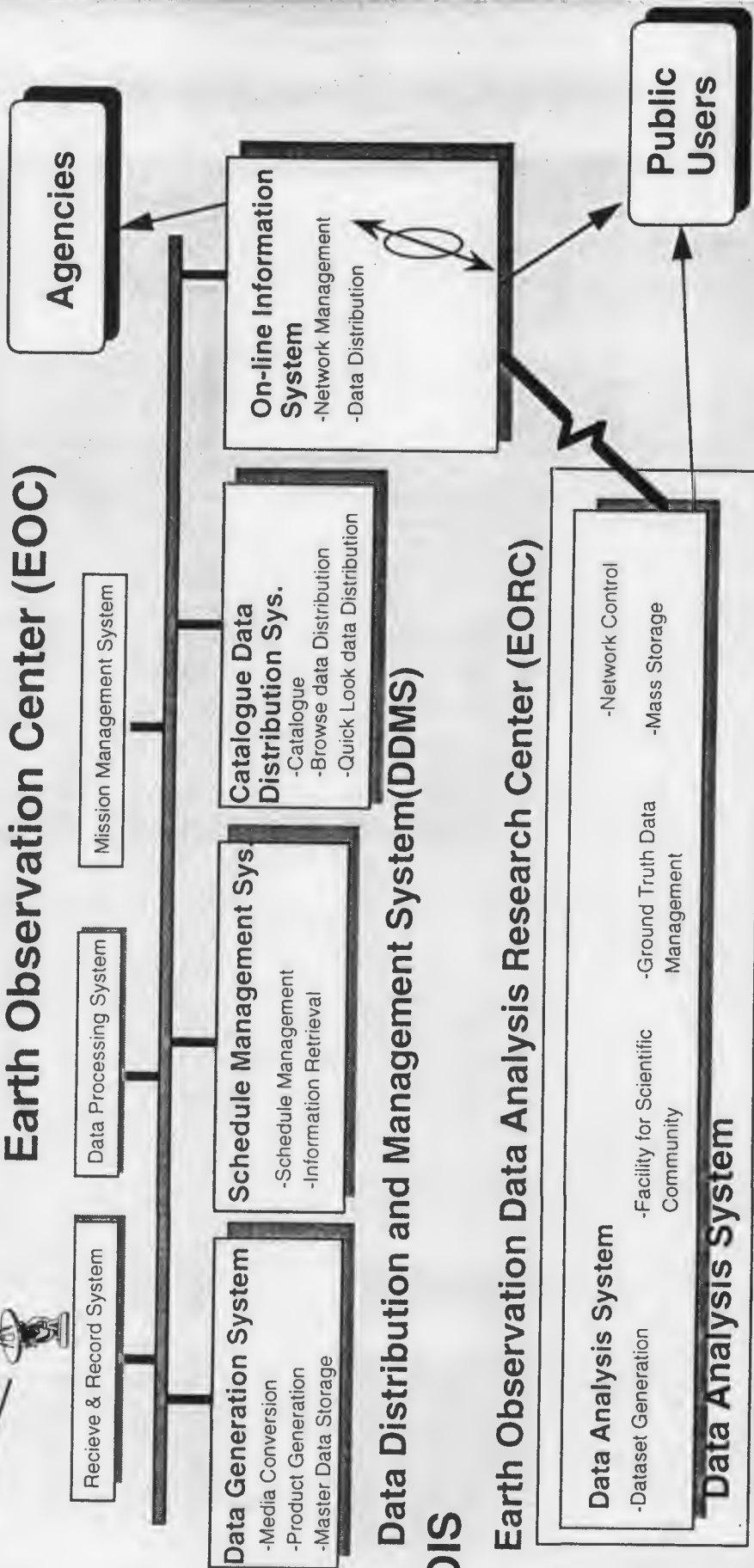
■ Sensor Operation Objectives

Sensor	Coverage	Operation Condition	Standard Products
AVNIR	Land and coast	Daytime(Operation on demand)	Geocoded image (Mu:16m, Pa:8m)
OCTS	Global	Daytime(VNIR) Nighttime(Cal/Val when IMG is halted)	Chlorophyll-a, Sea surface temp., etc.
POLDER	Global	Sun Elevation $\geq 15^\circ$	Surface reflectance, Aerosol reflectance, etc.
IMG	Global	Continuous (4 day obs. and 10 day halt)	Atmospheric Temp., CO ₂ , H ₂ O profile, etc.
ILAS	High latitudes	Sunrise and sunset of ADEOS	O ₃ , CH ₄ , H ₂ O, NO ₂ vertical profile, etc.
NSCAT	Global	Continuous	Sea surface wind vector
TOMS	Global	Continuous	Total O ₃ , SO ₂
RIS	Local	Over laser station	O ₃ profile, Column amounts of CO ₂ , etc.



EOIS Overview

Earth Observation Center (EOC)



Data Distribution and Management System (DDMS)

EOIS

Earth Observation Data Analysis Research Center (EORC)

Data Analysis System

-Dataset Generation

-Facility for Scientific Community

-Ground Truth Data Management

-Network Control

-Mass Storage

Data Analysis System

Public Users

EOIS Overview

■ EOIS(Earth Observation Information System) System Concepts

- EOIS supports NASDA Earth Observation activities.
- EOIS will provide easy and reliable access to the Earth Observation data archives and accept on-line observation requests.
- EOIS is implemented on the basis of distributed processing and TCP/IP networking technology on UNIX workstations.
- EOIS supports generation of standard products and development of data processing algorithms.



EOIS Overview

■ Plan

- EOIS phase 1 is now under development to provide users with effective access to each observation data from satellites and ground observations.
- In phase 1, EOIS services will include processing and providing MOS-1/1b, LANDSAT, JERS-1, ERS, SPOT, ADEOS and auxiliary data to users.
- Phase 2 of EOIS focuses on interoperability with EOSDIS (NASA) and MMUI/MMBS & Envisat ground system (ESA), etc.



NASDA

NATIONAL SPACE DEVELOPMENT AGENCY OF JAPAN

1995 ERS National & Foreign Stations Operators Working Group

EOIS Overview

■ EOIS Main Services

- Automatic on-line data exchange between Agencies and NASDA/EOC
 - Mission operation data
 - Earth observation data (especially near real-time data)
- Earth observation Data Archiving and Catalog Database
- Data format conversion and Media conversion
- On-line Database retrieval and data search
 - Catalog and Browse Images
- On-line data ordering and data production status
- Data analysis algorithm development

New Data Archive Policy

Takao Fukuda
NASDA/EOC

December 14-15, 1995

Phone

: +81-492-98-1235

Fax

: +81-492-98-1001

E-mail : fukuda@nsaeoc.eoc.nasda.go.jp

New Archive Media

Started on November 1994

Change of Archive media

- HDDT to D-1 cassette (Medium Size)
- Installed Digital Mass Storage System (DMS)

Level 0 Archive

- Temporarily use of Raw Data
- Recycle of D-1 cassette for Raw Data
- Archive the data as a Level 0

Level 0 Processor

Introduced Level 0 Processor

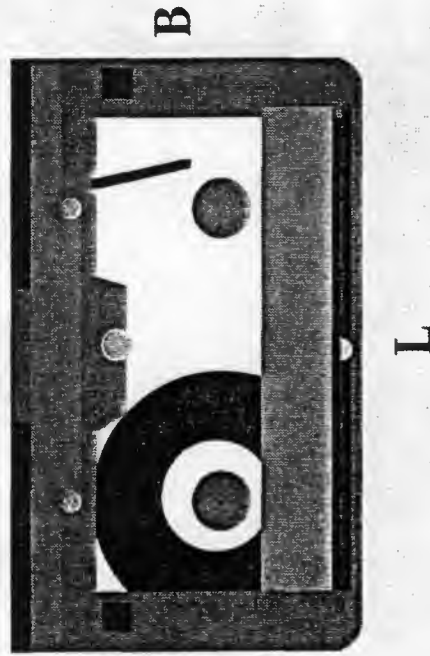
- Record on D-1 cassette with
synchronized sensor data
orbit elements
time difference
data quality
etc.

Level 0 Format

Three types of Level 0 Format

- Level 0R (use predicted orbit elements)
 - Record unit is one path
- Level 0 (use determined orbit elements)
 - Record unit is one path
 - Archive data
- Processed Level 0 (no function)
 - Generate on the Data Processing System
 - Record unit is one scene
 - Equivalent to CEOS Format

Data rate : 128 Mbps
Capacity : 40 GBytes
Bit error rate (corrected)
: 1*10E-10
Tape width : 19 mm
Size : 252mm (L)
149mm (B)
32mm (H)



Digital Mass Storage (DMS) System

DMS-700M



Storage capacity : 30TBytes
Cassette capacity : 736 cassettes
Max. Recorder No. : 6 sets
Access time : less than 6 sec

Technical Support (NASDA/EOC)

Mr. Tatsuya Fujisawa

Address	: 1401 Ohashi, hatoyama, hiki, saitama 350-03 Japan
Phone	: +81-492-98-1221
Fax	: +81-492-98-1001
E-mail	: fujisawa@nsaeoc.eoc.nasda.go.jp

Chung-Li Station Report

Prof. A. J. Chen

NSC/NCU Satellite Remote Sensing Laboratory
Center for Space and Remote Sensing Research
National Central University
Chung-Li, Taiwan, R. O. C.

Fifth EROWG Meeting, 14-15 December, 1995
Toulouse, France

I . Background:

**1. On-site Acceptance in June, 1993
Commission in December, 1993**

2. 13 Meter Antenna

G/T at 8.2 GHz: 35.3db/k

3. Collocation of

- User Service**
- Data Reception**
- Data Processing**
- Research and Development**
- Supporting Facilities**
- Total Floor Space: 7,500m²**

**4. High Revisit Acquisition
3-5 days (for Taiwan Area)**

TECHNICAL DESCRIPTION

Antenna characteristics:

Antenna		System G/T (dB/K)		BER
Company	Diameter (m)	X-band	S-band	
DTi	13	34.0 dB/K	22.5 dB/K	$<10^{-9}$

Recording characteristics:

Recorder type(s)	Tape type(s)	Recording Speed	Packing Density	ESA Compatibility
Metrum HD-96e	Ampex 799	175 ips	90 %	Yes

SAR processor type:

Processor manufacturer	MDA
Computer configuration	DEC/VAX 6520, STAR AP-1

Product types:

	Raw	Sic	Pri	Gec	Gtc	Other
Generated (Y/N)	Y	Y	Y	N	N	
Media (EXA, CCT, ...)	CCT CD-ROM	CCT CD-ROM	CCT CD-ROM			
Format (GEOS, or?)	ESA	ESA	ESA			
Processing time	30 min	4 hours	2 hours			
ESA validation (Y/N)	N	N	N			

Interface link:

Telecom link		Service	Protocol	Configuration
ESRIN to Station	Station to ESRIN			
FAX	FAX	FAX, TEL	-	-

Data User Services:

Do you have a catalogue and what kind?	Do you have a Browse/Quick-look facility?	Are the catalog and products accessible via Internet (WWW) ?
Yes, WWW	Yes	Yes

http://www.csr.hawaii.edu.tw/

II. Data Reception

1. Acquired

	SPOT 2,3	ERS 1,2	Landsat 5	Total	
				pass	sec.
CY1994	562	52	139	753	218,833
CY1995*	632	79	210	921	274,146

*Note: until Nov. 20, 1995

2. Failure

	Operations	System	Others	Total	
				pass	sec.
CY1944	13	1	16	30	2623
CY1995*	9	7	14	23	6047

3. Performance

	Success Rate	Data Loss	Availability
CY1944	98.7%	1.2%	95.6%
CY1995*	98.9%	2.2%	92.7%

III. Data Processing

1. Raw Scene Archived

	SPOT(Taiwan)	Landsat	ERS
CY1994	2870	839(150)	286
CY1995*	1554	2433(119)	462

2. Processed Scenes

	SPOT			Landsat			ERS	
	A	B	C	A	B	C	A	B
CY1994	49	128	354	1	3	1		286
CY1995*	3	53	377	9	8	25		462

- Category A: Bulk, levels 1, 4
- Category B: Georeferenced, levels 5, 6, 7
- Category C: Geocoded, levels 8, 9, 10

Data Acquired:

Number of orbits planned		Number of orbits acquired		Number of orbits archived	
1994	1995	1994	1995	1994	1995
56	31	51	72	51	46

Data Distributed:

Code I: to NFS Internal use (Tests, National PI's, PR, etc.)		Code X: to NFS external use (Commercial users inside the country)		Code C: to ESA internal use (PI/PP, PR, campaigns, etc.)		Code E: to ESA external use (Commercial users or ERSC distributor)	
1994	1995	1994	1995	1994	1995	1994	1995
26	20	26	19	28	366		

V. Future Plan

1. Reception Upgrade:

EROS, Radarsat, SPOT 4

2. System Upgrade:

Direct Archiving System, UNIX, Workstations.

Report of China
Remote Sensing Satellite Ground Station

— Prepared by LI An

P.O.BOX 2434, Beijing 100086, P.R.China

— Prepared for 1995 ESOWG meeting

Toulouse, France 15 December, 1995

Report of China Remote Sensing Satellite Ground Station

**—Prepared for 1995 ESOWG meeting
Toulouse, France 15 December, 1995**

- System Upgrade
- Data Acquisition, Archiving ,Processing
and Distribution
- Application of ERS-1 SAR Data

§ 1 System Upgrade

China Remote Sensing Satellite Ground Station (China RSGS) was founded in 1986. It was essentially a Landsat ground station before the system upgrade. In order to acquire and process ERS-1, JERS-1 and Landsat 6 data, the system upgrade started in July of 1992. It included the upgrade of Data Acquisition System (DAS), located in Miyun county, and Data Processing System (DPS) in the city area of Beijing. After the completion of system upgrade in August of 1993, China RSGS is capable of receiving and processing ERS-1 and JERS-1 SAR data.

The key points of DAS upgrade are:

- ① Implement two additional HF channels with variable frequency up/down converters.
- ② Use multifunctional DEMOD/BSSC to support ERS-1, JERS-1 and Landsat data receptions.
- ③ Add Penny & Giles HDDRs to Data Recording subsystem.
- ④ Use GPS for time code generator to provide more accurate time code.

The key points of DPS upgrade are:

- ① System is equipped by more powerful hardware including VAX6520 computer, Star VP-1 array processors and MDA MMSP.
- ② Data processing software provided by MDA consists of
SAR Processing System (SARPS),
Geocoded Image Correction System (GICS),
MERIDIAN Image Analysis System,
Quicklook Processing System (QPS).

Data acquisition and processing test using the new upgraded system were done in the mean time. With great help from ESA ESRIN, we successfully received some ERS-1 SAR data in August 1993. Part of these data were playback and processed to generate raw, georeferenced and geocoded product separately. A geocoded image of Beijing area produced at that time was shown great interest by many national research institutes and scientists. It is true that the accomplishment of China RSGS system upgrade established a good foundation for the application of ERS-1 SAR data in China.

§ 2. Data Acquisition, Archiving, Processing and Distribution

In the early 1995, the Agreement Between the European Space Agency and the Chinese Academy of Sciences Concerning the Direct Reception, Archiving, Processing and Distribution of ERS-1 SAR Data was signed. From then China RSGS began to receive and process ERS-1 SAR data.

