Data Acquisition Strategy for ALOS PALSAR

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Kyoto & Carbon Initiative - 3rd Science Advisory Panel meeting
Friedrich-Schiller Universität Jena, Germany
October 14-15, 2002

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K&C Acquisition Strategy

Operational PALSAR modes selected*

K&C Operational Mode 1: Dual-pol (HH/HV) @ θ =34.3°

- HH: surface- and double-bounce scat. (linear structures, inundation)
- HV: volume scattering (vegetation structure/biomass)
- HV ch. more important than resolution (single pol: 10m, dual-pol: 20m)
- Quad-pol: reduced swath and small inc. angle only - not feasible.
- θ = 34.3° best trade-off angle (low θ: surface features, high θ: veg,)
- θ continuity with JERS-1 (35°)

K&C Operational Mode 2: ScanSAR (HH © 100m)

- For improved temporal resolution

* Science Panel meeting #1
(Tokyo, Nov.2001)

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K&C Acquisition Strategy
General features

K&C Mode 1 (HH/HV 34.3° 20m)
- Annual coverage of all land areas
- 2 data takes during 2 consecutive cycles (2*46 days)
  - InSAR
  - Gap-filling
- Summer/dry season targeted

K&C Mode 1x (HH 34.3° 10m)
- Annual coverage of non-arid land areas
- Winter/wet season targeted

K&C Mode 2 (ScanSAR HH 100m)
- For intensive mapping of wetlands, rice paddy & freeze/thaw
- 1 data take each (46 d) cycle during 1 year

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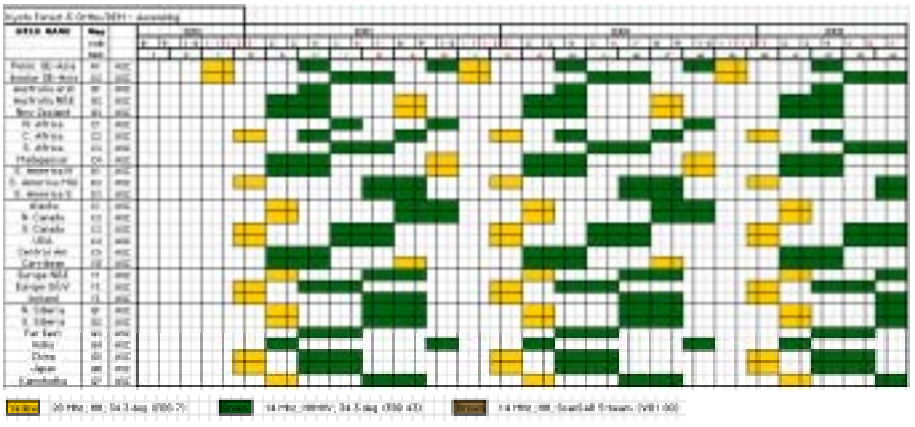
PALSAR Scenario (v.10/07/2002) - Ascending



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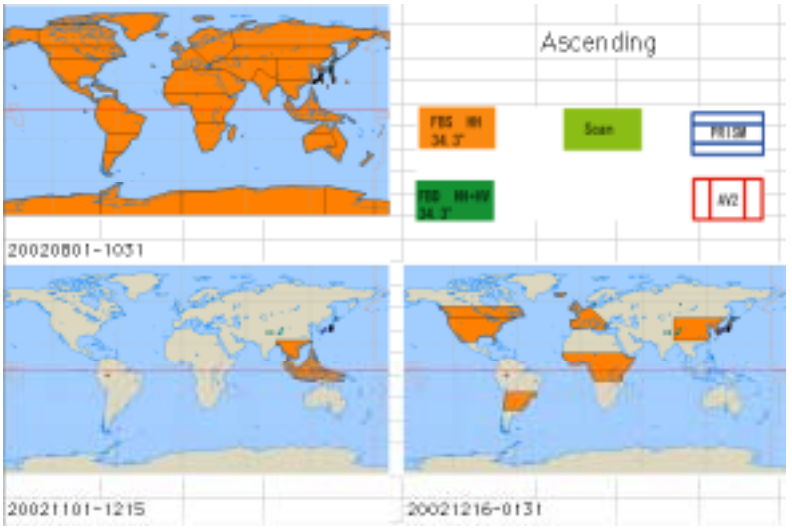
ALOS - Ascending

Cycle 1-4



PALSAR Observation Scenario v.10/07/2002

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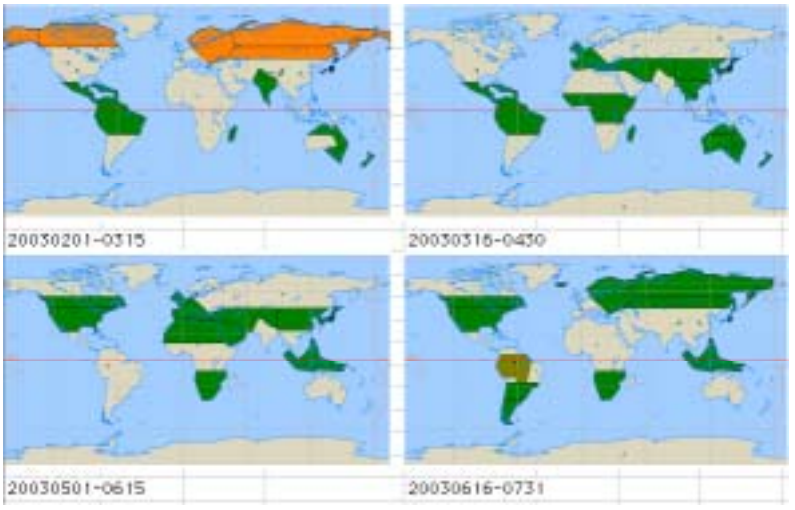
ALOS - Ascending

Cycle 5-8



PALSAR Observation Scenario v.10/07/2002

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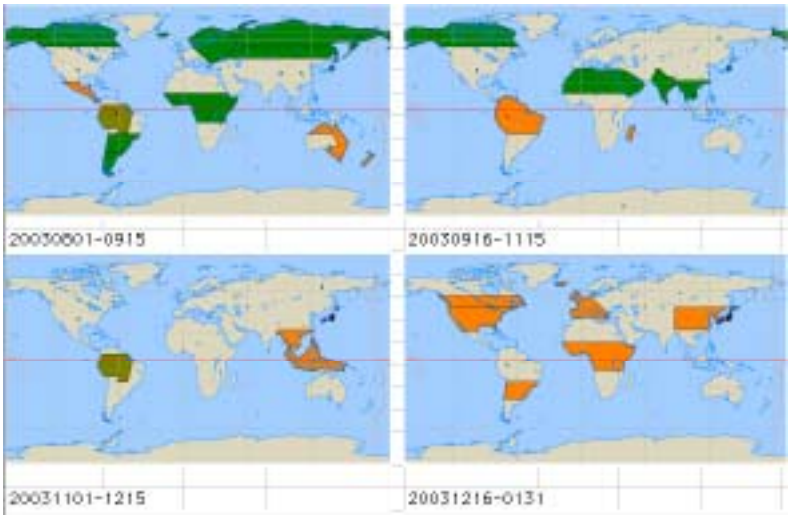
ALOS - Ascending Cycle 9-12



PALSAR Observation Scenario v.10/07/2002

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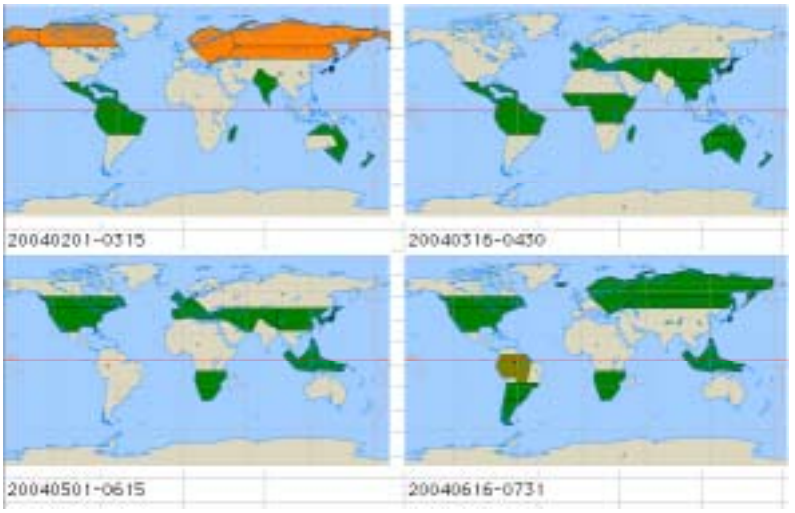
ALOS - Ascending Cycle 13-16



