Advanced Land Observing Satellite

The Advanced Land Observing Satellite (ALOS)

Haruhisa Shimoda
NASDA/EORC

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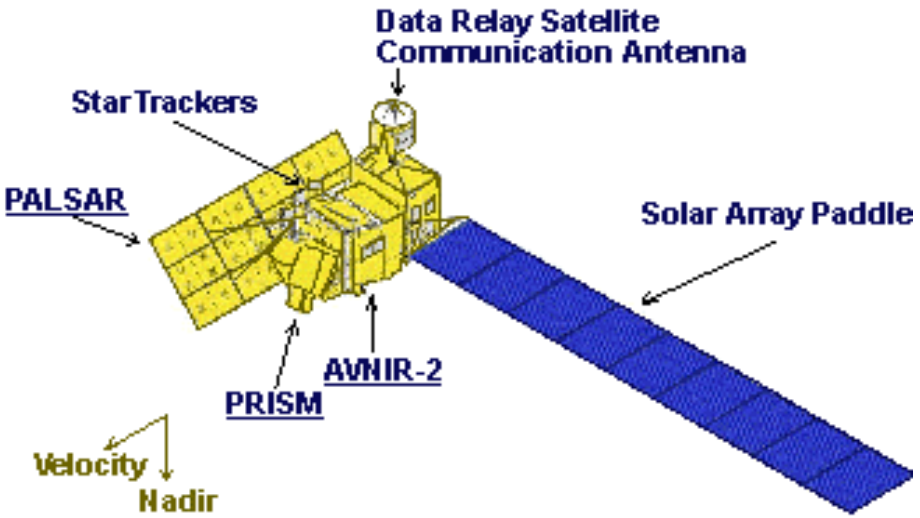
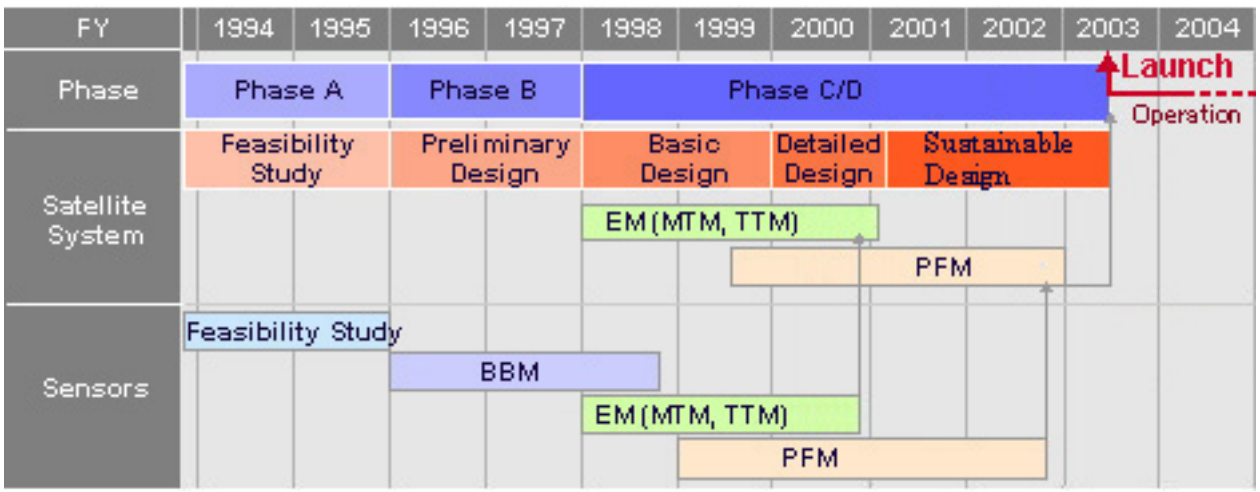
ALOS Overview

Advanced Land Observing Satellite





BBM=Bread Board Model

EM=Engineering Model

MTM=Mechanical Test Model

TTM=Thermal Test Model

PFM=Proto-Flight Model

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ALOS Overview

ALOS Characteristics	
Launch Date	Summer, 2003
Launch Vehicle	H-IIA
Launch Site	Tanegashima Space Center
Spacecraft Mass	Approx. 4 tons
Generated Power	Approx. 7 kW (at End of Life)
Design Life	3 -5 years
Orbit	Sun-Synchronous Sub-Recurrent
	Repeat Cycle: 46 days Sub Cycle: 2 days
	Altitude: 691.65 km (at Equator)
	Inclination: 98.16 deg.
Attitude Determination Accuracy	2.0×10^{-4} deg.(with GCP)
Position Determination Accuracy	1m (off-line)
Data Rate	240 Mbps (via Data Relay Technology Satellite) 120 Mbps (Direct Transmission)
Onboard Data Recorder	Solid-state data recorder (90Gbytes)

ALOS Overview

ALOS is one of the largest Earth observing satellites ever developed.

Its objectives are:

(1) to provide maps for Japan and other countries including those in the Asian-Pacific region (Cartography)

(2) to perform regional observation for "sustainable development", harmonization between Earth environment and development (Resional Observation),

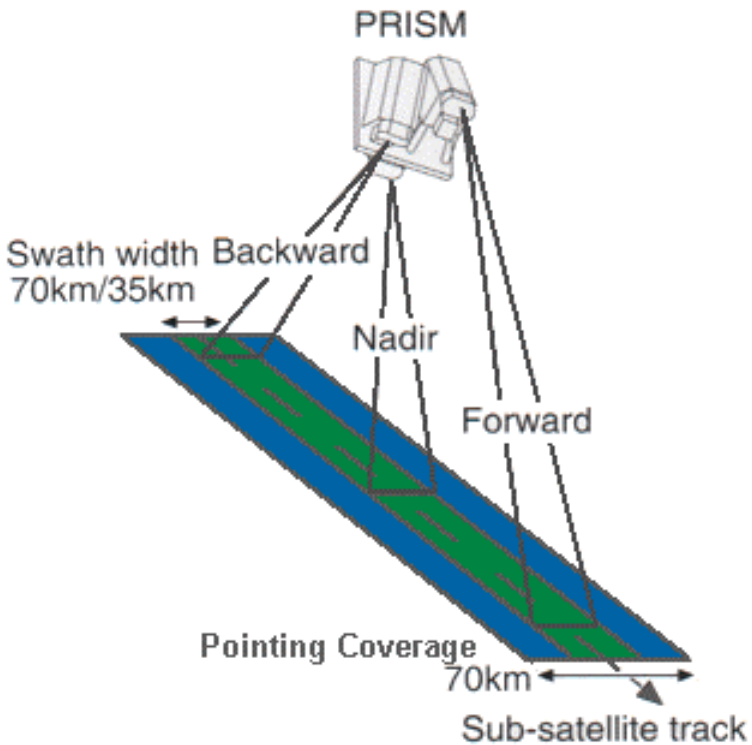
(3) to conduct disaster monitoring around the world (Disaster Monitoring),

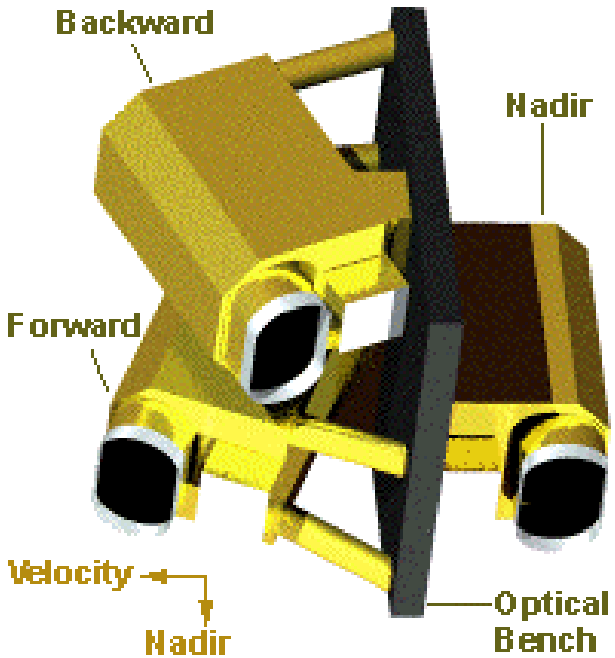
(4) to survey natural resources (Resources Surveying),

(5) to develop technology necessary for future Earth observing satellite (Technology Development)

PRISM

Panchromatic Remote-sensing Instrument
for Stereo Mapping





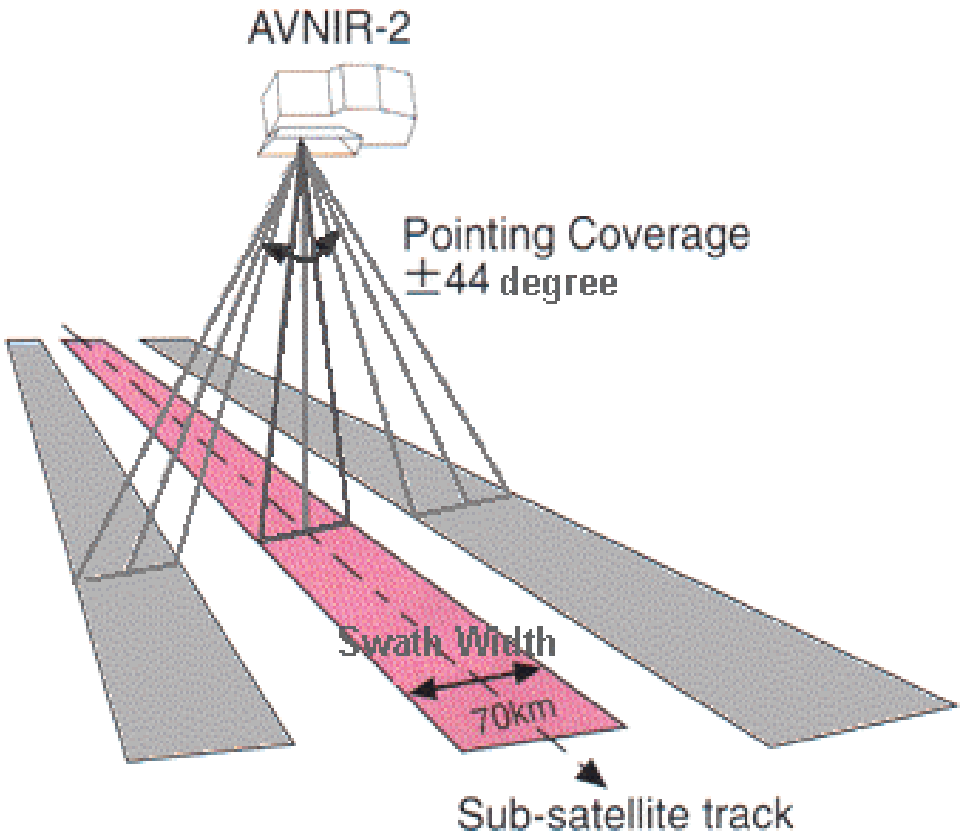
PRISM

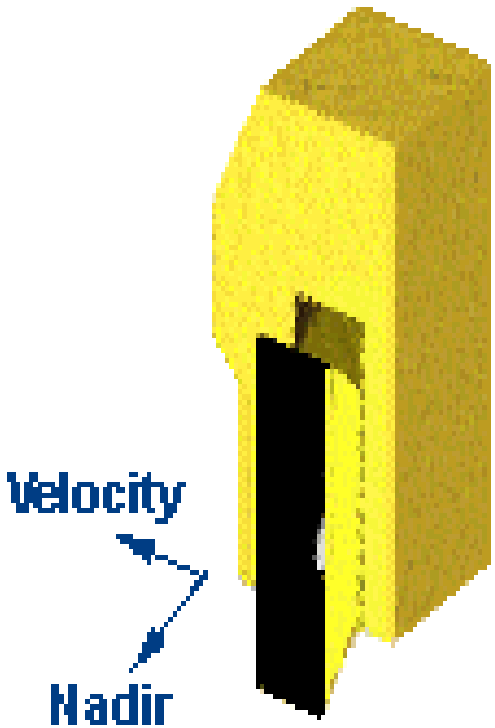
PRISM Characteristics	
Number of Bands	1 (Panchromatic)
Wavelength	0.52 ~ 0.77micrometers
Number of Optics	3 (Nadir; Forward; Backward)
Base-to-Height ratio	1.0 (between Forward and Backward looking)
Spatial Resolution	2.5m
Swath Width	70km (Nadir only) / 35km (Triplet mode)
S/N	>70
MTF	>0.2
Number of Detectors	28000 / band (Swath Width 70km) 14000 / band (Swath Width 35km)
Pointing Angle	-1.5 to +1.5 deg. (Triplet Mode, Cross Track)
Bit Length	8 bits

Note: PRISM cannot observe the areas beyond 82 degrees south and north latitude

AVNIR-2

Advanced Visible and Near Infrared
Radiometer type 2





Advanced Land Observing Satellite

AVNIR-2

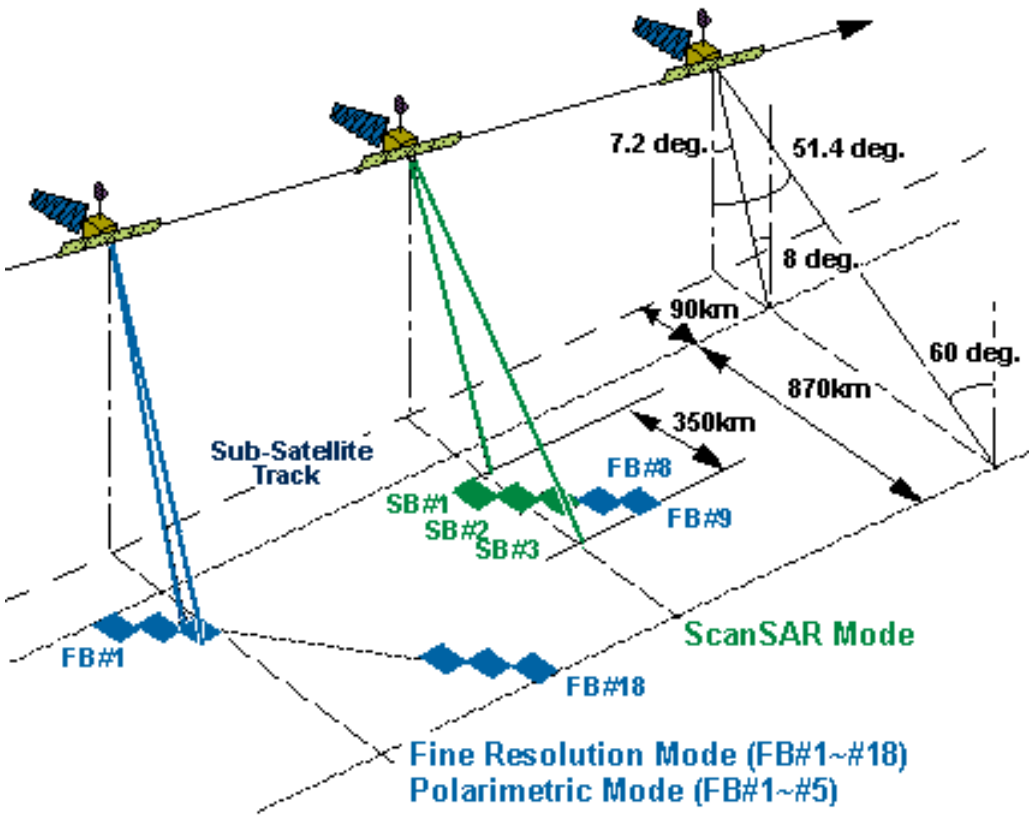
AVNIR-2 Characteristics	
Number of Bands	4
Wavelength	Band1 : 0.42 - 0.50 micrometers Band2 : 0.52 - 0.60 micrometers Band3 : 0.61 - 0.69 micrometers Band4 : 0.76 - 0.89 micrometers
Spatial Resolution	10 m (at Nadir)
Swath Width	70 km (at Nadir)
S/N	>200
MTF	Band 1~3 : >0.25 Band 4 : >0.20
Number of Detectors	7000 / band
Pointing Angle	- 44 to + 44 deg.
Bit Length	8 bits

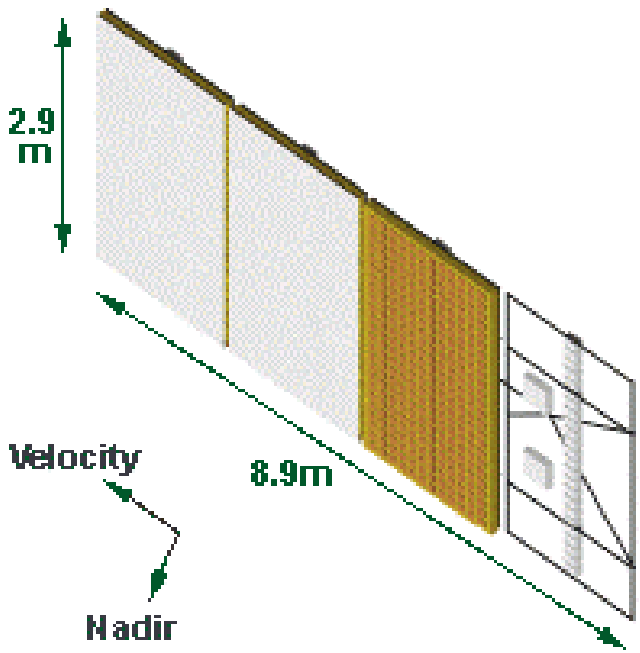
Note: AVNIR-2 cannot observe the areas beyond 85 degrees south and north latitude

PALSAR

Advanced Land Observing Satellite

Phased Array type L-band Synthetic Aperture Radar





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PALSAR

PALSAR Characteristics			
Mode	**Fine Resolution**	**ScanSAR**	**Polarimetric** (Experimental mode ∗1)
Center Frequency	1270 MHz (L-band)		
Bandwidth	28 / 14 MHz		
Polarization	HH or VV / HH+HV or VV+VH	HH or VV	HH+HV+VH+VV
Resolution ∗2	10m (2 look) / 20m (4 look)	100m (multi look)	30m
Swath Width ∗2	70km	250 ~ 350km	30km
Incidence Angle	8 ~ 60deg.	18 ~ 43 deg.	8 ~ 30 deg.
NE sigma zero ∗2	< -23dB (Swath Width 70km) < -25dB (Swath Width 60km)	< -25dB	< -29dB
S/A ∗2,∗3	> 16dB (Swath Width 70km) > 21dB (Swath Width 60km)	> 21dB	> 19dB
Bit Length	3bits / 5bits	5bits	3bits / 5bits
Antenna Size	AZ:8.9m x EL:2.9m		

Note: PALSAR cannot observe the areas beyond 81 degrees south and north latitude.

