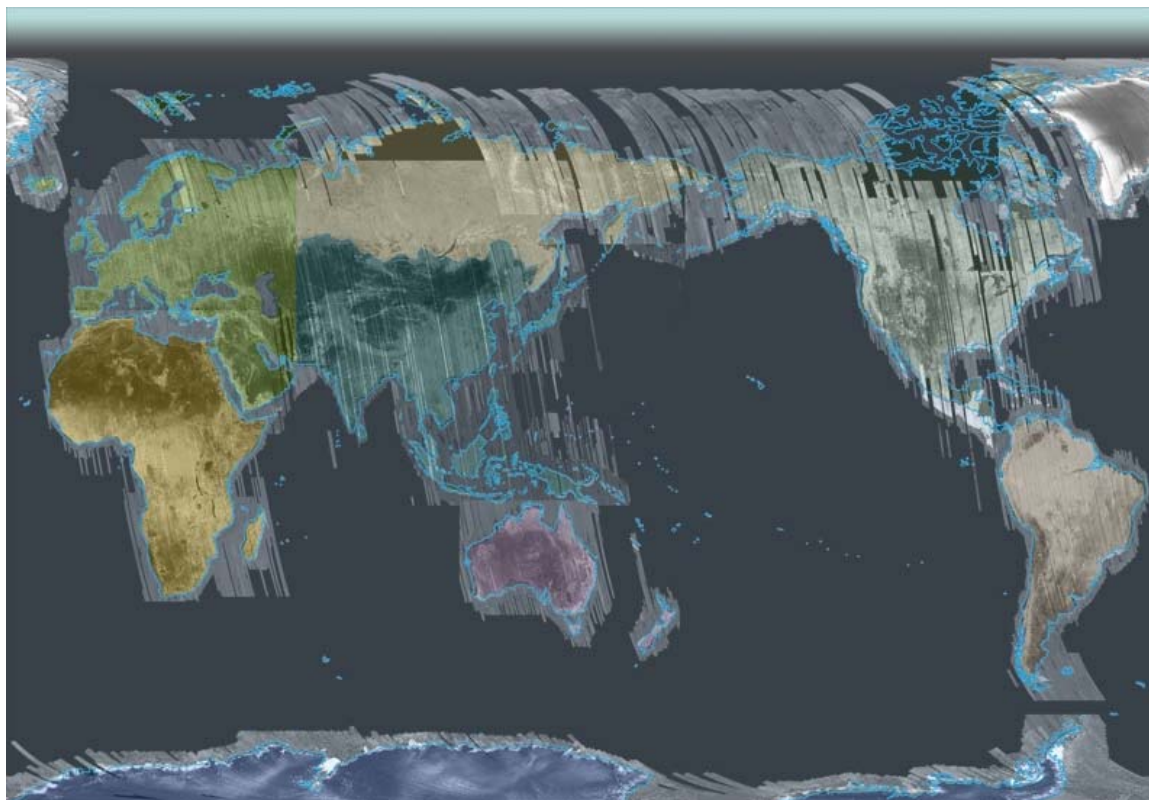


The PALSAR Systematic Observation Strategy

Ake Rosenqvist & Masanobu Shimada

JAXA EORC





The Systematic Observation Strategy (Basic Observation Scenario – BOS) for ALOS PALSAR

- Fine resolution satellite archived traditionally fragmented and heterogeneous
- ALOS the first fine resolution satellite mission to implement a fixed systematic data acquisition plan
- Implemented as a top-level **foreground mission** with a priority second only to that of special observation requests and emergency observations (e.g. earthquakes, natural disasters) and sensor calibration/validation.
- Designed to serve all ALOS user categories
- Aims to accommodate systematic global-scale, fine-resolution, monitoring of the environment through spatially and temporally consistent acquisitions over all land areas on the Earth on a repetitive basis.



Objectives of the ALOS Observation Strategy

- Support the ALOS PALSAR science objectives
- Improve initial poor simulation results due to request conflicts between the many ALOS user groups:
 - JAXA internal requests (K&C science programme, Cal/Val, solid Earth, sea ice...)
 - METI/ERSDAC (geology, resource exploration)
 - Japanese Gov't Agencies (M-Environment, M-Forestry & Agriculture, Coast Guard, Geographical Survey Inst. ...)
 - ALOS PI programme
- Response to Art. 10d of the Kyoto Protocol, which calls on Parties to *"promote the maintenance and development of systematic observation systems and development of data archives to reduce uncertainties related to the climate system, and the adverse impacts of climate change..."*.
 - > 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 the target, continuation with ALOS-2

***Systematic Data Acquisitions - A Pre-requisite for Meaningful Biophysical Parameter Retrieval?**

Communications, IEEE Transactions on Geoscience and Remote Sensing, Vol. 41:7, 2003.