PALSAR Observation Scenario v.10/07/2002

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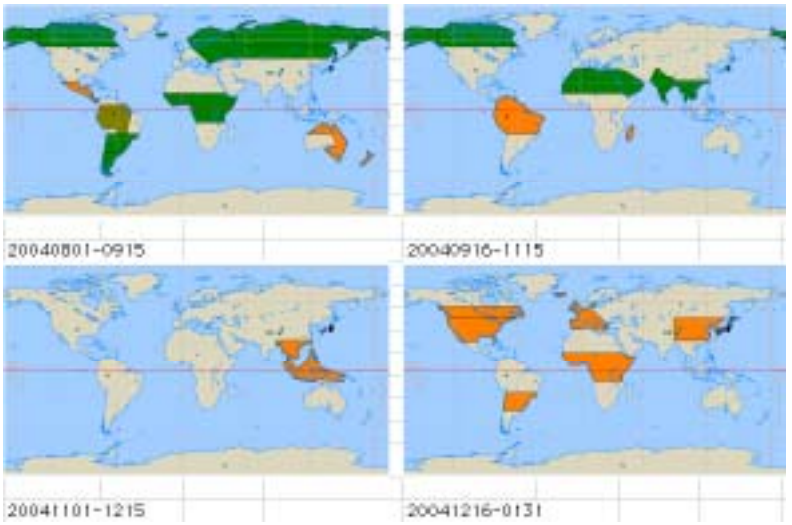
ALOS - Ascending

Cycle 17-20



PALSAR Observation Scenario v.10/07/2002

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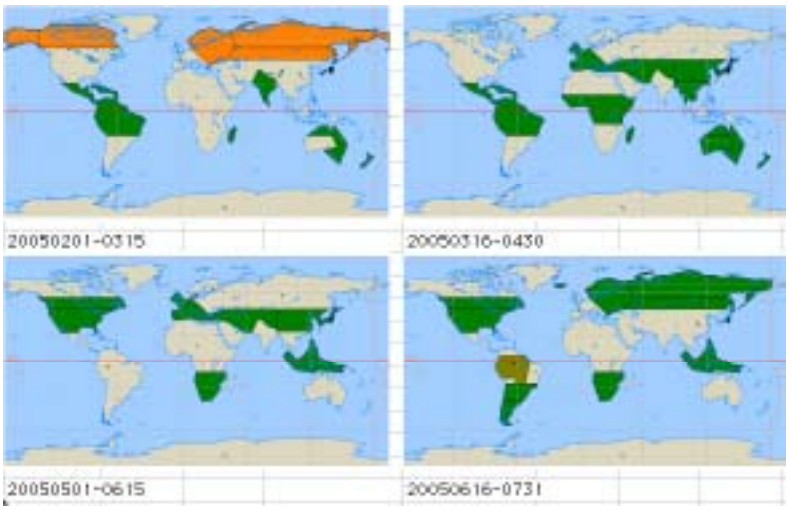
ALOS - Ascending

Cycle 21-24



PALSAR Observation Scenario v.10/07/2002

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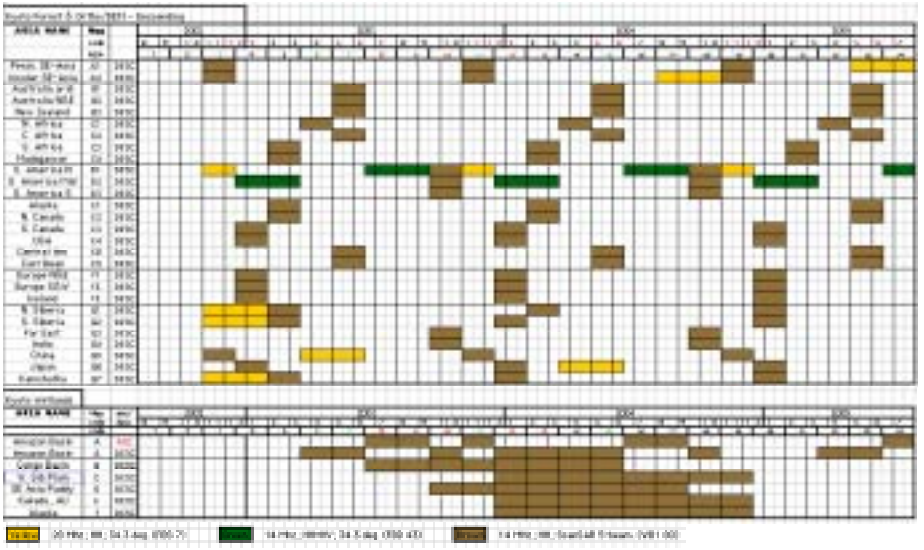
PALSAR Scenario (v.10/07/2002) - Descending



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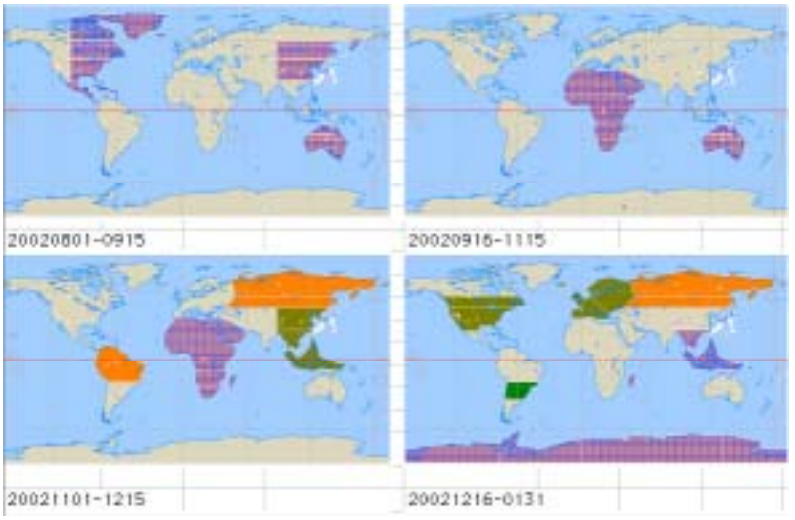
ALOS - Descending Cycle 1-4



PALSAR, PRISM AVNIR-2 Obs. Scenario v.10/07/2002

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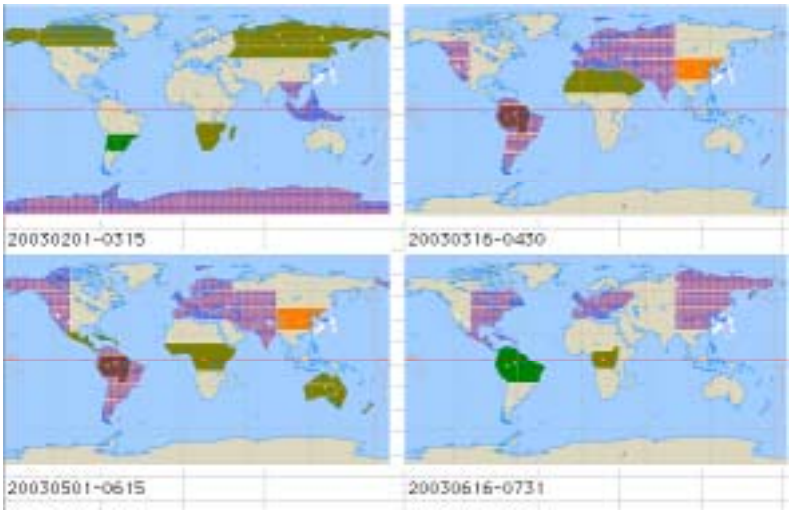
ALOS - Descending

