

# Japan Aerospace Exploration Agency (JAXA) Agency Positioning and Mission Update

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Space Data Coordination Group meeting 1  
Montreal, Canada. 6-8 March 2012

# Summary of Mission Capacity to Meet FCT/GFOI needs

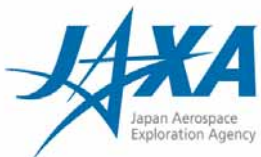
- Role/Interest in GEO-FCT/GFOI: **JAXA is an FCT Co-lead**
- Current Mission Portfolio for Forest Monitoring:
  - Sensors available: **ALOS PALSAR**
  - Spatial resolution: **10-20 m**
  - Nominal revisit frequency: **46 days**
  - Acquisition strategies relevant to GEO FCT:

## **Global systematic acquisition strategy implemented**

- Coverage available over all FCT National Demonstrators:

## **Wall-to-wall coverage over all land areas on Earth**

**(incl. all FCT ND's, UN-REDD, WB-FCPC and REDD+ pilot countries)  
at least 2 times/year during 2007 – spring 2011**

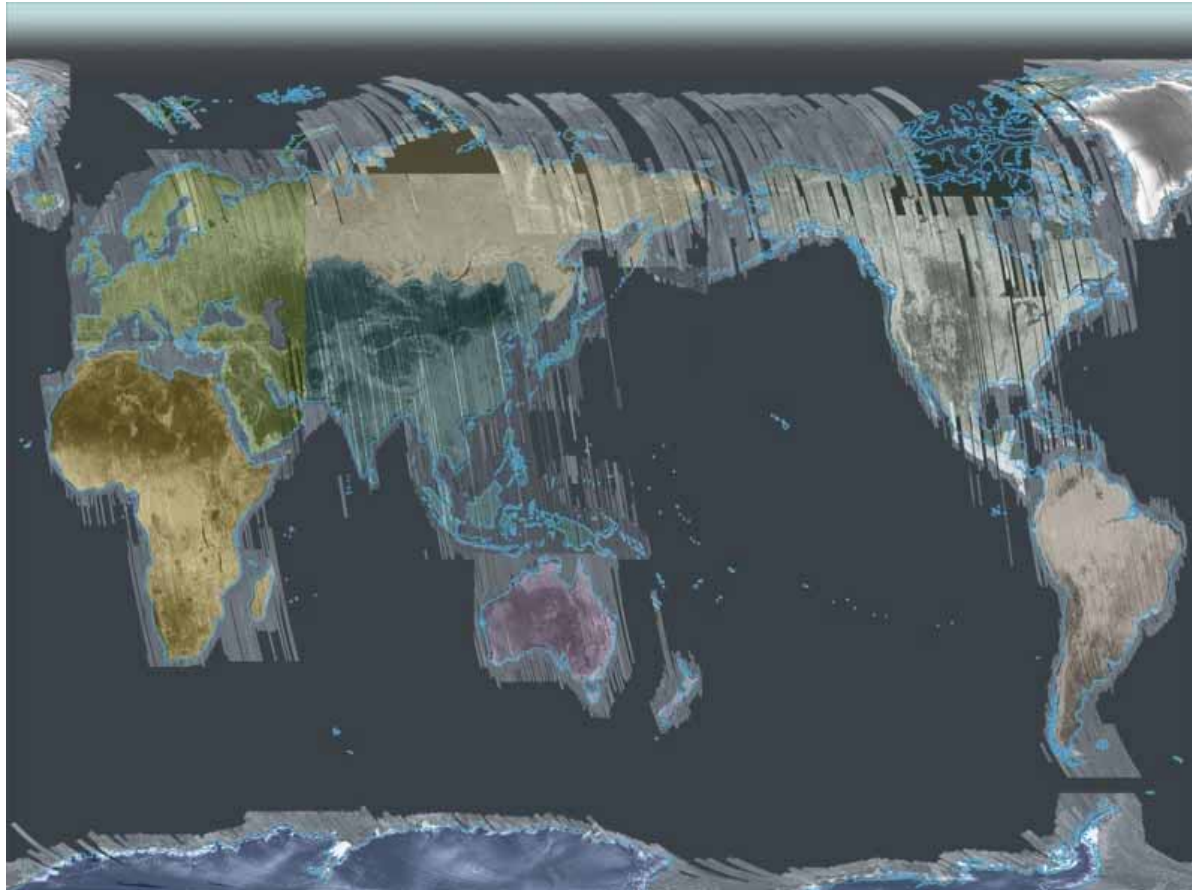


# Meeting the FCT/GFOI Data Requirements

- Capability to meet the specific FCT/GFOI data request
  - Capabilities:
    - Selected PALSAR data over Verifican Sites is being provided to ND's (on-going)
    - Full national coverages (wall-to-wall) available on a commercial basis
  - Possible data gaps:
    - In average, two global coverages (95% success rate) acquired per year (Dec-March & June-Sept) between 2007 and 2011
  - System constraints
    - ALOS PALSAR mission ended April 2011



# Description of the ALOS PALSAR Global Systematic Observation Strategy



# Objectives of the ALOS Observation Strategy

- Aimed to support the ALOS PALSAR science objectives, and serve all user categories
- Improve initial poor simulation results due to request conflicts between the many ALOS user groups:
  - JAXA internal requests (K&C science programme, Cal/Val, InSAR, ...)
  - METI/ERSDAC (geology, resource exploration)
  - Japanese Gov't Agencies (M-Environment, M-Forestry & Agriculture, Coast Guard, Geographical Survey Inst. ...)
  - ALOS PI programme
- **Creation of a systematic archive of L-band SAR data, in which a consistent time series of data can be found for any arbitrary point, or region, on the Earth.**