∗1	Due to power consumption, the operation time will be limited.
∗2	Fine resolution mode: Off-nadir is 34.3 deg.
	ScanSAR mode :4th scan; off-nadir is 34.1 deg.
	Polarimetric mode: Off-nadir is 21.5 deg.
∗3	S/A level may deteriorate due to engineering changes in PALSAR.

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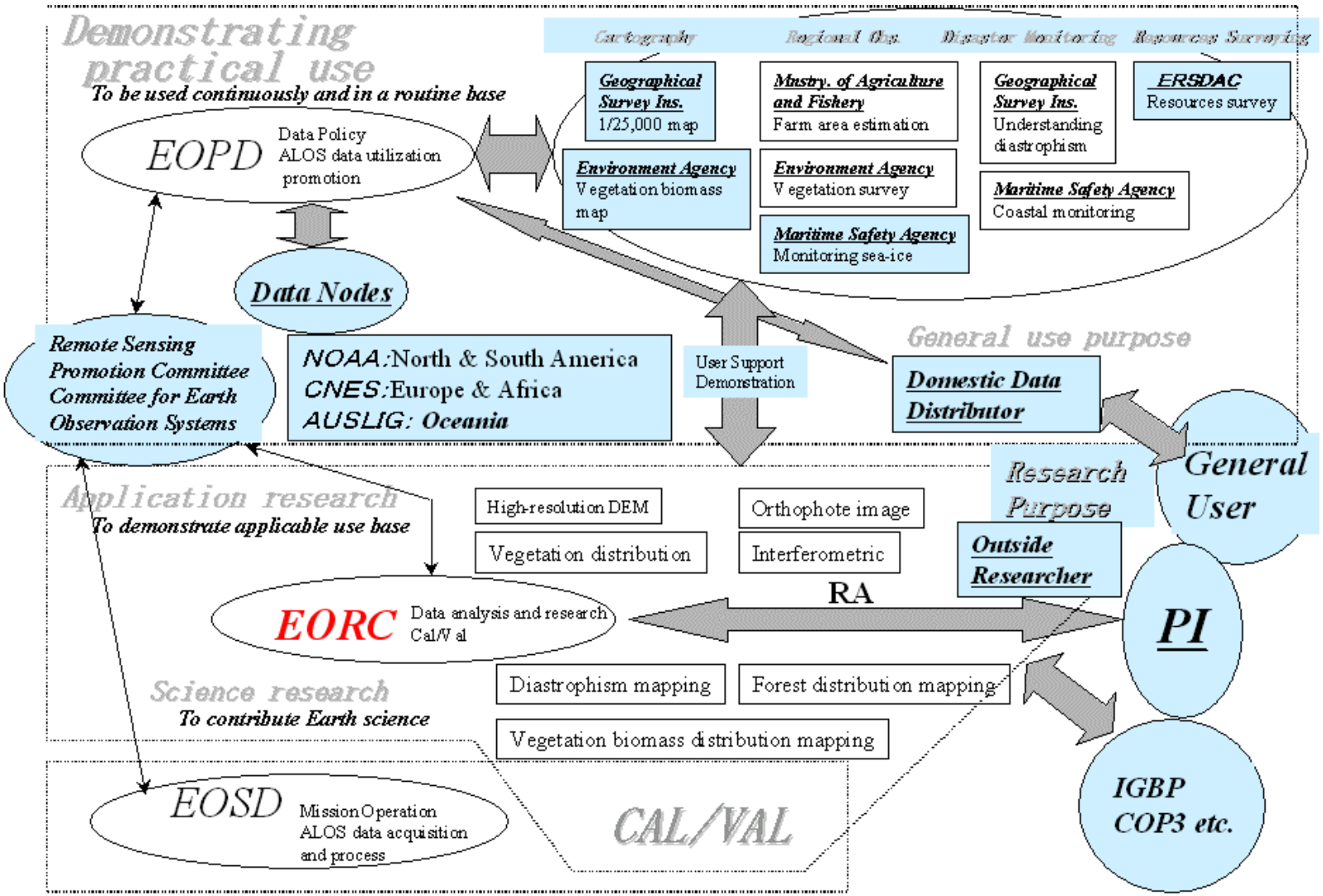
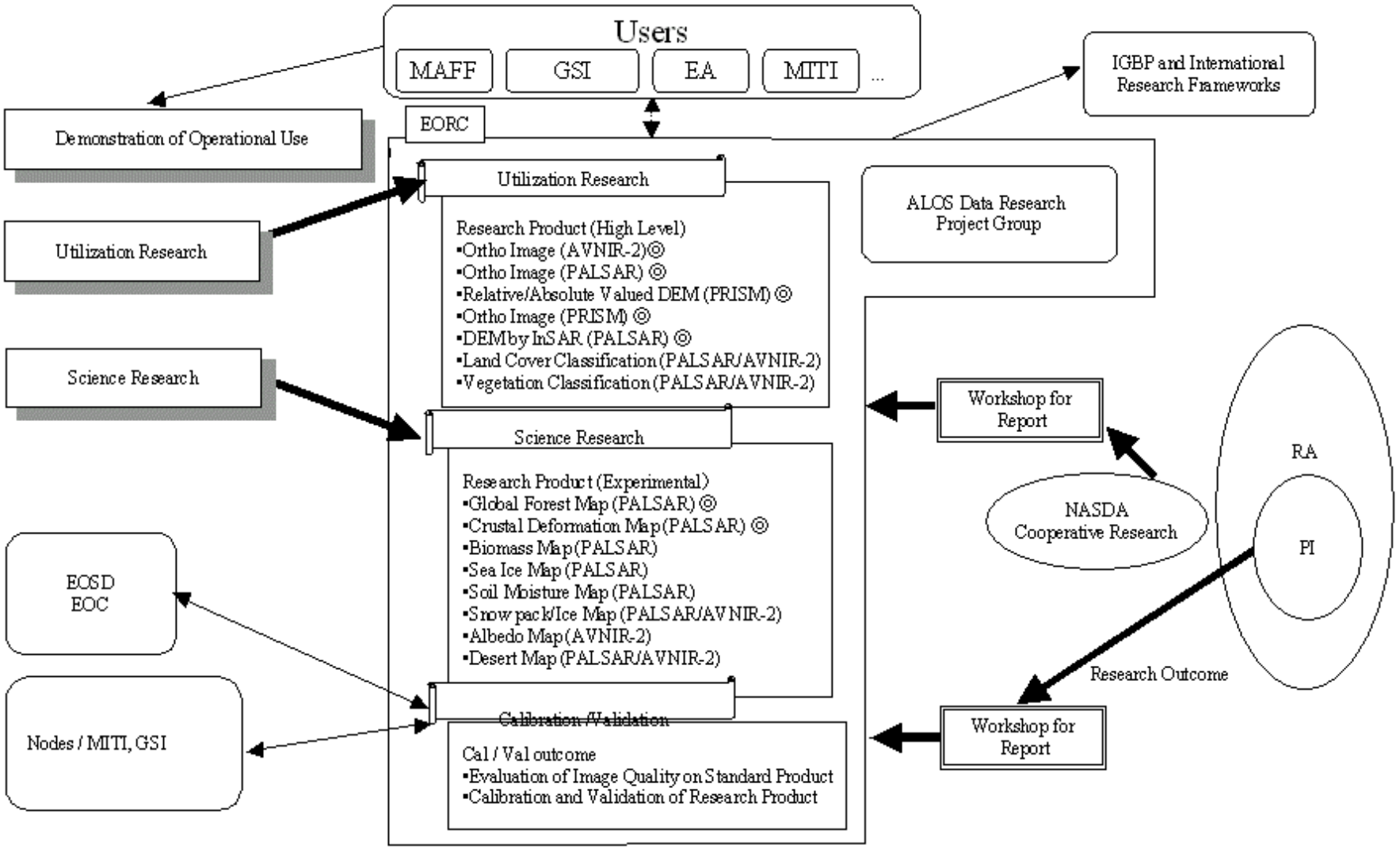
Data Utilization Promotion Plan



1.1 ALOS Science



1.2 Global Forest Mapping

Advanced Land Observing Satellite

Objectives

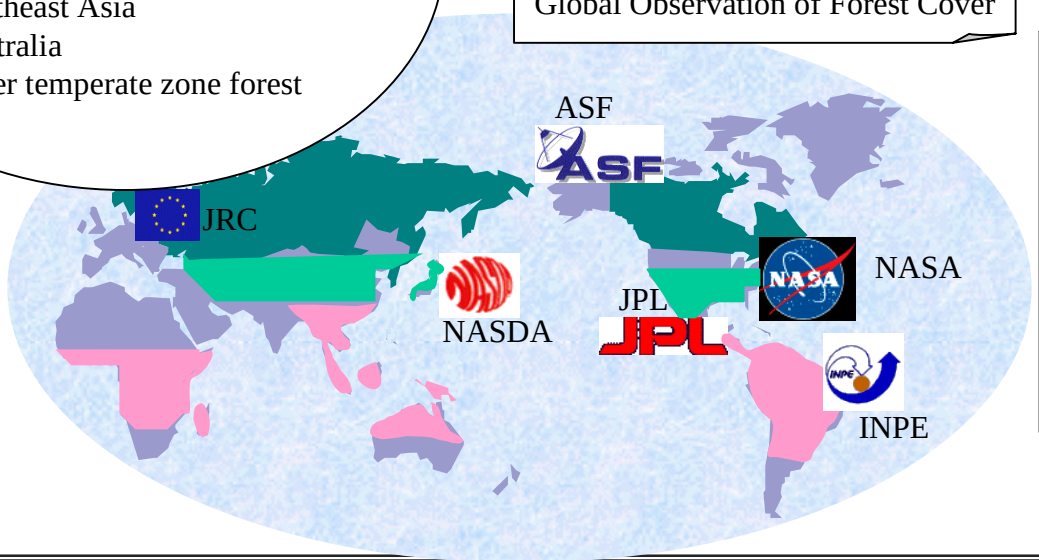
(1) Global Rain Forest / Boreal Forest SAR Data Set Generation
(2) Monitoring of deforestation using PALSAR and AVNIR-2
(3) Geographic Map Generation of Africa using SAR
(4) Monitoring Forest Fire (Amazon, South East Asia, Australia)
(5) Land use classification (7〜11classes)
(6) Biomass Estimation towards Kyoto protocol

Area
- North America
- East west Siberia
- Africa
- South Africa (Amazon)
- Southeast Asia
- Australia
- Other temperate zone forest

10000 scenes / year

Satellite Data
- PALSAR
- AVNIR-2

Global Observation of Forest Cover



NASDA/EOC and Data Node

Anticipated Cooperative Organization
- NASDA/ERSDAC
- JPL,ASF,(NASA/NOAA)
- JRC (EU)
- CEOS / GOFC Project partners

Anticipated Users
- Forestry Environmental Institutes, Universities (INPE/PETROBRAS)
- IGBP, WCRP, IGOS / TCO, FAO, UNEP
- Japan
  -MAFF
  -EA
  - Universities, Institutes

Established JERS-1 Program is applicable

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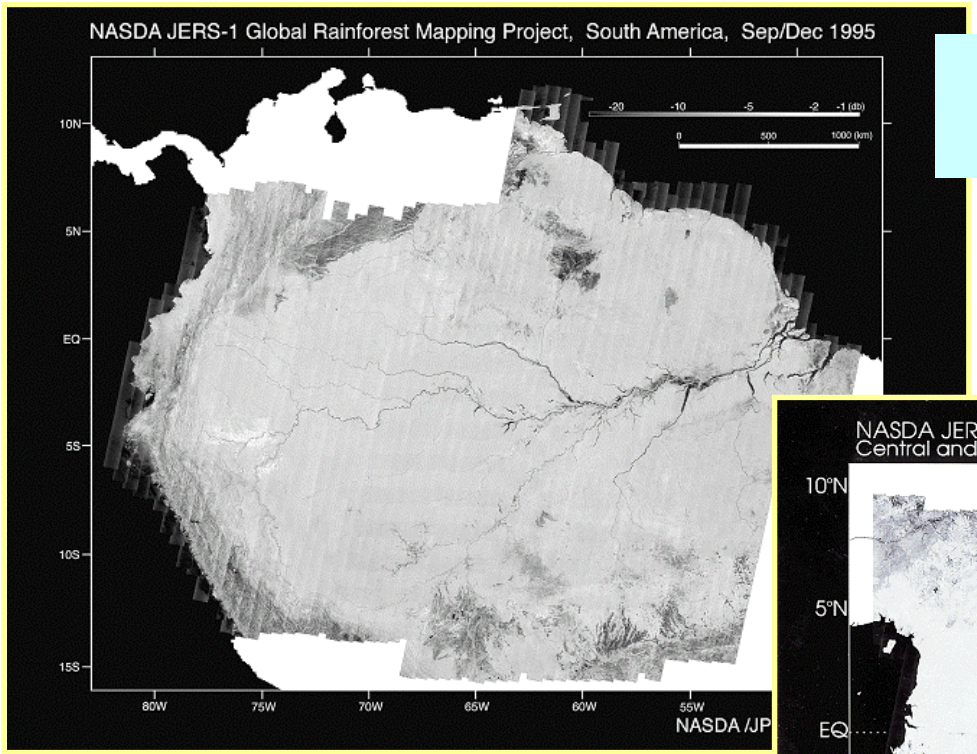
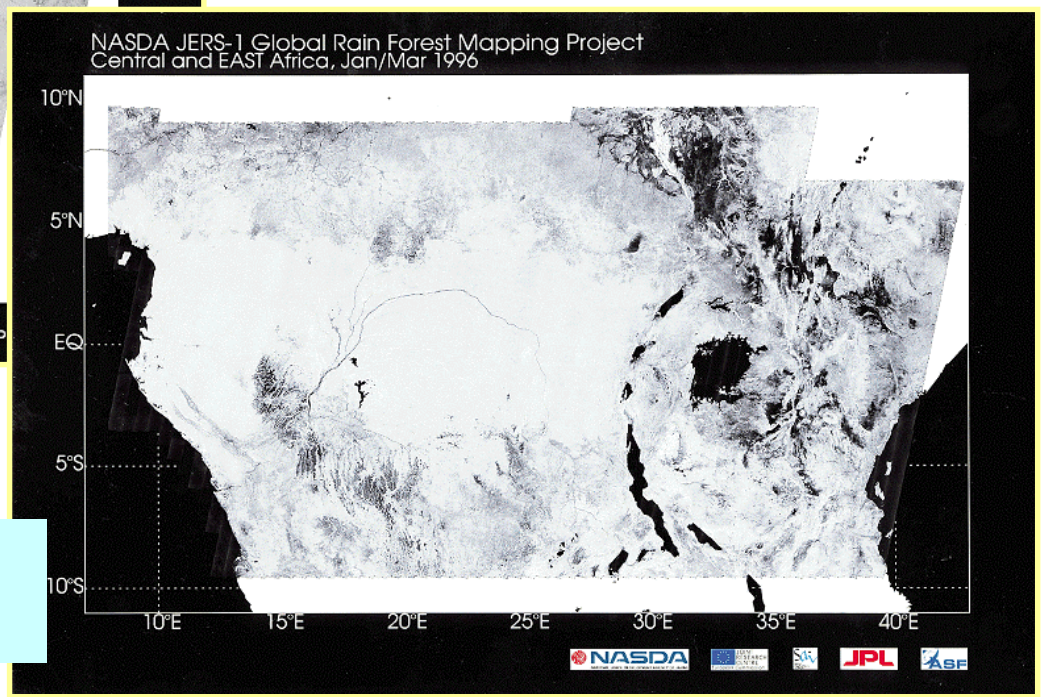
1.2 Global Forest Mapping