The Data Receiving Facility (DRF) of China RSGS is located at Miyun County in the suburbs of Beijing, about 100 KM away from the city center. The status of DRF antenna is shown in Table 1.

Location	40° 27' N 116° 51' E
Altitude	105m
Diameter	10m
System G/T	X-band: 31.5dB/K S-band: 21dB/K
BER	$\leq 10^{-7}$

Table 1. DRF Antenna Status

The recorded data are sent regularly to the Data Processing Facility (DPF) to archive. According to the different request, they are

processed to generate different kinds of product. The product types and processing time are shown in Table 2.

	Raw	Slc	Gtc
Product Media	CCT, EXA	CCT, EXA	CCT, EXA
Format	EIC	VMP	CCRS
Processing Time	30 min.	70 min.	110 min.

Table 2. China RSGS Product Types and Data Processing Time

Till the end of October 1995, China RSGS has received ERS-1 SAR data 259 paths. Now we are selecting one scene from every path for data processing test.

In this year China RSGS provides ERS-1 SAR data to some national users to support their research in some science fields such as SAR processing technology research, sea ice monitoring and flood investigation etc.

Generally speaking, the ERS-1 SAR data can now be received and processed by China RSGS and the products are being used for research purpose. It is certainly that accompanying the application of ERS-1 SAR data, China RSGS will play a more and more important role in China.

The main problem in our system is that there is no ERS-1 SAR data catalogue or browse imagery in the system. With time going on, the amount of archive data will increase continuously. So it will be more and more difficult to manage or search data. If this problem is not solved earlier, it will take a great trouble for Chinese users to order ERS-1 SAR data from China RSGS.

§ 3. Application of ERS-1 SAR Data

Accompanying with ERS-1 SAR data provided by China RSGS, the application of SAR data is developing in some science fields. Here are two examples.

▲ Investigating flooding in Poyang Lake

In June 1995, the Poyang Lake, in the east of China, suffered a worst flooding. Because of the heavy cloud and rain at that time, the TM image can't be used to investigate the flood. Under this situation, with great help from ESA we received the ERS-1 SAR data corresponding to the flood area. The SAR image of Poyang Lake is mosaicked with 2 scenes in path 20661, dated 28 June, 1995. It is a geocoded image processed by filtering and enhancement. The boundary of water and land is distinct. In order to get the more accurate information, the SAR image is merged to a TM image, dated 4 November 1994, which is before the flood. Then a colour image is generated by using SAR data and two band TM data. It is easier to identify the original water surface and flooding area surface from the colour image. The latter analysis work is to statistic the area of flooding and assess what kind of fields is flooded. These image and analysis result give a great help to Chinese government officers. It is said to be a very good example for applying ERS-1 SAR data in China.

▲ Sea Ice Monitoring Program

Bohai Sea is located in the north of China. It is partially covered by sea ice every year from early December to March of next year. Bohai Sea and its coastal regions are an important economic zone for China, and sea ice scope and its drift can have a significant effect on marine traffic. So it is important to monitor the development of sea ice in winter.

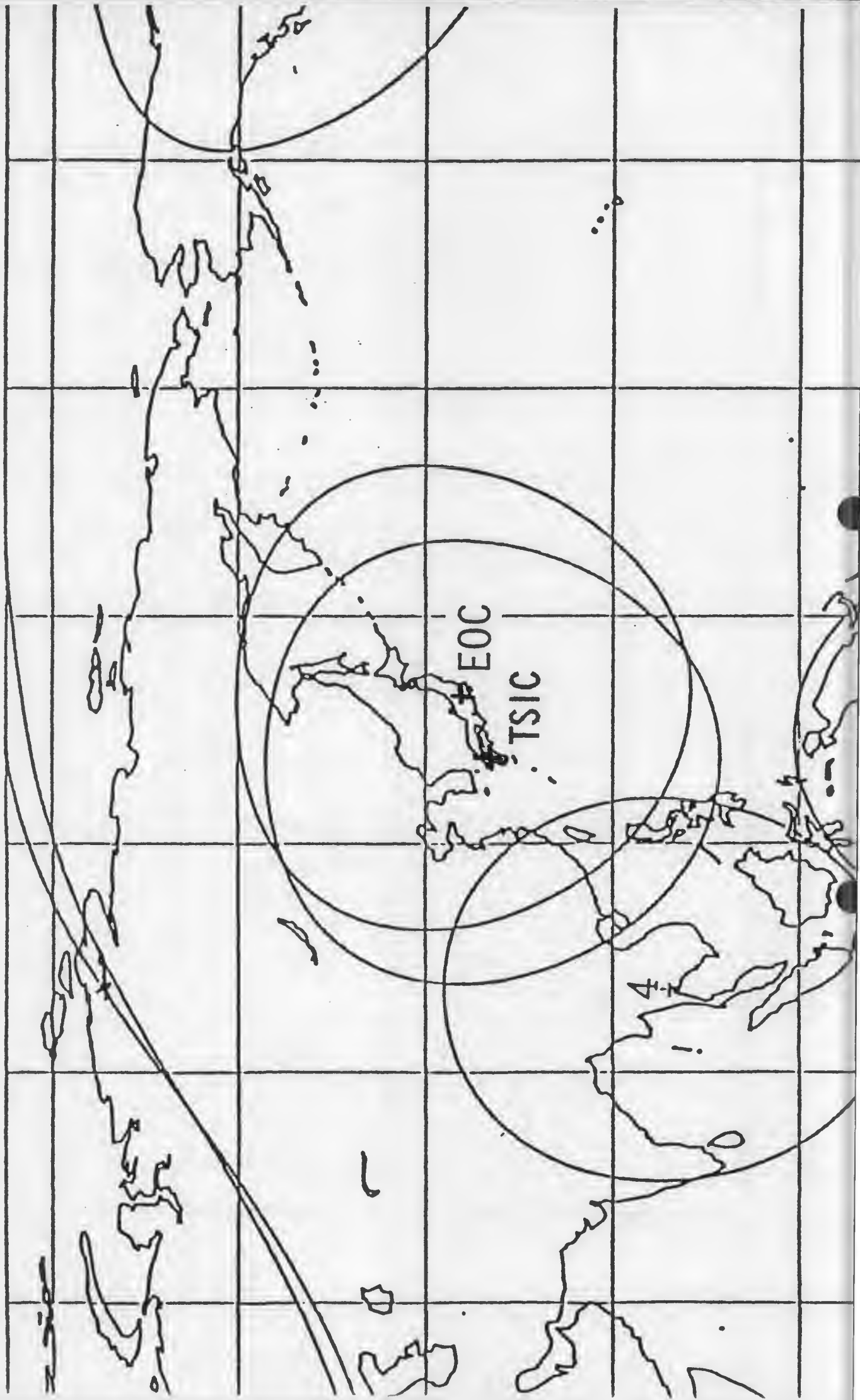
The Canada-China Sea Ice Monitoring Program was funded under the Canadian GlobleSAR program and lasted from January 2nd to 28th in 1995. The main objective of this project was to demonstrate the benefits of spaceborne SAR for sea ice reconnaissance and forecasting in Bohai Sea, China. Another objective was to demonstrate the capability of 'fast delivery' at the China RSGS by assisting with quick turn-around data delivery to an end user. The Chinese participants of this project include State Oceanic Administration (SOA), and China RSGS. The Canadian participants include The Canada Centre for Remote Sensing Applications Division (CCRS/AD), a division of Natural Resources Canada (NRCan), and Noetix Research Inc.

During this project, China RSGS received ERS-1 and JERS-1 SAR data 10 paths totally, and for the first time processed and delivered 10 scenes near real-time. Five of them (2 ERS-1 scenes and 3 JERS-1 scenes) were used for sea ice reconnaissance and forecasting. We

are very glad to make a good effort for this project. We are also pleased that the capability of China RSGS DRF and DPF are demonstrated once more.

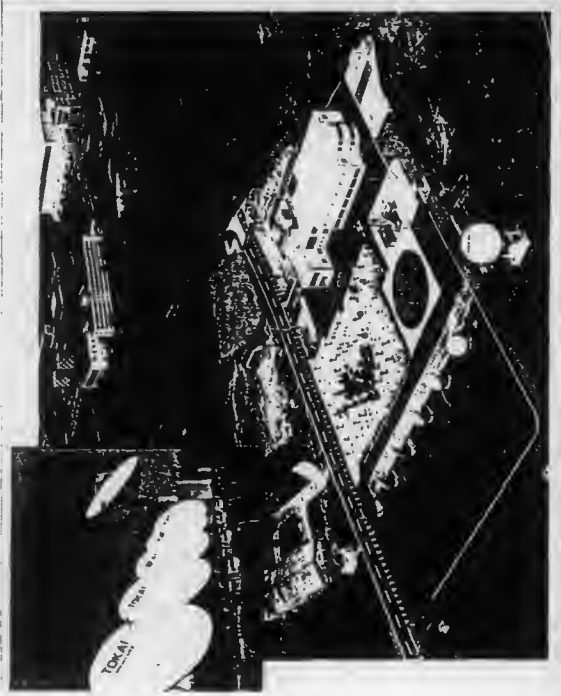
*Current Status
of
Satellite Data Reception
at
Tokai University*

*December 1995
Haruhisa Shimoda*



Features

- *Multi satellite data receiving and processing system for MOS-1/1b, JERS-1, ERS-1, and NOAA, GMS*
- *24hour automated one man operation*
- *PC based system configuration*
- *Unique zenith tracking with azimuth and cross elevation 3-axis mounted antenna*



東海大学宇宙情報センター(熊本受信局)
Tokai university Space Information Center (TSLC)



TRIC 東海大学情報技術センター, 東京
Tokai Research & Information Center, TOKYO



Data Products

87.5.31 - 95.9.30

Received	MOS-1, b	5,090 paths	783 HDDTs
	JERS-1	103	103
	ERS-1	333	275
	NOAA	17,300	
	GMS	30,300 scenes	
Processed	MOS-1, b	MESSR Level 0	301 CCTs
	MOS-1, b	MESSR Level 1	6
	MOS-1, b	MESSR Level 2	100
	MOS-1, b	VTIR Level 0	14
	MOS-1, b	VTIR Level 1	7

Antenna

• *Tracking satellites* MOS-1b, JERS-1, ERS-1, GMS,
NOAA

• *Type* Cassegrain

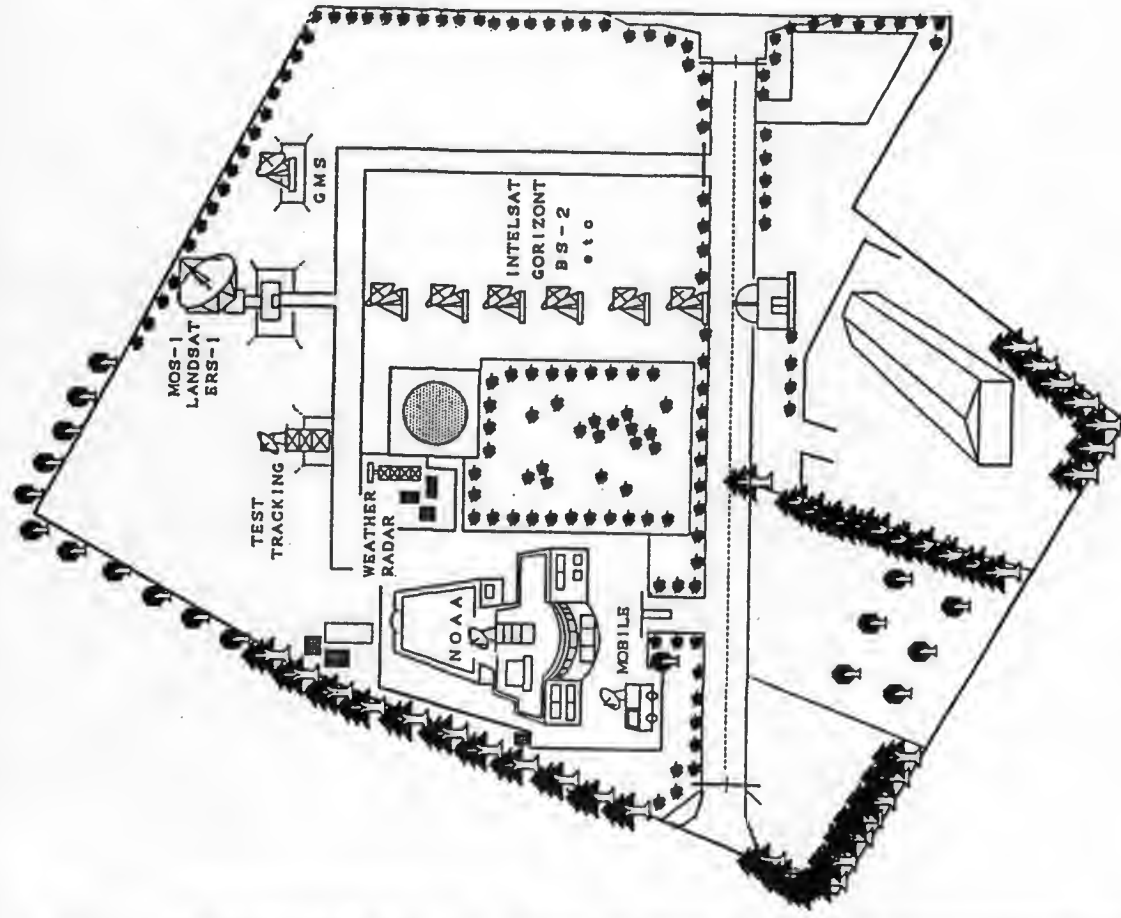
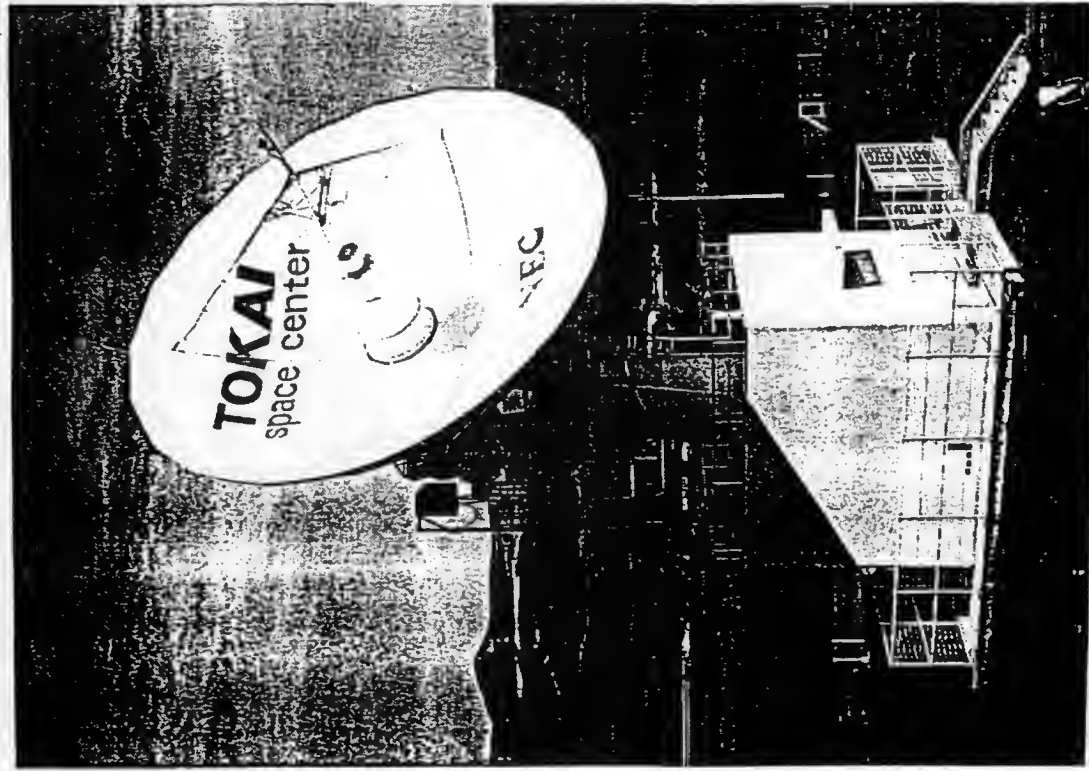
• *Diameter* 11m