Approach to minimise programming conflicts

Step 1: Reducing the number of operational modes to a small number of "default observation modes" (132 => 6)

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:

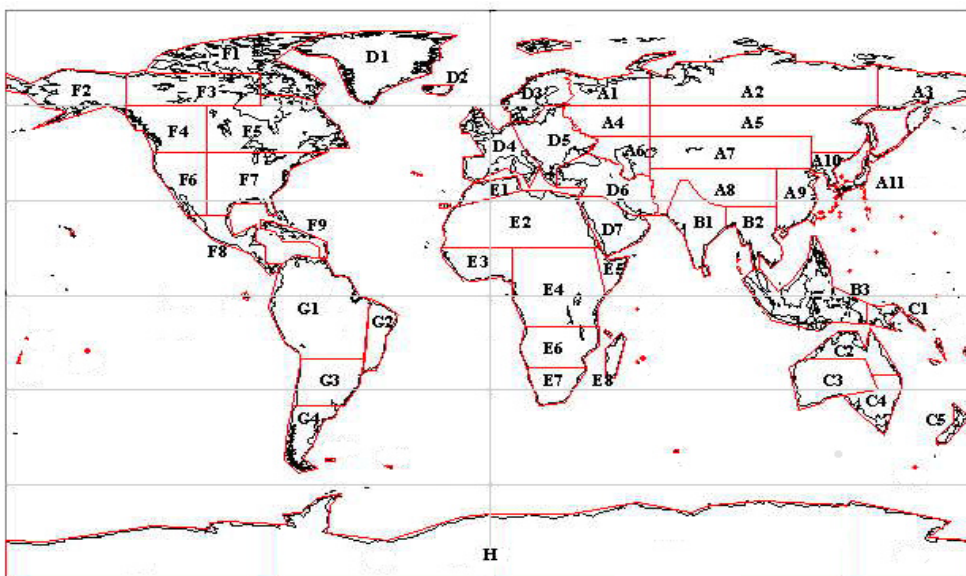
- Dedicated to regional-scale, every-cycle repeat monitoring
- ScanSAR HH 5-beam (Wetlands & Rapid-deforestation)

"Best trade-off" sensor modes based on scientific requirements, identified in collaboration with a science advisory group.




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										
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																				



QE Islands	F1															
Alaska	F2															

Fixed observation modes (ascending passes)

HH 34.3°	
HH+HV 34.3°	
HH+HV+VH+VV 21.5°	



PALSAR Ascending acquisitions

Year		2005												2006												2007												2008												2009				
Month		12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5											
Satellite cycle		3	4	5	6		7	8	9	10		11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26		27	28	29	30																						
Siberia NW	A1																																																					
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Korea	A12																																																					
Japan	A20-35																																																					
India	B1																																																					
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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																																																					
Europe central	D5																																																					
Europe E	D6																																																					
Middle East	D7																																																					
Arabia	D8																																																					
Morocco	E1																																					</																



HH 34.3°



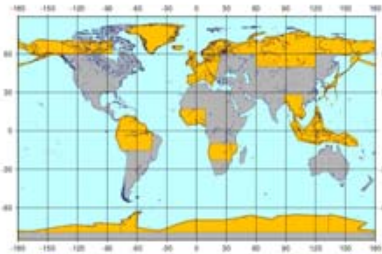
HH+HV 34.3°



HH+HV+VH+VV 21.5°



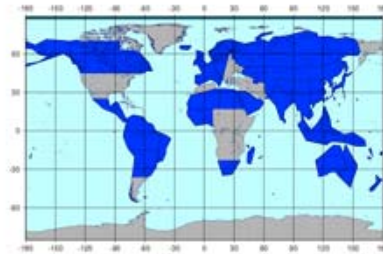
PALSAR Ascending acquisitions 2009/2010



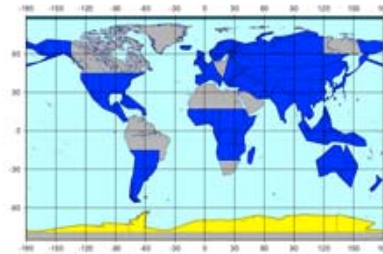
CYCLE_27 / 27-Apr.-2009



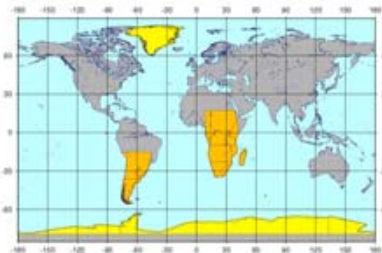
CYCLE_28 / 12-Jun.-2009



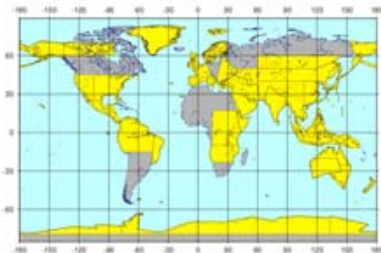
CYCLE_29 / 28-Jul.-2009



CYCLE_30 / 12-Sep.-2009



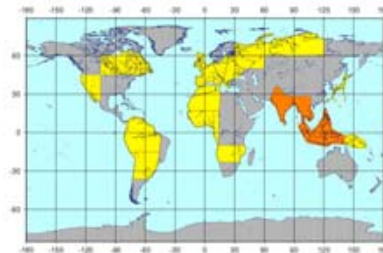
CYCLE_31 / 28-Oct.-2009



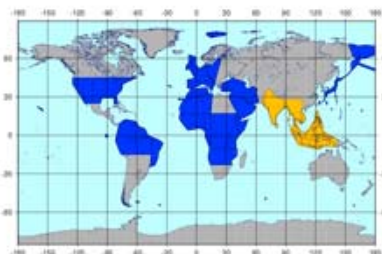
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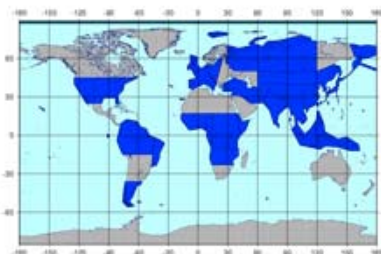
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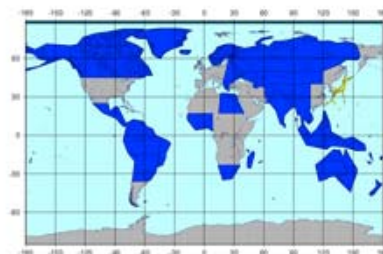
CYCLE_34 / 15-Mar.-2010