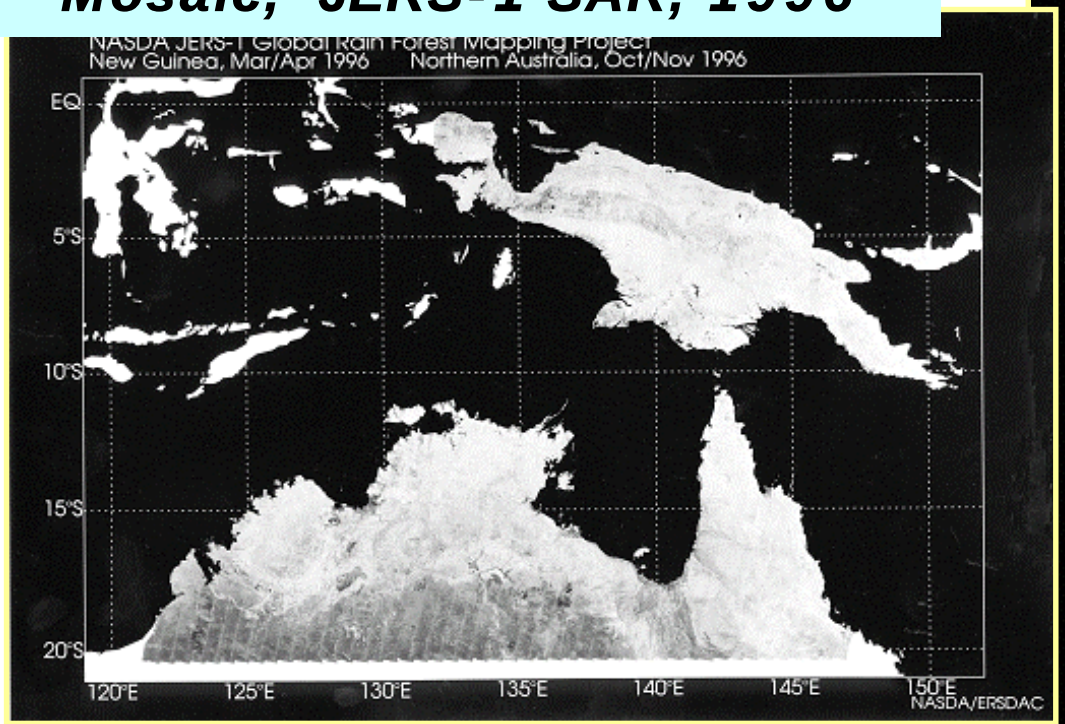
South America Mosaic, JERS-1 SAR, 1995

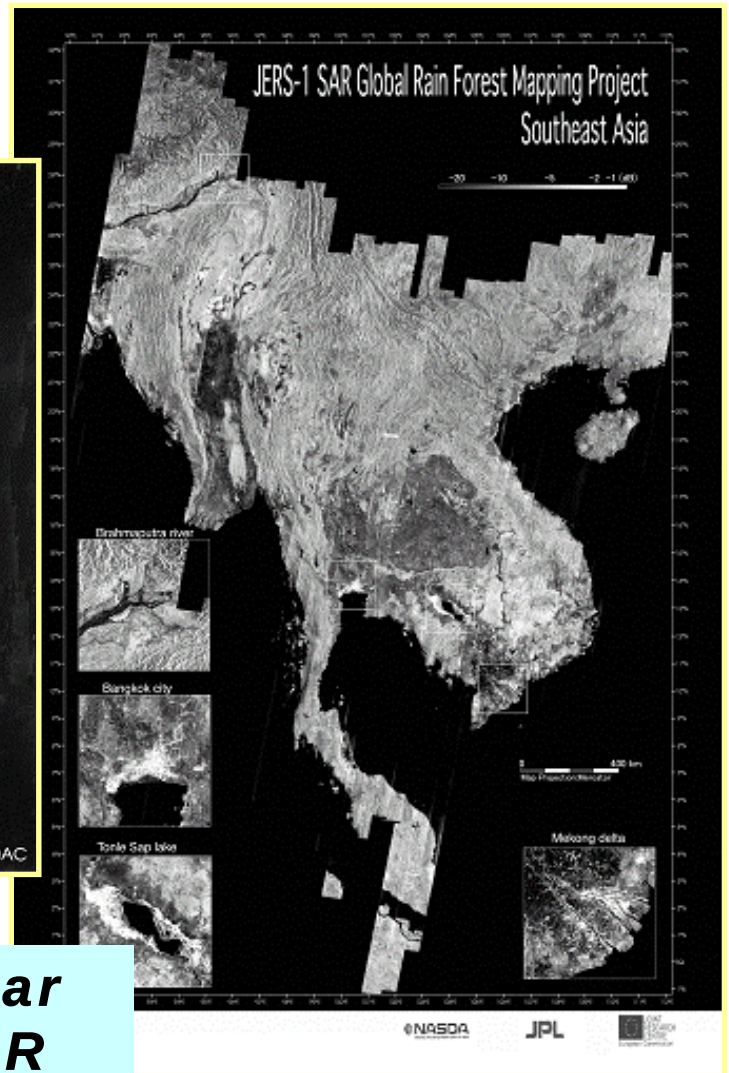


Central Africa Mosaic, JERS-1 SAR, 1996

1.2 Global Forest Mapping

New Guinea and N. Australia Mosaic, JERS-1 SAR, 1996



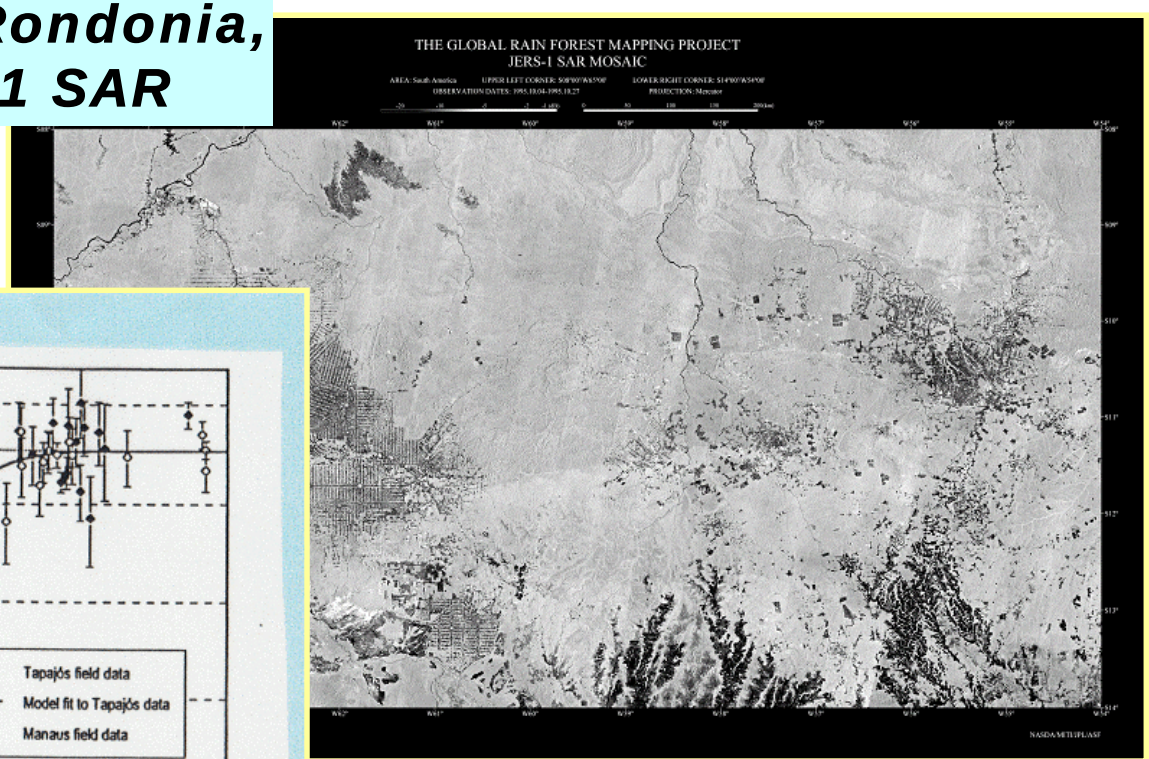


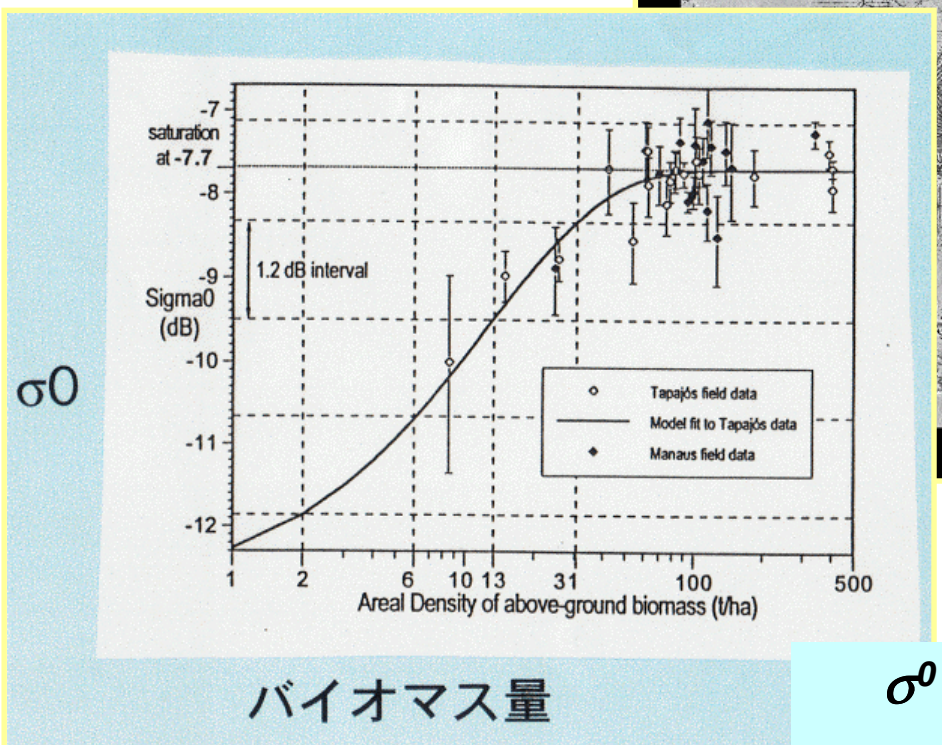
Indochina Peninsular Mosaic, JERS-1 SAR

1.2 Global Forest Mapping

Advanced Land Observing Satellite

Deforestation in Rondonia, Amazon, JERS-1 SAR





σ^0 vs Biomass Density, JERS-1 SAR

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1.3 Disaster Management

Objectives

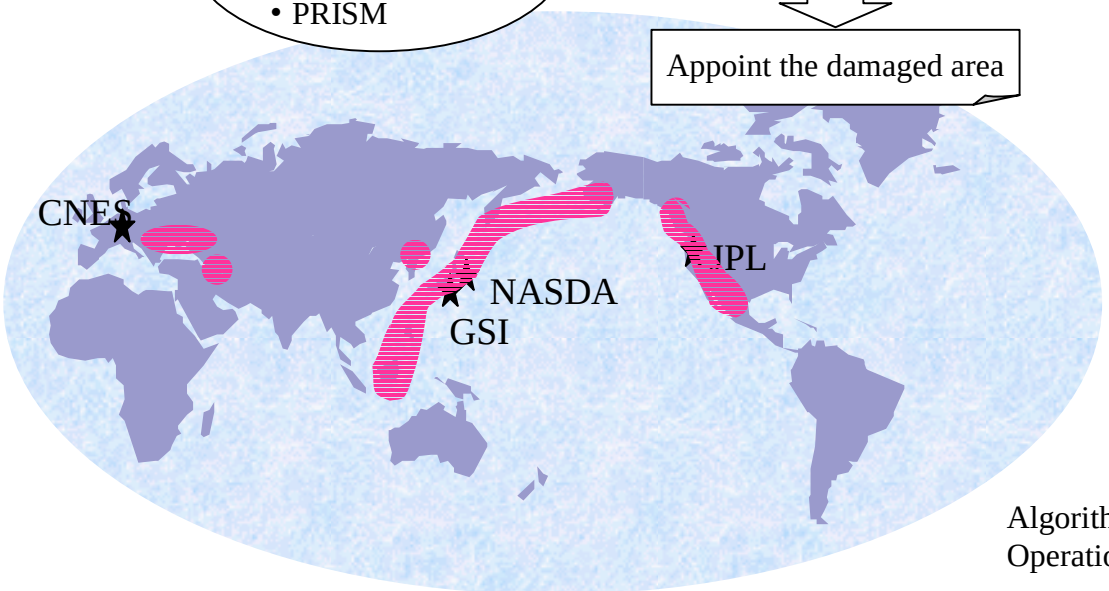
(1) Measurement of crustal deformation due to earthquake (InSAR)
(2) Monitoring of topographic deformation due to volcanic activity (InSAR)
(3) Delineation of flood area (PALSAR)
(4) Oil spill detection (PALSAR / AVNIR-2 / PRISM)

Area
- Global

Satellite Data
- PALSAR
- AVNIR-2
- PRISM

1000 scenes / year

Appoint the damaged area



NASDA/EOC and Data Node

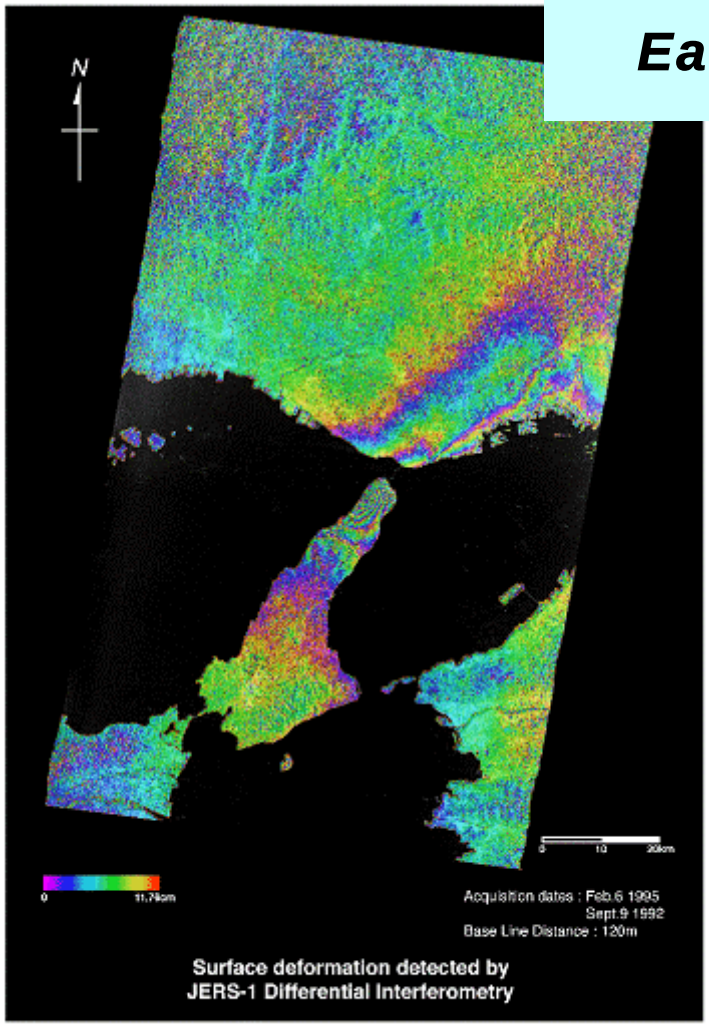
Anticipated Cooperative Organization
- CRL, GSI
- NIED
- Univ. of Tokyo (Earthquake Research Institute)
- JPL / CNES

Anticipated Users
- Coordinating Committee for Earthquake Prediction
- Damaged Area / UNESCO
- NOAA etc.
- Japan
  -Local Governments
  -Governmental Agencies (MOC, Asian Disaster Reduction Center etc.)