• *Mount* Azimuth Cross Elevation

• *Gain* X band 36dB/K
S band 23dB/K

• *Band* X band 8 - 8.66 GHz
S band 2.2 - 2.3 GHz

TSIC : Tokai Univ. Space Information Center



Recording

• Recording Rate	8.86 Mbps	MOS-1, b MESSR / VTIR
	105 Mbps	ERS-1 AMI (Image mode)
	60 Mbps	ERS-1 SAR,
		ADEOS AVNIR

• HDDR	Honeywell HD-96
	Penny & Giles SE-9000
	SONY D-1

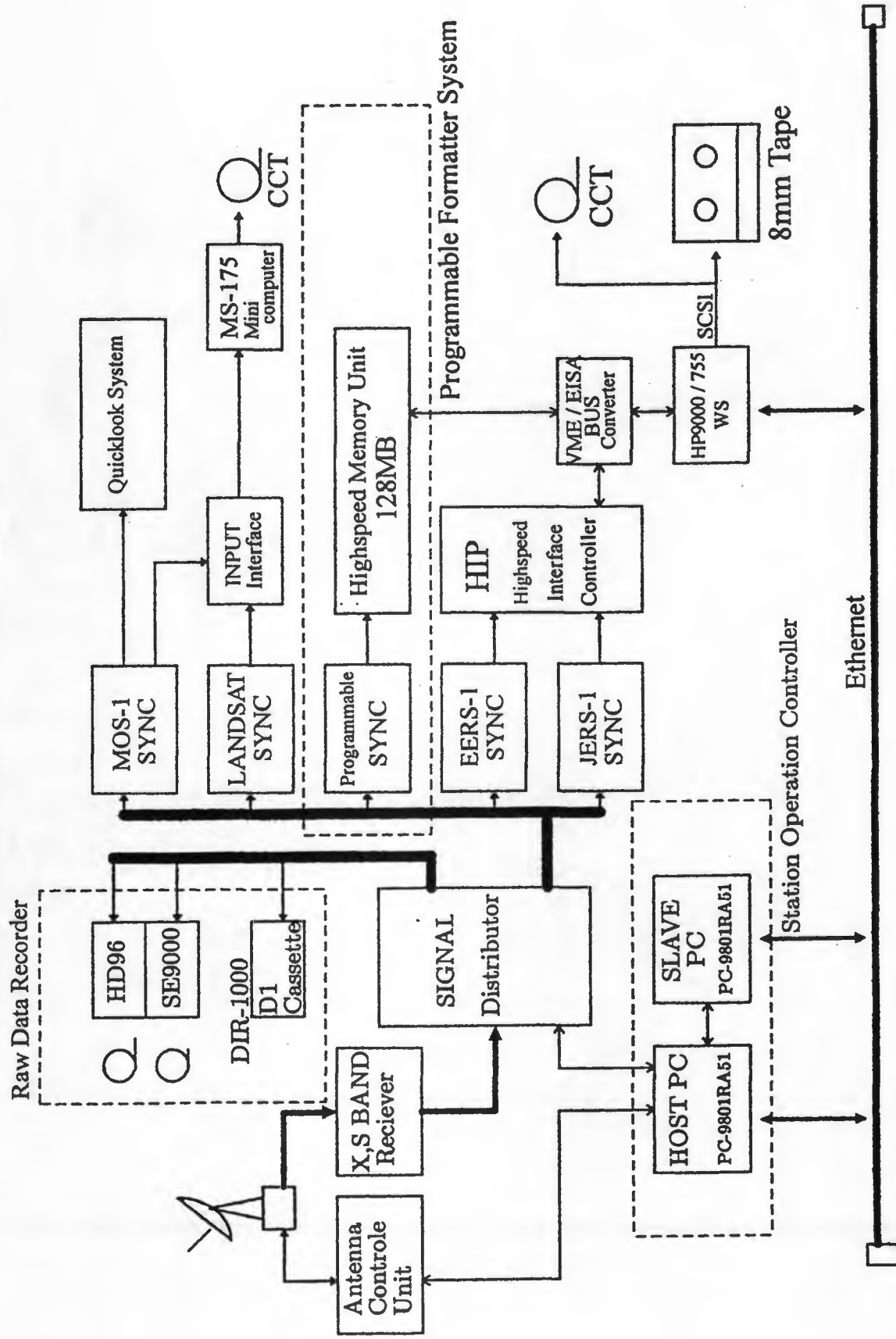
Processing

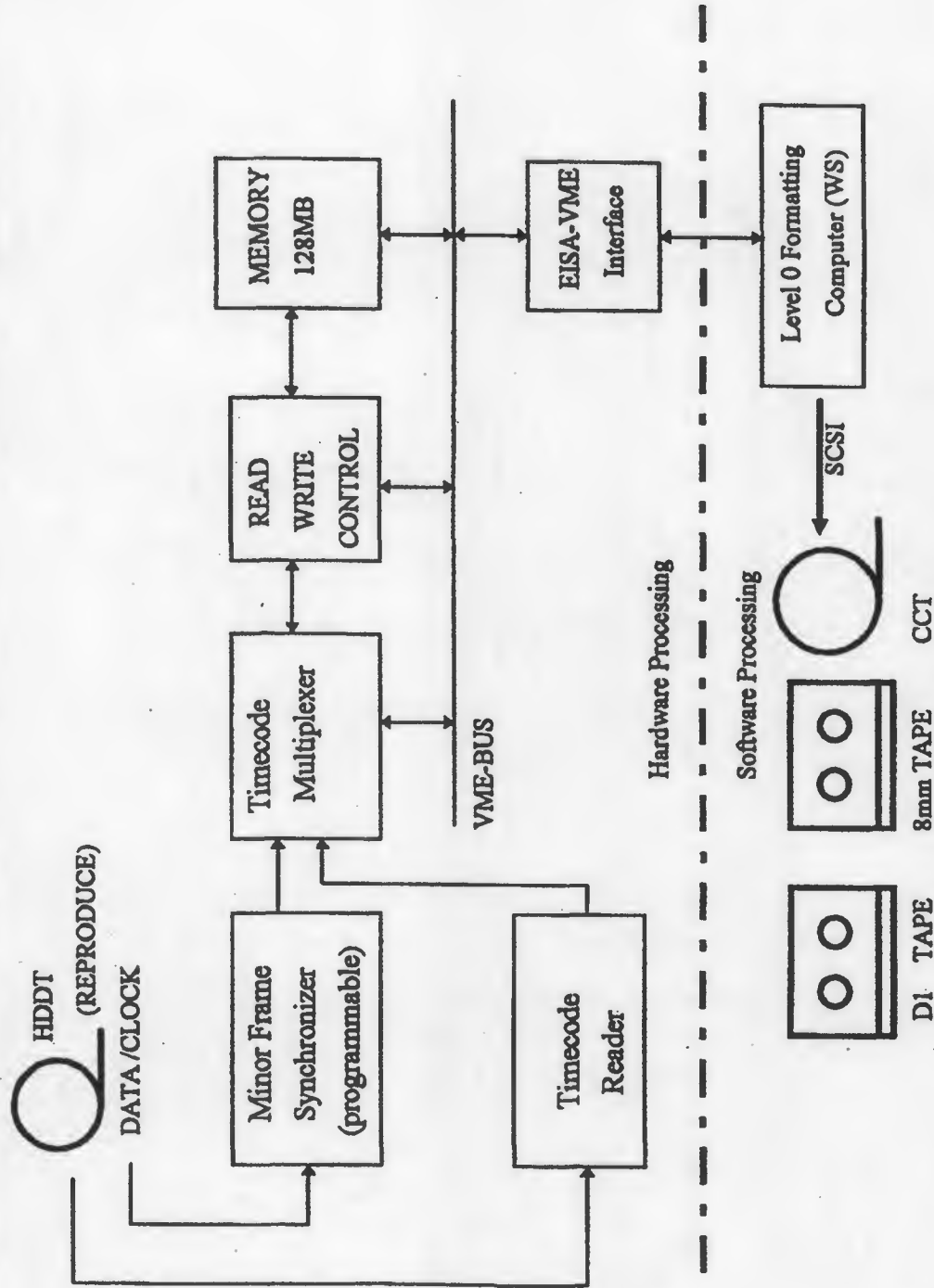
- NEC MS-175
MOS-1 MESSR and VTIR (Level 1 - 3)
- HP-755
JERS-1 SAR, ERS-1 and ADEOS AVNIR (Level 0)
- SONY SIPS
ERS-1 AMI (Level 1, 2)
- SUN 20
NOAA AVHRR (Level 0, 1)
- NEC NESDAS-210
GMS SVISSR (Level 0, 1)

System summary

- *High speed Interface Processor with D-1 raw data recording*
- *Easy to format all sensor data by TSIC original programmable formatter*
- *File interface with NASDA EOC system*

System Block Diagram of TSIC





Block diagram of the programmable formatter system

Data Reception Policy

- *Build up sophisticated remote sensing technology for scientific research*
- *Collaboration with International organizations*
- *Data reception task share with NASDA*
- *Data distribution through NASDA / RESTEC*
- *Develop data processing and analyzing technology*

Future Plan

- *Fully remote controlled reception*
- *New reception antenna construction for ADEOS, ERS-2, RADARSAT, Landsat-7*

Contact Point

◆ Prof. Haruhisa SHIMODA

Tokai University

Research & Information Center (TRIC)

2-28-4, Tomigaya, Shibuya-ku, Tokyo 151 Japan

Tel: +813-3481-0611

Fax: +813-3481-0610

E-mail: smd@keyaki.cc.u-tokai.ac.jp

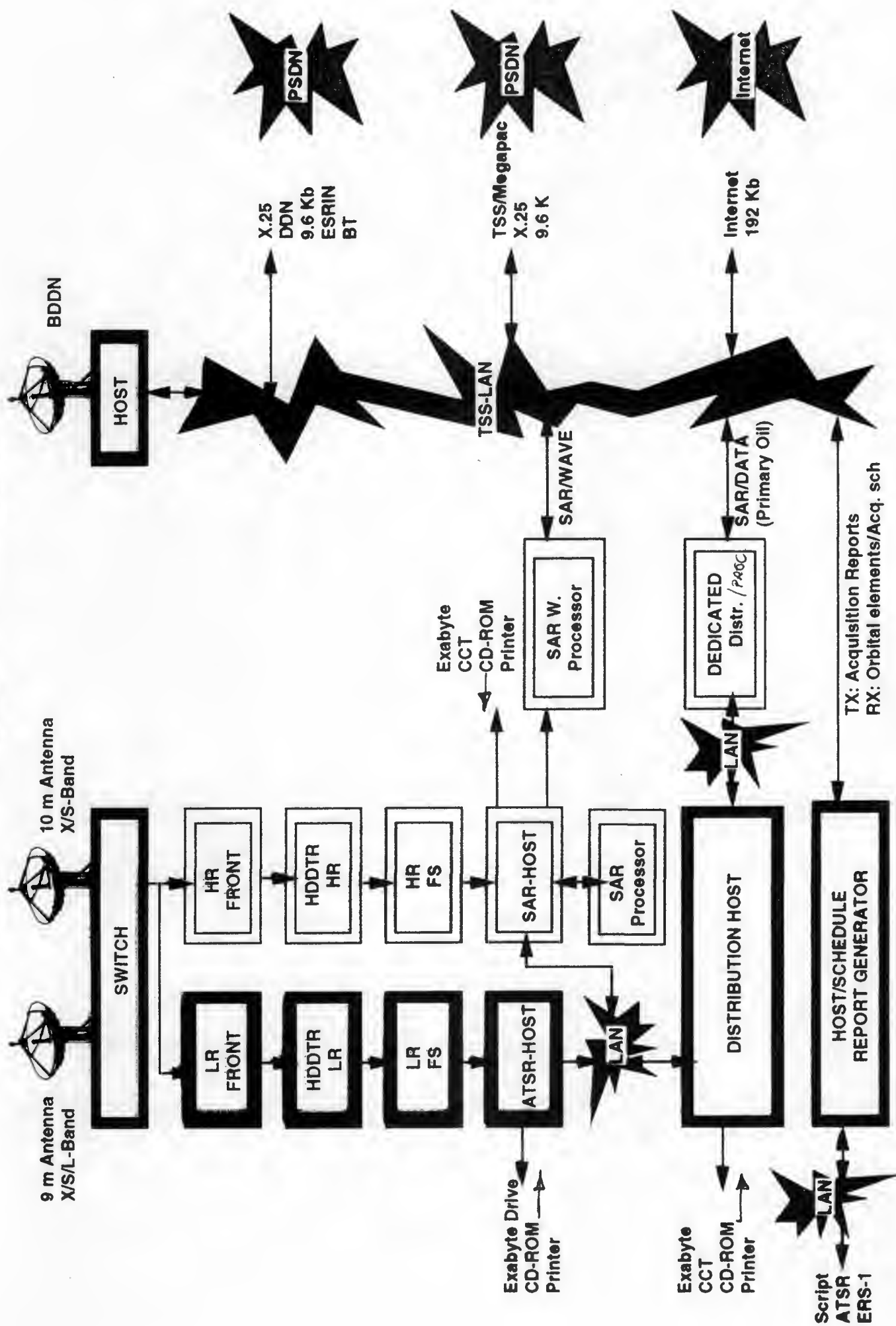
TROMSØ SATELLITE STATION

- **LOCATION**
 - 69 degrees 39 minutes North
 - 18 degrees 56 minutes East
- **ALTITUDE**
 - 111 metres
- **OPERATIONAL**
 - 24 hours a day, 365 days a year
- **STAFF**
 - 26 persons
- **COSPAS/SARSAT OPERATION**
- **NATIONAL RECEIVING STATION FOR
ERS-1 and ERS-2.**
 - MOU with ESA
- **ESA CONTRACTS**
 - NOAA AVHRR: Reception, Preprocessing and Archiving
 - JERS: Reception
 - ATSR: Reception, Processing and NRT-product distribution
- **SVALSAT**
 - NASA Backup for AM1
 - EUMETSAT - EPS
- **RADARSAT**
 - Agreement signed with RADARSAT International, September 1995