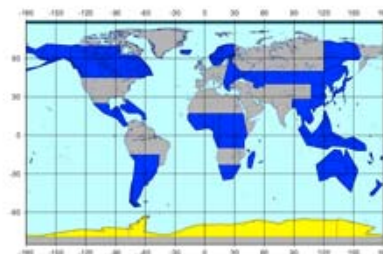
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CYCLE_36 / 15-Jun.-2010

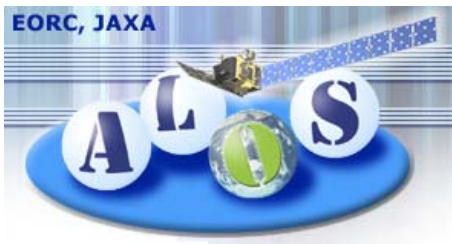


CYCLE_37 / 31-Jul.-2010



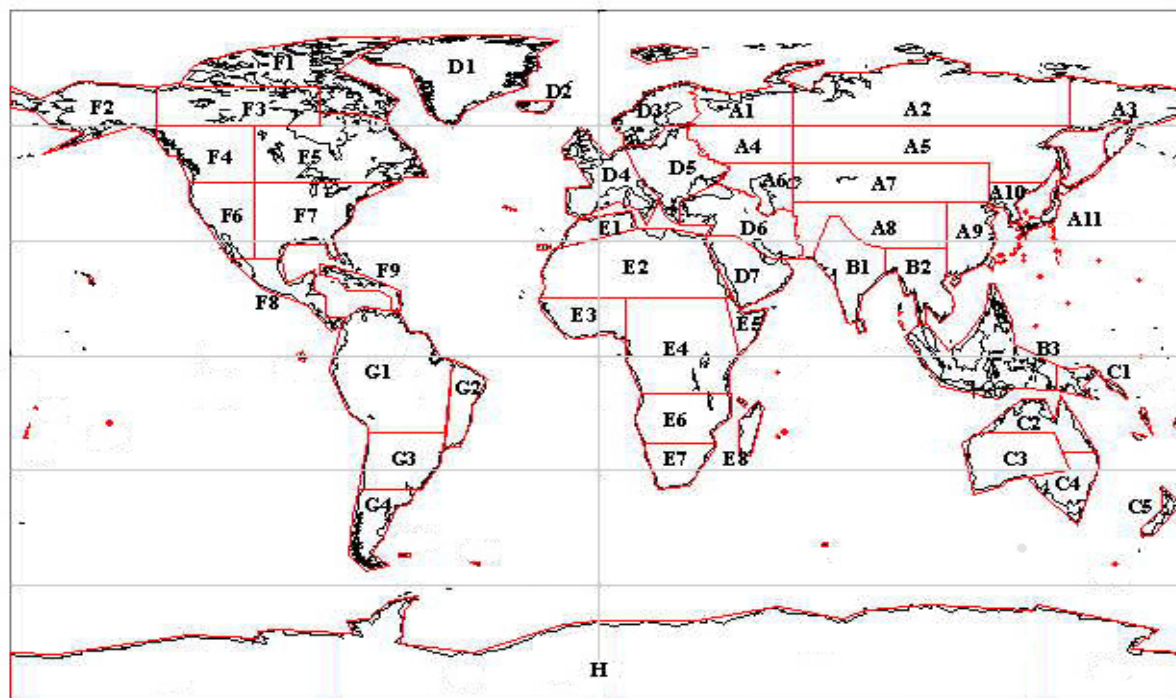
CYCLE_38 / 15-Sep.-2010

Sensor mode	Off-nadir	Polarization
Fine Beam	41.5°	HH
Fine Beam	34.3°	HH+HV
Fine Beam	21.5°	HH+HV+VH+VV
Fine Beam	23.1°	HH+HV+VH+VV
Fine Beam	34.3°	HH