Algorithm has been established in JERS-1 project.
Operational Structure should be considered

1.3 Disaster Management

Southern Hyogo-pref. Earthquake, JERS-1 DinSAR, 1995



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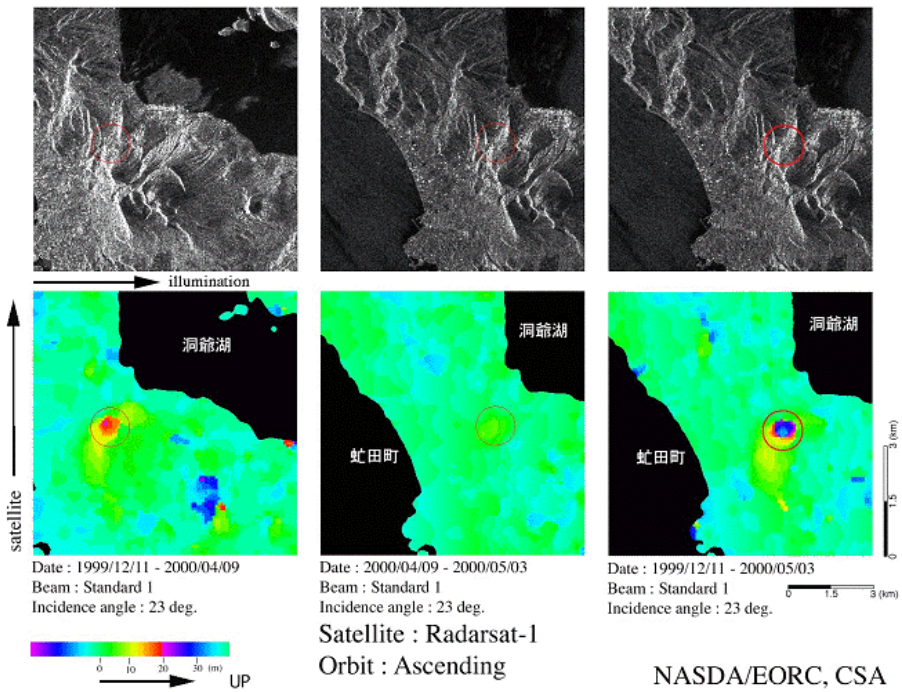
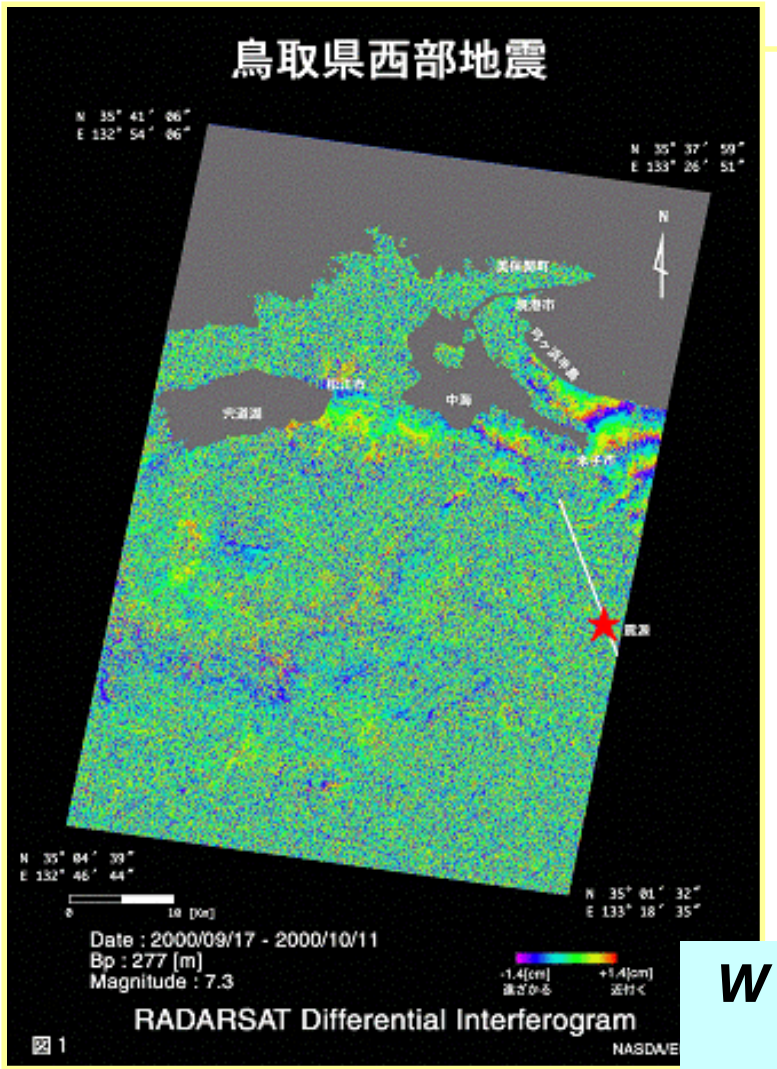
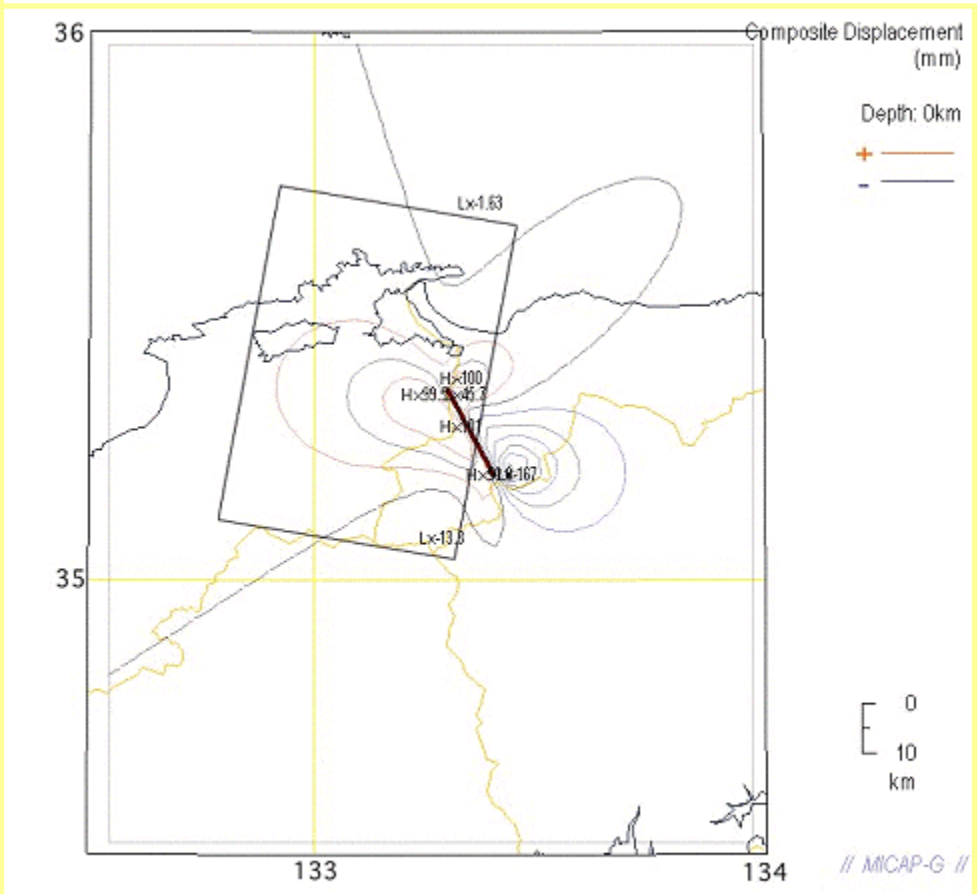


Mt. Usu Eruption, RADARSAT DinSAR, 2000

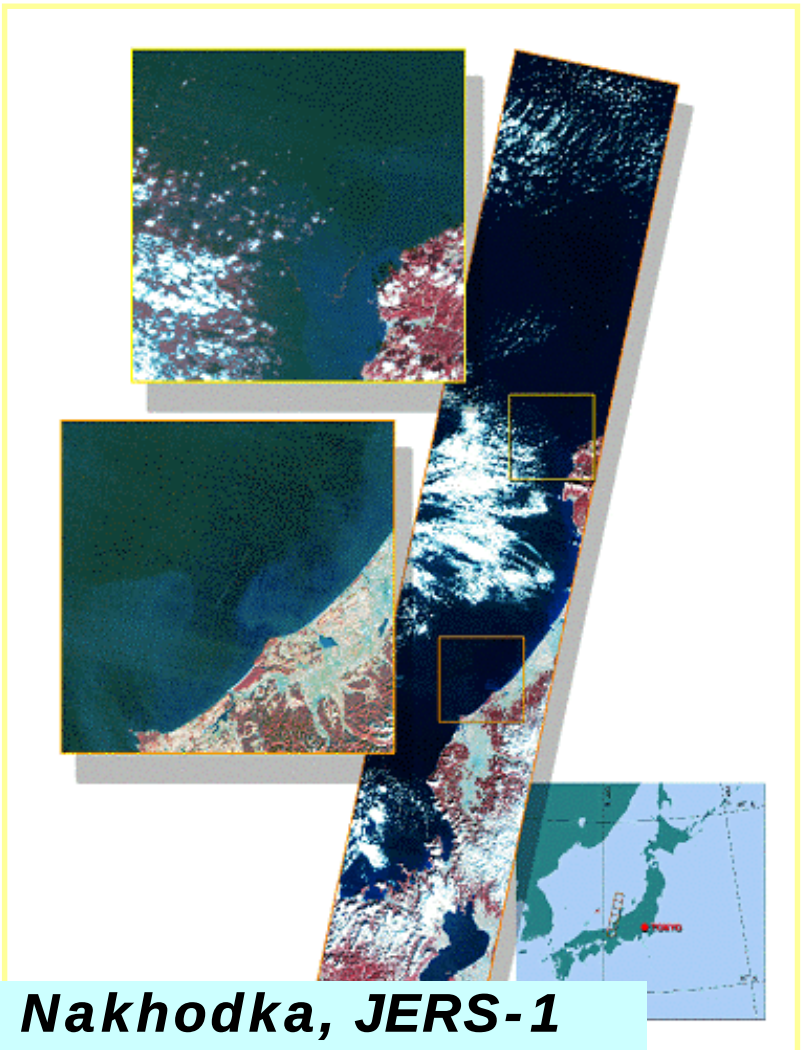
1.3 Disaster Management



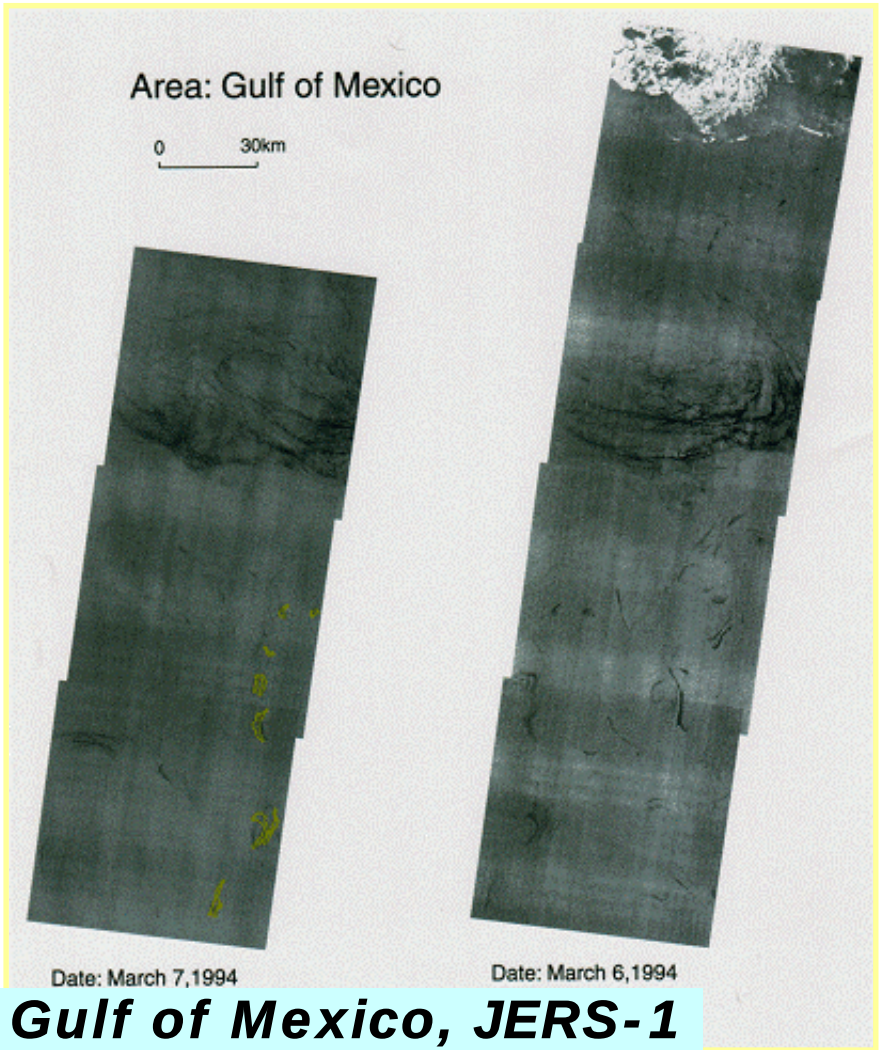


Western Tottori-pref. Earthquake, RADARSAT DinSAR, 2000

1.3 Disaster Management



Nakhodka, JERS-1
OPS, 1997



Gulf of Mexico, JERS-1
SAR, 1994

1.4 Map / GIS Applications

Objectives

(1) R&D of Ortho image and DEM generation using optical sensors (PRISM, AVNIR-2, and PALSAR

(2) Evaluation of Image Quality, Geometric and Radiometric Accuracy

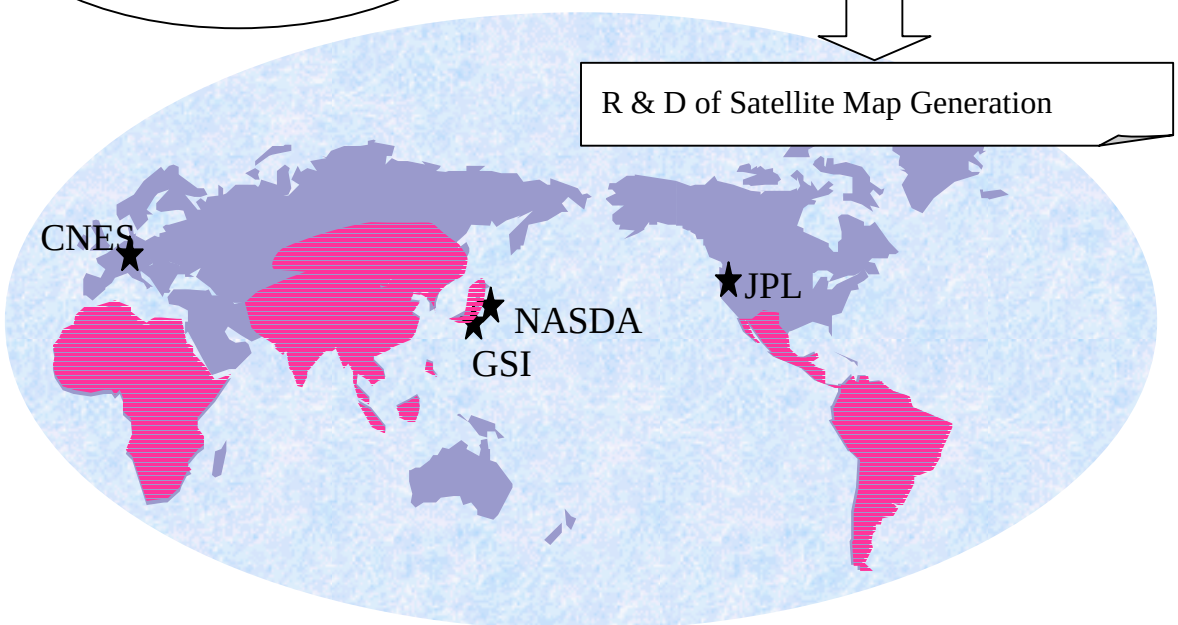
(3) Demonstration of Map Generation

Area
- Japan
- Asian Region
- Developing Countries

Satellite Data
- PALSAR
- AVNIR-2
- PRISM

TBD scenes / year

R & D of Satellite Map Generation



NASDA/EOC and Data Node

Anticipated Cooperative Organization
- GSI
- CNES, JPL
- Universities, Institutes

Anticipated Users
- GSI, NIED, MOC, MAFF
- Local Governments
- Developing Countries (JICA Project)
- Universities, Institutes

-Product
- Map (Generation, Update)
- Hazard Map
- Thematic Maps / GIS (Agriculture, Environment, Ecosystem, Urban Area Planning)

etc.