# The Systematic Observation Strategy - Factors considered

## **Spatio-temporal consistency over regional scales**

- Semi-continental wall-to-wall coverage
- Acquisitions within a short time window (46-day cycle)

## **"Adequate" temporal repetition;**

- Plan individually adapted to forest and wetlands monitoring

## **Accurate timing;**

- Regional seasonality a major driver

## **Consistent sensor configuration;**

- Limitation of the PALSAR operational modes
  - Creation of consistent archives
  - Minimising request conflicts

## **Long-term continuity**

- Repetition to EOL, continuation with ALOS-2



# Approach to minimise PALSAR programming conflicts

**Step 1:** Reducing the number of operational modes to a small number of "default observation modes" (132 => 5)

**Step 2:** Designating each 46-day cycle to a specific default mode.

**Step 3:** Separating conflicting requests into ascending and descending operations.

## Ascending passes:

- Dedicated to global-scale, dual-season monitoring
- Fine-res, HH+HV @ 34.3° (Forest & Land Cover)
- Fine-res, HH @ 34.3° (Solid Earth, Forest & Land Cover)
- Quad-pol @ 21.5° & 23.2° (Pol-InSAR R/D)

## Descending passes:

- Dedicated to regional-scale, every-cycle repeat monitoring
- ScanSAR HH 5-beam (Wetlands & Rapid-deforestation monitoring)



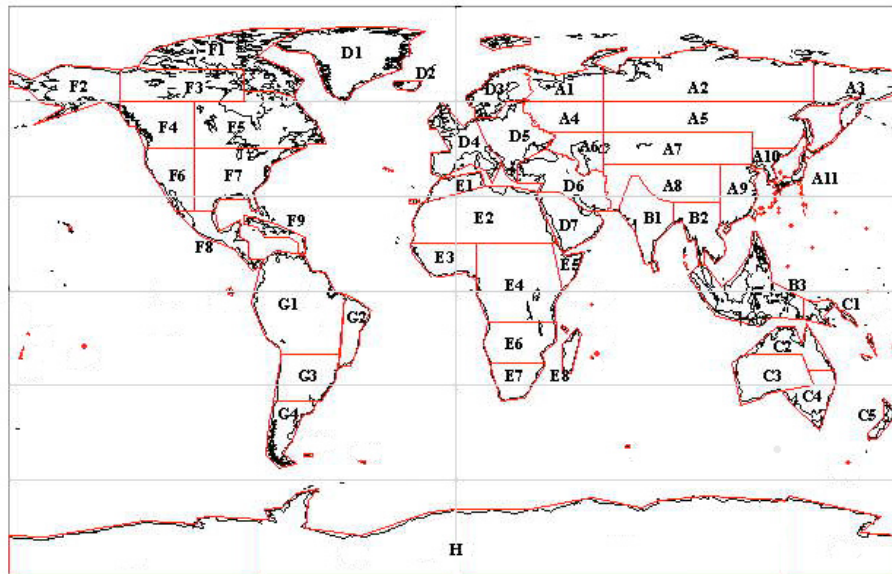
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"Best trade-off" sensor modes based on scientific requirements, identified in collaboration with an international science advisory group (K&C Science Advisory Panel)



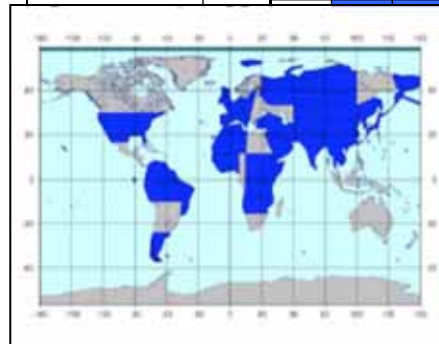
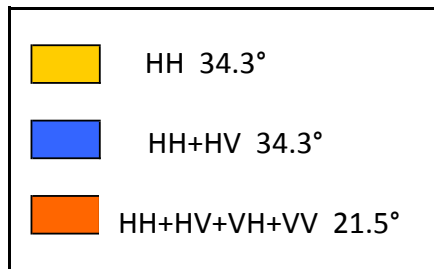
# Observation matrix plan concept