ERS - SIMPLIFIED BLOCKDIAGRAM



STATION EQUIPMENT I

ERS SAR CHAIN

- **9m and 10 m Antenna**
X/S/L (9m) og X/S (10 m)
- **1 HR Demodulator - BTM**
- **1 Format Synchronizer - Spacetec**
- **1 P&G HDDTR**
- **1 SAR HOST - Silicon Graphics**
 - Memory 64 Mb, 2 x 640 Mb,
 - 270 Mb Internal, 4 Gb External
 - Exabyte Drive (8200)
 - 1 CCT 1/2" Chipper Drive
 - 1 CD-ROM
 - Printer
- **1 SAR Processor - Informasjonskontroll**
 - CESAR III Array Processor
 - 4 x Malu
- **1 Distribution Host - Sun SPARC 10**
 - 64 Mb Memory
 - Disk 530 Mb, 9 Gb, 4 Gb
 - Exabyte Drive (8500)
 - CD-ROM
 - Printer



STATION EQUIPMENT II

ERS SAR CHAIN

- **1 SAR Wave Processor - SG Indy**
 - 64 Mb Memory
 - Disk: 1 Gb Internal, 2 Gb External
 - CD-ROM
- **1 Distribution Computer**
PC Windows WG
- **1 Scheduler/Report Generator**
ALPHA 3300
 - 48 Mb Memory
 - Disk: 1 Gb
- **Other: MACs & PCs**



TSS COMMUNICATION LINKS

- Internet - 192 Kb line to UiTø
- X.25 PSDN/TSS 9.6 Kb
- X.25 PSDN/ESRIN - DDN 9.6 Kb
- 2 Mb SAT link - IDUN (sleeping)
- LAN Ethernet
- Future Plans:
 - ISDN
 - ATM/Supernet 2



ERS-1 AND ERS-2 STATION SAR

OPERATION

- **National ERS Ground Station (MoU with ESA)**
- **Acquisition of all ESA scheduled SAR passes within coverage area**
- **SAR processing for near real-time applications**
- **Rolling HDDT archive (20 days)**
- **All processed scenes (Low Resolution) are archived on Exabyte**



ERS-1 SAR ACQUISITION 1995

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Okt.	Nov.	Total
Scheduled passes	168	212	219	224	269	248	231	205	212	221	186	2395
Fully acquired	163	204	214	210	262	235	211	192	206	213	179	2289
Partially acquired	1	3	1	5	2	4	13	7	4	3	3	46
Lost passes	4	5	4	9	5	9	7	6	2	5	4	60

ERS-2 SAR ACQUISITION 1995

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total
Scheduled passes								25	188	215	145	573
Fully acquired								18	161	201	135	515
Partially acquired								6	7	2	1	11
Lost passes								1	20	12	9	47

ERS SAR PRODUCTS

- **SAR Full Resolution Image - FRI (similar to U116)**
- **SAR Low Resolution Image - LRI (FRI subsampling, 5x5 averaging)**
- **SAR Calibrated Low Resolution Image**
- **SAR Wave spectra based on SAR FRI**
- **SAR paper quick -look**



ERS SAR PRODUCTS 1995

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total
LRI products	488	500	537	658	795	593	663	807	573	713	482	6809
FRI products		3	2	1	2	3	1	6	2	10	2	32
SAR Wave prod.									31	130	95	256
Total number	488	503	539	659	797	596	664	813	606	853	579	7107

NATIONAL ERS SAR PROJECTS

The main objective is to develop operational services based on the users requirements

Oil Spill detection

A project for use of ERS SAR data for detection of oil spill at sea. Today's service is a first step towards a fully operational system covering Norwegian and adjacent waters.

Ice Service

A project to demonstrate the possibilities of using ERS-1/2 data for a future Ice Center in Norway.

Ocean Wave

A project for use of ERS SAR data to provide ocean wave direction and length information in near real-time.

Ship detection

A project for use of ERS and RADARSAT data for ship detection



TROMSØ SATELLITE STATION

SEA ICE MONITORING

- **Development of a Norwegian Ice Service in co-operation with NERSC and DNMI:**
 - Basic service
 - Special service
 - Data products for further analysis
- **Areas of interest are the Arctic waters**
- **No present plans for activities in the Gulf of Bothnia. Area may be included upon request**



INTERNATIONAL PROJECTS

Joint ERS-1/SLAR flight project

Joint flight operation with Holland, UK and Germany for data collection, analysis and documentation of oil spill detection capabilities.

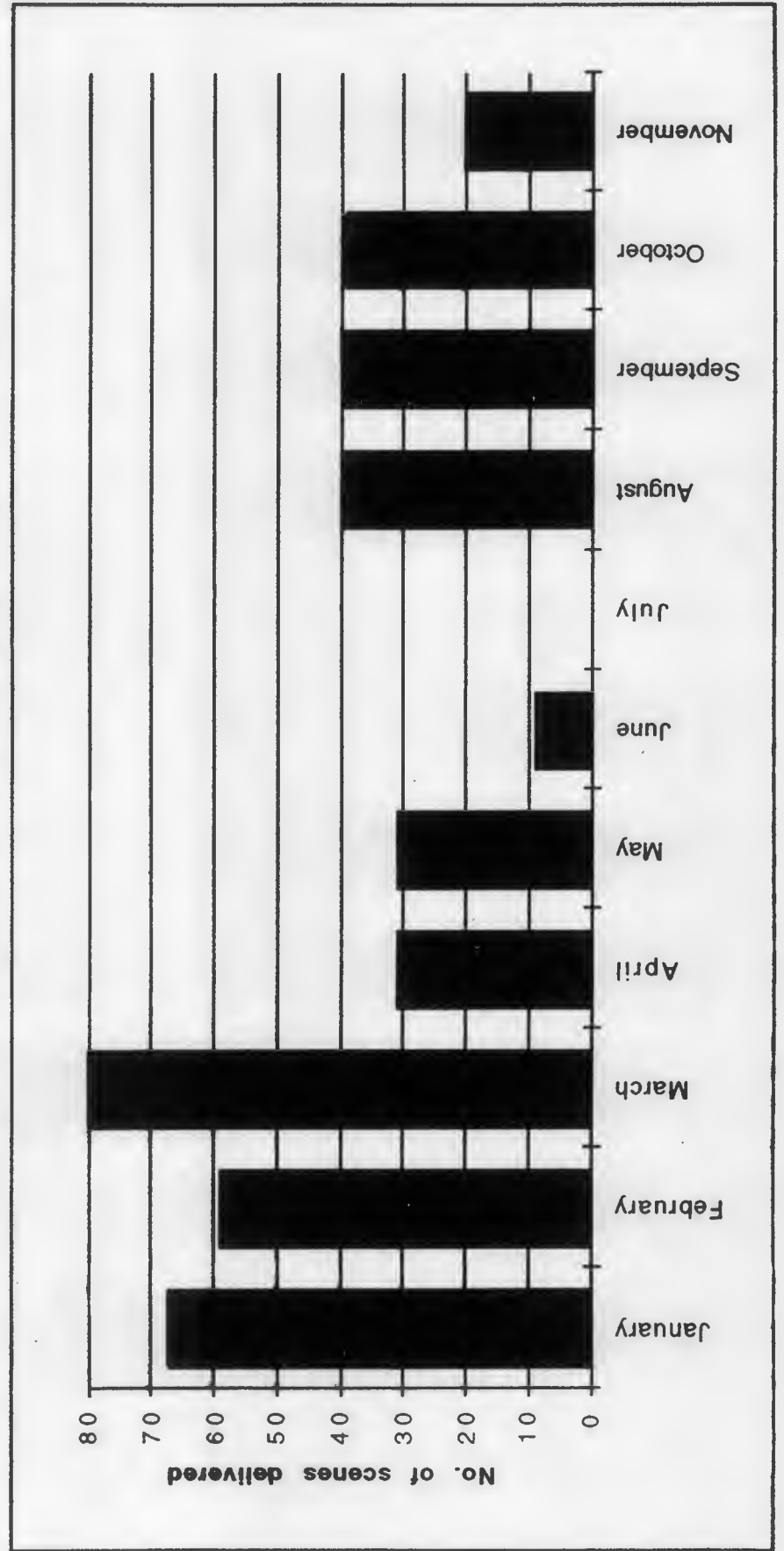
CEO Proof of Concept Study

The objective is to investigate current and potential users of Earth Observation (EO) data concerning their requirements for EO information obtained through practical interaction with the oil spill detection service.

SAR Low Resolution Products to ESA Pilot Projects



ESA PILOT PROJECTS

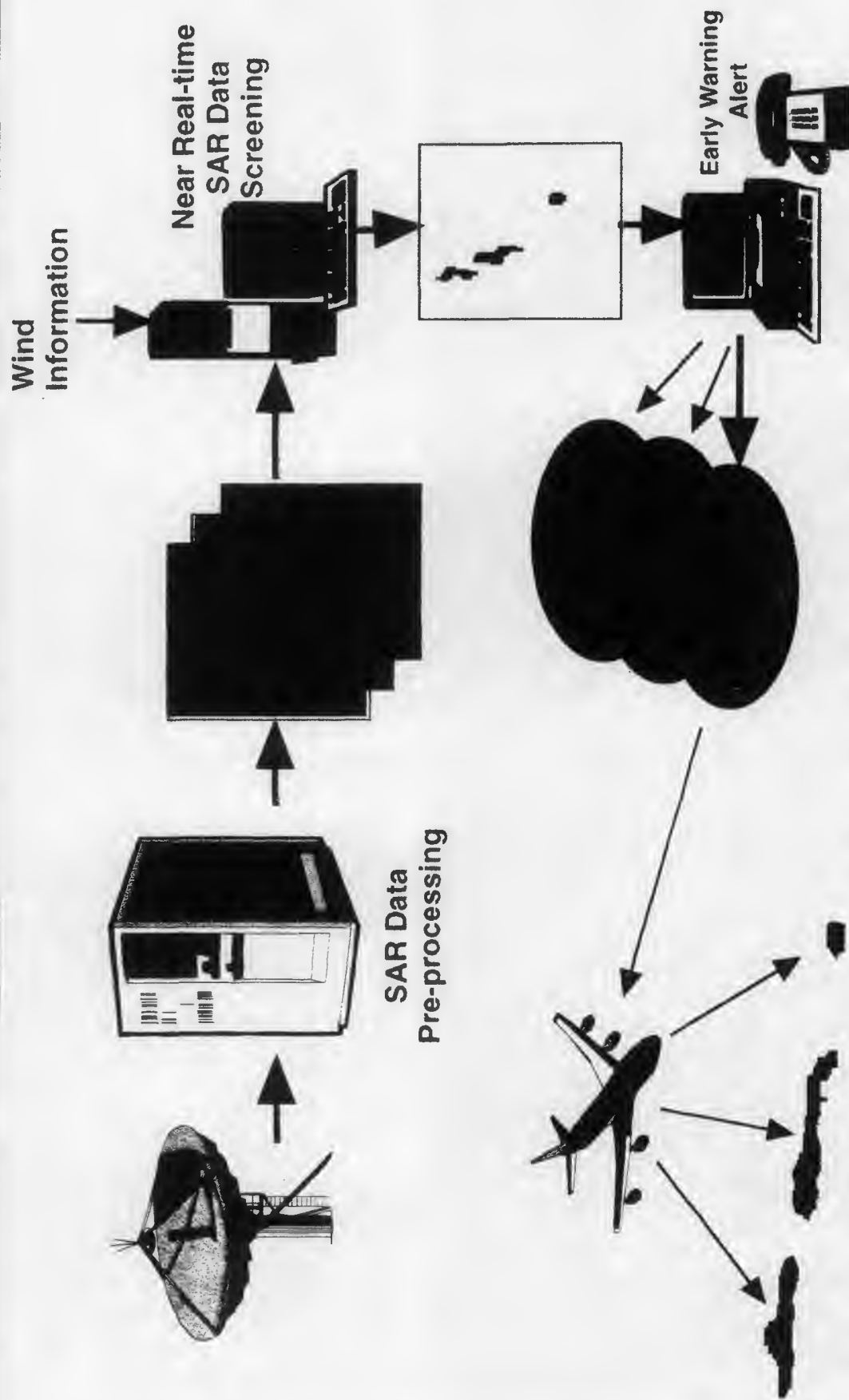


ERS SAR PRODUCT DISTRIBUTION

- **99% distributed via Internet**



TROMSØ SATELLITE STATION



OIL SPILL SERVICE CONCEPT MODEL

Satellite Based Detection of Oil Spill

-  National areas
-  Extended areas



ERS-1 SAR

Possible oil spill

Jul. 21 1995
10:43:35 UTC

Slick position
N 52° 53' E 003° 05'



Scala:

1 cm = 2,1 km

ATSR OPERATION

- Rehosting of ATSR Near Real-time Service - November 1994
- Processing and distribution from January 1995
- 10 passes per day
- BROWSE, ASST, CAT. and ENG. products processed from all passes
- No archiving, 25 days rolling HDDT archive



STATION EQUIPMENT III

ATSR CHAIN

**9 and 10 m Antenna X/L/S
(9m) X/S (10 m)**

1 LR-Demodulator - BTM

1 HDDTR - P&G

1 Format Synchronizer - Spacetec

ATSR Host/Processor

Alpha1 - AXP3600

Alpha2 - AXP3300

64 Mb/32 Mb Memory

Disk: 3 + 1 Gb

Exabyte 8200

CD-ROM

Printer

Distribution Platform - SUN SPARC10

1 Scheduler/Report Generator

ALFA 3300 as for SAR operations



ATSR ACQUISITION 1995

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total
Scheduled passes	286	266	296	290	299	288	298	295	289	300	288	3195
Fully acquired	273	255	280	266	287	281	277	284	283	289	278	3053
Partially acquired	7	9	4	12	5	4	4			5	7	57
Lost passes		2	12	12	7	3	17	11	6	6	3	85

ATSR PRODUCTS

ASST

BROWSE

REPORT, (ENGINEERING)

CAT.