Cycle 5-8

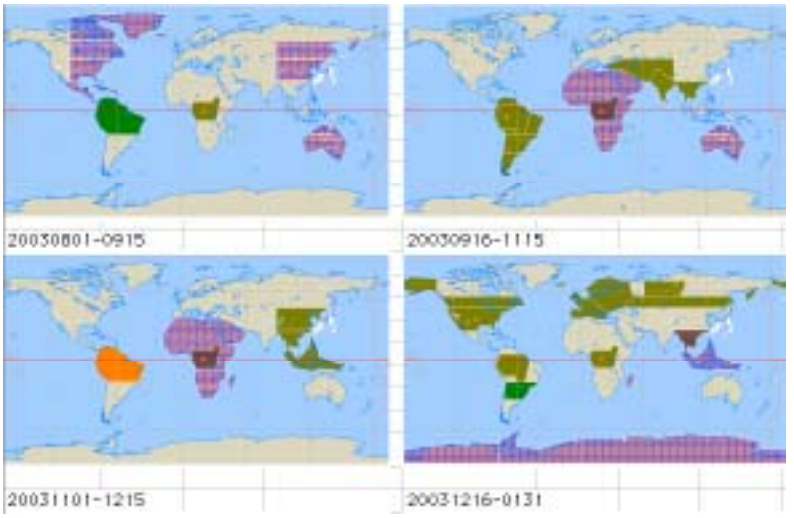


PALSAR, PRISM AVNIR-2 Obs. Scenario v.10/07/2002

NASDA

ALOS - Descending

Cycle 9-12

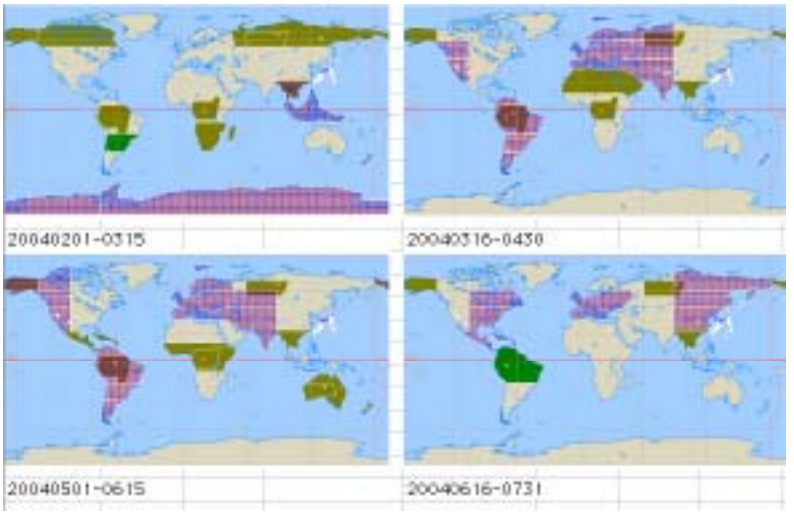


PALSAR, PRISM AVNIR-2 Obs. Scenario v.10/07/2002

NASDA

ALOS - Descending

Cycle 13-16

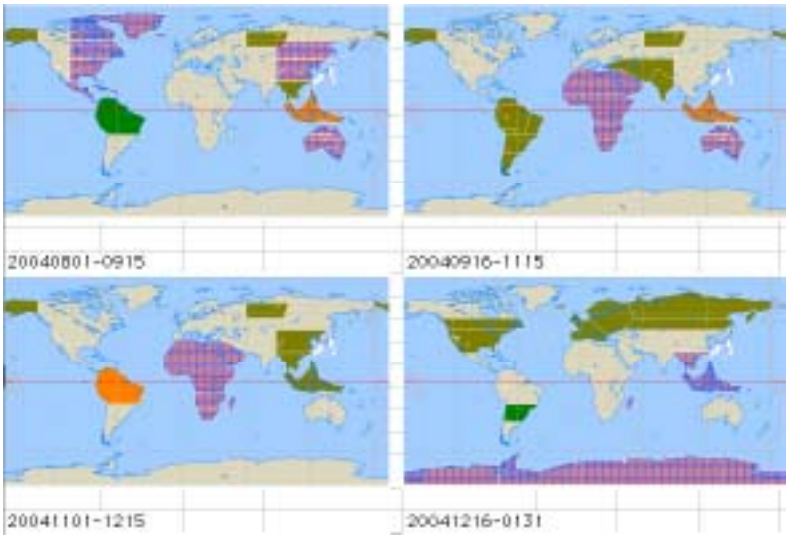


PALSAR, PRISM AVNIR-2 Obs. Scenario v.10/07/2002

NASDA

ALOS - Descending

Cycle 17-20



PALSAR, PRISM AVNIR-2 Obs. Scenario v.10/07/2002

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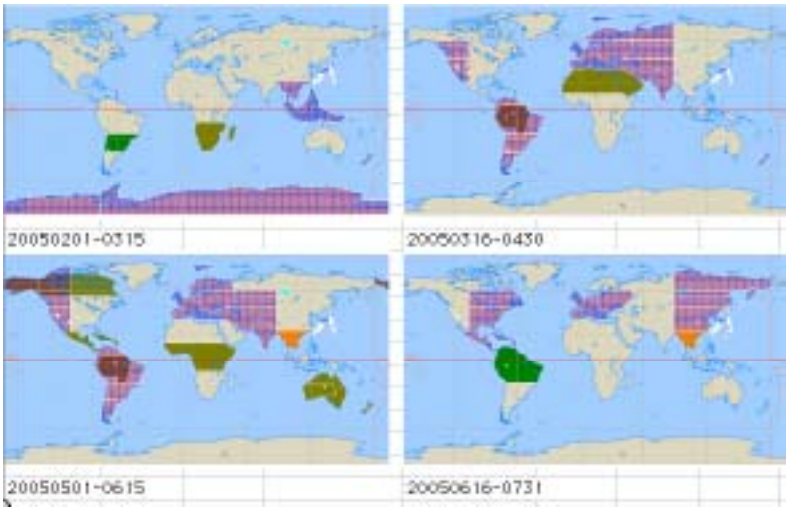
ALOS - Descending Cycle 21-24



PALSAR, PRISM AVNIR-2 Obs. Scenario v.10/07/2002

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Implementation of the ALOS PALSAR Acquisition Strategy

- ALOS acquisition simulations are currently on-going at NASDA on an iterative basis.
- Acquisition plan is in a "state of evolution" as the effects of conflicts and technical constraints that are revealed, are attempted to be by-passed or minimised.
- Alignment of the plan with other internal and external observation requests attempted.
- Over-all "rules" for meaningful data acquisitions are still being observed.