PALSAR Ascending acquisition plan

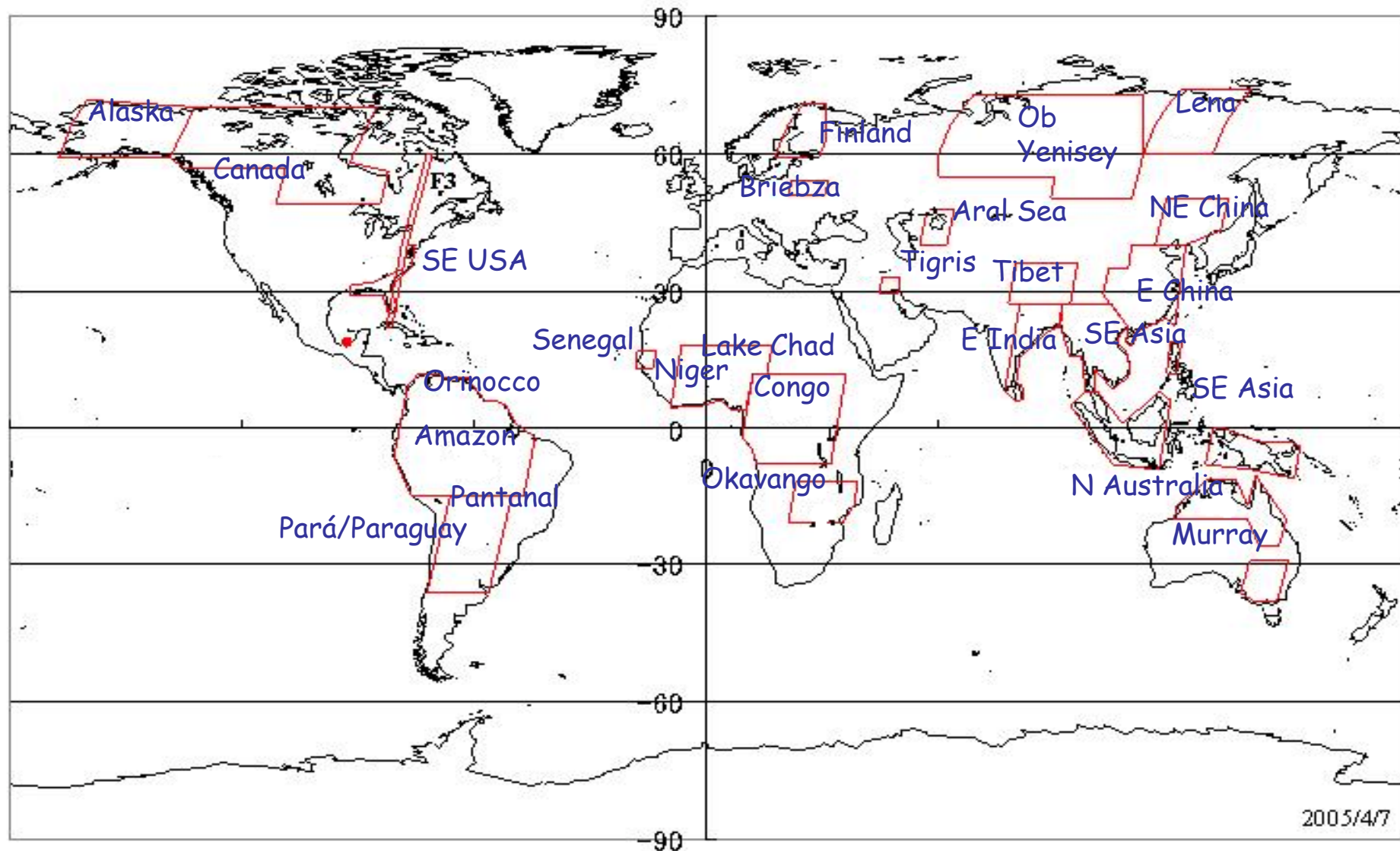
- 3-5 global PALSAR coverages annually
 - Fine-res HH+HV @ 41.5° (summer/dry season)
 - Fine-res HH @ 41.5° (winter/wet season)
 - Scansar HH (descending)
- Bi-annual global coverage in InSAR mode (boreal - annual)
- Repetition during ALOS life-time

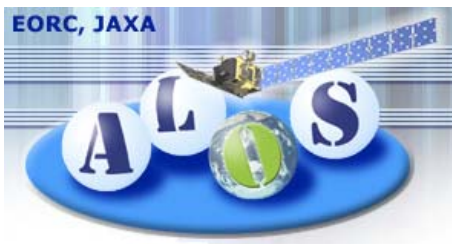


To minimise seasonal bias in the PALSAR time series, each region is covered the same time (months) every year, within a 46-day time period.



PALSAR Descending acquisition plan (ScanSAR)