BT

ACLOUD

CLOUD

SST



ATSR PRODUCTS 1995

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Total
CAT.		1174	576	570	578	568	550	570	566	578	570	6300
ACLOUD		40	289	285	289	284	275	285	283	289	285	2604
ASST		656	289	285	289	284	275	285	283	289	285	3220
ENG.		616	289	285	289	284	275	285	283	289	285	3180
BROWSE		8543	7038	22130	22712	22296	21616	22556	22509	22960	22491	194851
CLOUD		7282	7013	2188								16483
BT		794	364	471	382	268	237	296	303	292	295	3702
SST		1823	405	525	693	107	129	153	157	120	29	4141
Total		20928	16263	26739	25232	24091	23357	24430	24384	24817	24240	232481



ATSR DISTRIBUTION

- Internet
- DDN (Data Dissemination Network)



ATSR PROJECTS

James Renell Centre for Ocean Circulation, UK

"Near real-time ATSR support for cruises D213 and D214"

MétéoMer, France

"Real-time Antarctic Converge Detection"

Leicester University, UK and Iwate University, Japan

"Near real-time ATSR data for validation campaign"

Nansen Remote Sensing Center, Norway

"ESA Pilot Project AO2.N108"



RADARSAT

- Agreement with RADARSAT signed (September 1995)
- New 10 meter antenna installed (August 1995)
- Demodulator, Formatsynch, Host and Penny & Giles HDDT Cassette Recorder installed
- New SAR processor will be installed during March 1996
- Data-products from RADARSAT available from March 1996
- Cyclic Rawdata Archive



ERS USER SERVICES/HELPDESK

DOCUMENTATION

GENERAL

ESA-SP-1146
ESA-SP-1148
ESA-SP-1149
ESA-SP-1176/1
ESA-BR-109

ERS-1 SYSTEM
ERS-1 USER HANDBOOK
ESA ERS-1 PRODUCT SPECIFICATIONS
NEW VIEWS OF THE EARTH
LAND AND SEA ERS-1 APPLICATIONS
REPORT ON DESCOPING STRATEGY
EARTH OBSERVATION QUARTERLY (BACK ISSUES 39 TO 47)
DESCW INFORMATION ANNEX

SAR

ER-IS-EPO-GS-0506
ER-IS-EPO-GS-5902.1
ER-IS-EPO-GS-5902.2
ER-IS-EPO-GS-5902.3
ER-IS-EPO-GS-5902.4
ER-IS-EPO-GS-5902.5
ER-IS-EPO-GS-5902.6
ERS-D-IF-22000
ER-TN-ESA-GS-0207
ES-TN-DPE-OM-GS01
ER-TN-DPE-OM-GS02

ERS-1 SAR PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX A. ERS-1 SAR.RAW CCT and EXABYTE
ANNEX B. ERS-1 SAR.FDC CCT and EXABYTE
ANNEX C. ERS-1 SAR.SLC CCT and EXABYTE
ANNEX D. ERS-1 SAR.PRI CCT and EXABYTE
ANNEX E. ERS-1 SAR.GEC CCT and EXABYTE
ANNEX F. ERS-1 SAR.GTC CCT and EXABYTE
INTERFACE SPECIFICATION FOR THE INGESTION OF USER SUPPLIED INFORMATION FOR GTC03/GTC04
ERS-1 SAR LOW RESOLUTION PRODUCT SPECIFICATION
AN ASSESSMENT OF SAR LOW RESOLUTION IMAGERY
ERS-1 SAR RADIOMETRIC CALIBRATION / ERS-1 SAR PRODUCTS VALIDATION*
ERS-1 SAR CALIBRATION DERIVATION OF BACKSCATTERING COEF. SIGMA 0 IN ERS-1.SAR.PRI PRODUCTS
ERS-1 INTERFEROMIC BASELINE ALGORITHM VERIFICATION
CEOS ANNOTATIONS STRUCTURE FOR ESA ERS-1 SAR PRODUCTS

LOW BIT RATE

DEX/E/92-10-002
DEX/E/93-01-002
C1-EX-MUT-A21-01-CN
ER-IS-EPO-GS-0502
ER-IS-EPO-GS-0503
ER-IS-EPO-GS-0503.1
ER-IS-EPO-GS-0503.2
ER-IS-EPO-GS-0503.4
ER-IS-EPO-GS-0504.2
ER-IS-EPO-GS-0504.7
ER-IS-EPO-GS-0505.2
ER-TN-ESA-JP-0016
ER-TN-ESA-GP-1120
ER/ALT/OPR/IN/JB/004
ER-IS-DLR-GO-0004
ER-AD-DLR-GO-0016

RA UNAVAILABILITY PERIODS SINCE LAUNCH
ATSR UNAVAILABILITY PERIODS SINCE LAUNCH
ALTIMETER PRODUCTS USER MANUAL
ERS-1 LBR PRODUCTS CCT FORMAT SPECIFICATIONS
ERS-1 ALT PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX A. ERS-1 ALT.RAW PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX B. ERS-1 ALT.FDC PRODUCTS CCT FORMAT SPECIFICATIONS
ANNEX D. ERS-1 ALT.OPR PRODUCTS CCT FORMAT SPECIFICATIONS
ERS-1 WSC.FDC PRODUCT CCT FORMAT SPECIFICATIONS
ERS-1 WSC.DWP PRODUCT CCT FORMAT SPECIFICATIONS
ERS-1 SWM.FDC PRODUCT CCT FORMAT
CMOD3 MODEL DESCRIPTION
CMOD4 MODEL DESCRIPTION
A 1ST EVALUATION OF ERS-1 ALT. OCEAN PRODUCTS
INFORMATION CONCERNING THE 2ND RELEASE OF ERS-1.ALT.OPR02 PRODUCTS
INFORMATION CONCERNING THE 4TH RELEASE OF ERS-1 ALT.OPR02 PRODUCTS
ERS-1 D-PAF GLOBAL PRODUCTS MANUAL (ORB.PRI/PRC,ALT.EGM/QLOPR/SSHQL/SSH/OGE/TOP)
INTERFACE SPECIFICATION DOCUMENT OF THE GOME DATA PROCESSOR
PRODUCT SPECIFICATION DOCUMENT OF THE GOME DATA PROCESSOR

DOCUMENTATION

SOFTWARE PACKAGES

DISPLAY ERS-1 SAR COVERAGE (DESC) SOFTWARE (v 1 53) (Diskette)
DESCW SOFTWARE VERSION 1.2 (2X Diskette)
CEOS READER SOFTWARE PROGRAM FOR LOW BIT RATE PRODUCTS - UNIX
CEOS READER SOFTWARE PROGRAM FOR SAR PRODUCTS - UNIX
CEOS READER SOFTWARE PROGRAM FOR SAR PRODUCTS - UNIX (EXABYTE)

CD-ROMs

- *THE ERS-1 SAR REFERENCE COVERAGE CD-ROM
- THE CD GUIDE TO ERS-1
- *AVHRR CD-BROWSER
- *SAR INTERFEROMETRY ORBIT LISTINGS - Dates of interest to be stated when ordering

*Available via Internet <http://services.esrin.esa.it>

E-mail Address:

Mailing Address:

Name:

Organisation:

Address

Town:

Zip Code

Tel no. fax no

Project Code:

Date:

ERS Level 0
Format Specification

Version 1.0

December 1994

National Space Development Agency of Japan
Earth Observation Center

1. Overview

This specification describes each sensors' level 0 product (D-1 cassette tape) formats. The data generated by the level 0 processing system at Earth Observation Center of National Space Development Agency of Japan is recorded to the D-1 cassette tapes in these formats.

The level 0 data consists of the orbit elements, time difference data, and quality etc. in addition to the science data from each sensor.

Table 1-1 and 1-2 show the sensors and satellites covered by this specification.

Table 1-1 Sensors Covered in This Specification (Underlined)

Sattelite	Sensor Name	Sensor Code
LANDSAT	MSS Multi Spectrum Scanner	MSS
	TM Thematic Mapper	TM
SPOT	HRX XS (High Resolution Visible)	HX
	HRX Pan (High Resolution Visible)	HP
MOS	MESSR (Multispectral Electronic Self-Scanning Radiometer)	MES
	VTIR (Visible and Thermal Infrared Radiameter)	VTI
	MSR (Microwave Scanning Radiaometer)	MSR
JERS	VNIR (Visible and Near Infrared Radiaometer)	OVN
	SWIR (Short Wave Infrared Radiometer)	OSW
	SAR (Synthethic Aperture Radar)	SAR
<u>ERS</u>	<u>AMI image (Activ Microwave Instrument)</u>	<u>AIM</u>

Table 1-2 Satellites Covered in This Specification (Underlined)

Sattelite Name	Sattelite Code
LANDSAT-2	L2
LANDSAT-3	L3
LANDSAT-4	L4
LANDSAT-5	L5
SPOT-1	S1
SPOT-2	S2
SPOT-3	S3
MOS-1	M1
MOS-1b	M2
JERS-1	J1
<u>ERS-1</u>	<u>E1</u>

2. Definition of Product

2.1 Recording Media

The following medium records the level 0 processed products.

[D-1 Cassette Tape]

Media name:	D-1 M cassette (Sony SD1-600M or equivalent)
Reel length:	587 m
Record format:	ANSI x3.175-1990 ID-1 format
Recorder:	DIR-1000 series or equivalent
Storage capacity:	42.23 GB

2.2 Format Rule

Eight-bit (one byte) is the fundamental unit of recording. Every field is a multiple of eight-bit.

2.2.1 Alphanumeric Field

An alphanumeric field is a text data, including abbreviations consisting of alphabets and numbers. This field is a series of 8-bit (1-byte) fields, and alphanumeric characters are expressed in ASCII format. The 8-bit (1-byte) fields are recorded on the media in sequence, hence, the first character is recorded as the first byte, and the second character as the second byte.

In this specification, this alphanumeric field is referred to as "AW" where A indicates a textual data and W represents the field width (number of bytes). This format is the same as the FORTRAN format statement rule.

(Example) A32: Text string of 32 characters

2.2.2 Numeric Field

A numeric field is used to define a numeric data in text format. The fields of this type are recorded on the media as a series of 8-bit (1-byte) fields, in a similar way of the textual data in the alphanumeric field described in the previous section. "IW" indicates an integer, "Fw.d" indicates a decimal floating point number, and "Ew.d" indicates an exponential decimal number, where w represents the field width and d represents the exponent.

That is, "F16.7" is a decimal number of 16-byte fields. The first byte is for the sign (space is used for "+"), the integer follows as the next seven bytes, the decimal-point character comes, then the decimal fraction follows as the last seven bytes. When the integer part is less than seven digits, the sign character comes the top of it. (See example 1 and 2.)

In the same way, "E20.10" is an exponential decimal number of 20 bytes field. The first byte is for the sign (space is used for "+"), the integer of the mantissa follows as the second through fifth bytes, then the decimal-point character comes, the decimal fraction of the mantissa follows as the seventh through 16th bytes, then the last four bytes are used for the exponent. (See Example 3.)

(Example 1) F16.7: 1234567.1234567

(Example 2) F16.7: -12.3456789

(Example 3) E20.10: -1234.1234567890E+04

2.2.3 Binary Field

A binary field is used to define binary data. The size of the binary field is defined as a multiple of 8-bit (1-byte) as well as the other field types. The MSB of the binary data is recorded prior to the LSB.

The binary data, however, is not separated into 8-bit units. Hence, the data is read depending on its type. Addressing varies according to the file specification, because there is no general field definition.

Still, 8-bit (1-byte) unit is the fundamental unit of recording on the media. In this specification, "BW" is used for a binary field. B indicates binary data, and W represents the field width. When the size of binary data is not a multiple of 8-bit fields, the size of the binary field is a smallest number of multiple of 8-bit units, which is greater than that binary data size.

2.2.4 Others

In addition to the formats previously described, the following rule is used in this specification.

\$: represents a space character (20₍₁₆₎).

2.3 Logical Volume Structure

A logical volume consists of the volume header file, signal header file, and two or more signal files. On a D-1 cassette tape, there is a dummy area between the signal header file and the first signal file.

The volume header file is located at the top of the physical volume, describing types and contents of the data files recorded on the D-1 cassette tape physical volume. The location and size of those data files are also described.

The volume header file consists of three volume header records, in which the same contents are recorded. The three volume header records have the same record length 9 IDs (*). The purpose of these same three records is backup.

A signal file consists of the following records:

Signal header descriptor record

Signal header block:

Platform position data record

Facility related data record

Signal data descriptor record

Signal data record

Telemetry data descriptor record (only for MOS and JERS)

Telemetry data record (only for MOS and JERS)

In a signal file, there are three records for signal header block and telemetry data descriptor record, respectively, as well as the volume header record in the volume header file.

A signal header file consists of the signal header areas corresponding to the signal files. The signal file header area has the three signal file header blocks whose contents are the same. The length of the signal files varies depending on the sensor type because the maximum number of signal files for a single D-1 cassette tape is not the same.

The signal header file basically contains the same records to the signal header blocks in the signal files. The orbit elements in the signal header file and in the signal file, however, may not be the same because they may be the predictive orbit data or determined orbit data, depending on the processing conditions. (See Table 2-4 in the section 2.3.3(1).)

- (*) For the D-1 cassette tape, the minimum unit for read/write is 29 IDs. "ID" is the address data for read/write of the ID-1 format data, and 1 ID is 144432 bytes.
- The top ID number assigned to the physical volume is 128 ID, that is, the physical beginning of tape (PBOT) is 128 ID.
- The difference between the PBOT and the logical beginning of tape (LBOT) is 5872 IDs, hence the LBOT is 6000 ID.

Figure 2-1 shows the entire D-1 cassette tape format. Table 2-1 shows the allocation and length of each record. Table 2-2 shows sizes of the signal data record for each sensor.

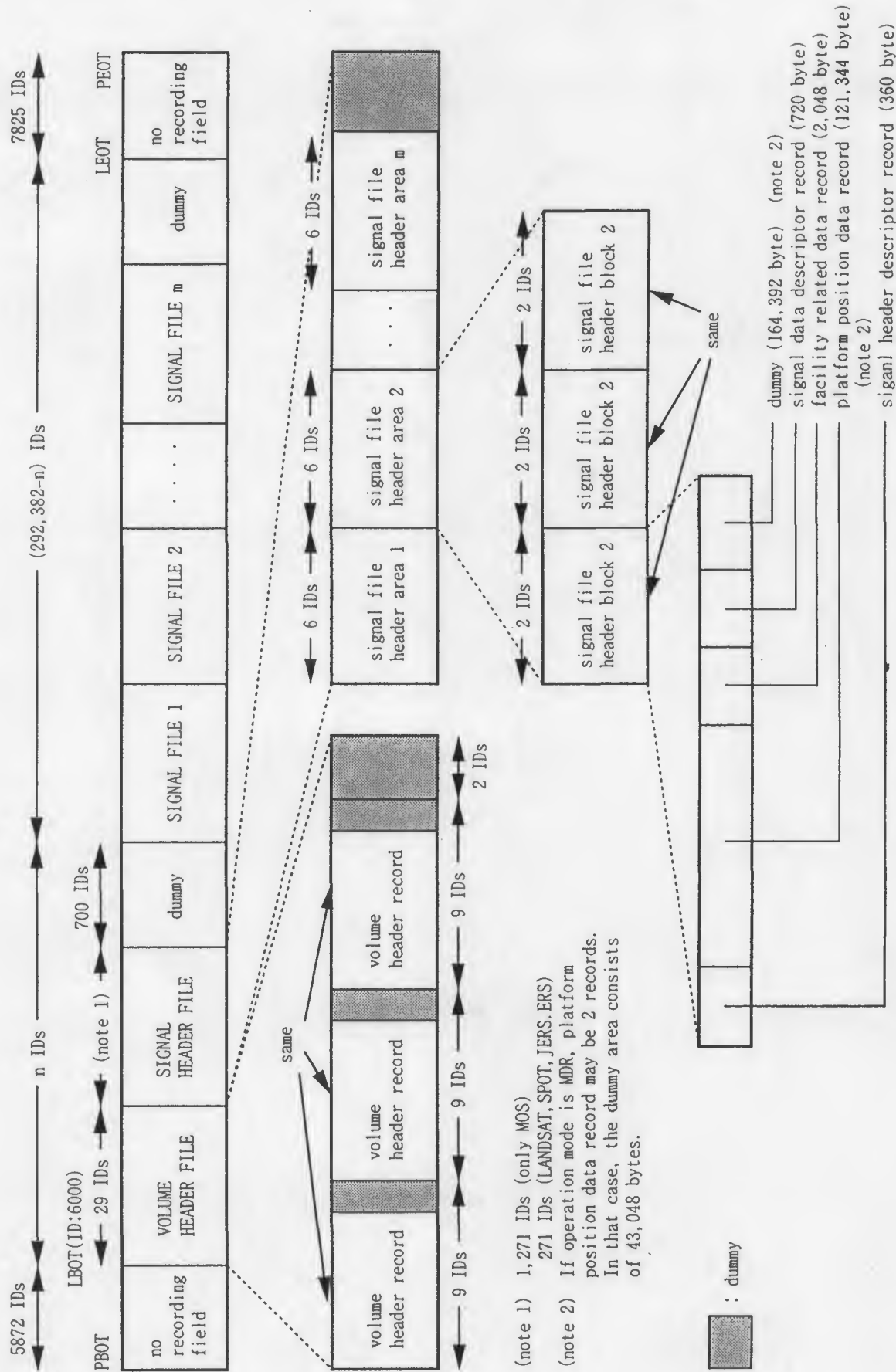


Figure 2-1 D-1 Cassette Tape Format (1/2)