Geographical observation units



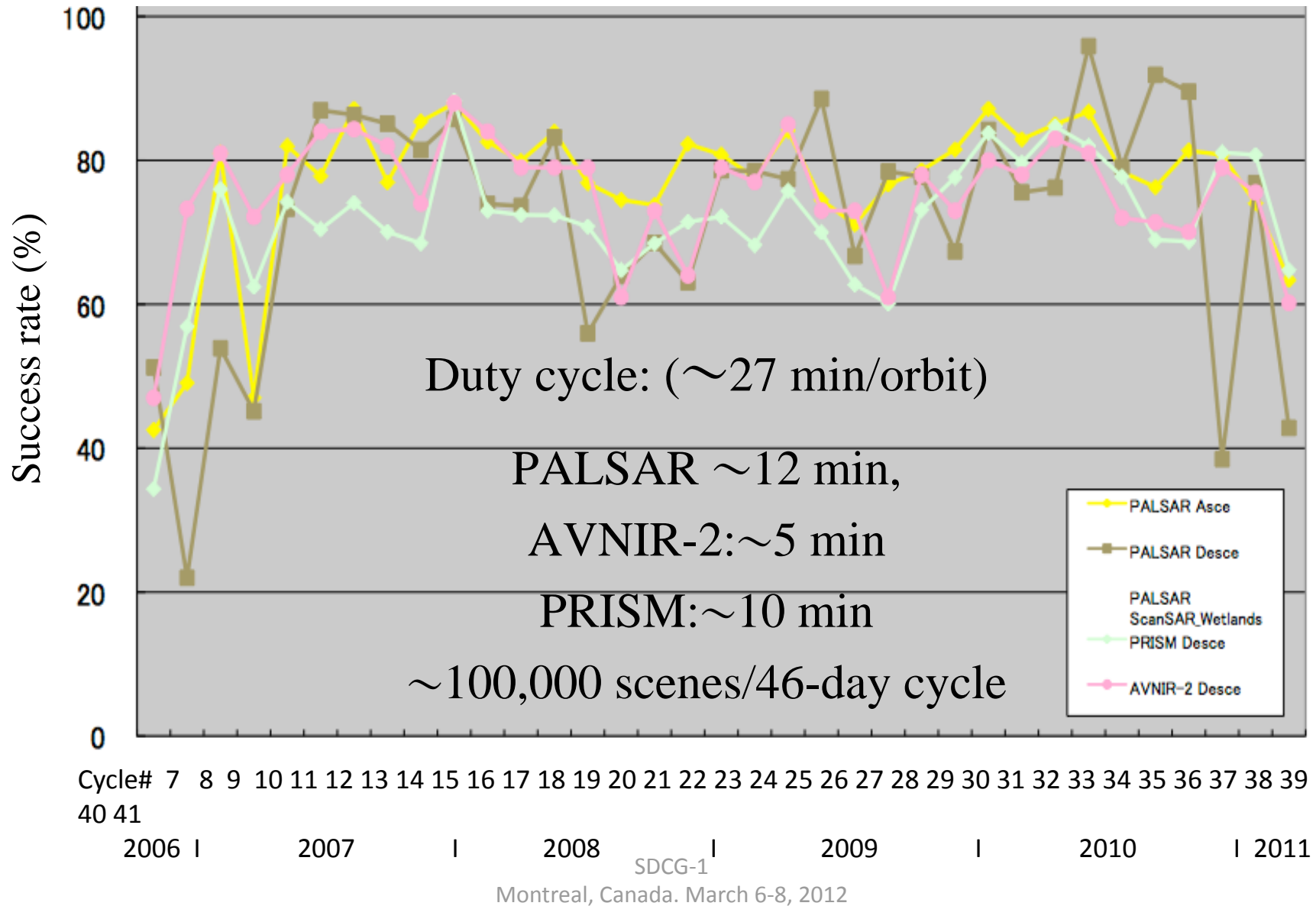
Year		2006										2007							
Month		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8			
Satellite cycle		7	8	9	10	11	12	13	14	15	16	17	18	19	20				
Siberia NW	A1																		
Siberia N-central	A2																		
Siberia NE	A3																		
Kanchatka	A4																		
Siberia SW	A5																		
Siberia S-central	A6																		
Siberia SE	A7																		
Caspian Sea	A8																		
Central Asia	A9																		
Himalayas	A10																		
China East	A11																		
Korea	A12																		
Japan	A20-35																		
India	B1																		
Peninsular SE-Asia	B2																		
Insular SE-Asia	B3																		
PNG	C1																		
Australia N&E	C2																		
Australia arid	C3																		
Australia S&E	C4																		
New Zealand	C5																		
Greenland	D1																		
Iceland	D2																		
Europe N	D3																		
Europe SW	D4																		
OE Islands	F1																		
Alaska	F2																		

Fixed observation modes (ascending passes)