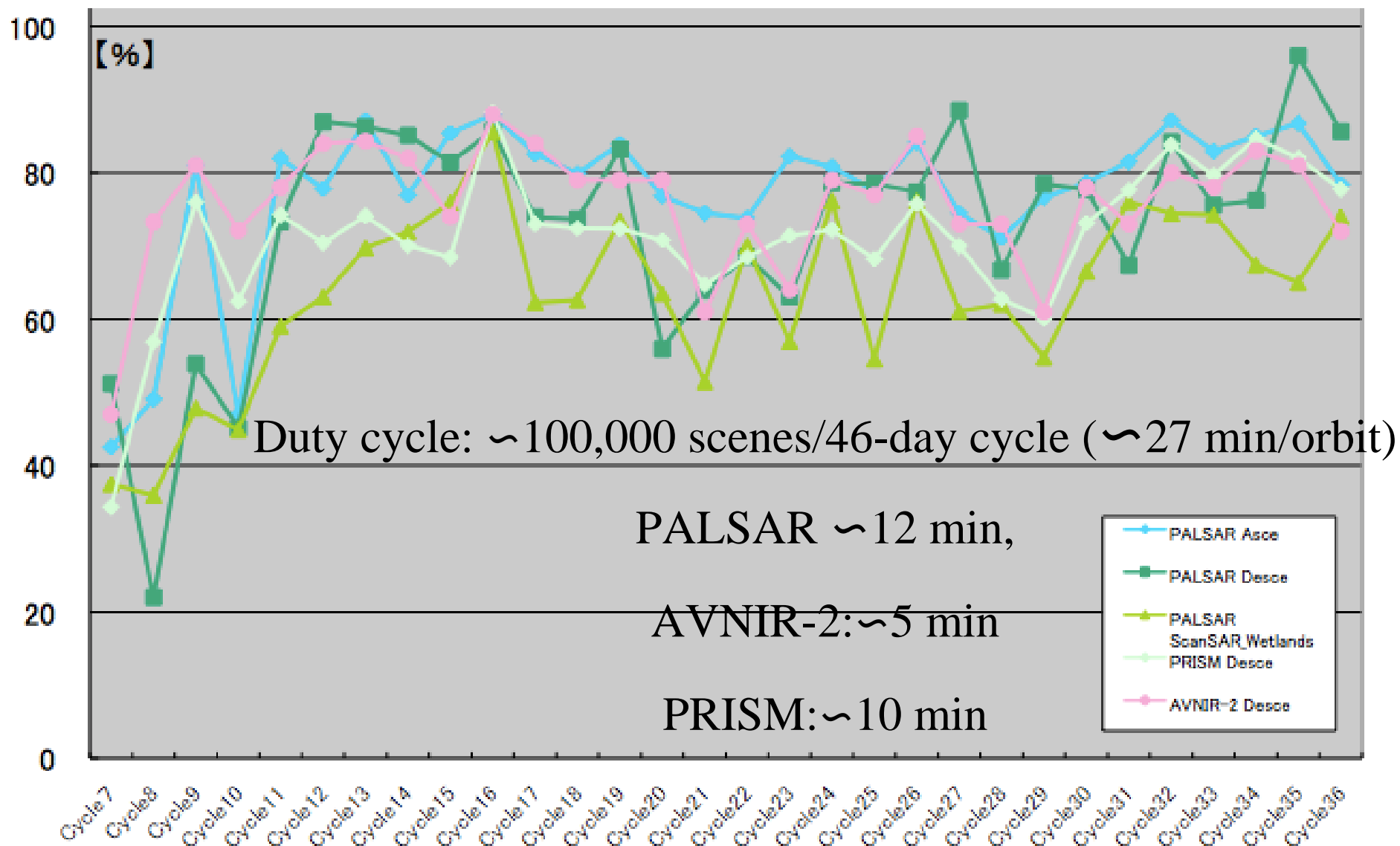




ALOS BOS in operation

Acquisition success rate:

Strip map (Asc) : ~80%, ScanSAR (Desc) : ~72%





Acquisition results available online at

http://www.eorc.jaxa.jp/ALOS/en/kc_mosaic/kc_mosaic.htm



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http://www.eorc.jaxa.jp/ALOS/en/index.htm

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- New Arrived Images
- Library
- Examples of Researches

IPY Dataset Homepage

Monitoring the north and south polar regions using the ALOS/PALSAR (International Polar Year).

- IPY Dataset Homepage

K&C Mosaic Homepage

The research development targets for ALOS data utilization and its algorithm development for data products are described.

- K&C Mosaic Homepage

Science Program

The research development targets for ALOS data utilization and its algorithm development for data products are described.

- Concept and its Background
- Goals of ALOS Research Plan
- Concept and its Background
- General Goals
- Strategic Goals

Guidance

FAQ and guidance to use ALOS products.

LINK

- ALOS User's Forum (AADN)
- Data search for PI AUIG
- Sentinel Asia
- Earth Observation Research Center (EORC), JAXA
- Earth Observation Center (EOC), JAXA
- ALOS Project Team, JAXA
- Space Applications Mission Directorate, JAXA
- Japan Aerospace Exploration Agency (JAXA)
- PI-SAR@EORC (Japanese only)

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The International Charter Space and Major Disasters

http://www.eorc.jaxa.jp/ALOS/en/kc_mosaic/kc_mosaic.htm

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K&C Mosaic Homepage

Downloading products and browsing images

Data files (Raw format) and image files (PNG format) are available via each clickable map by FTP.

KML file is also available for browsing the mosaic image by using Google Earth or NASA World Wind.

PALSAR 50m Orthorectified Mosaic Product

This product covers over Asia and Oceania regions by mosaicing PALSAR data which is resampled into 50m^{*1} from original data. The product will be made once a year. Following observation mode is used for the product.

FBD 34.3 HH / HV^{*2}

*1. Mosaic images are projected into geographical latitude and longitude coordinates. So the spatial resolution of 50m is corresponded to 1.6170 sec.