1.4 Map / GIS Applications

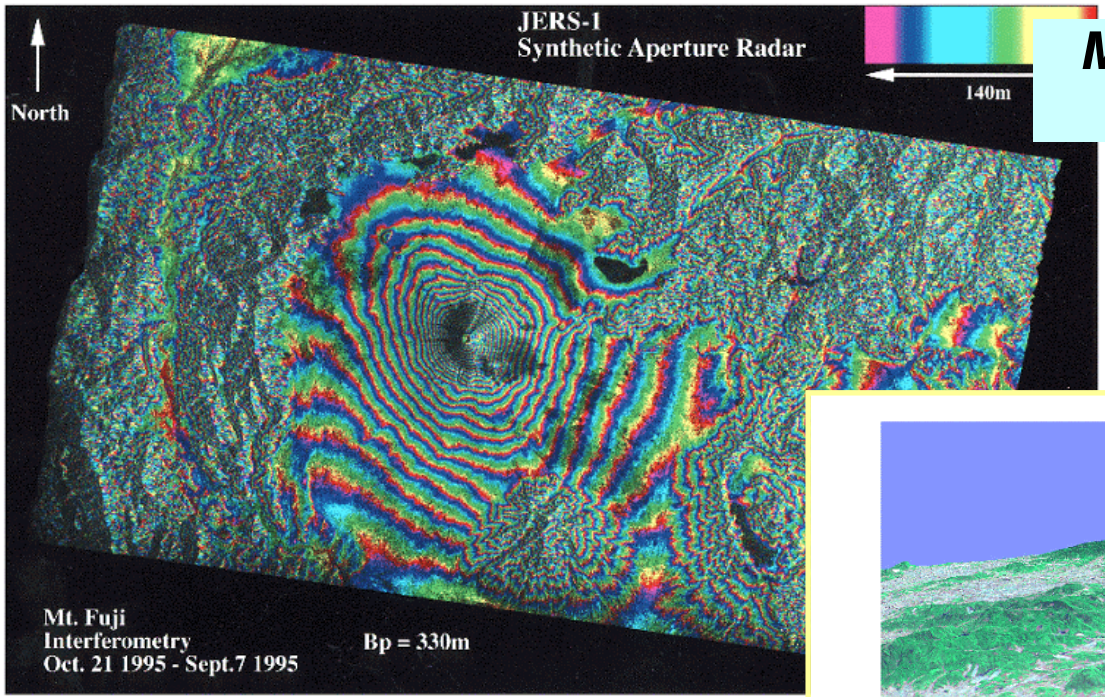


Fig. 2

Mt. Fuji DEM, JERS-1 InSAR, 1995

Gulf of Hakata, JERS-1 OPS Stereo, 1997

1.5 Land Use / Land Cover Change Applications

Advanced Land Observing Satellite

Objectives

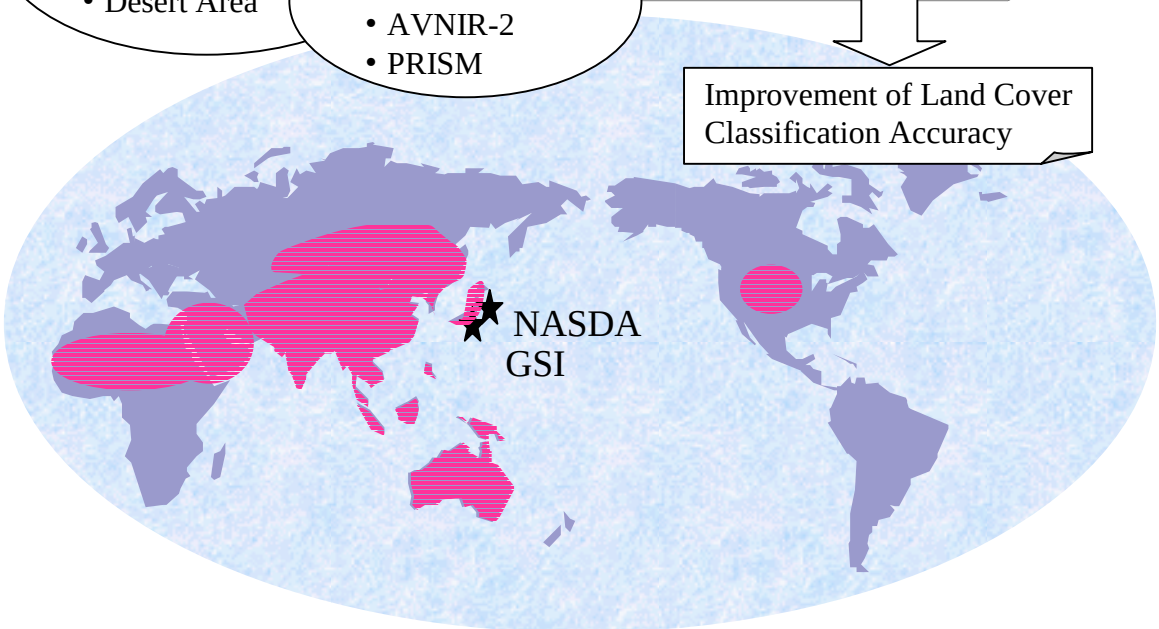
(1) Albedo Map (AVNIR-2)
(2) Desert Map(PALSAR/AVNIR-2)
(3) Land Cover Map (AVNIR-2,PRISM,PALSAR)
(4) Vegetation Map (AVNIR-2,PRISM,PALSAR)
(5) Improvement of classification accuracy using fusion technique of SAR, optical sensors, high resolution data and polarimetric SAR data

Area
- Japan
- Asian Region
- Desert Area

Satellite Data
- PALSAR
- AVNIR-2
- PRISM

TBD scenes / year

Improvement of Land Cover Classification Accuracy



NASDA/EOC and Data Node

Anticipated Cooperative Organization
- GSI
- MAFF
- EA
- MITI / ERSDAC
- Universities, Institutes

Anticipated Users
- GSI
- EA, MAFF, MITI, Local Governments
- International Research Programs / Organization (IGBP, WCRP, IGOS / TCO, FAO, UNEP, etc.)
- Universities, Institutes

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1.5 Land Use / Land Cover Change Applications

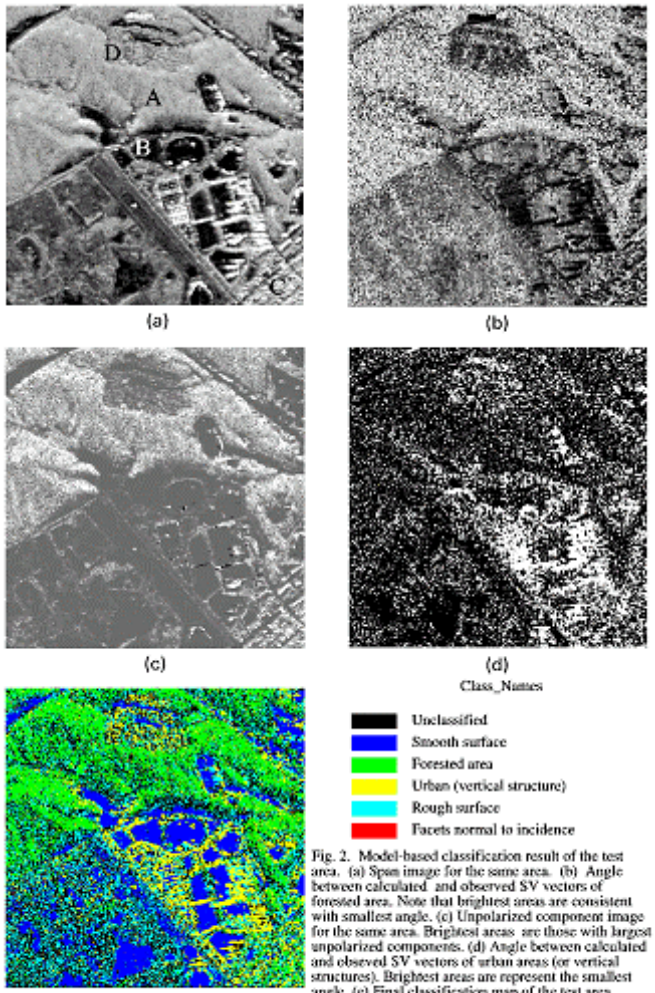


Fig. 2. Model-based classification result of the test area. (a) Span image for the same area. (b) Angle between calculated and observed SV vectors of forested area. Note that brightest areas are consistent with smallest angle. (c) Unpolarized component image for the same area. Brightest areas are those with largest unpolarized components. (d) Angle between calculated and observed SV vectors of urban areas (or vertical structures). Brightest areas are represent the smallest angle. (e) Final classification map of the test area. The image covers an area 1.8 km by 1.8 km area. The radar illumination is from SW to NE.

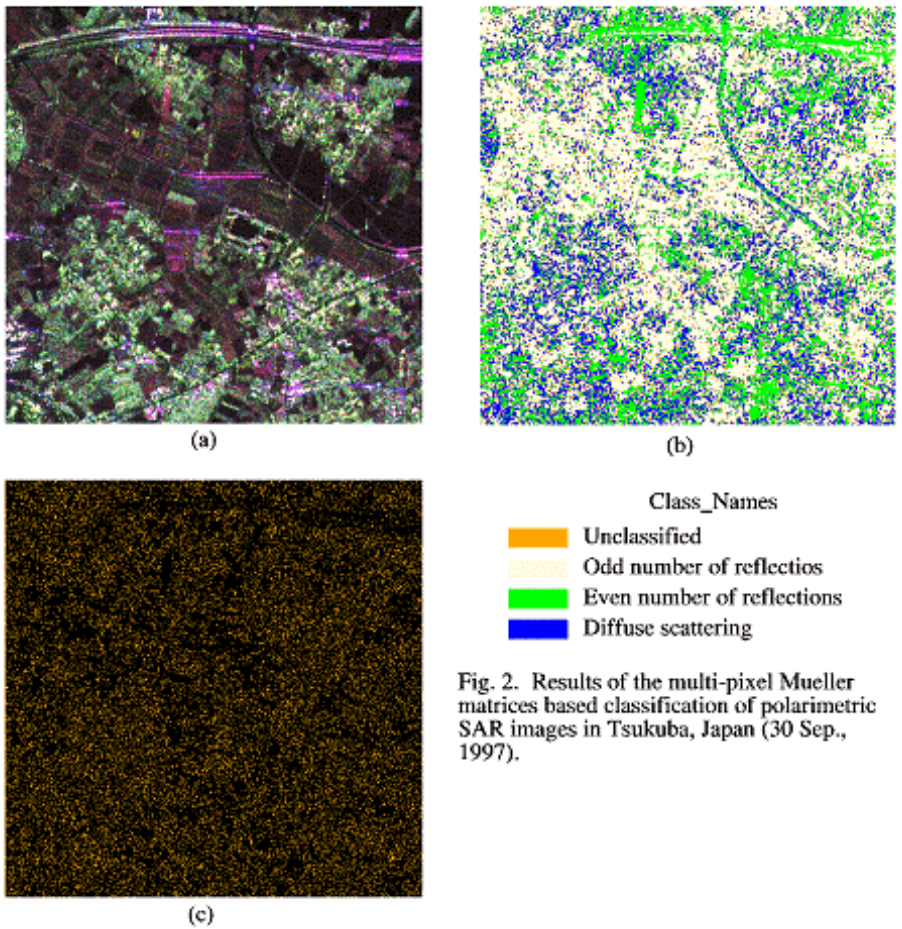


Fig. 2. Results of the multi-pixel Mueller matrices based classification of polarimetric SAR images in Tsukuba, Japan (30 Sep., 1997).

1.6 Terrestrial Hydrology Applications

Advanced Land Observing Satellite

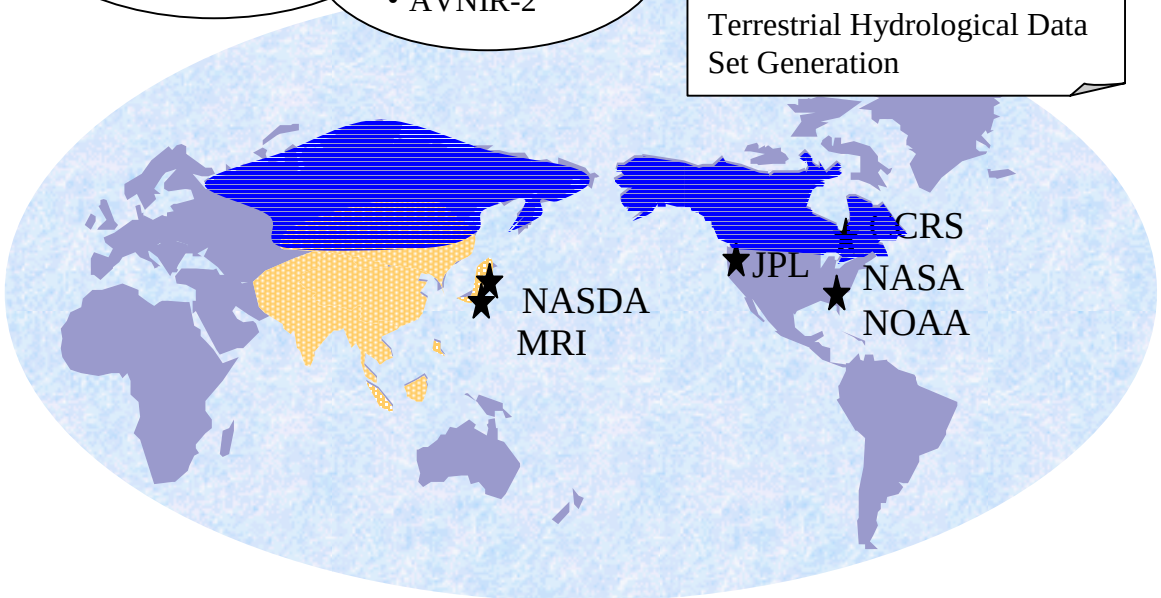
Objectives
(1) Soil Moisture(PALSAR)
(2) Snow Pack Distribution (PALSAR, AVNIR-2)
(3) Evaluation of Accuracy

Area
- Japan
- Asia
- Siberia
- North America

TBD scenes / year

Satellite Data
- PALSAR
- AVNIR-2

Terrestrial Hydrological Data Set Generation



NASDA/EOC and Data Node

Anticipated Cooperative Organization
- NASA, NOAA, CCRS
- CRL
- MRI
- International Research Programs
- Local Governments
- Universities, Institutes