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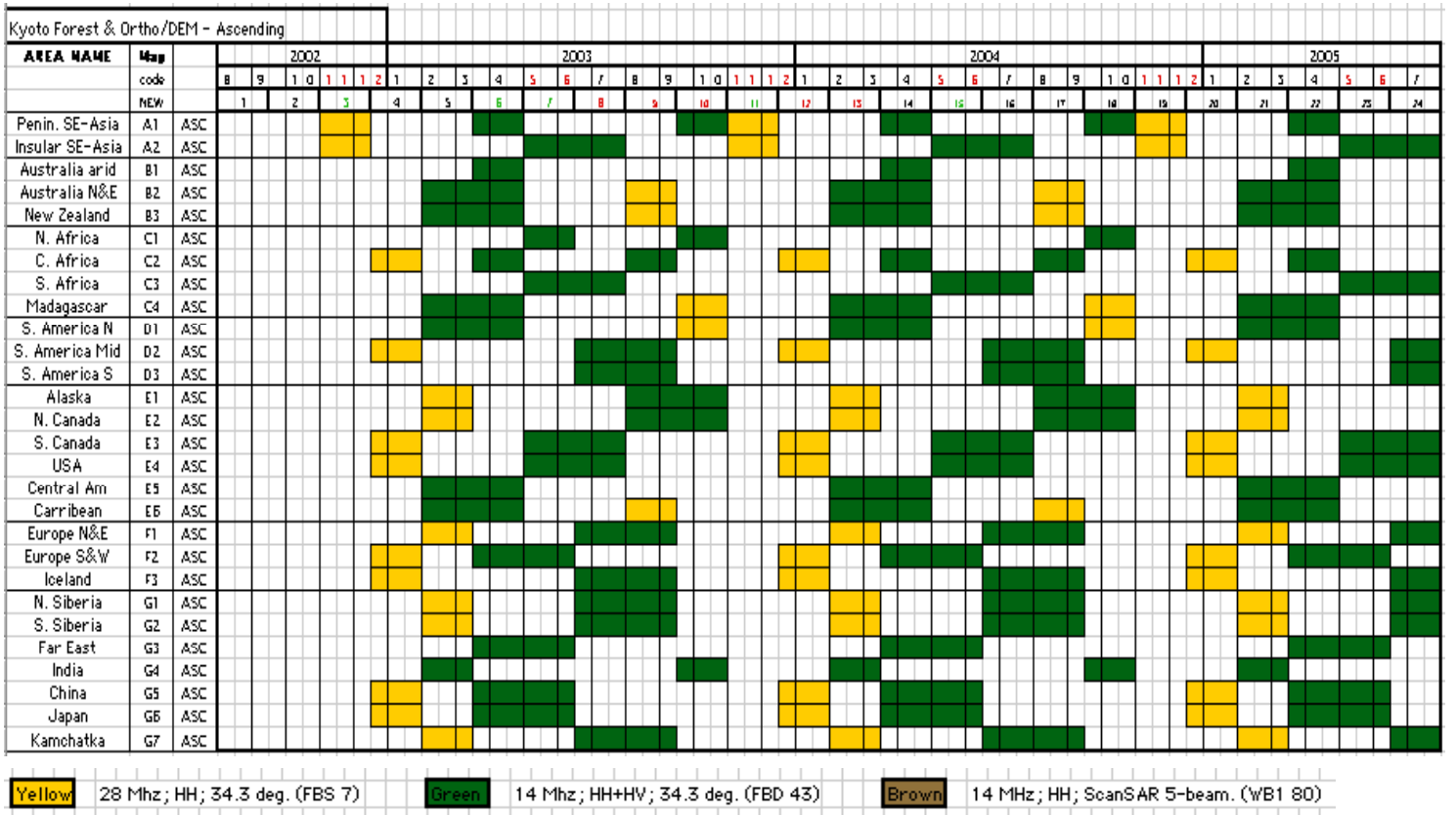
PALSAR Scenario (v.10/07/2002) - Ascending



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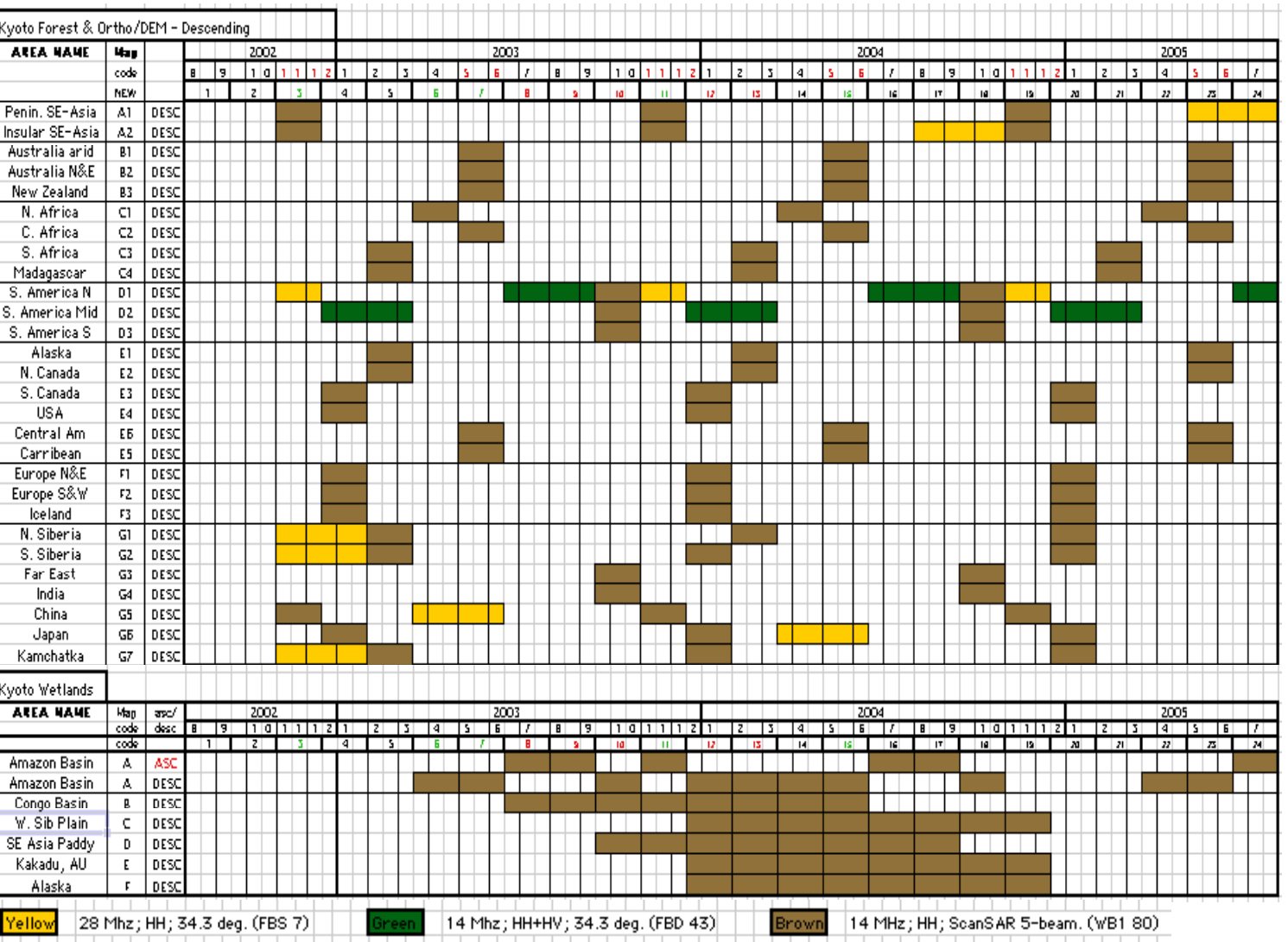
PALSAR Scenario (v.10/07/2002) - Descending



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National Space Development Agency of Japan NASDA

Data Acquisition Strategy for ADEOS-II GLI 250 m

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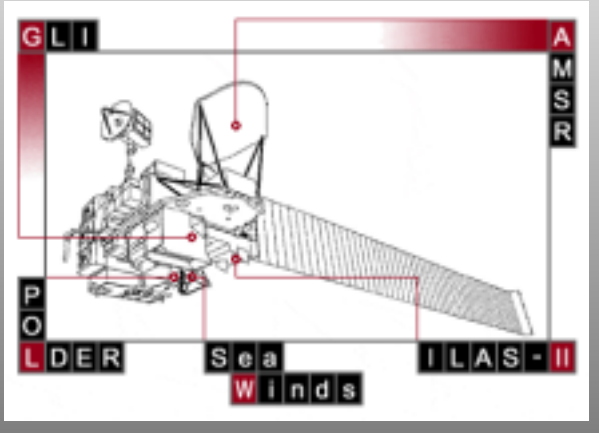
National Space Development Agency of Japan NASDA

ADEOS-II GLI-250m was incorporated into the K&C Initiative in 2002, complementing the SAR observations with medium resolution, 6 channel (B, G, R, NIR, MIR*2) optical data.