*2. HH and HV polarization data are kept in BSQ format. Color composition of the image data is R=HH, G=HV, B=HH/HV and enhanced.

kml file (All area) download (kml file / 26KB) download

PALSAR 500m Browse Mosaic Product

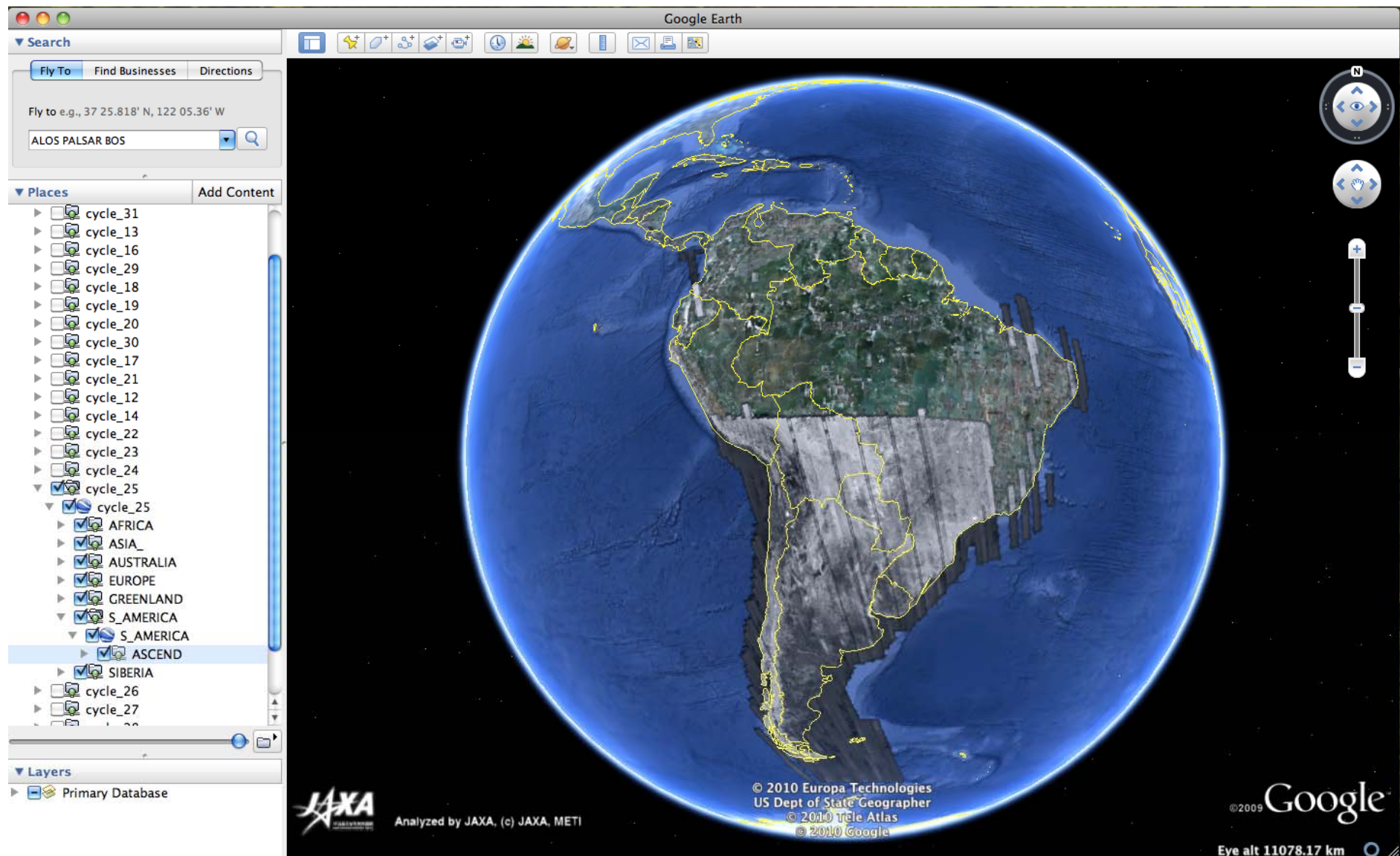
This product covers all over the world by mosaicing PALSAR data which is resampled into 500m from original data. The product will be made every cycle. Following observation modes are used to generate products.

FBS 34.3 HH
FBD 34.3 HH / HV
WB1 5beam HH
WB2 5beam HH

Done



500 m browse mosaics showing acquisition results for each 46-day cycle available as KML files.