Table 2-1 Records on D-1 Cassette Tape (1/3)

Record Length	No.of Records	Record Name	No.of Blocks	Area Name	File Name
9 IDs	3	Volume Header			Volume Header File
Dummy Data 2 IDs					
360 bytes	1	Signal Header Descriptor	Signal File Header Block 1 (2 IDs)	Signal File Header Area 1	Signal Header File
121,344 bytes	1	Platform Position Data			
2,048 bytes	1	Facility Related Data			
720 bytes	1	Signal Data Descriptor			
Dummy Data 164,392 bytes					
360 bytes	1	Signal Header Descriptor	Signal File Header Block 1 (2 IDs)		
121,344 bytes	1	Platform Position Data			
2,048 bytes	1	Facility Related Data			
720 bytes	1	Signal Data Descriptor			
Dummy Data 164,392 bytes					
360 bytes	1	Signal Header Descriptor	Signal File Header Block 1 (2 IDs)		
121,344 bytes	1	Platform Position Data			
2,048 bytes	1	Facility Related Data			
720 bytes	1	Signal Data Descriptor			
Dummy Data 164,392 bytes					
.	.	.	.	.	
.	.	.	.	.	
360 bytes	1	Signal Header Descriptor	Signal File Header Block 2	Signal File Header Area 2	
121,344 bytes	1	Platform Position Data			
2,048 bytes	1	Facility Related Data			
720 bytes	1	Signal Data Descriptor			
Dummy Data 164,392 bytes					
.	.	.	Signal File Header Block 2		
.	.	.	Signal File Header Block 2		
.	.	.	Signal File Header Block 2		
Dummy Data					
Dummy Data 700 IDs					

Table 2-1 Records on D-1 Cassette Tape (2/3)

360 bytes	1	Signal Header Descriptor	Signal File Header Block 3		
121,344 bytes	1	Platform Position Data			
2,048 bytes	1	Facility Related Data			
720 bytes	1	Signal Data Descriptor			
Dummy Data 164,392 bytes					
.	.	.	.		
.	.	.	.		
360 bytes	1	Signal Header Descriptor	Signal File Header Block 3		
121,344 bytes	1	Platform Position Data			
2,048 bytes	1	Facility Related Data			
720 bytes	1	Signal Data Descriptor			
Dummy Data 164,392 bytes					
Dummy Data 23 IDs					
m	n	Signal Data			
360 bytes	1	Telemetry Data Descriptor	(2 IDs)		
Dummy Data 288,504 bytes					
360 bytes	1	Telemetry Data Descriptor	(2 IDs)		
Dummy Data 288,504 bytes					
360 bytes	1	Telemetry Data Descriptor	(2 IDs)		
Dummy Data 288,504 bytes					
Dummy Data 23 IDs					
p	q	Telemetry Data			
.	.	.	.		
.	.	.	.		

Table 2-1 Records on D-1 Cassette Tape (3/3)

.	.	.	.	.	.		
360 bytes	1	Signal Header File	Signal File Header Block	Signal File			
121,344 bytes	1	Platform Position Data					
2,048 bytes	1	Facility Related Data					
720 bytes	1	Signal Data Descriptor					
Dummy Data 164,392 bytes							
.	.	.	.				
360 bytes	1	Signal Header File	Signal File Header Block				
121,344 bytes	1	Platform Position Data					
2,048 bytes	1	Facility Related Data					
720 bytes	1	Signal Data Descriptor					
Dummy Data 164,392 bytes							
Dummy Data 23 IDs							
m	n	Signal Data					
360 bytes	1	Telemetry Data Descriptor	(2 IDs)				
Dummy Data 288,504 bytes							
360 bytes	1	Telemetry Data Descriptor	(2 IDs)				
Dummy Data 288,504 bytes							
360 bytes	1	Telemetry Data Descriptor	(2 IDs)				
Dummy Data 288,504 bytes							
Dummy Data 23 IDs							
P	q	Telemetry Data					

m: Record length of signal data

n: Number of records of signal data

p: Record length of telemetry data

q: Number of records of telemetry data

r: Number of paths

(Note 1) The number of platform position data in the signal file header block may be two, depending on the observation time. In such a case, dummy data size is:

164,392-121,377=43,048 bytes. (See (2) in the section 2.3.2.)

(Note 2) The records from the telemetry data descriptor to the telemetry data in the table are contained only in the files for MOS and JERS.

Table 2-2 D-1 Sizes of Sensors

Sensor Name	Signal Header File Size/ Max.Area No.	Signal Data Record Length	Telemetry Data Record Length	D-1 Size when Observation Time is 10 min. (Example)		
	(IDs/Area)	(Bytes)	(Bytes)	No. of Signal Data Record	No. of Signal File Header Area = Total No. of Signal Files	No. of Telemetry Data Records
	k/MAX. r	m	p	n	r	q
MSS	271/45	180,053	-	8,175	28.5	-
TM	271/45	800,128	-	8,397	6.3	-
HRV Pa	271/45	12,246	-	199,535	17.2	-
HRV XS	271/45	9,246	-	199,535	22.8	-
MESSR	1271/99	8,320	160	78,844	63.5	1200
VTIR	1271/99	22,526	160	4,364	(99)	1200
MSR	1271/99	1,408	160	188	(99)	1200
SAR	271/45	6,303	160	964,631	6.9	1200
OPS(VNIR)	271/45	16,512	160	173,411	14.7	1200
OPS(SWIR)	271/45	16,512	160	173,411	14.7	1200
<u>AMI image</u>	<u>271/45</u>	<u>11,461</u>	-	<u>1,061,947</u>	<u>3.5</u>	-

2.3.1 Volume Header File

The volume header file specifies data of the multiple signal files recorded on a single volume of D-1 cassette tape.

(1) Volume header record

This record is located at the top of each tape. It consists of the data of tape creation, such as the tape creation start/end dates and times, country, and information on the files, such as the valid flag of the signal header file, the signal file position in this volume, observation start/end dates and times, and receipt start/end dates and times.

2.3.2 Signal Header File

A signal header file consists of several signal file header areas.

A signal file header area consists of three signal header blocks. Their contents are exactly the same.

A signal file header block contains the following records:

1. Signal header descriptor record
2. Platform position data record
3. Facility related data record
4. Signal data descriptor record

(1) Signal header descriptor record

The signal header descriptor record consists of logical volume data, such as the signal file ID, logical volume ID, volume set ID, logical volume record date, and physical volume data.

The number of records of the platform position data records is specified in the 169th through 172nd bytes in this signal header descriptor record.

(2) Platform position data record

The platform position data record contains the satellite orbit data, such as the satellite position, velocity, and orbit accuracy data.

The satellite orbit data is represented with the position vector (X, Y, Z) and velocity vector (X', Y', Z'), or the six elements.

The format of the orbit data is specified in the 13th through 44th bytes, and the interval of the orbit data is specified in the 217th through 230th bytes in this platform position data record. (Basically, CARTESIAN ECI true of date format and one minute interval are used.)

The number of the platform position data records in the signal data file is 1 or 2, as shown in Figure 2-2.

When the observation using a single sensor in a single signal file spends two days, the orbit data is divided into two platform position data records: one for the observation start day, and the other for the observation end day.

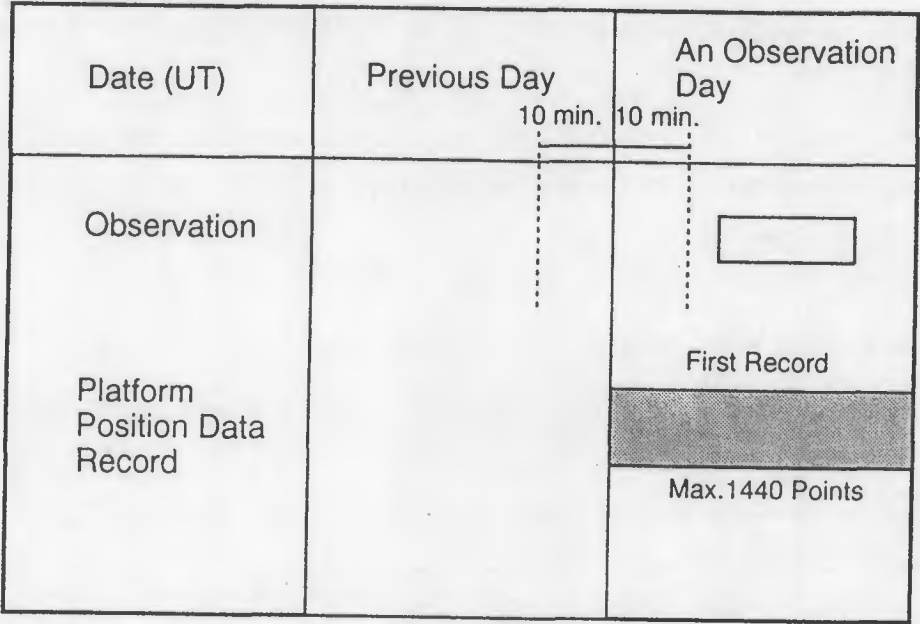
Even when the observation finishes within a single day, the platform position data is divided into two records if the observation start time is between 0:00 and 0:10, or if the observation end time is between 23:50 and 0:00.

(3) Facility related data record

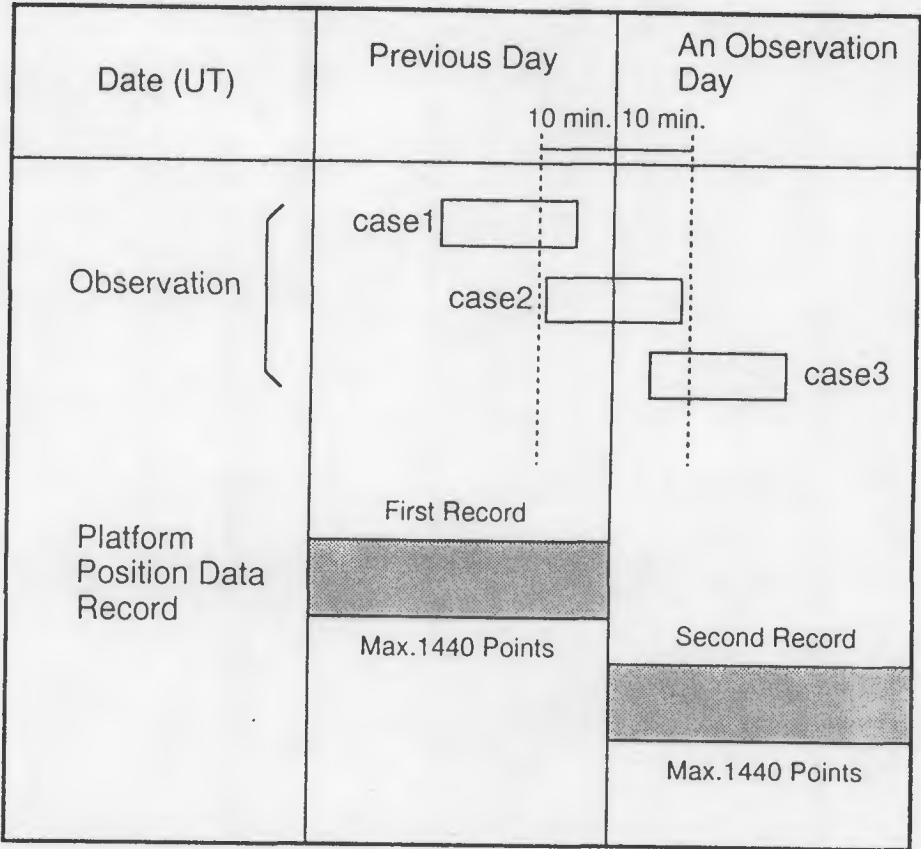
The facility related data contains data used for the level 0 processing by the recording system.

(4) Signal data descriptor record

The signal data descriptor record defines the signal data format of each sensor, such as the length of the signal records contained in the signal data files.



(a) In the Case of One Record



(b) In the Case of Two Records

Figure 2-2 Platform Position Data Record Method

2.3.3 Signal File

A signal file consists of the following data.

1. Three signal file header blocks
2. Multiple signal data records
3. Three telemetry data descriptor records (*)
4. Multiple telemetry data records (*)

(*) The third and fourth items are contained in only the signal files for MOS and JERS. (See Table 2-3.)

Table 2-3 Records (Blocks) in Signal Files for Sattelites

	LANDSAT	SPOT	MOS	JERS	ERS
Signal File Header Record	○	○	○	○	○
Signal Data Record	○	○	○	○	○
Telemetry Data Descriptor Record	×	×	○	○	×
Telemetry Data Record	×	×	○	○	×

○: Contained ×: Not Contained

(1) Signal file header block

A signal file header block consists of the signal header descriptor record, platform position data record (one or two records), facility related data record, and signal data descriptor record.

Each record is the same to (1) to (4) of the signal header file respectively. The orbit data in the platform position data record, however, is different (predictive orbit or determined orbit) as shown in Table 2-4.

Table 2-4 Platform Position Data Record

	Level 0' Processing during Real-Time Receiving Level 0	Level 0 Translation After Orbit Determination Level 0'→Level 0	Level 0 Processing After Orbit Determination Raw→Level 0
Platform Position Data Record of Signal Header File	Predictive orbit or blank	Determined orbit (*)	Determined orbit (*)
Platform Position Data Record of Signal File	Predictive orbit	Predictive orbit	Determined orbit (*)

(*) Predictive orbit in the case of LANDSAT.

(2) Signal data record

Consists of the following data.

1. Additional data of 128 bytes
2. Signal data of one block

The format of the additional data is shown in Figure 2-3.

(a) AMI image

The signal data of AMI image consists of the additional data of 128 bytes, sync-code of 1 byte, IDHT general header of 10 bytes, Aux data of 18 bytes, calibration/replica data of 72 bytes, and image data of 11,232 bytes.

The image data and the calibration/replica data consists of pairs of I data (1 byte) and Q data (1 byte). The high-order three bits of each byte of the image data, and the the high-order two bits of each byte of the calibration/replica data are 0.

Figure 2-4 shows the signal data format of the AMI image.