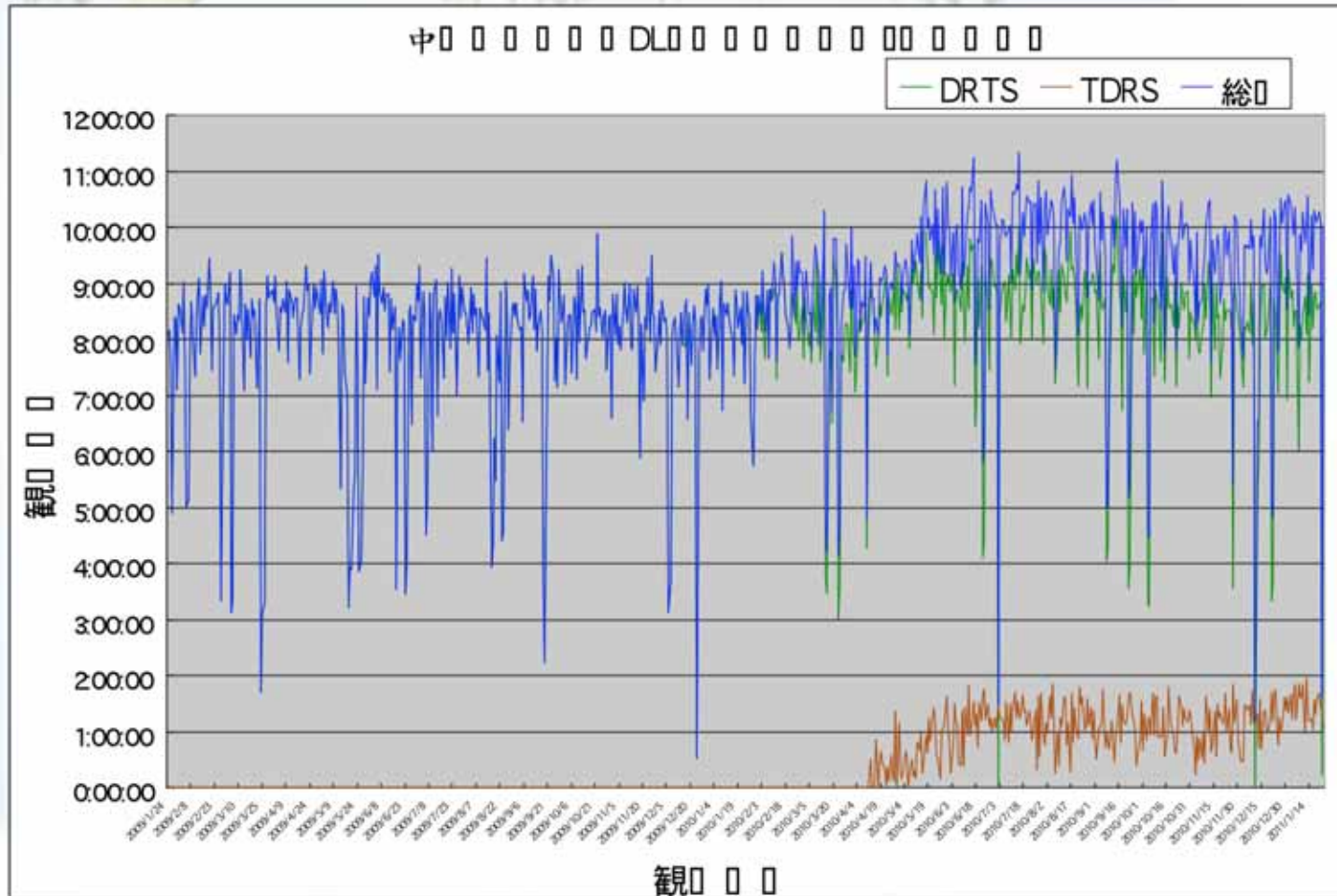


# Acquisition success rate and duty cycle



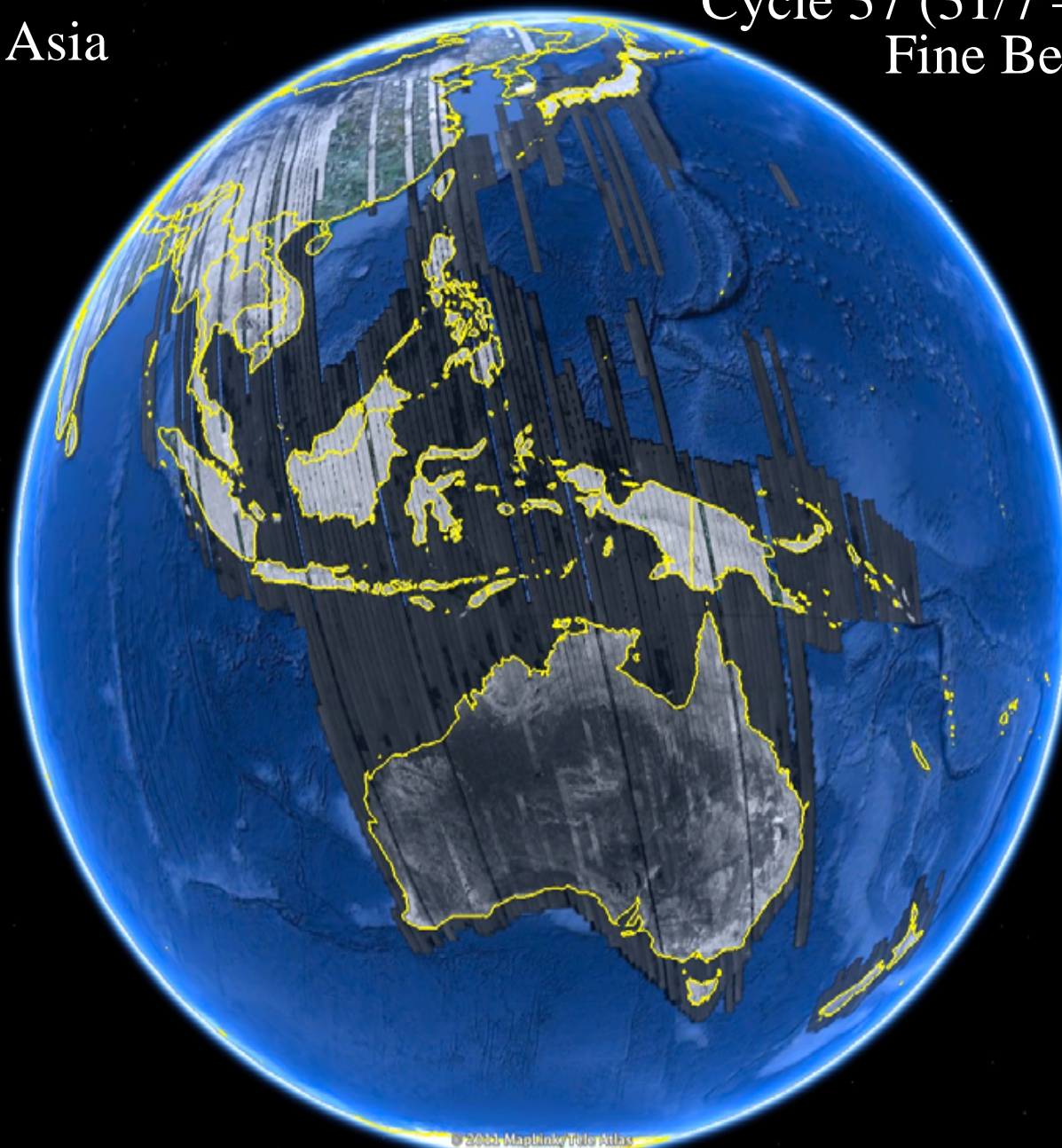
# Mission Status

## 8. TDRS: Increase of ALOS data



Southeast Asia  
Australia

Cycle 37 (31/7 – 14/9 2010)  
Fine Beam HH+HV



Analyzed by JAXA, (c) JAXA, METI

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US Dept of State Geographer  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