PALSAR pass definition

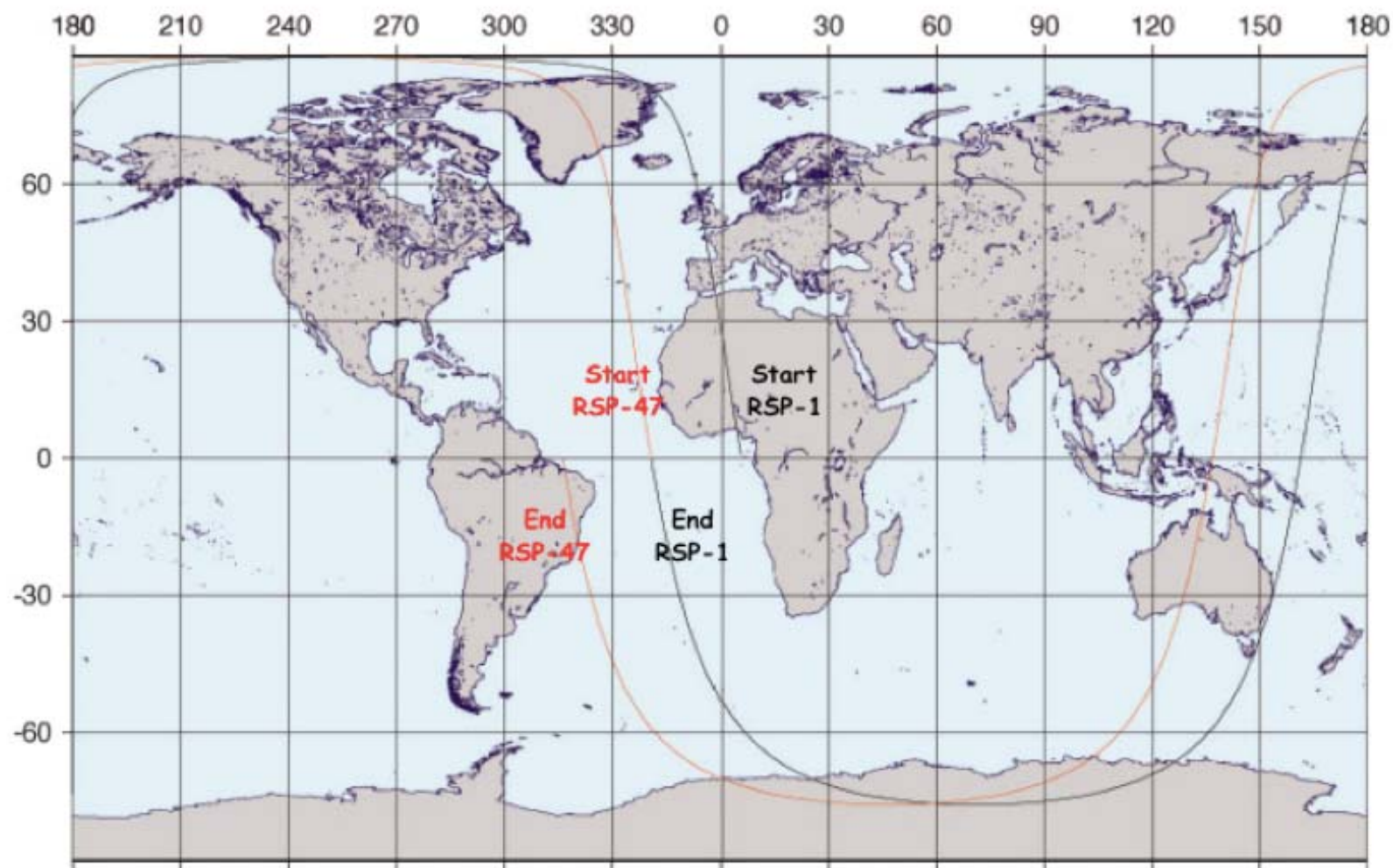


Figure 1.4.1 RSP pass definition concept. RSP pass numbers begin and end at ascending crossing of the Equator.