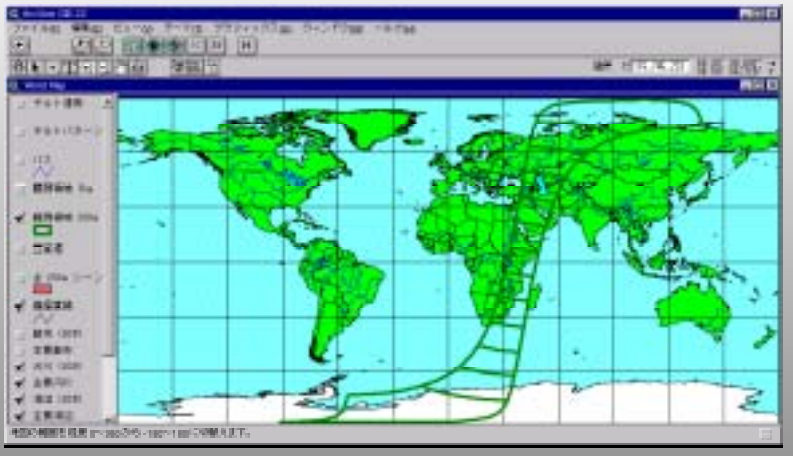
GLI-250 Products

250 m resolution Land Cover Classifications:
Continental -> Global
(K&C collaboration with Chiba University)

Annual GLI-250 image (6 ch) mosaics of all continents.
Corresponding in time with PALSAR mosaics

National Space Development Agency of Japan
NASDA

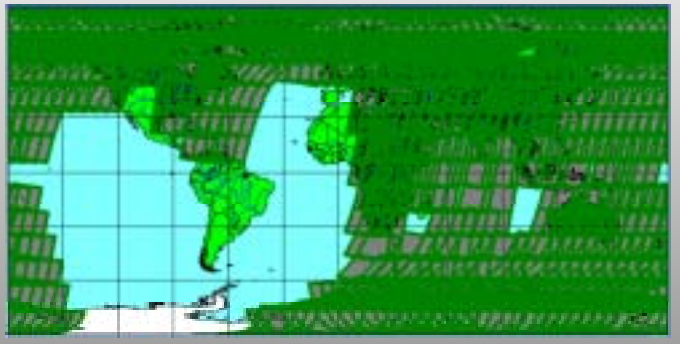
ADEOS-II GLI 250 m



- Global coverage (land & water): 741 scenes
- Land only: ~335 scenes
- Land,excl. Arctic, Antarctic and isolated island: ~240 scenes

National Space Development Agency of Japan NASDA

GLI regional coverage
using DRTS (E 90°) and direct down-link (DT) to the
4 main ground stations (EOC, ASF, KRNS & WFF)



Insufficient coverage over South America, Western USA, South Europe, West Africa & Central Siberia.

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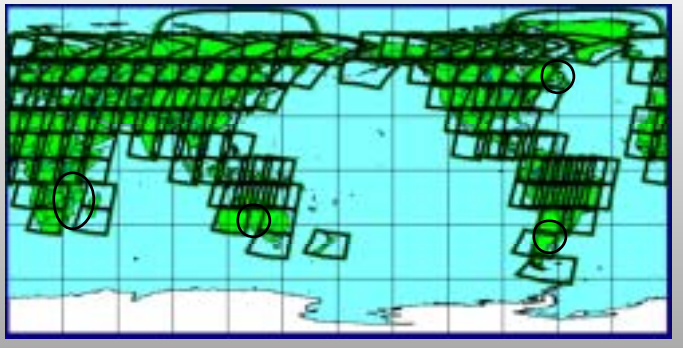
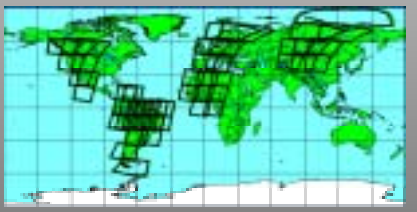
K&C Observation plan for GLI 250 m
Version 1.0 (Feb-02)



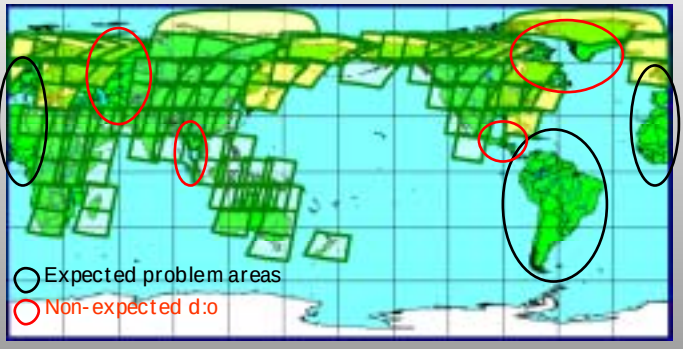
K&C request v.1.0:
- DT and DRTS: 1,866 scenes
- ODR: 328 scenes

TOTAL: 2,194 scenes



ODR approved regions

First simulation results (Feb-2002)
Simulation period: 2003/02/03 - 07/13 (40 cycles)



Simulation success rate:
- DT/DRTS: 57~63%
- ODR: 36~47%

- Succes rate geogr. dependent
- ODR operation poor (why?)
- v.0.1 plan non-optimal
- Effect of MMO background mission?

Default background mission: 13,149 scenes (DT/DRTS)

K&C Observation Strategy for GLI 250 m
Version 0.2 (Oct-02)

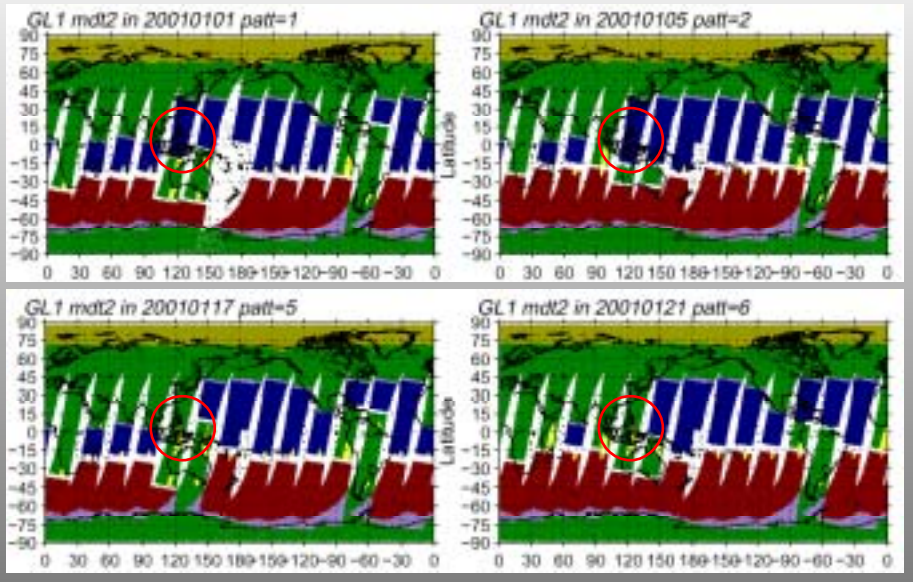
- All land areas covered;
- Acquisition time window latitude dependent
  - arctic/antarctic: summer solstice +/- 1 month;
  - boreal:April 1 - September 30:
  - temperate/tropical: all year.
- Acquisition priority for a scene is assigned sequentially within each pass, using a rotating scheme (effect of tilt-mode not taken into account);
- ODR use max 1 scene/orbit, in non-DT/DRTS areas;
- DT/DRTS: 13,469 scenes
- ODR: 1,557 scenes

TOTAL: 15,026 scenes/year

In comparison:
Default background mission (Feb-02 simulation):
13,149 scenes/40 cycles -> ~29,900 scenes/year
~2X K&C Obs. Strategy v.0.2