lat -8.877550° lon 129.358204° elev -1244 m

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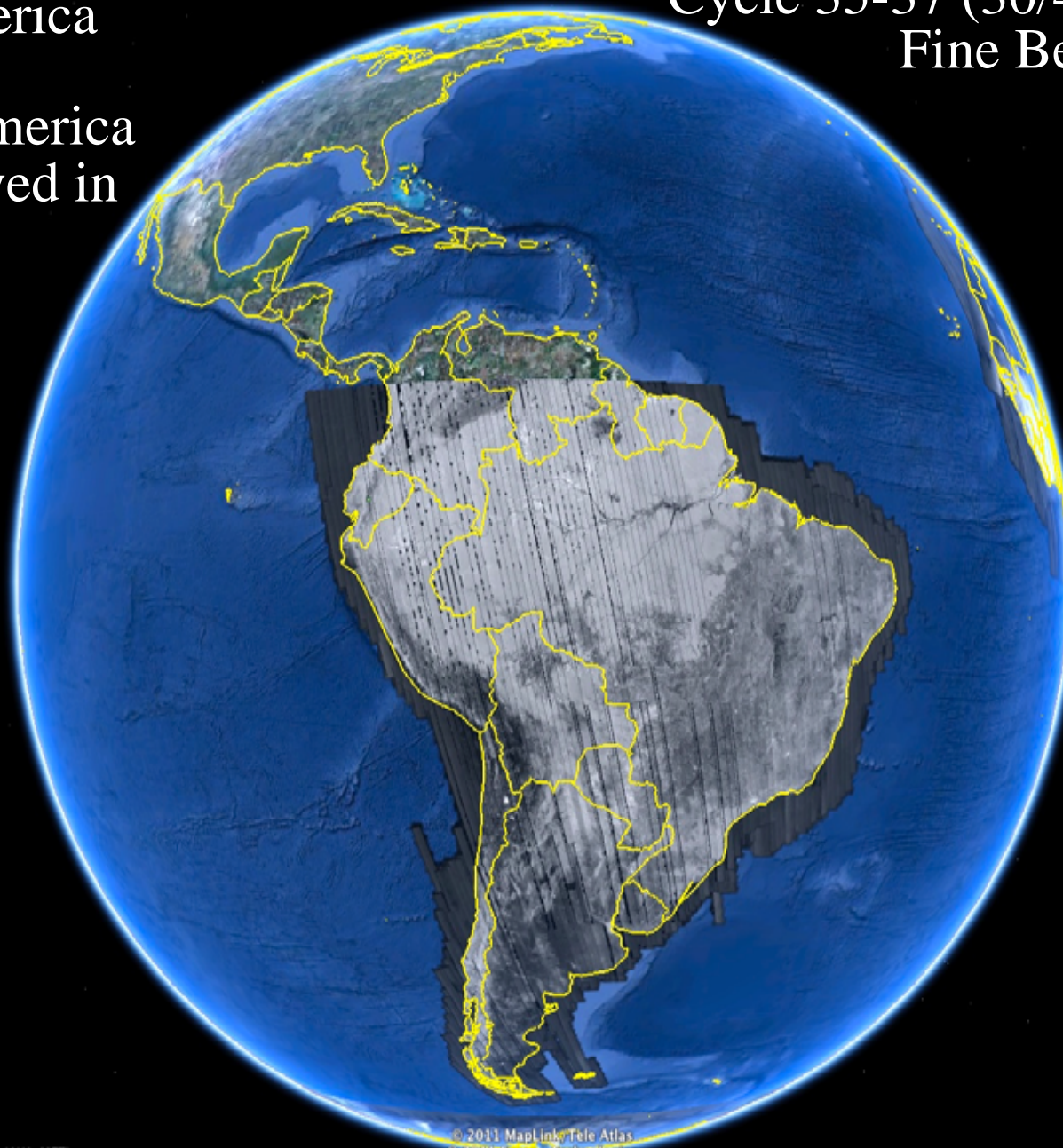
Eye alt 12095.93 km



# South America

(N & C America  
not displayed in  
this plot)

Cycle 35-37 (30/4–14/9 2010)  
Fine Beam HH+HV



Analyzed by JAXA, (c) JAXA, METI

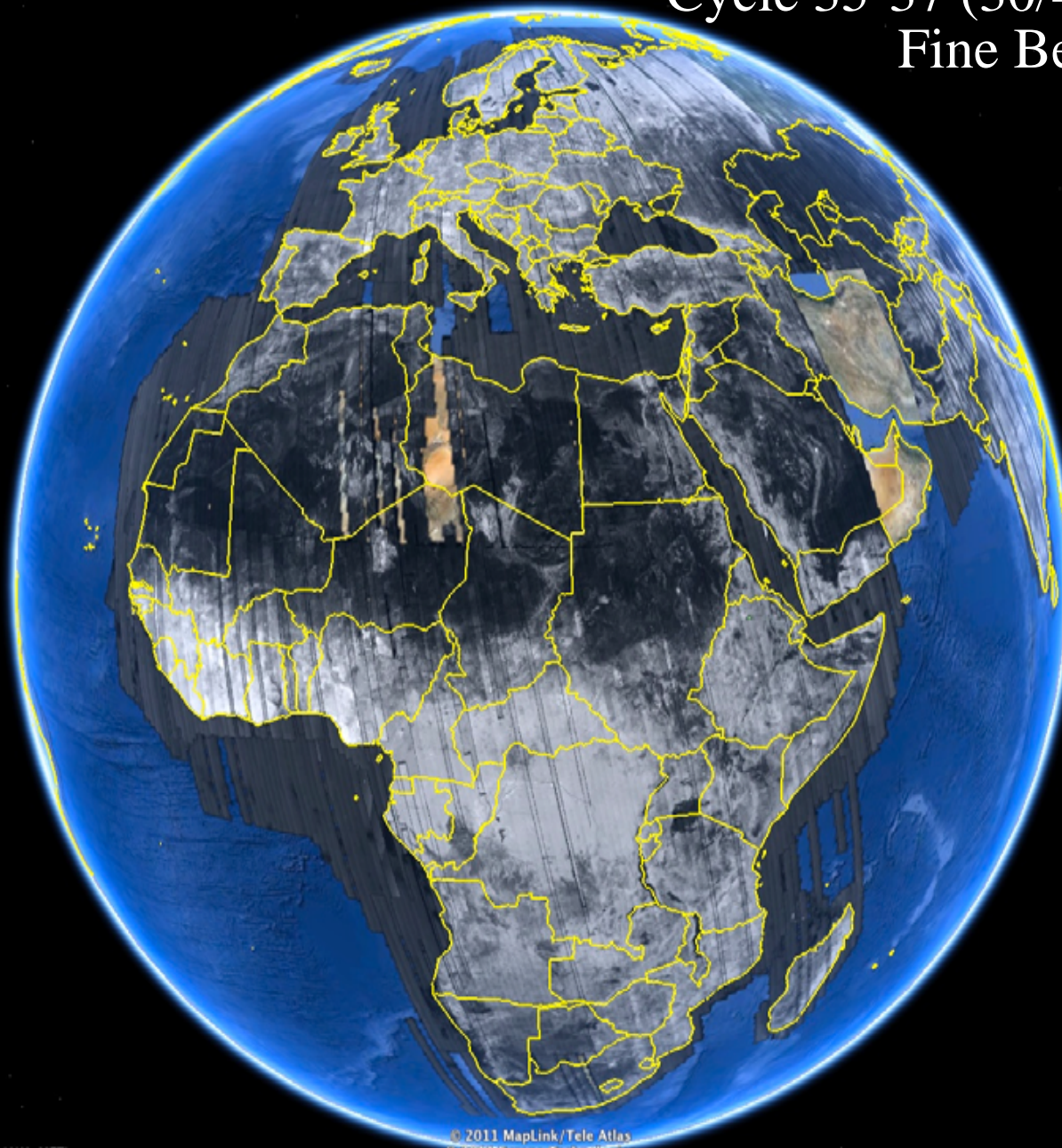
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Eye alt 12103.56 km