Anticipated Users
- MAFF, MOC
- JMA
- Local Governments
- International Research Programs / Organization (WCRP, FAO, UNEP, etc.)
- Universities, Institutes

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1.6 Terrestrial Hydrology Applications

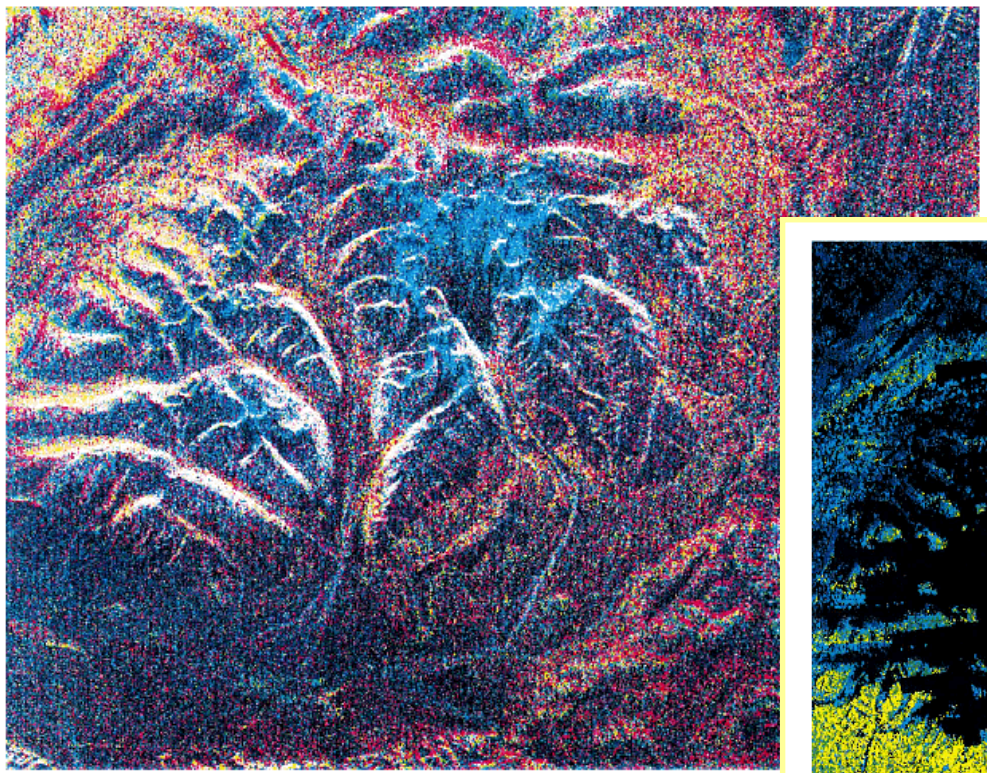
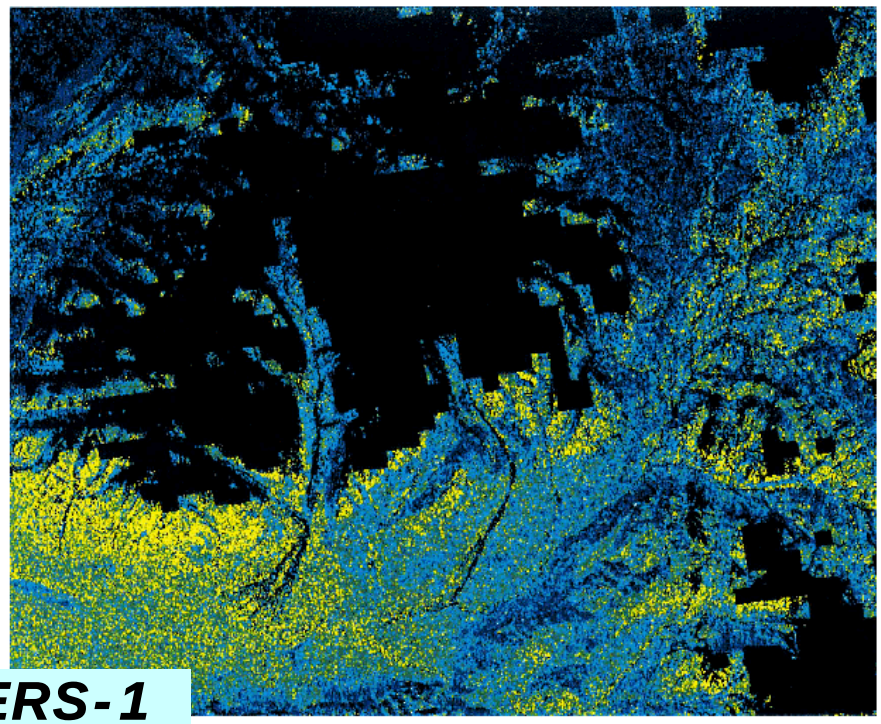


Fig. 1 The imege was processed by overlaying thee images of JERS-1 SAR (blue), May (red), and August (red), 1993

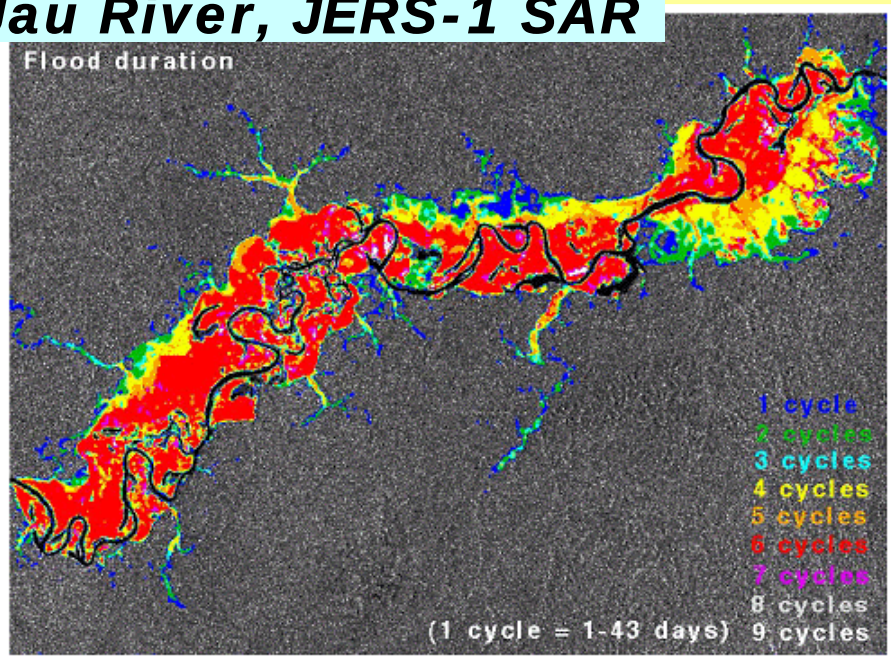


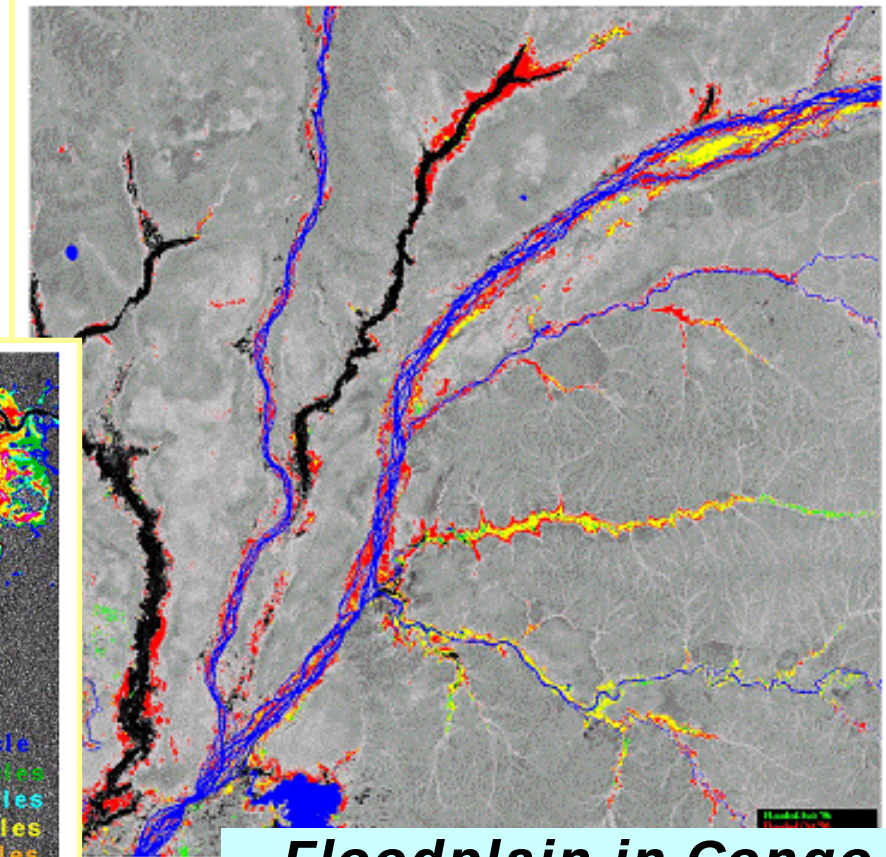
Soil Moisture, JERS-1 SAR, 1993

1.6 Terrestrial Hydrology Applications

Advanced Land Observing Satellite

Forest Innundation Jau River, JERS-1 SAR





Floodplain in Congo River, JERS-1 SAR

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1.7 Sea Ice Monitoring in Sea of Okhotsk and Polar-Region

Advanced Land Observing Satellite

Objectives

(1) Evaluation of measurement accuracy of sea ice concentration, type, velocity and ridge density

(2) Evaluation of Scan SAR, Polarimetric SAR characteristics

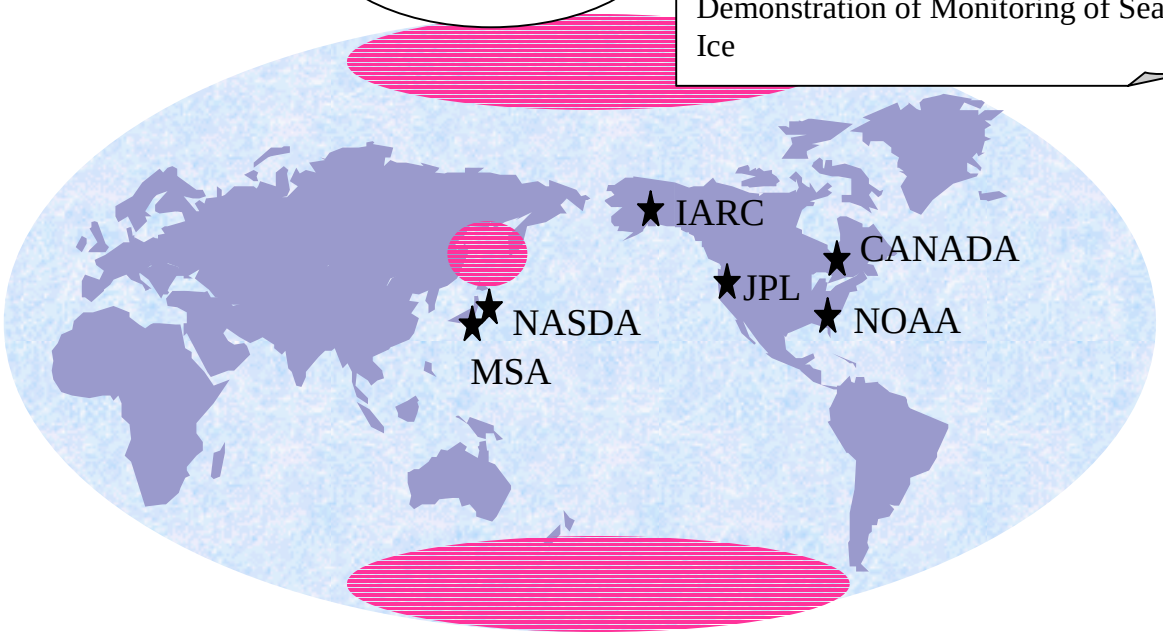
(3) Validation and demonstration

Area
- Polar-Region
- Okhotsk Sea

Satellite Data
- PALSAR
- AVNIR-2

TBD scenes / year

Demonstration of Monitoring of Sea Ice



NASDA/EOC and Data Node

Anticipated Cooperative Organization
- CRL
- MSA
- CCRS
- ASF

Anticipated Users
- MSA
- JAMSTEC, IARC
- Canadian Ice Center / CCRS etc.
- NOAA, National Snow and Ice Data Center (Ice Information Service for Ship Navigation)
- International Research Programs

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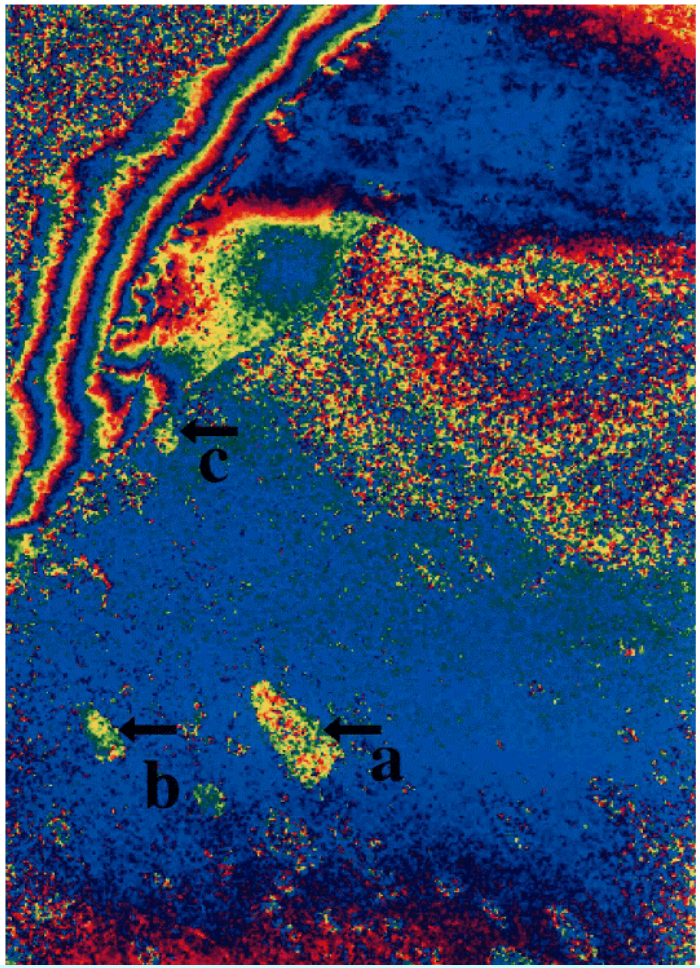
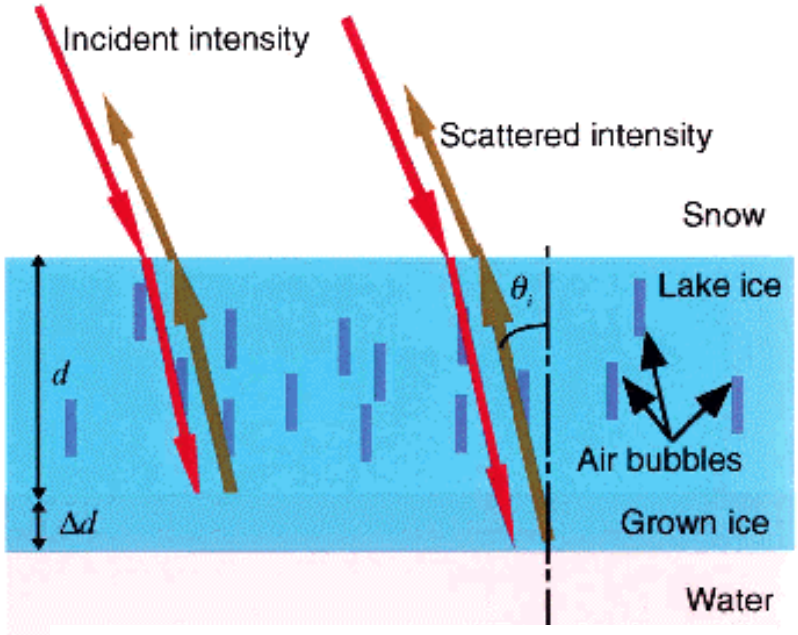
1.7 Sea Ice Monitoring in Sea of Okhotsk and Polar-Region



Ice Thickness, JERS-1 InSAR, Alaska,1997



3

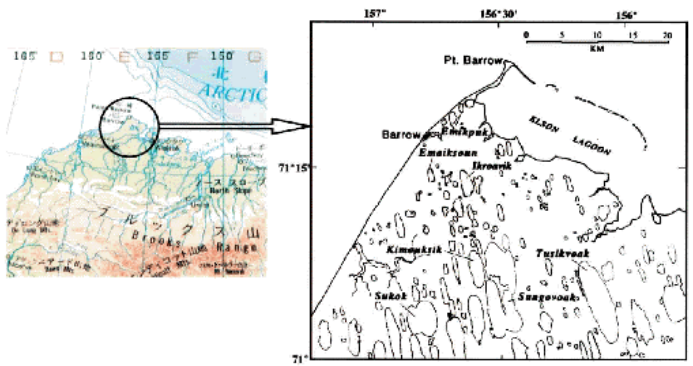


Fig. 2

2. EORC System Design Policy

(1) To develop system to implement calibration and validation for the high quality processed / analyzed data distribution to meet research requirement.