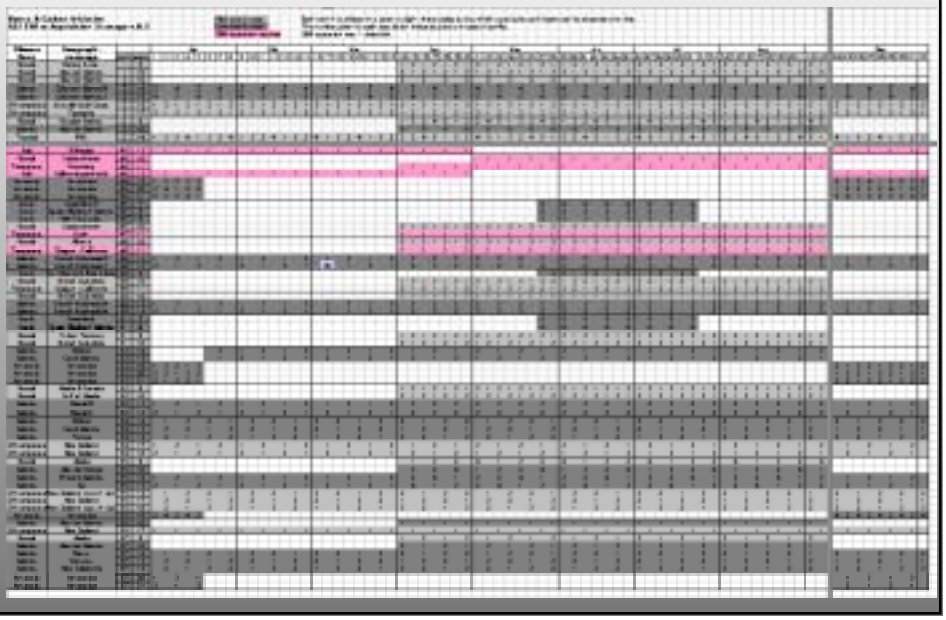
GLI sensor off-nadir tilting

Reduced # useful scenes in coastal areas

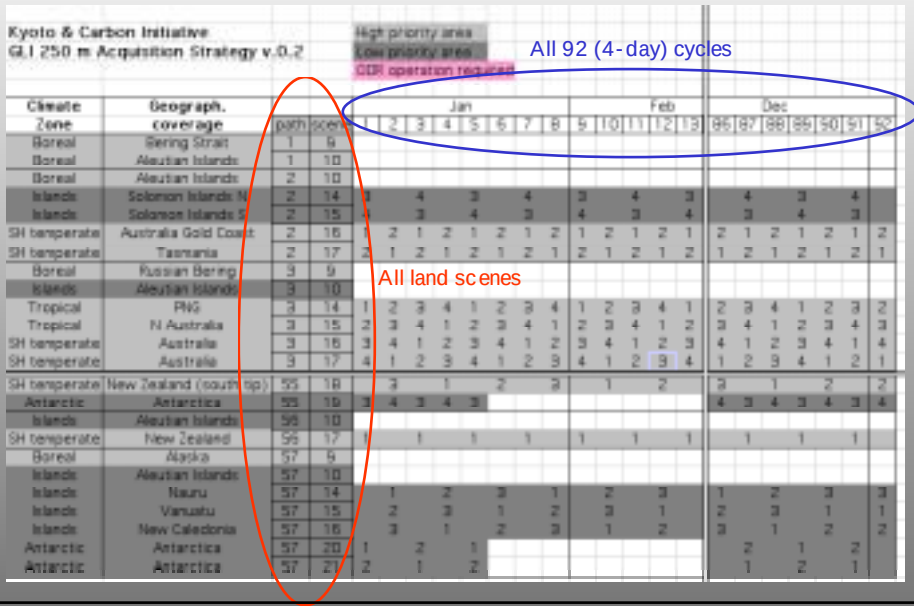


K&C Observation Strategy for GLI 250 m

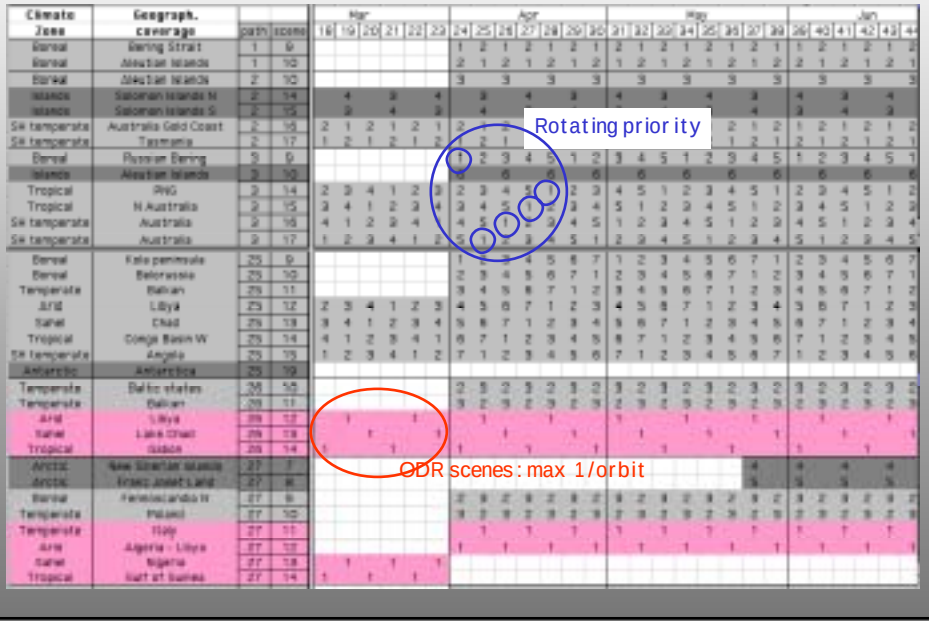
Version 0.2 (Oct-02)



K&C Observation Strategy for GLI 250 m
Version 0.2 (Oct-02)



K&C Observation Strategy for GLI 250 m
Version 0.2 (Oct-02)



K&C v.0.2 Data flows

K&C Observation Strategy v.0.2 (100% success rate case):
- Average data flow: ~41 scenes/day
- Peak flow: ~57 scenes/day

(MMO background mission Feb-02: ~82 scenes/day)

Current capacity for 250 m Level 1B processing at EOC: ~30 scenes/day
Required capacity: 45/60 scenes/day for average/peak flow.

Current capacity for higher level (geom-corr, atm-corr, composit) processing at EORC: <5 scenes/day -> Bottle-neck!

Improved EORC processing capacity must be considered.

Kyoto & Carbon Initiative
GLI 250 m Processing Flow

NASDA EOC
- Level 1B processing (EOC standard product)

NASDA EORC
- Geometric (DEM) correction;
- 16-day compositing (cloud elimination);
- Atmospheric correction (Rayleigh + O^3)

NASDA EORC/Chiba Univ.
- Regional 16-day mosaic assembly

Chiba Univ.
- Continental -> Global 250 m Land Cover Classification

Acquisition plan - Time schedule

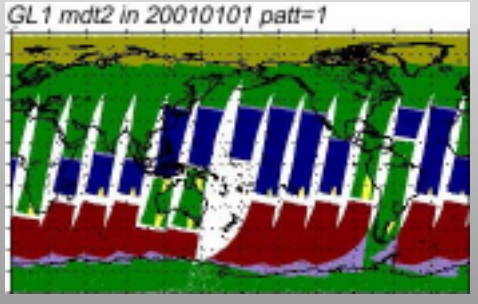
Oct.'02
K&C v.0.2 simulation

Nov.'02
v.0.2 plan revision -> K&C v.0.3
- Include additional obs. requests from GLI PI's and K&C collaborators
- Modify ODR mask
- Modify priority settings
- Consider tilt-mode bias effects

Dec.'02 (Jan.'03)
- K&C v.0.3 simulation
- v.0.3 plan revision -> K&C v.1.0 (FINAL)

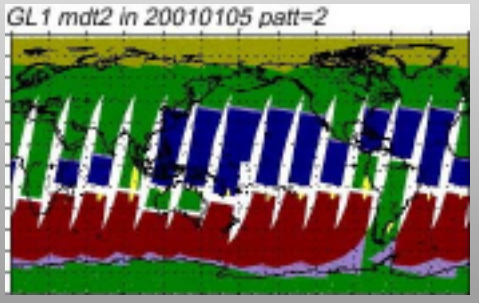
ADEOS-II launch

GLI tilt-patterns
Satellite cycle 1 (day 1)

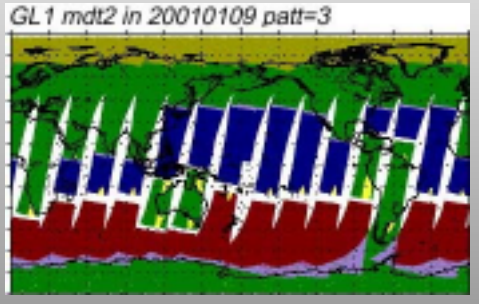


Tilting of the GLI sensor +/- 20° off-nadir
applied to minimise sun glint in ocean and coastal scenes.
Nadir/Off-nadir tilting cycle-dependent.