Africa  
Europe

Cycle 35-37 (30/4–14/9 2010)  
Fine Beam HH+HV



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Data SIO, NOAA, U.S. Navy, NGA, GEBCO

lat 16.658318° lon 21.588759° elev 791 m

©2010 Google

Eye alt 12100.92 km

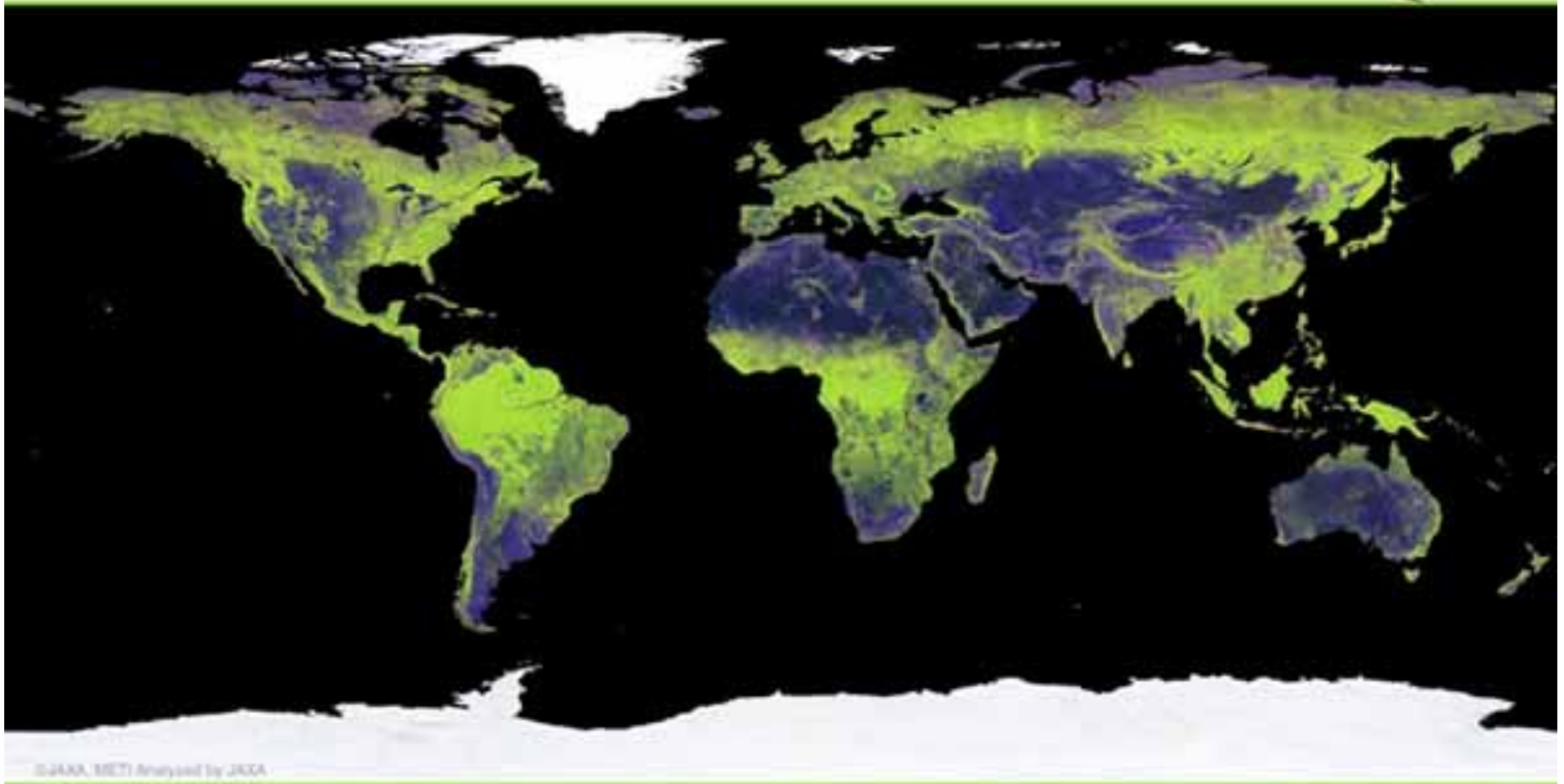


# ALOS-1 data acquired June-Sep 2009

## To be continued....



PALSAR 10m Global Mosaic 2009



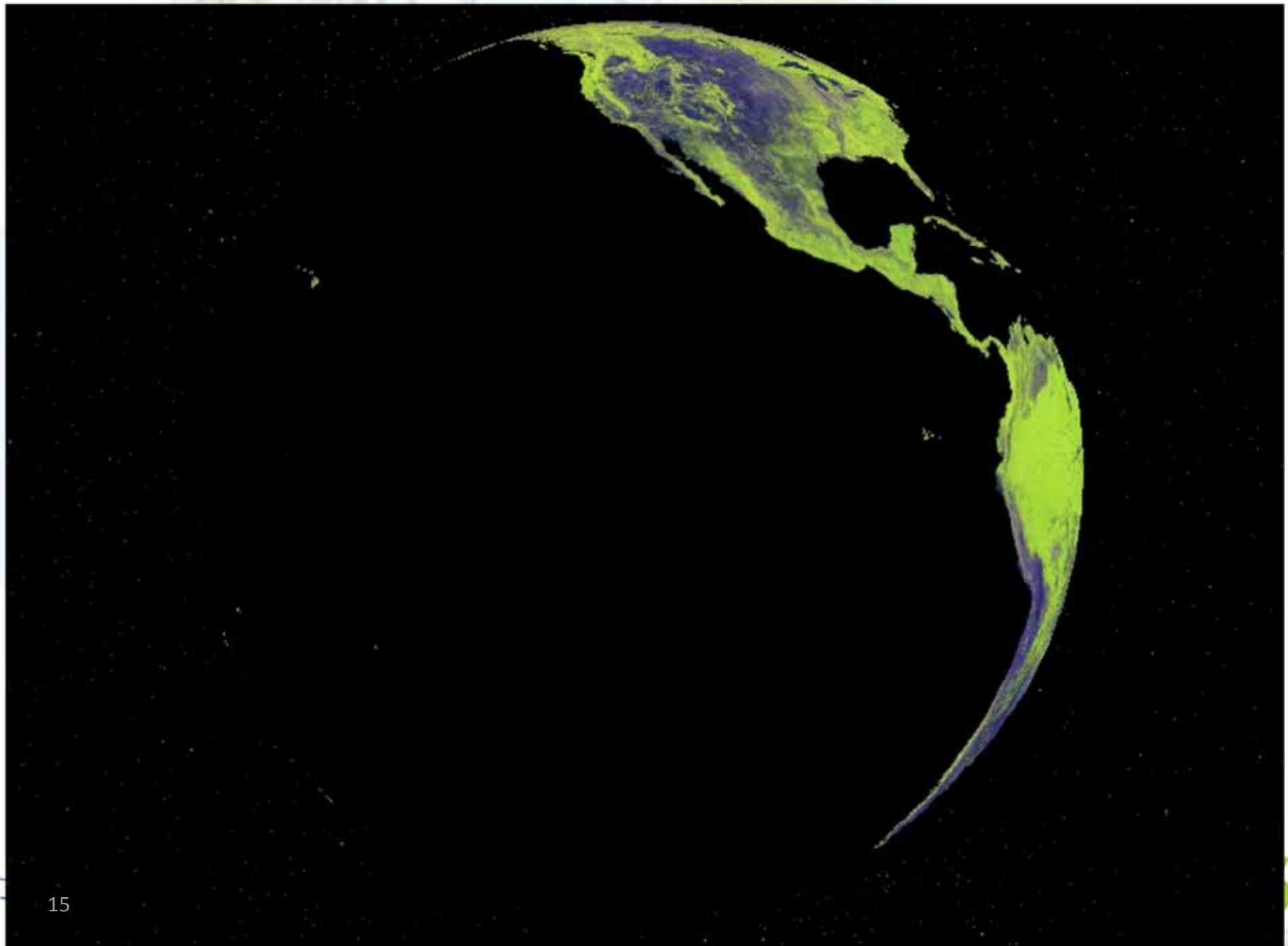
SDCG-1

Montreal, Canada. March 6-8, 2012

RHH G.HV BHKW



PALSAR (HH+HV) 10m Global Mosaic 2009 and Forest/Non-forest mosaic



# Summary of Mission Capacity to meet FCT/GFOI needs (2/2)

## Near-future missions of relevance

- Mission Please provide a short description of the **near-future** missions of relevance (several slides ok), including the following points:
  - Scheduled launch
  - Expected start of operations
  - Planned mission life time
  - Sensor characteristics (type, spatial resolution, nominal revisit, etc.)
  - Expected system capacity / average duty cycle (min/rev)
  - Planned acquisition strategies of relevance to/in support of GEO-FCT/GFOI (if any)
  - Possibilities to accommodate modifications in the acquisition scheduling (as per jointly developed plans through SDCG)
  - Geographical Priorities, if any

# Meeting the FCT/GFOI Data Requirements

- Expected capacity to contribute to the “CEOS Data Strategy in support to GFOI” (Level-1: continental-scale wall-to-wall; Level-2: national/sub-national-scale wall-to-wall; Level-3: Local-scale over FCT National Demonstrator sites)
  - Capabilities
  - Possible data gaps
  - System constraints
  - Acquisition Scheduling Procedure
  - Geographical Priorities, if any