PALSAR pass order

Ascending passes

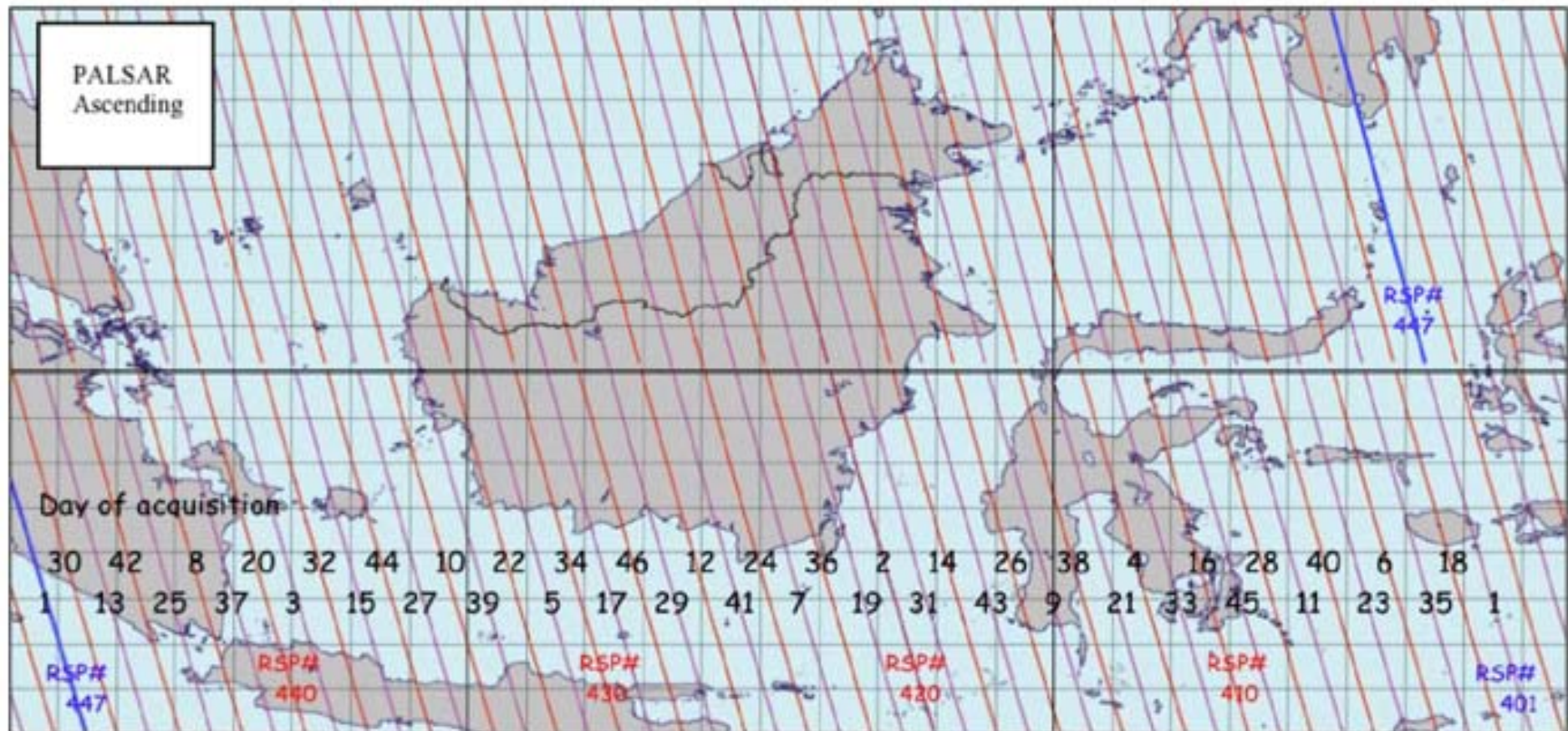


Figure 1.4.2 RSP pass map [ascending passes]. Numbers in black indicate the relative day of acquisition during a given 46-day repeat cycle (Note: path numbers depend on off-nadir angle and are here are given for illustration only).



PALSAR pass order

Descending passes

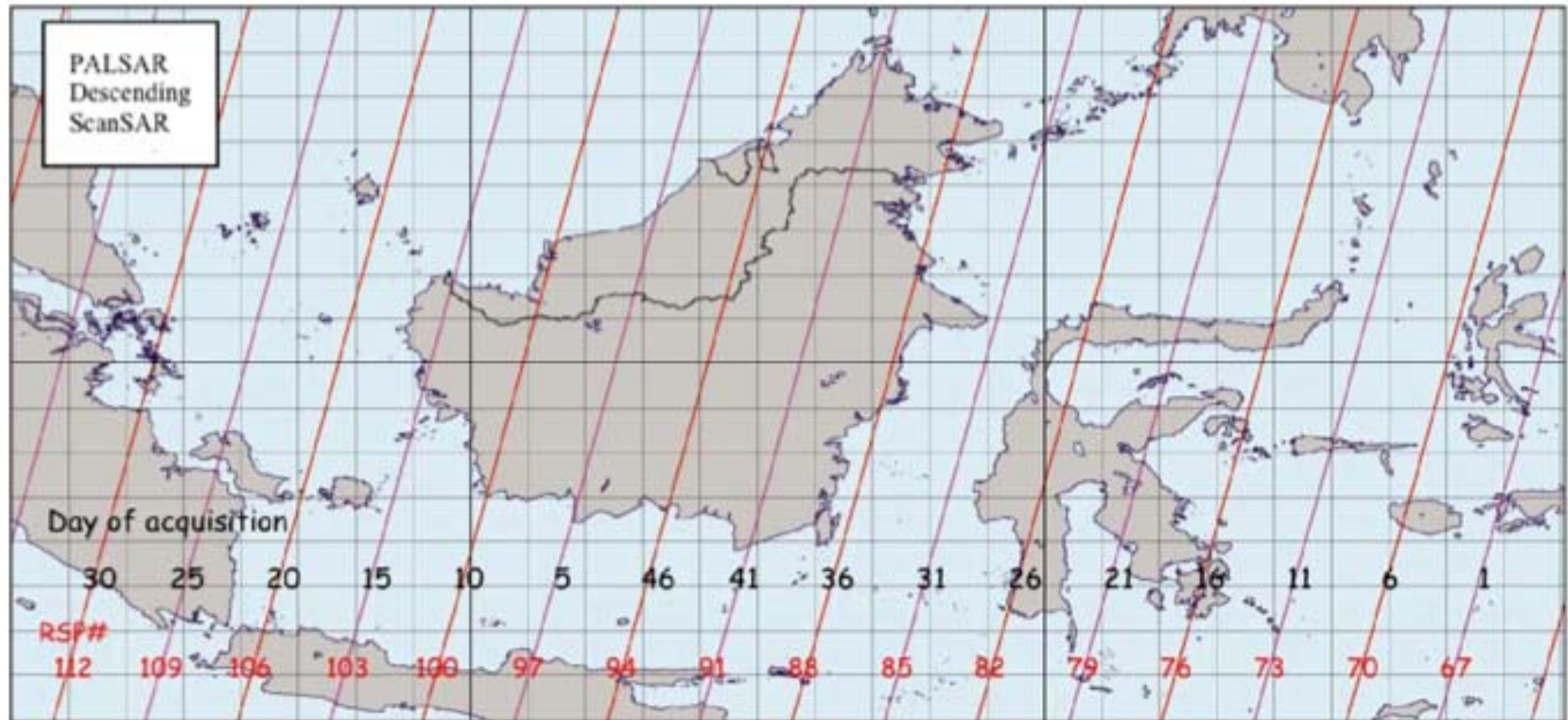


Figure 1.4.3 RSP pass map [descending; ScanSAR]. During standard operations in ScanSAR mode, data volumes are reduced by 2/3 by decreasing acquisitions to 1 out of every 3 ScanSAR passes.