	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
D07			'0'	'0'	'0'	8×10 ¹ days	8×10 ¹ hrs	8×10 ¹ min	8×10 ¹ sec	8×10 ² msec	8×10 ⁶ msec
D06			'0'	'0'	'0'	4×10 ¹ days	4×10 ¹ hrs	4×10 ¹ min	4×10 ¹ sec	4×10 ² msec	4×10 ⁶ msec
D05			'0'	'1'	'0'	2×10 ¹ days	2×10 ¹ hrs	2×10 ¹ min	2×10 ¹ sec	2×10 ² msec	2×10 ⁶ msec
D04			'0'	'1'	'0'	1×10 ¹ days	1×10 ¹ hrs	1×10 ¹ min	1×10 ¹ sec	1×10 ² msec	1×10 ⁶ msec
D03			'0'		8×10 ² days	8×10 ⁶ days	8×10 ⁶ hrs	8×10 ⁶ min	8×10 ⁶ sec	8×10 ¹ msec	'0'
D02			'0'		4×10 ² days	4×10 ⁶ days	4×10 ⁶ hrs	4×10 ⁶ min	4×10 ⁶ sec	4×10 ¹ msec	'0'
D01					2×10 ² days	2×10 ⁶ days	2×10 ⁶ hrs	2×10 ⁶ min	2×10 ⁶ sec	2×10 ¹ msec	'0'
D00	LOCK STATUS 1		S/C TIME Q/D		1×10 ² days	1×10 ⁶ days	1×10 ⁶ hrs	1×10 ⁶ min	1×10 ⁶ sec	1×10 ¹ msec	'0'

system used (D07-D01) + quality code(D00)

system used

quality code for ground time of observation for JERS-1 (MDR mode only)

system used

ground time (UT) of acquisition (BCD)

	B11	B12	B13	B14	B15	B16	B17	B18	B19	B27
D07	'0'	'0'	8×10 ¹ days	8×10 ¹ hrs	8×10 ¹ min	8×10 ¹ sec	8×10 ² msec	8×10 ⁶ msec		
D06	'0'	'0'	4×10 ¹ days	4×10 ¹ hrs	4×10 ¹ min	4×10 ¹ sec	4×10 ² msec	4×10 ⁶ msec		
D05	'0'	'0'	2×10 ¹ days	2×10 ¹ hrs	2×10 ¹ min	2×10 ¹ sec	2×10 ² msec	2×10 ⁶ msec		
D04	'0'	'0'	1×10 ¹ days	1×10 ¹ hrs	1×10 ¹ min	1×10 ¹ sec	1×10 ² msec	1×10 ⁶ msec		
D03	'0'	8×10 ² days	8×10 ⁶ days	8×10 ⁶ hrs	8×10 ⁶ min	8×10 ⁶ sec	8×10 ¹ msec	'0'		
D02	'0'	4×10 ² days	4×10 ⁶ days	4×10 ⁶ hrs	4×10 ⁶ min	4×10 ⁶ sec	4×10 ¹ msec	'0'		
D01	'0'	2×10 ² days	2×10 ⁶ days	2×10 ⁶ hrs	2×10 ⁶ min	2×10 ⁶ sec	2×10 ¹ msec	'0'		
D00	'0'	1×10 ² days	1×10 ⁶ days	1×10 ⁶ hrs	1×10 ⁶ min	1×10 ⁶ sec	1×10 ¹ msec	'0'		

(note 1) quality code
 "1"x : good data
 "0"x : bad data → Signal data record filled with all "0" data by level 0 processor. (Although the prefix data is right.)

(note 2) quality code for ground time of observation

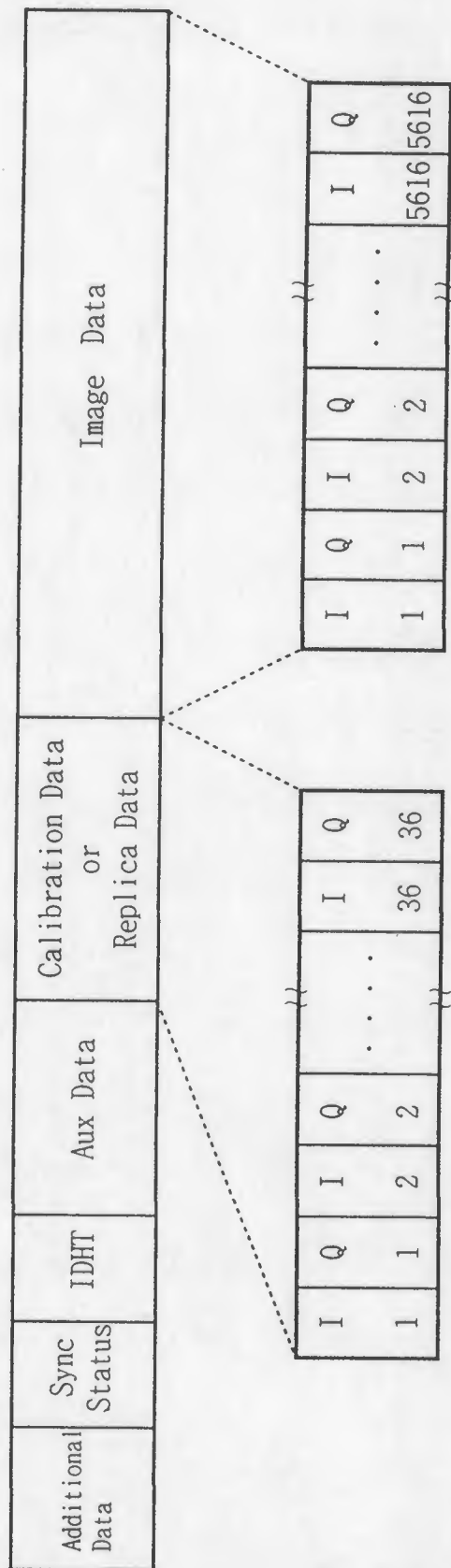
(note 3) ground time of observation is available for JERS-1 (MDR mode only).

ground time (UT) of observation (BCD)

system used area

	S/C MFLOCK	S/C TIME Q/D
OPS, SAR	"1"	"1"
other	system used (= "1")	"1"

Figure 2-3 Format of Additional Data in the Signal Data



Calibration Data
or Replica Data

b7	0
b6	0
b5	MSB
b4	D
b3	A
b2	T
b1	A
b0	LSB

Image Data

b7	0
b6	0
b5	0
b4	MSB
b3	
b2	DATA
b1	
b0	LSB

Table 3-1 Volume Header Record (1/5)

Byte	Type	Contents, Settings
1-4	B4	Record number
5	B1	First record subtype code = 18
6	B1	Record type code = 10
7	B1	Second record subtype code = 18
8	B1	Third record subtype code = 18
9-12	B4	Record length = 9 (ID) x 144432 = 1,299,888
13-14	A2	ASCII/EBCDIC flag ASCII code = 'A\$' EBCDIC code = 'E\$'
15-16	A2	Blank
17-28	A12	Format management document ID = 'SSS-L0-FMT\$\$' SSS: Sensor type code (AMI image = 'AIM')
29-30	A2	Revision level of the above document = 'A\$'
31-32	A2	Blank
33-44	A12	Software release and version number = 'NNN\$\$\$\$\$\$\$\$\$' NNN: 1.0, 1.1,...
45-60	A16	Tape ID (Physical volume ID) = 'HEOC-DSSpnnnnnn\$' D: Media type ('D': D-1 cassette) SS: Level 0 processing system ID ('02': for LAND, SPOT, MOS, ERS) p: Product type ('0': Master, '1': Copy, '9': Work) nnnnnn: Physical volume sequential number ('000001' to '999999')
61-64	I4	Total number of signal files in the physical volume ('\$\$\$1' to '\$\$99')
65-72	A8	Start date of tape creation = 'YYYYMMDD' Creation date of first signal file (UT) YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)

Table 3-1 Volume Header Record (2/5)

Byte	Type	Contents, Settings
73-80	A8	Start time of tape creation = 'hh:mm:ss' Creation time of first signal file (UT) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
81-88	A8	End date of tape creation = 'YYYYMMDD' Creation date of last signal file (UT) YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)
89-96	A8	End time of tape creation = 'hh:mm:ss' Creation time of last signal file (UT) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
97-108	A12	Tape creation country (Japan) = 'JAPAN\$\$\$\$\$\$'
109-116	A8	Organization (National Space Development Agency of Japan) = 'NASDA\$\$\$'
117-132	A16	System (Earth Observation Center / Data Recording System) = 'HEOC-MOSLSE-HREC'
133-140	I8	First signal file start ID = '\$\$\$\$7000'
141-144	A4	Signal header file valid flag = 'YES\$'
145-256	A112	Reserved
257-264	I8	Data for 257th to 512nd bytes repeated number of signal files Signal File number Sequential signal file number for this file ('\$\$\$\$\$\$\$1' to '\$\$\$\$\$\$\$99')
265-272	I8	Signal file start ID Start position ID of this signal file ('\$\$\$\$7000' to '99999999')
273-280	I8	Signal file end ID End position ID of this signal file ('\$\$\$\$7000' to '99999999')

Table 3-1 Volume Header Record (3/5)

Byte	Type	Contents, Settings
281-304	A24	Reserved
305-312	I8	Number of synchrosized code lacks Number of signal data lacks in this signal file ('\$\$\$\$\$\$\$0' to '99999999')
313-326	A14	File ID = 'DSSpnnnnnnmmmm' D: Media type ('D': D-1 cassette) SS: Level 0 processing system ID ('02': for LAND, SPOT, MOS, ERS) p: Product type ('0': Master, '1': Copy, '9': Work) nnnnnn: Physical volume sequential number ('000001' to '999999') mmmm: File sequential number in this volume ('0001' to '9999')
327-334	A8	Date of file creation = 'YYYYMMDD' Creation date of this file (UT) YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)
335-342	A8	Time of file creation = 'hh:mm:ss' Creation time of this file (UT) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
343-350	A8	Mission ID = 'MMMMMM\$\$' MMMMMM: Mission name ('ERS1\$\$')
351-358	A8	Sensor ID = 'SSSSSS\$\$' SSSSSS: Sensor name ('AMIIMG')
359-366	A8	Sensor operation ID = 'MMMMMMMM' MMMMMMMM: 'REAL\$\$\$\$'
367-370	I4	Sensor number = 'NNNN' = Blank
371-378	A8	Start date of observation *App2 = 'YYYYMMDD' Observation start date *App2 of this sensor (UT) YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)

Table 3-1 Volume Header Record (4/5)

Byte	Type	Contents, Settings
379-386	A8	Start time of observation *App2 = 'hh:mm:ss' Recording start time *App2 (UT) of this sensor hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
387-394	A8	End date of observation *App2 = 'YYYYMMDD' Recording end date *App2 (UT) of this sensor YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)
395-402	A8	End time of observation *App2 = 'hh:mm:ss' Recording end time *App2 (UT) of this sensor hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
403-410	A8	Start date of level 0 processing *App2 = 'YYYYMMDD' Date (ground time) for the first record of this signal data (UT) YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)
411-422	A12	Start time of level 0 processing *App2 = 'hh:mm:ss.ttt' Ground time for the first record of this signal data (UT) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
423-430	A8	End date of level 0 processing *App2 = 'YYYYMMDD' Date (ground time) for the last record of this signal data (UT) YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)
431-442	A12	End time of level 0 processing *App2 = 'hh:mm:ss.ttt' Ground time for the last record of this signal data (UT) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)

Table 3-1 Volume Header Record (5/5)

Byte	Type	Contents, Settings
443-450	A8	Total orbit number of observation start = '\$\$\$NNNNN' (Total orbit number: Total amount of orbit rotation number since the satellite has been launched.) 'NNNNN': '00000' to '99999'
451-455	A5	Reserved
456-461	A6	System area
462-466	A5	Reserved
467-472	A6	System area
473-478	A6	Reserved
479-482	A4	Telemetry data valid flag = 'NO\$\$'
483-490	I8	Start ID of telemetry data descriptor record = Blank
491-512	A22	Reserved Data for 257th to 512nd bytes repeated number of signal files

Table 3-2 Signal Header Descriptor Record (1/3)

Byte	Type	Contents, Settings
1-4	B4	Record number
5	B1	First record subtype code = 18
6	B1	Record type code = 20
7	B1	Second record subtype code = 18
8	B1	Third record subtype code = 18
9-12	B4	Record length = 360
13-14	A2	ASCII/EBCDIC flag ASCII code = 'A\$' EBCDIC code = 'E\$'
15-16	A2	Blank
17-28	A12	Format management document ID = 'SSS-L0-FMT\$\$' SSS: Sensor type code (AMI image = 'AIM')
29-30	A2	Revision level of the above document = 'A\$'
31-32	A2	Blank
33-44	A12	Software release and version number = 'NNN\$\$\$\$\$\$\$\$\$' NNN: 1.0, 1.1,...
45-58	A14	File ID (Same as 313th to 326th bytes of volume header record) = 'DSSpnnnnnnmmmm' D: Media type ('D': D-1 cassette) SS: Level 0 processing system ID ('02': for LAND, SPOT, MOS, ERS) p: Product type ('0': Master, '1': Copy, '9': Work) nnnnnn: Physical volume sequential number ('000001' to '999999') mmmm: File sequential number in this volume ('0001' to '9999')
59-60	A2	Blank

Table 3-2 Signal Header Descriptor Record (2/3)

Byte	Type	Contents, Settings
61-76	A16	Signal file summary = 'MMSSSTYYYYMMDD\$\$' MM: Sattelite type code ERS-1 = 'E1' SSS: Sensor type code AMI image = 'AIM' T: Tape type (D-1 cassette = 'D') YYYY: Year of file creation (UT) (0001 to 9999) MM: Month of file creation (UT) (01 to 12) DD: Date of file creation (UT) (01 to 31)
77-92	A16	Volume set ID = 'MMMMMM\$SSSSSS\$\$\$' MMMMMM: Abbreviation of sattelite ('ERS1\$\$') SSSSSS: Sensor name ('AMIIMG')
93-104	A12	Blank
105-112	A8	Blank
113-120	A8	Date of Signal file creation = 'YYYYMMDD' Creation date of this signal file (UT) YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)
121-128	A8	Time of signal file creation = 'hh:mm:ss' Creation time of this signal file (UT) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
129-140	A12	Signal file creation country (Japan) = 'JAPAN\$\$\$\$\$\$'
141-148	A8	Organization (National Space Development Agency of Japan) = 'NASDA\$\$\$'
149-164	A16	System (Earth Observation Center / Data Recording System) = 'HEOC-MOSLSE-HREC'
165-168	A4	Blank
169-172	I4	Number of platform position data records = '\$\$\$1', '\$\$\$2'

Table 3-2 Signal Header Descriptor Record (3/3)

Byte	Type	Contents, Settings
173-260	A88	Reserved
261-360	A100	Reserved

Table 3-3 Platform Position Data Record (1/2)

Byte	Type	Contents, Settings
1-4	B4	Record number
5	B1	First record subtype code = 18
6	B1	Record type code = 30
7	B1	Second record subtype code = 18
8	B1	Third record subtype code = 18
9-12	B4	Record length = 121,344
13-44	A32	Orbit data element type = 'CARTESIAN\$'
45	A1	Blank
46-141	A96	Reserved
142-145	I4	Number of orbit data points = 1440
146-153	A8	Blank
154	A1	Blank
155-158	A4	Orbit accuracy indicates that orbit data is predictive or determined. ('OPRD': Predictive, 'PPED': Determined)
159	A1	Blank
160-194	A35	Reserved
195	A1	Blank
196-216	A21	Date and time of first orbit data (UT) = 'YYYYMMDD\$hh:mm:ss.000' YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)

Table 3-3 Platform Position Data Record (2/2)