# Summary of Mission Capacity to meet FCT/GFOI needs

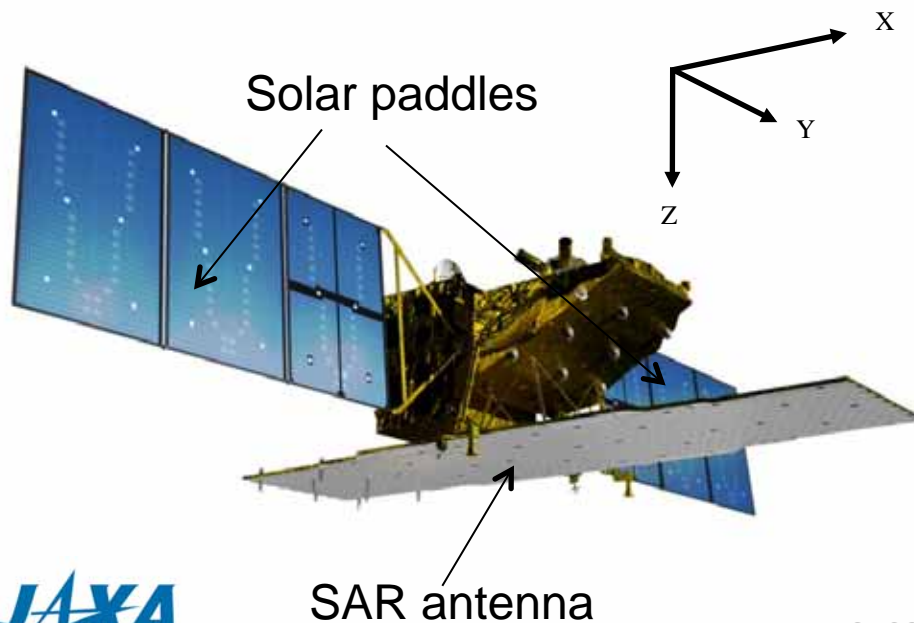
## Near-future missions of relevance: **ALOS-2**

### ALOS-2 satellite

- **Launch** : Aug-Oct 2013
- **Orbit type** : Sun-synchronous
- **Altitude** : 628 km +/- 500 m (for reference orbit)
- **Revisit time** : 14 days
- **LSDN** : 12:00 +/- 15 min

### PALSAR-2

- L-band Synthetic Aperture Radar
- Active Phased Array Antenna type  
two dimensions scan (range and azimuth)
- Antenna size : 3m(EI) x 10m(Az)
- Bandwidth : 14 – 84MHz
- Peak transmit Power : 5100W
- Observation swath : 25 – 490km
- Resolution : Range: 3 m to 100 m  
Azimuth: 1 m to 100 m



## ALOS-2 mission objectives

- ALOS-2 is an L-band SAR (PALSAR-2) satellite mission planned for launch in Aug/Oct. 2013
- Main mission objectives are:
  - Land management and forest monitoring
  - Resource management and map generation
  - Resource exploration
  - Disaster monitoring
- ALOS-2 provides higher resolution, improved sensitivity and higher image quality than ALOS.
- Data Policy: yet to be determined

# PALSAR-2 Specifications

	Spotlight	Ultra Fine	High sensitive	Fine	ScanSAR nominal		ScanSAR wide
Bandwidth	84MHz	84MHz	42MHz	28MHz	14MHz	28MHz	14MHz
Resolution	Rg×Az: 3×1m	3m	6m	10m	100m		60m
Swath	Rg×Az: 25×25km	50km	50km	70km	350km (5-scan)		490km (7-scan)
Polarization	SP	SP/DP	SP/DP/FP/CP		SP/DP		
NESZ	-24dB	-24dB	-28dB	-26dB	-26dB	-23dB	-23dB
S/A	Rg	25dB	25dB	23dB	25dB	25dB	20dB
	Az	20dB	25dB	20dB	23dB	20dB	20dB

SP : HH or VV or HV , DP : HH+HV or VV+VH , FP : HH+HV+VH+VV , CP : Compact pol (Experimental mode)

Main applications:

Fine beam (DP): Forest and land cover monitoring

ScanSAR (DP): Rapid deforestation / wetlands / InSAR (ScanSAR-ScanSAR)

Spotlight (SP): Emergency observations

Ultra Fine (SP) : InSAR base mapping

High sensitive (QP): Forestry, flood observations

ScanSAR wide (SP) : ship detection.



## ALOS-2 Global Acquisition Strategy

- A global-scale systematic acquisition strategy was implemented for ALOS (Dec 2006 – April 2011), providing wall-to-wall coverage of all global land areas 2 times per year (20 m resolution, dual-polarisation)
- A similar global acquisition strategy is being implemented for PALSAR-2 on ALOS-2
  - Global w2w: 10 m, dual-pol (HH+HV) 2 times/year
  - Global w2w: 3 m, HV, 1 time/3 years
  - Pan-tropical w2w: 100 m, dual-pol 5 times/year
  - Pan-tropical w2w: 6 m, quad-pol, 1 time/year
- PALSAR-2 acquisition strategy: **FOREGROUND** mission
  - i.e. top priority programming

# Meeting the FCT/GFOI Data Requirements

- Expected capacity to contribute to the “CEOS Data Strategy in support to GFOI” (Level-1: continental-scale wall-to-wall; Level-2: national/sub-national-scale wall-to-wall; Level-3: Local-scale over FCT National Demonstrator sites)
  - Capabilities: CEOS Global Baseline (Level-1) covered by default by ALOS-2 within BOS-2 acquisition plan.  
Level-2 and Level-3 also foreseen to be accommodated within BOS-2.
  - Possible data gaps: Automatic gap-filling to be applied
  - System constraints: Duty cycle XX min/orbit
  - Acquisition Scheduling Procedure: Pre-launch scheduling. By ALOS-2 group at JAXA EORC. Manager: M. Shimada.
  - Geographical Priorities, if any: All global land areas