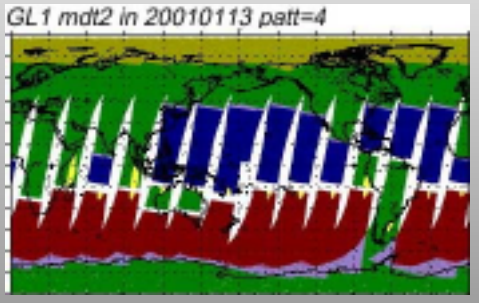
GLI tilt-patterns
Satellite cycle 2 (day 1)



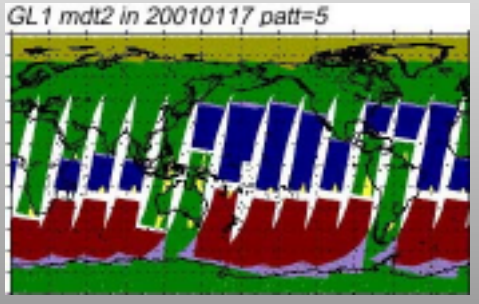
GLI tilt-patterns
Satellite cycle 3 (day 1)



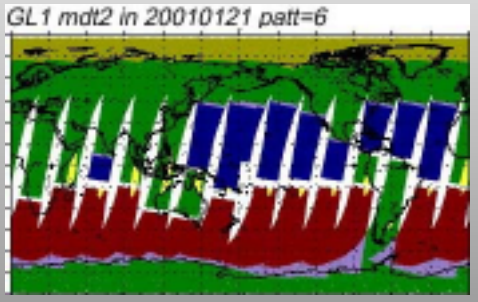
GLI tilt-patterns
Satellite cycle 4 (day 1)



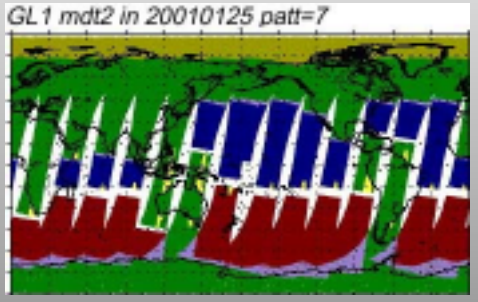
GLI tilt-patterns
Satellite cycle 5 (day 1)



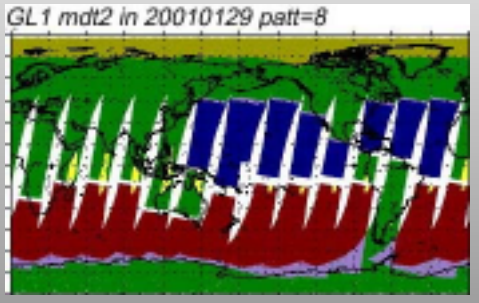
GLI tilt-patterns
Satellite cycle 6 (day 1)



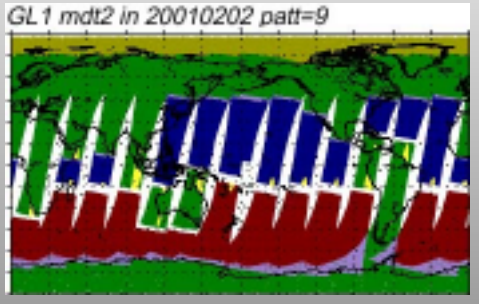
GLI tilt-patterns
Satellite cycle 7 (day 1)



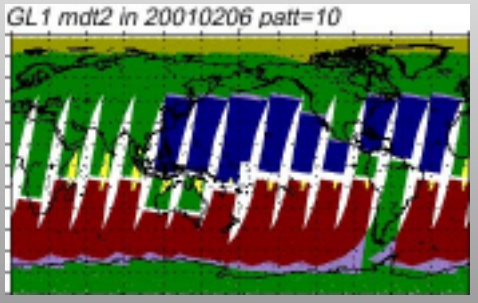
GLI tilt-patterns
Satellite cycle 8 (day 1)



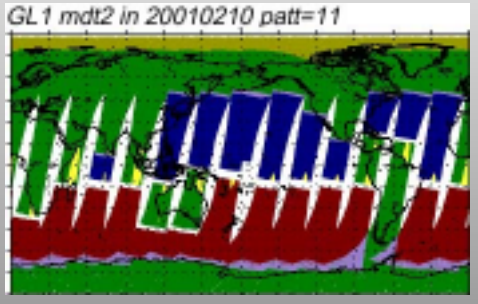
GLI tilt-patterns
Satellite cycle 9 (day 1)



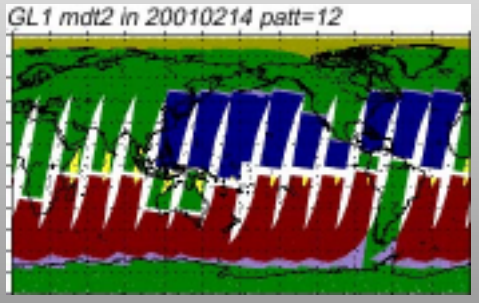
GLI tilt-patterns
Satellite cycle 10 (day 1)



GLI tilt-patterns
Satellite cycle 11 (day 1)



GLI tilt-patterns
Satellite cycle 12 (day 1)



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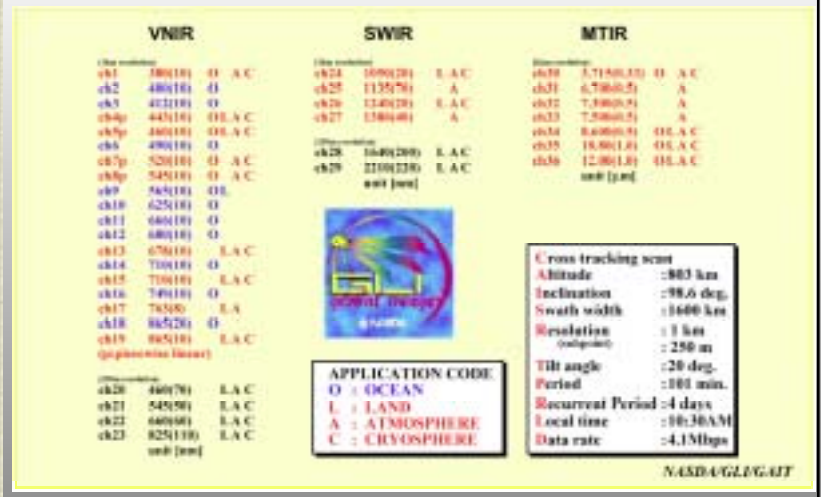
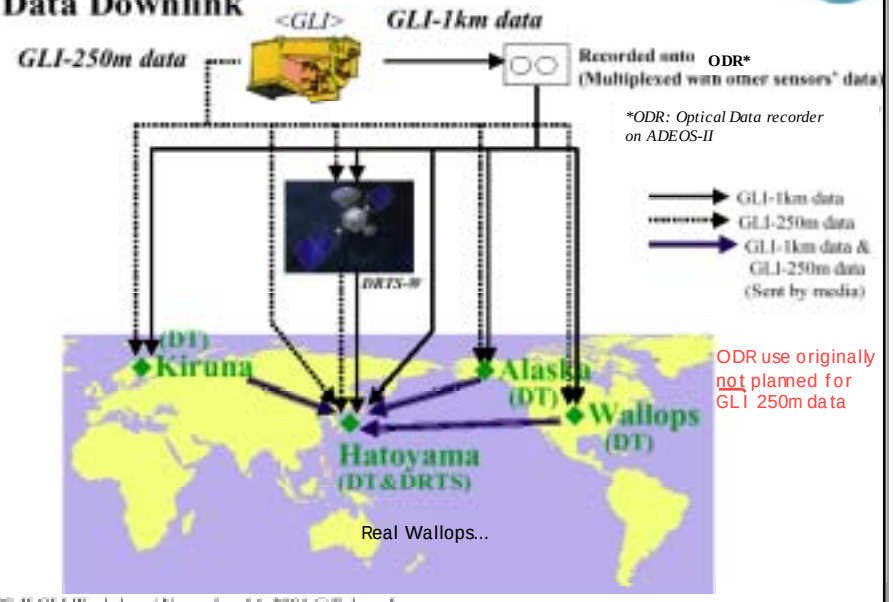
Global Imager - Spectral characteristics