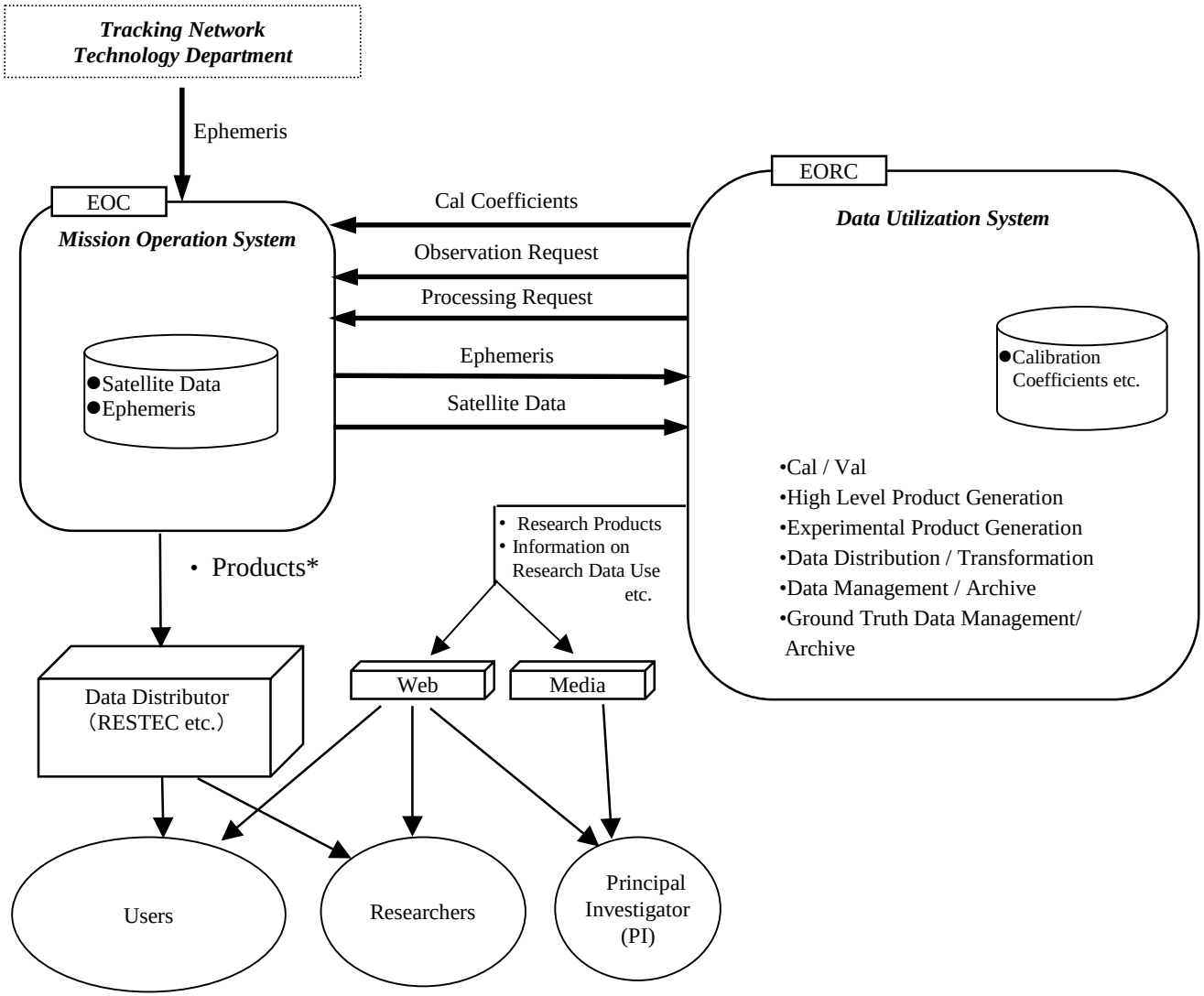
(2) To process each sensor data effectively on a quasi-automatic basis.

(3) To develop highly reliable algorithm for data processing and analysis.

(4) To provide information on data utilization for researchers.

(5) To equip EORC with main part of data utilization system.

3. Interface Requirement



*Products processed on a operational basis

4. Standard Products

(1) Common

Level	Definition	Note
Raw	Demodulated bit stream	Packetized Temporarily archived
0	Frame synchronization and PN decoding of CADUs and R-S Error Detection and Correction of VCDUs Extracted mission telemetry, orbit and attitude data are stored on separate files.	Compressed (except for PALSAR) Permanently archived Level for distribution to Data Node

4. Standard Products

(2) PRISM

Level	Definition	Note
1A	Uncompressed, reconstructed digital counts appended with radiometric calibration coefficients and geometric correction coefficients (appended but not applied). Individual files for forward, nadir, and backward looking data.	
1B1	Radiometrically calibrated data at Sensor input	
1B2	Geometrically corrected data Options G: Systematically Geo-coded (No option: Geo-referenced)	Map projection Resampling Pixel spacing

4. Standard Products

(3) AVNIR-2

Level	Definition	Note
1A	Uncompressed, reconstructed digital counts appended with radiometric calibration coefficients and geometric correction coefficients (appended but not applied).	
1B1	Radiometrically calibrated data at Sensor input	
1B2	Geometrically corrected data Options G: Systematically Geo-coded (No option: Geo-referenced) D: Correction with coarse DEM	Map projection Resampling Pixel spacing

4. Standard Products

(4) PALSAR

Level	Definition	Note
1.0	Reconstructed, unprocessed signal data appended with radiometric and geometric correction coefficients (appended but not applied). In Polarimetric mode, polarimetric data is separated.	
1.1	Range and azimuth compressed complex data on slant range. Full resolution	Beam modes: Full resolution mode, Low data rate mode, Polarimetric mode SLC: Single Look Complex Used for interferometry
1.5	Multi-look processed image projected to map coordinates. Option G: Systematically Geo-coded (No option: Geo-referenced)	Map projection Resampling Pixel spacing

5. Requirement for Operation

(1) Generation of Research Product (High Level and Experimental)

(a) Quasi-automatic operation (24 hours operation) should be available.

(2) Data Archive

(a) Ground Truth Data and Research Product should be archived independently.

(b) Back-up function for Cal / Val data and Research Product should be available.

(3) Data Distribution

(a) Data distribution of archived data((2)(a))should be available.

(b) Quasi-automatic operation (24 hours on-line) should be available.

(c) Data retrieval and distribution for PIs should be available.

(4) Service for PIs

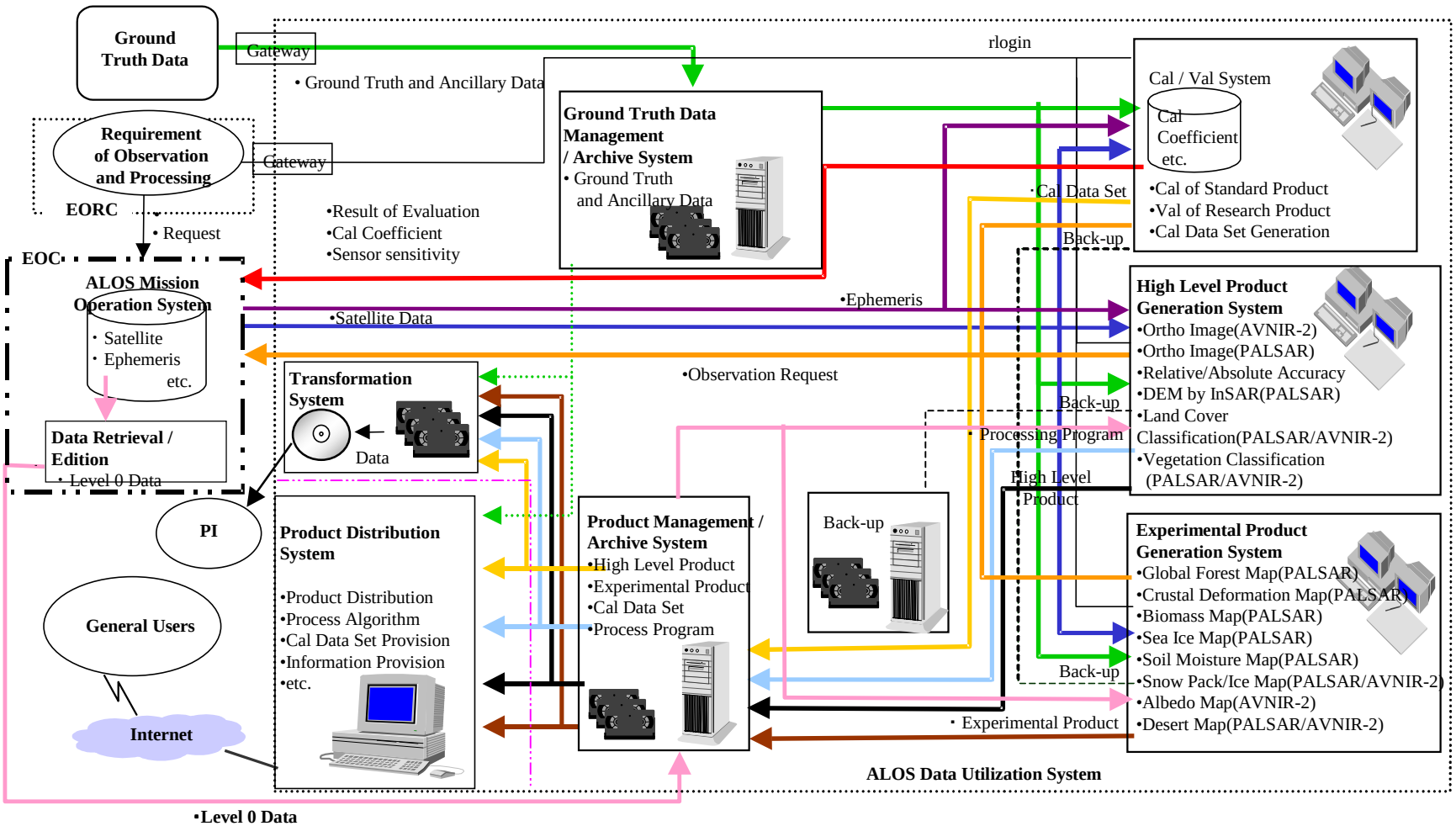
(a) Help Desk to serve for PIs and CIs request should be set up.

(5) Service for General Users

(a) Information Service (Event, Cal Coefficient, Data Distribution etc.) on Web site of EORC, quasi-automatic basis should be available.

6. System Requirement

(1) Function and Flow



7. Definition of Cal / Val

(1) PALSAR Calibration

Evaluation Item	Radiometric Characteristics	Geometric Characteristics
A.Sensor Characteristics	• Attenuator (STC, AGC) • Antenna Pattern (AZ., El.) • Noise Level • Basic Characteristics (Saturation, SNR, I-Q Perpendicularity, I-Q Gain Balance) • Transmitted Chirp • Doppler Center Frequency • Stability of Transmitted Power • Polarization • Resolution	• Attitude Determination Accuracy • Orbit Determination Accuracy • Data Acquisition Start Time
B. Calibration of Absolute Value	• Calibration of Intensity and Polarization using ARC, CR, PARC, REC • Cross- Calibration using under flight airborne SAR	• Data Acquisition Start Time Offset
C. Image Quality	Resolution, PSLR, ISLR, SA	• Resolution

7. Definition of Cal / Val

(2) PRISM Calibration

Evaluation Item	Radiometric Characteristics	Geometric Characteristics
A.Sensor Characteristics	• Dummy Pixel • Dark Currents • Deviation of detector sensitivity	• Alignment • Attitude Determination Accuracy • Orbit Determination Accuracy
B. Calibration of Absolute Value	• Absolute sensitivity (Vicarious Cal, Under fight Airborne observation • Radiometric Accuracy • Geometric Correction Accuracy	• Attitude Offset
C. Image Quality	Resolution, SN, etc.	• Resolution

7. Definition of Cal / Val

(3) AVNIR-Ⅱ Calibration

Evaluation Item	Radiometric Characteristics	Geometric Characteristics
A.Sensor Characteristics	• Dummy Pixel • Dark Currents • Deviation of detector sensitivity	• Pointing Angle Accuracy • Alignment • Attitude Determination Accuracy • Orbit Determination Accuracy
B. Calibration of Absolute Value	• Absolute sensitivity (Vicarious Cal, Under fight Airborne observation • Radiometric Accuracy • Geometric Correction Accuracy	• Attitude Offset
C. Image Quality	Resolution, SN, etc.	• Resolution

7. Definition of Cal / Val

(4) Definition of Validation

1. **Characterization of Physical Parameter on High Level Product**
   -> Goal: Ex.) Position Accuracy 2.5m
   Height Accuracy less than 5m

2. **Characterization of Estimated Geophysical Parameter Accuracy on Experimental Product**
   -> Goal: Ex.) Crustal Deformation 2cm
   Forest Mosaic less than 1dB
   Forest Biomass less than 20ton/ha

8. Definition of Research Product

(1) High Level Product (1/2)

Product	Definition	Amount of Product	Algorithm Development
Ortho Image ◎ (AVNIR-II)	Ortho Image Generation Using 50m mesh data of GSI	Amount of Product: 10 scenes / day (tentative) Size of 1 scene: 70km×70km	EORC Inhouse (and RA) ① Ortho Image Processing Using DEM
Ortho Image ◎ (PALSAR)	Ortho Image Generation Using 50m mesh data of GSI	Amount of Product: 10 scenes / day (tentative) Size of 1 scene: 70km×70km	EORC Inhouse(and RA) ① Geometric Correction (Improvement of JERS-1 SAR Algorithm)
Ortho Image ◎ (PRISM)	Ortho Image Generation Using ALOS PRISM simulation data (which produced in the process of DEM generation)	Amount of Product: 2 scenes / day (tentative) 500 scenes / year (tentative) Resolution: 2.5m × 2.5m Size of 1 scene: 35km×35km Area: Test site, TBD	EORC Inhouse (and RA) ① Ortho Image Processing Using DEM

8. Definition of Research Product

(1) High Level Product (2/2)

Product	Definition	Amount of Product	Algorithm Development
Relative Valued DEM◎ (PRISM)	Generation of Relative Valued DEM from PRISM data	Amount of Product: 2 scenes / day (tentative) 500 scenes / year (tentative) Resolution: 2.5m × 2.5m Size of 1 scene: 35km×35km Area: Test site, TBD	EORC Inhouse(and RA) ① Rad ometric Correction EORC Inhouse (or consignment) ① Matching ② Relative DEM Processing ③ Interpolation
Absolute Valued DEM◎ (PRISM)	Generation of Absolute Valued DEM from PRISM data and GCP	Amount of Product: 20 scenes / day (tentative) Resolution: 2.5m × 2.5m Size of 1 scene: 35km×35km Area: Test site, TBD	EORC Inhouse (and RA) ① Absolute Valued DEM Derivation
DEM generated from SAR◎ (PALSAR)	Generation of DEM with 50m spatial resolution and 10m height resolution using SAR Differential Interferometry Processing (1) Applicable for crustal deformation analysis (2) DEM generation in the area where PRISM is not applicable	Amount of Product: 10scene / day (tentative) Resolution: 50m × 50m Size of 1 scene: 70km×70km Area: TBD	EORC Inhouse(and RA) ① Interferometry Processing (Improvement of JERS-1 Algorithm)
Land Cover Classification (PALSAR/ AVNIR-2)	Classification using fusion data processing combining PALSAR and AVNIR-2	Goal: 2 seasons / year (Summer, Winter) ×5 years	RA and/or Inhouse
Vegetation Classification (PALSAR/ AVNIR-2)	Classification using fusion data processing combining PALSAR and AVNIR-2	Goal: 2 seasons / 5years	RA and/or Inhouse