Byte	Type	Contents, Settings
217-230	F14.6	Orbit data interval (sec) = '\$\$\$\$\$60.000000' Interval of orbit data points
231-262	A32	Cartesian orbit element coordinate = 'ECI\$'
263-304	3*F14.6	First orbit position vector (X,Y,Z) (km) ('-999999.999999' to '\$999999.999999')
305-346	3*F14.6	First orbit velocity vector (X',Y',Z') (km/s) ('-999999.999999' to '\$999999.999999')
347- 121222	(N-1)*6 *F14.6	Second and following orbit position and velocity vector elements Data for 263th to 346th bytes repeated number of data points specified by 142nd to 145th bytes
121223- 121344	A122	Blank

Table 3-4 Facility Related Data Record (1/5)

Byte	Type	Contents, Settings
1-4	B4	Record number
5	B1	First record subtype code = 18
6	B1	Record type code = 40
7	B1	Second record subtype code = 18
8	B1	Third record subtype code = 18
9-12	B4	Record length = 2048
13-14	A2	ASCII/EBCDIC flag ASCII code = 'A\$' EBCDIC code = 'E\$'
15-16	A2	Blank
17-22	A6	Mission ID = 'MMMMMM' MMMMMM: Sattelite abbreviation ('ERS1\$\$')
23	A1	Blank
24-31	A8	Sensor ID = 'SSSSSS\$\$' SSSSSS: Sensor name ('AMIIMG')
32	A1	Blank
33-40	A8	Reserved
41	A1	Blank
42-48	A7	Product ID 'LEVEL0\$' (Level 0 product) 'LEVEL0-' (Level 0 prime product)
49	A1	Blank
50-54	A5	Reserved
55	A1	Blank

Table 3-4 Facility Related Data Record (2/5)

Byte	Type	Contents, Settings
56-60	A5	Total orbit number of receiving = 'NNNNN' Total orbit number when data receiving. 'NNNNN': '00000' to '99999'
61	A1	Blank
62-72	A11	Reserved
73	A1	Blank
74-94	A21	Start date and time of data receiving *App2 = 'YYYYMMDD\$hh:mm:ss.ttt' Recording start date and time (UT) in the case of this sensor *App2 YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
95	A1	Blank
96-116	A21	End date and time of data receiving *App2 = 'YYYYMMDD\$hh:mm:ss.ttt' Recording end date and time (UT) in the case of this sensor *App2 YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
117	A1	Blank
118-119	A2	Receive frequency type = 'F1' Frequency used for down link by satellite. F1: 8140 MHz
120	A1	Blank
121-124	A4	Data receive mode = 'REAL'
125	A1	Blank

Table 3-4 Facility Related Data Record (3/5)

Byte	Type	Contents, Settings
126-129	A4	Data receive station code = 'HEOC', ...etc.
130	A1	Blank
131-164	A34	Reserved
165	A1	Blank
166-186	A21	Start time of level 0 processing *App2 = 'YYYYMMDD\$hh:mm:ss.ttt' Planned start time (UT) of level 0 processing for the signal data YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
187	A1	Blank
188-208	A21	End time of level 0 processing *App2 = 'YYYYMMDD\$hh:mm:ss.ttt' Planned end time (UT) of level 0 processing for the signal data YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
209	A1	Blank
210-271	A62	Reserved
272	A1	Blank
273-283	A11	Reserved
284	A1	Blank
285-296	A12	System area
297	A1	Blank

Table 3-4 Facility Related Data Record (4/5)

Byte	Type	Contents, Settings
298-309	A12	System area
310	A1	Blank
311-315	A5	Total orbit number of observation start = 'NNNNN' (Total orbit number: Total amount of orbit rotation number since the satellite has been launched.) 'NNNNN': '00000' to '99999'
316	A1	Blank
317-321	A5	Total orbit number of observation end = 'NNNNN' 'NNNNN': '00000' to '99999'
322	A1	Blank
323-343	A21	Start time of observation *App2 = 'YYYYMMDD\$hh:mm:ss.ttt' Recording start time (UT) *App2 in the case of this sensor YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
344	A1	Blank
345-365	A21	End time of observation *App2 = 'YYYYMMDD\$hh:mm:ss.ttt' Recording end time (UT) *App2 in the case of this sensor YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
366	A1	Blank

Table 3-4 Facility Related Data Record (5/5)

Byte	Type	Contents, Settings
367	I1	Number of time error data = 1 The number of time error data used to change the satellite counter to calendar time.
368	A1	Blank
369-417	A49	Reserved
418	A1	Blank
419-431	F13.10	Time error data; satellite counter cycle = 'XX.XXXXXXXXXX' ('\$0.0000000000' to '99.999999999')
432	A1	Blank
433-443	A11	Time error data; standard satellite counter = 'NNNNNNNNNN' ('00000000000' to '9999999999')
444	A1	Blank
445-465	A21	Time error data; standard satellite time (UT) = 'YYYYMMDD\$hh:mm:ss.ttt' = Blank YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59) ttt: Millisecond (000 to 999)
466	A1	Blank
467-1249	A783	Reserved
1250	A1	Blank
1251-1392	A142	System area
1393	A1	Blank
1394-2048	A655	Reserved

Table 3-5 Signal Data Descriptor Record (1/2)

Byte	Type	Contents, Settings
1-4	B4	Record number
5	B1	First record subtype code = 18
6	B1	Record type code = 50
7	B1	Second record subtype code = 18
8	B1	Third record subtype code = 18
9-12	B4	Record length = 720
13-14	A2	ASCII/EBCDIC flag ASCII code = 'A\$' EBCDIC code = 'E\$'
15-16	A2	Blank
17-28	A12	Format management document ID = 'SSS-L0-FMT\$\$' SSS: Sensor type code (AMI image = 'AIM')
29-30	A2	Revision level of the above document = 'A\$'
31-32	A2	Blank
33-44	A12	Software release and version number = 'NNN\$\$\$\$\$\$\$\$\$' NNN: 1.0, 1.1,...
45-48	I4	Signal file number Sequential signal file number of this file ('\$\$\$1' to '\$\$99')
49-62	A14	File ID (Same as 313th to 326th bytes of volume header record) = 'DSSpnnnnnnmmmm' D: Media type ('D': D-1 cassette) SS: Level 0 processing system ID ('02': for LAND, SPOT, MOS, ERS) p: Product type ('0': Master, '1': Copy, '9': Work) nnnnnn: Physical volume sequential number ('000001' to '999999') mmmm: File sequential number in this volume ('0001' to '9999')
63-64	A2	Blank
65-186	A122	Reserved

Table 3-5 Signal Data Descriptor Record (2/2)

Byte	Type	Contents, Settings
187-192	I6	Signal data record length = 'NNNNNN' (Prefix data + Signal data + Suffix data) NNNNNN: '\$11461'
193-216	A24	Blank
217-220	I4	Sample bit length = 'NNNN' NNNN: '\$\$\$6'
221-276	A56	Reserved
277-280	I4	Prefix data size (bytes) = 128
281-288	I8	Signal data size (bytes) = 'MMMMMMMM' MMMMMMMM: '\$\$\$11333'
289-292	I4	Suffix data size (bytes) = 0
293-720	A428	Reserved

Table 3-6 Signal Data Record

Byte	Type	Contents, Settings
1	B1	Quality data bit7 to bit1: don't care bit0: 1 (Good data), 0 (Bad data)
2-4	B3	Reserved
5-11	B7	Ground time (BCD)
12-128	B117	System area
129-nnnnn	Bmmmmm	Signal data (129-11461 B11333 AMI image signal data) 1st to 128th bytes are prefixed data. See Figure 2-3. Data of 129th byte and after varies depending on the sensor. See the following figure for details. AMI image: Figure 2-4

Appendix 1 Definitions in System Area

Definitions in System Area (1) (1/2)

Byte	Type	Contents, Settings
Volume Header Record		
443-450	A8	Total orbit number of observation start = '\$\$\$\$NNNNN' (Total orbit number: Total amount of orbit rotation number since the satellite has been launched.) 'NNNNN': '00000' to '99999'
456-461	A6	RSP argument of latitude of observation start = 'NNNNNN' RSP argument of latitude (unit: degree) when observation has started. (Argument of latitude: Digression along orbit from ascending node.) 'NNNNNN': '000.00' to '359.99'
467-472	A6	RSP argument of latitude of observation end = 'NNNNNN' 'NNNNNN': '000.00' to '359.99'
Facility Related Data Record		
56-60	A5	Total orbit number of receiving = 'NNNNN' Total orbit number when data receiving. 'NNNNN': '00000' to '99999'
118-119	A2	Receive frequency type = 'F1', 'F2' Frequency used for down link by satellite. (F1: 8150MHz, F2: 8350MHz in the case of JERS-1) (F1: 8140MHz in the case of ERS-1)
285-296	A12	RSP of observation start = 'NNNNN\$XXX.XX' RSP path number and argument of latitude (unit: degree) when observation has started. NNNNN: Path number ('00000' to '99999') XXX.XX: Argument of latitude ('000.00' to '359.99')
297	A1	Blank
298-309	A12	RSP of observation end = 'NNNNN\$XXX.XX' NNNNN: Path number ('00000' to '99999') XXX.XX: Argument of latitude ('000.00' to '359.99')
310	A1	Blank

Definitions in System Area (1) (2/2)

Byte	Type	Contents, Settings
311-315	A5	Total orbit number of observation start = '\$\$\$NNNNN' (Total orbit number: Total amount of orbit rotation number since the satellite has been launched.) 'NNNNN': '00000' to '99999'
316	A1	Blank
317-321	A5	Total orbit number of observation end = '\$\$\$NNNNN' 'NNNNN': '00000' to '99999'

Definitions in System Area (2) (1/2)

Byte	Type	Contents, Settings
1251-1260	A10	Facility Related Data Record RAW data number = 'DSSpnnnnnn' Number of media on which input RAW data is recorded when level 0 processing. This area is blank when the data is not defined. D: Media type ('D': D-1 cassette, 'H': HDDT) SS: RAW data recording system ID ('02': for LAND, SPOT, MOS, ERS) p: Product type ('0': Master, '1': Copy, '9': Work) nnnnnn: Physical volume sequential number ('000001' to '999999')
1261	A1	Blank
1262-1267	A6	Start ID of RAW data recording = 'NNNNNN' Recording start position on input RAW data recording media when level 0 processing. This area is blank when the data is not defined. 'NNNNNN': '000000' to '999999'
1268	A1	Blank
1269-1274	A6	End ID of RAW data recording = 'NNNNNN' Recording end position on input RAW data recording media when level 0 processing. This area is blank when the data is not defined. 'NNNNNN': '000000' to '999999'
1275	A1	Blank
1276-1296	A21	Date and time of RAW data recording start (UT) = 'YYYYMMDD\$HH:MM:SS.000' Recording start date and time of input RAW data recording media when level 0 processing. This area is blank when the data is not defined. YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
1297	A1	Blank

Definitions in System Area (2) (2/2)

Byte	Type	Contents, Settings
1298-1318	A21	Date and time of RAW data recording end (UT) = 'YYYYMMDD\$HH:MM:SS.000' Recording end date and time of input RAW data recording media when level 0 processing. This area is blank when the data is not defined. YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31) hh: Hour (00 to 23) mm: Minute (00 to 59) ss: Second (00 to 59)
1319	A1	Blank
1320-1340	A21	Reserved
1341	A1	Blank
1342-1362	A21	Reserved
1363	A1	Blank
1364-1366	A3	Software release and version ID = 'NNN' NNN: 1.0,1.1, ...
1367-1382	A16	Blank
1383	A1	HDDR number of RAW data media = 'N' HDDR number where input RAW data media is loaded, when level 0 processing. This area is blank when the data is not defined. 'N': '0' to '9'
1384	A1	Blank
1385-1392	A8	Date of level 0 processing = 'YYYYMMDD' YYYY: Year (0001 to 9999) MM: Month (01 to 12) DD: Day (01 to 31)

Apeendix 2 Definitions on Time

(1/2)

Record	Byte	Time Label	Definition
Volume Header	371-386	Start of observation (UT)	Planned observation start time using the sensor. This area may records start of recording (* Note) time, depending on the sensor.
	387-402	End of observation (UT)	Planned observation end time using the sensor. This area may records end of recording (* Note) time, depending on the sensor.
	403-422	Start of level 0 processing (UT)	Ground time of first record in the signal data records. (IRIG-A time)
	423-442	End of level 0 processing (UT)	Ground time of last record in the signal data records. (IRIG-A time)
Facility Related Data	74-94	Start of data receiving (UT)	Planned down link start time of RAW data. This area may records start of recording (* Note) time, depending on the sensor.
	96-116	End of data receiving (UT)	Planned down link end time of RAW data. This area may records end of recording (* Note) time, depending on the sensor.
	166-186	Start of level 0 processing (UT)	Planned level 0 processing start time. That is, ground time of signal data (IRIG-A time).
	189-208	End of level 0 processing (UT)	Planned level 0 processing end time. That is, ground time of signal data (IRIG-A time).
	323-343	Start of observation (UT)	Same as 353rd to 368th bytes in volume header record.
	345-365	End of observation (UT)	Same as 353rd to 368th bytes in volume header record.

Record	Byte	Label	Definition
Telemetry Data Descriptor	93-113	Start of telemetry data (UT)	Ground time of first record in the telemetry data records. (IRIG-A time)
	115-135	End of telemetry data (UT)	Ground time of last record in the telemetry data records. (IRIG-A time)
* Note		Start of recording (UT)	Start time of RAW data recording when data receiving.
		End of recording (UT)	End time of RAW data recording when data receiving.

Appendix 3 Abbreviations

(1/2)

A.	
AMI	Active Microwave Instrumentation
ANSI	American National Standard Institute
ASCII	American Standard Code for Information Interchange
B.	
BCD	Binary Coded Decimal
E.	
EBCDIC	Extended Binary Coded Decimal Interchange Code
ECI	Earth Center Inertial (coordinate system)
ECR	Earth Center Rotation (coordinate system)
EOC	Earth Observation Center
ERS	European Remote Sensing Satellite
H.	
HDDR	High Density Digital Recorder
HRV	High Resolution Visible
J.	
JERS	Japanese Earth Resources Satellite
L.	
LANDSAT	Land Satellite
LBOT	Logical Beginning of Tape
LEOT	Logical End of Tape
LSB	Least Significant Bit
M.	
MDR	Mission Data Recorder
MESSR	Multispectral Electronic Self-Scanning Radiometer
MOS	Marine Observation Satellite
MSR	Microwave Scanning Radiometer
MSS	Multispectral Scanner
MSB	Most Significant Bit
N.	
NASDA	NAtional Space Development Agency of Japan
O.	
OPRD	Orbit PRediction Data
OPS	Optical Sensor

P.

Pa(n)	Panchromatic mode
PBOT	Physical Beginning of Tape
PEOT	Physical End of Tape
PPED	Post Pass Ephemeris Data

R.

RSP	Reference System for Planning
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S.

SAR	Synthetic Aperture Radar
SPOT	Satellite Pour l'Observation de la Terre
SWIR	Short Wave Infrared Radiometer

T.

TLM	Telemetry
TM	Thematic Mapper

U.

UT	Universal Time
UTM	Universal Transverse Mercator

V.

VNIR	Visible and Near Infrared Radiometer
VTIR	Visible and Thermal Infrared Radiometer

W.

WRS	Worldwide Reference System
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X.

XS	multi spectral mode
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