30 bands @ 1 km
6 bands @ 250 m

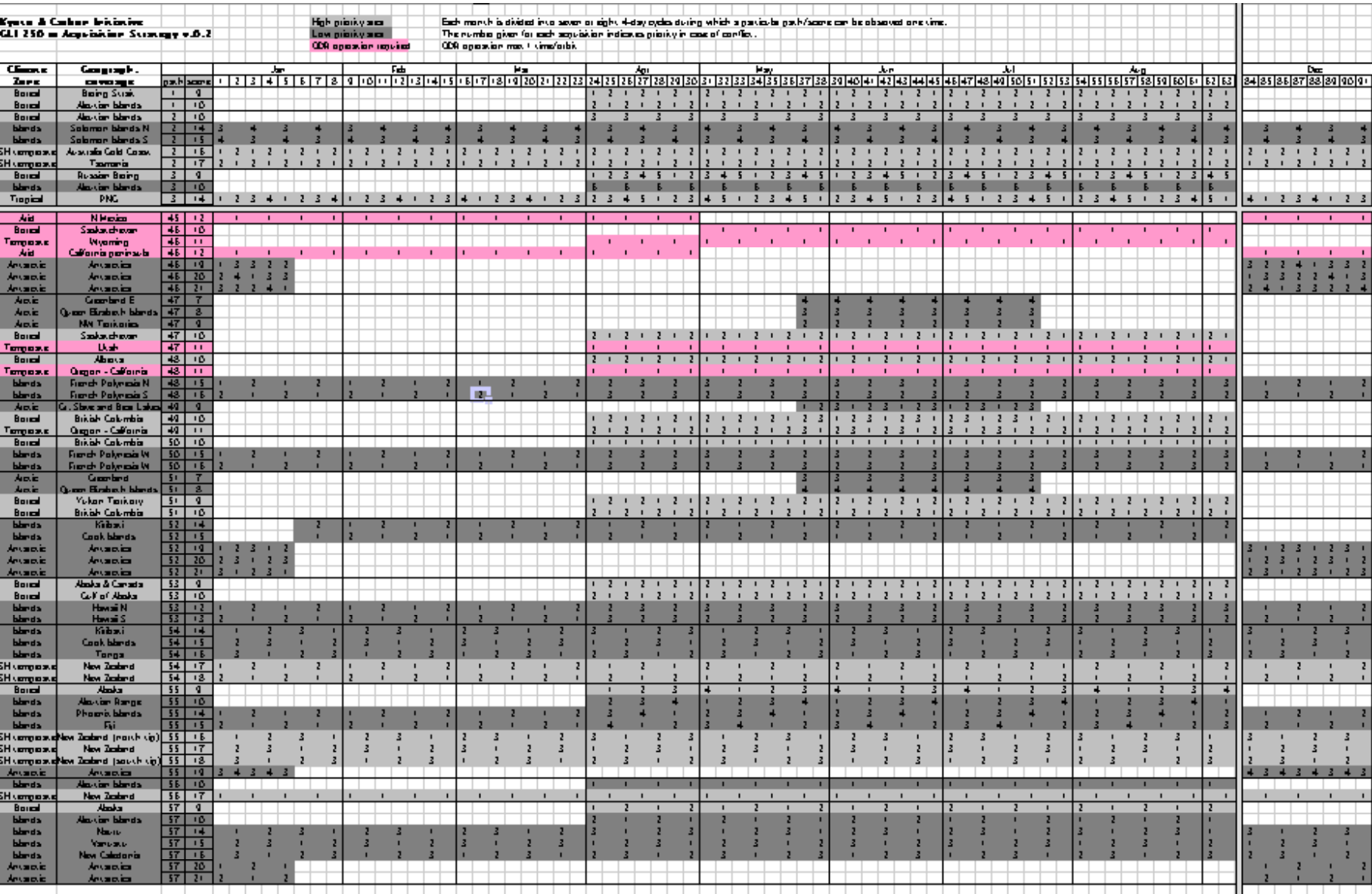
1. ADEOS-II Mission Operation

1.2 Data Downlink



ODR use originally not planned for GLI 250m data

K&C Observation Strategy for GLI 250 m
Version 0.2 (Oct-02)



K&C Observation Strategy for GLI 250 m
Version 0.2 (Oct-02)

Kyoto & Carbon Initiative
GLI 250 m Acquisition Strategy v.0.2

High priority area
Low priority area
ODR operation required

All 92 (4-day) cycles

All land scenes

Climate Zone	Geograph. coverage	path	scene	Jan								Feb					Dec						
				1	2	3	4	5	6	7	8	9	10	11	12	13	86	87	88	89	90	91	92
Boreal	Bering Strait	1	9																				
Boreal	Aleutian Islands	1	10																				
Boreal	Aleutian Islands	2	10																				
Islands	Solomon Islands N	2	14	3		4		3		4		3		4		3		4		3		4	
Islands	Solomon Islands S	2	15	4		3		4		3		4		3		4		3		4		3	
SH temperate	Australia Gold Coast	2	16	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
SH temperate	Tasmania	2	17	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
Boreal	Russian Bering	3	9																				
Islands	Aleutian Islands	3	10																				
Tropical	PNG	3	14	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	2
Tropical	N Australia	3	15	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	3
SH temperate	Australia	3	16	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	4
SH temperate	Australia	3	17	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	1
SH temperate	New Zealand (south tip)	55	18		3		1		2		3		1		2		3		1		2		2
Antarctic	Antarctica	55	19	3	4	3	4	3									4	3	4	3	4	3	4
Islands	Aleutian Islands	56	10																				
SH temperate	New Zealand	56	17	1		1		1		1		1		1		1		1		1		1	
Boreal	Alaska	57	9																				
Islands	Aleutian Islands	57	10																				
Islands	Nauru	57	14		1		2		3		1		2		3		1		2		3		3
Islands	Vanuatu	57	15		2		3		1		2		3		1		2		3		1		1
Islands	New Caledonia	57	16		3		1		2		3		1		2		3		1		2		2
Antarctic	Antarctica	57	20	1		2		1										2		1		2	
Antarctic	Antarctica	57	21	2		1		2										1		2		1	

K&C Observation Strategy for GLI 250 m
Version 0.2 (Oct-02)

Climate Zone	Geograph. coverage	path	scene	Mar 18	19	20	21	22	23	Apr 24	25	26	27	28	29	30	May 31	32	33	34	35	36	37	38	Jun 39	40	41	42	43	44
Boreal	Bering Strait	1	9							1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2
Boreal	Aleutian Islands	1	10							2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	2	1	2	1	2	1
Boreal	Aleutian Islands	2	10							3		3		3		3		3		3		3		3		3		3		3
Islands	Solomon Islands N	2	14		4		3		4		3		4		3		4		3		4		3		4		3		4	
Islands	Solomon Islands S	2	15		3		4		3		4												4		3		4		3	
SH temperate	Australia Gold Coast	2	16	2	1	2	1	2	1	2	1	2										2	1	2	1	2	1	2	1	2
SH temperate	Tasmania	2	17	1	2	1	2	1	2	1	2	1										1	2	1	2	1	2	1	2	1
Boreal	Russian Bering	3	9							1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1
Islands	Aleutian Islands	3	10							6		6		6		6		6		6		6		6		6		6		6
Tropical	PNG	3	14	2	3	4	1	2	3	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2
Tropical	N Australia	3	15	3	4	1	2	3	4	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3
SH temperate	Australia	3	16	4	1	2	3	4	5	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4
SH temperate	Australia	3	17	1	2	3	4	1	2	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Boreal	Kola peninsula	25	9							1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Boreal	Belorussia	25	10							2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1
Temperate	Balkan	25	11							3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2
Arid	Libya	25	12	2	3	4	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3
Sahel	Chad	25	13	3	4	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4
Tropical	Congo Basin W	25	14	4	1	2	3	4	1	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5
SH temperate	Angola	25	15	1	2	3	4	1	2	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6
Antarctic	Antarctica	25	19																											
Temperate	Baltic states	26	10							2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2
Temperate	Balkan	26	11							3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
Arid	Libya	26	12		1			1			1			1			1			1			1			1			1	
Sahel	Lake Chad	26	13			1			1			1			1			1			1			1			1		1
Tropical	Gabon	26	14	1			1			1			1			1			1			1			1			1		
Arctic	New Siberian Islands	27	7																				4		4		4		4	
Arctic	Franz Josef Land	27	8																				5		5		5		5	
Boreal	Fennoscandia N	27	9							2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2
Temperate	Poland	27	10							3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
Temperate	Italy	27	11								1		1		1		1		1		1		1		1		1		1	
Arid	Algeria - Libya	27	12							1		1		1		1		1		1		1		1		1		1		1
Sahel	Nigeria	27	13		1		1		1																					
Tropical	Gulf of Guinea	27	14	1		1		1																						

Rotating priority

ODR scenes: max 1/orbit