8. Definition of Research Product

(2) Experimental Product (1/2)

Product	Definition	Amount of Product	Algorithm Development
Global Forest Map ◎ (PALSAR)	Mosic Image from 400m spatial resolution data more than four times observation is required to generate two seasons mosic images	Amount of Product: 14 (7 ×2) scenes / year Resolution: 100m×100m Area: Tropical Rain Forest Boreal Forest Temperate Zone Forest / TBD	EORC Inhouse(and RA) ① High Speed Processing from each path image (Improvement of JERS-1 SAR Algorithm) ② Stripe elimination between paths (Improvement of JERS-1 SAR Algorithm)

8. Definition of Research Product

(2) Experimental Product (2/2)

Product	Definition	Amount of Product	Algorithm Development
Crustal Deformation Map (PALSAR)	Mosic Image of differential Interferometry processed data to cover large area of crustal movement Area: Japan Island, Chishima, Kamchatska, Aleutian	Amount of Product: 5 scenes / day (tentative) Resolution: 50m×50m Size of 1 scene: 70km×70km Area: Japan Island Aleutian etc.	EORC Inhouse(and RA) ① Radiometric Correction EORC Inhouse (or consignment) ① Matching ② Relative DEM Processing ③ Interpolation
Biomass Map (PALSAR)	Biomass Map using PALSAR	Goal: 2 times / year × 5years	EORC Inhouse(and RA), Cooperative Research in Ground Truth
Sea Ice Map (PALSAR)	Sea Ice Distribution and Density Map in Sea of Okhotsk, Arctic Ocean, and the fringe of Antarctica	Goal: 5years	EORC Inhouse(and RA)
Soil Moisture Map (PALSAR)	Soil Moisture Map in continental scale from PALSAR	Goal: Once / year × 5years	RA and/or EORC Inhouse
Snow pack / Ice Map(PALSAR/ AVNIR-2)	Snow pack, Glacier Map using PALSAR and AVNIR-2	Goal: Once / year × 5years	RA and/or EORC Inhouse
Albedo Map (AVNIR-2)	Reflectance Map on Earth surface 1) Albedo on Earth surface with atmospheric correction 2) Albedo on top of atmosphere	Goal: 2 times / year × 5years	RA and/or EORC Inhouse
Desert Map (PALSAR/ AVNIR-2)	Desert Map using PALSAR and AVNIR-2 for the monitoring of desertification	Goal: 2 seasons / year × 5years	RA and/or EORC Inhouse

9. Research Announcement

(1) Research Purpose

1. Cal / Val 2. Utilization Research 3. Science Research

(2) Period of Research

- 5 years (Evaluation after 3 years)

(3) Data Provision to PIs

- Existing satellite data possessed by NASDA
- ALOS data after launch

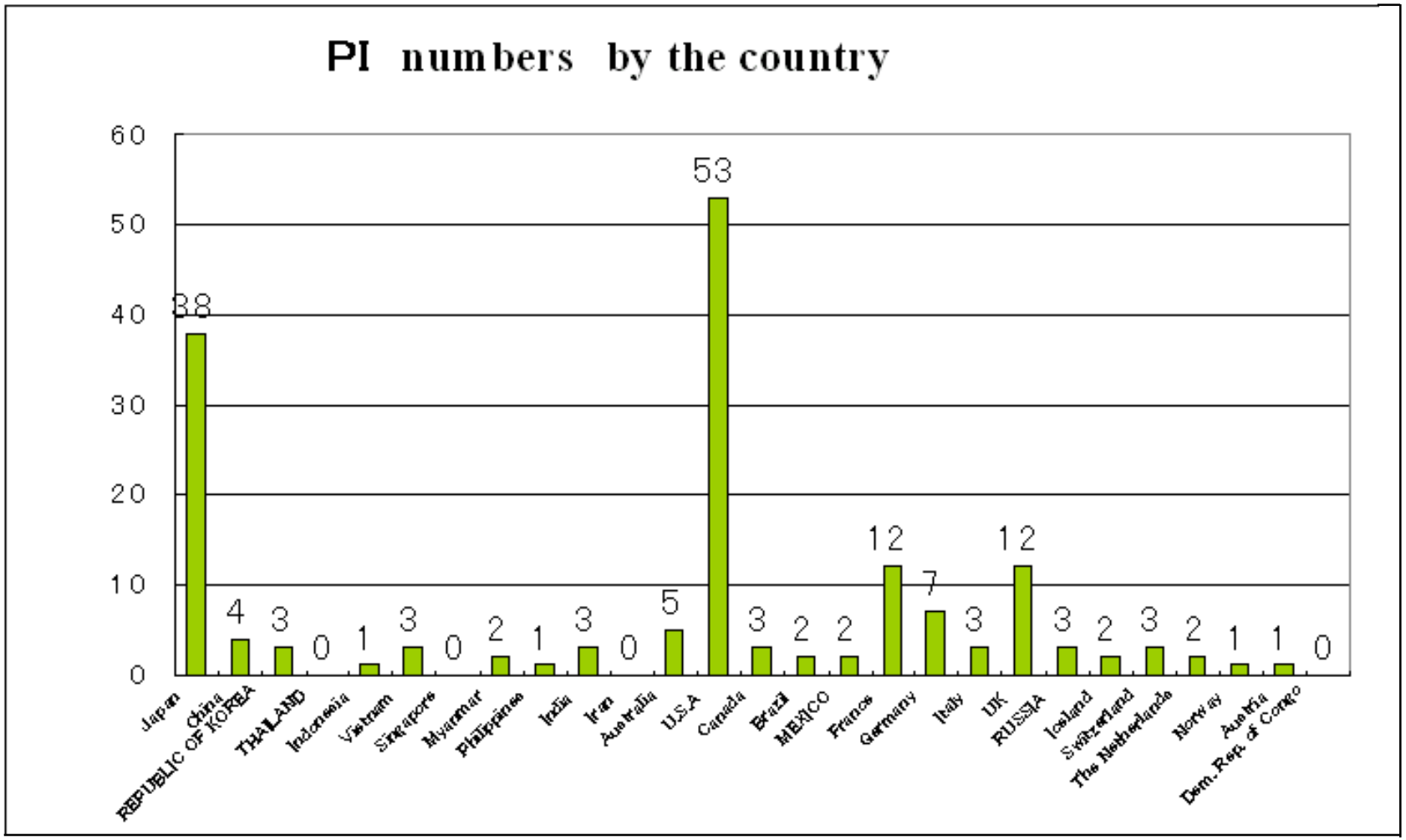
(4) Researchers

- Accept proposal from wide ranging researchers from private research institutes as well as universities / national institutes. Research purpose is restricted to the peaceful purpose.

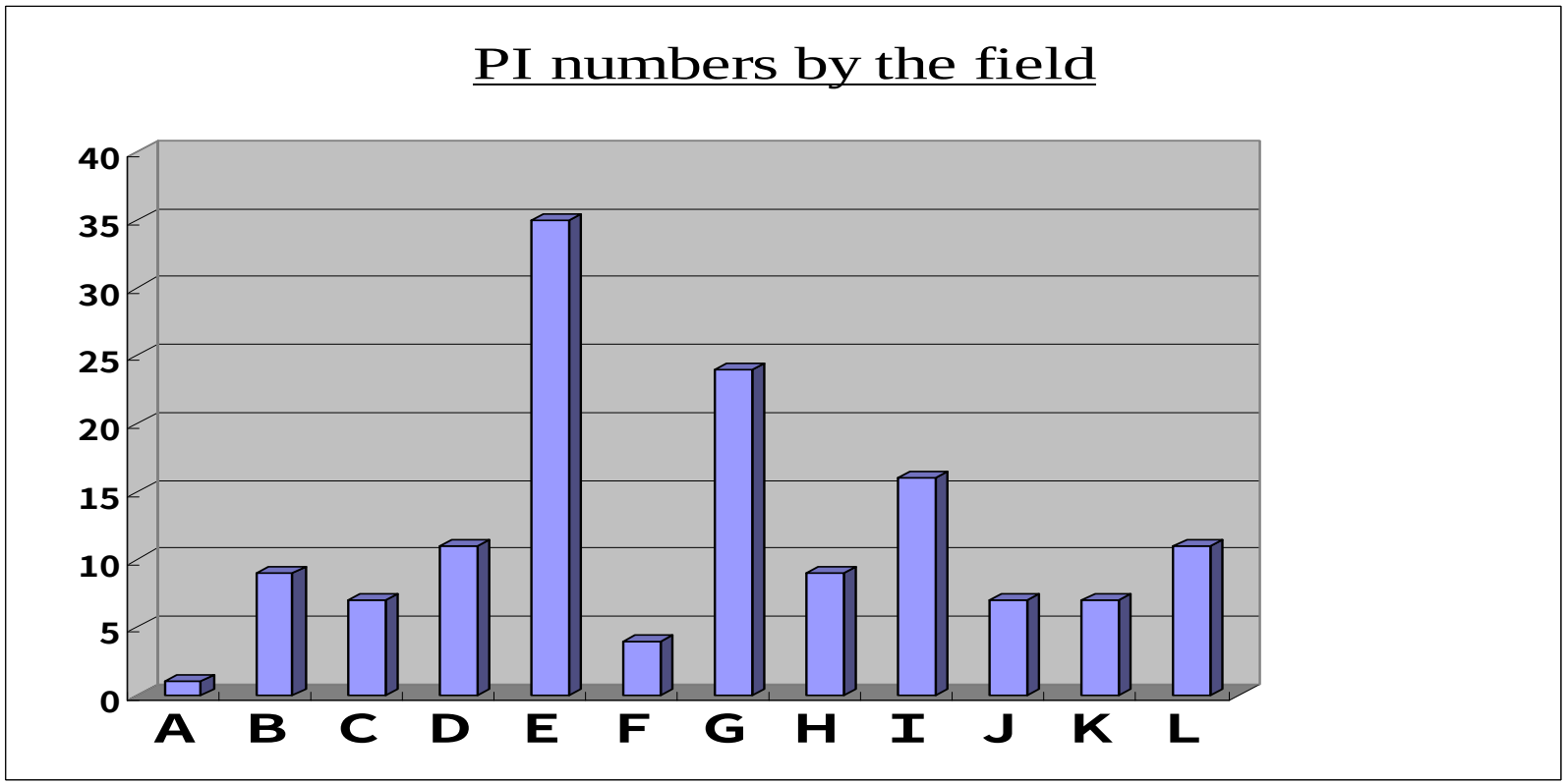
(6) Schedule

Document release -- October 1999
Deadline for submission of proposals -- January 31, 2000
Notification of PI selection -- September, 2000
Contract -- October 2000 <--> December 2000
PI meeting and Symposia -- Late March 2001
Interim evaluation -- March 2004 (in FY2003)

9. Research Announcement



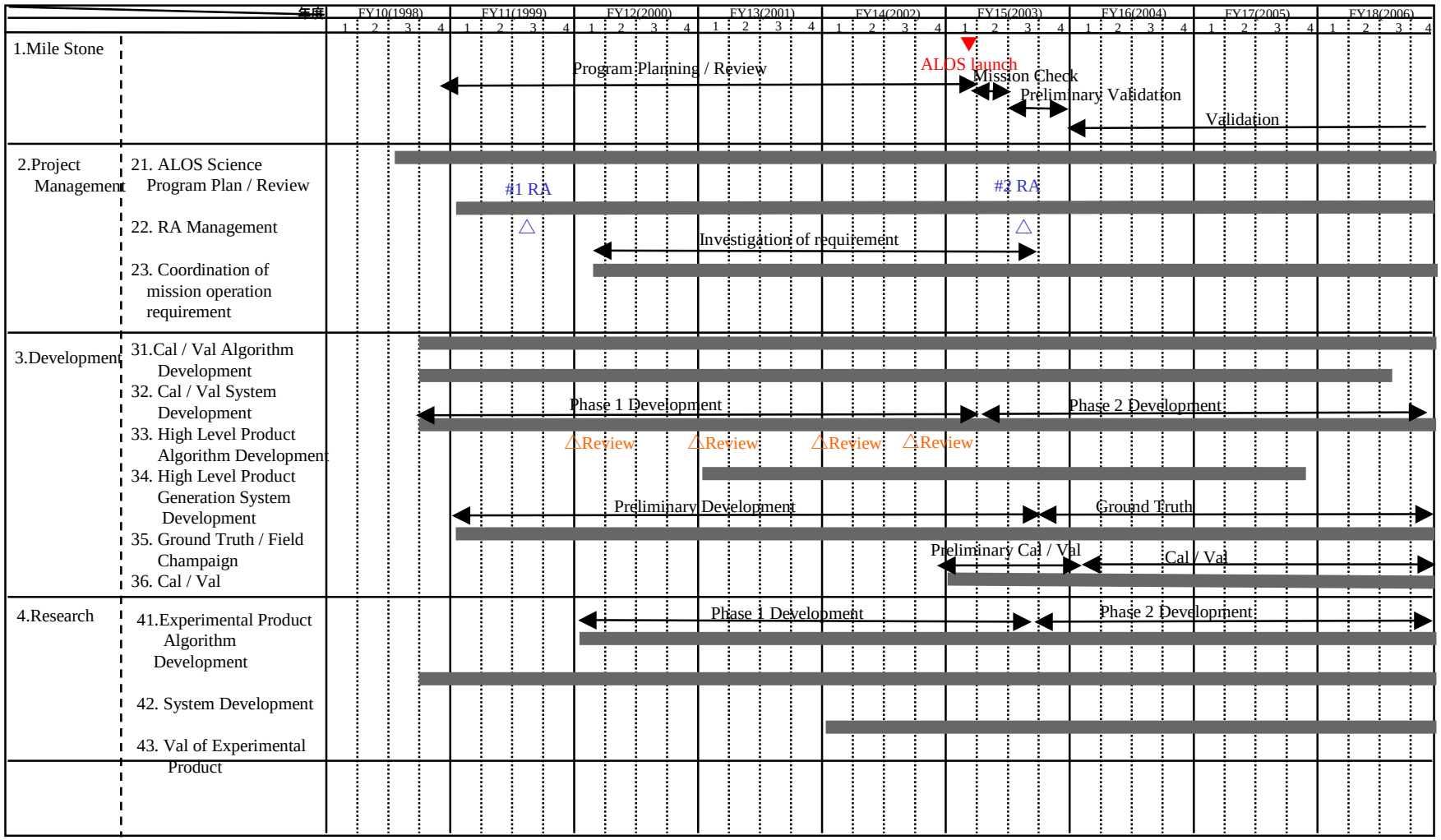
9. Research Announcement



A: Calibration of optical Sensors
B: Calibration of SAR
C: DEM & Mapping
D: Land use & Land Cover
E: Disaster Management
F: Geology & Non renewable Resources
G: Terrestrial
H: Oceanography & Coastal Zone Applications
I: Cryoshere,Snow and Ice Distribution
J : Agricultural Applications
K : Hydrology & Water Resources
L: Geography & GIS Applications

Advanced Land Observing Satellite

10. Master Schedule



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11. Conclusions

ALOS is a land remote sensing satellite of the following mission concept.

1) Global high resolution observation and wide swath width observation will be available.
2) Three dimensional land topography, and two dimensional spectral images and geodetic land surface deformation will be measured simultaneously.
3) ALOS program will improve algorithms based on experiences of JERS-1 and ADEOS to realize above mentioned mission concept.
4) ALOS will develop possibility of new science and applications, such as Kyoto forest mapping, global observation of forest cover for the estimation and elucidation of carbon cycle system on the earth.
5) The strategic application like the integration of remote sensing and GIS for prevention against vernacular diseases and so on.
6) EORC Responsibility
   (1) Algorithm development for research product including high level and experimental product.
   (2) Support in calibration of standard product and validation of research product.
   (3) Research product data set generation and data distribution to PIs.
   (4) Research announcement activities.