



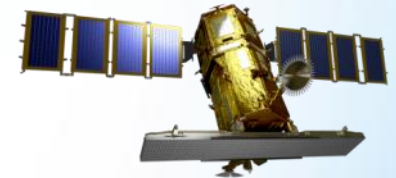
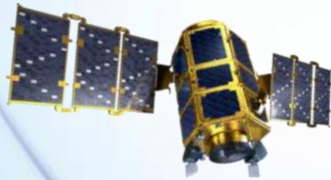
GISTDA

Fair Access to Space

KOMPSAT Workshop

- Discover the Earth at Sub-meter Resolution -

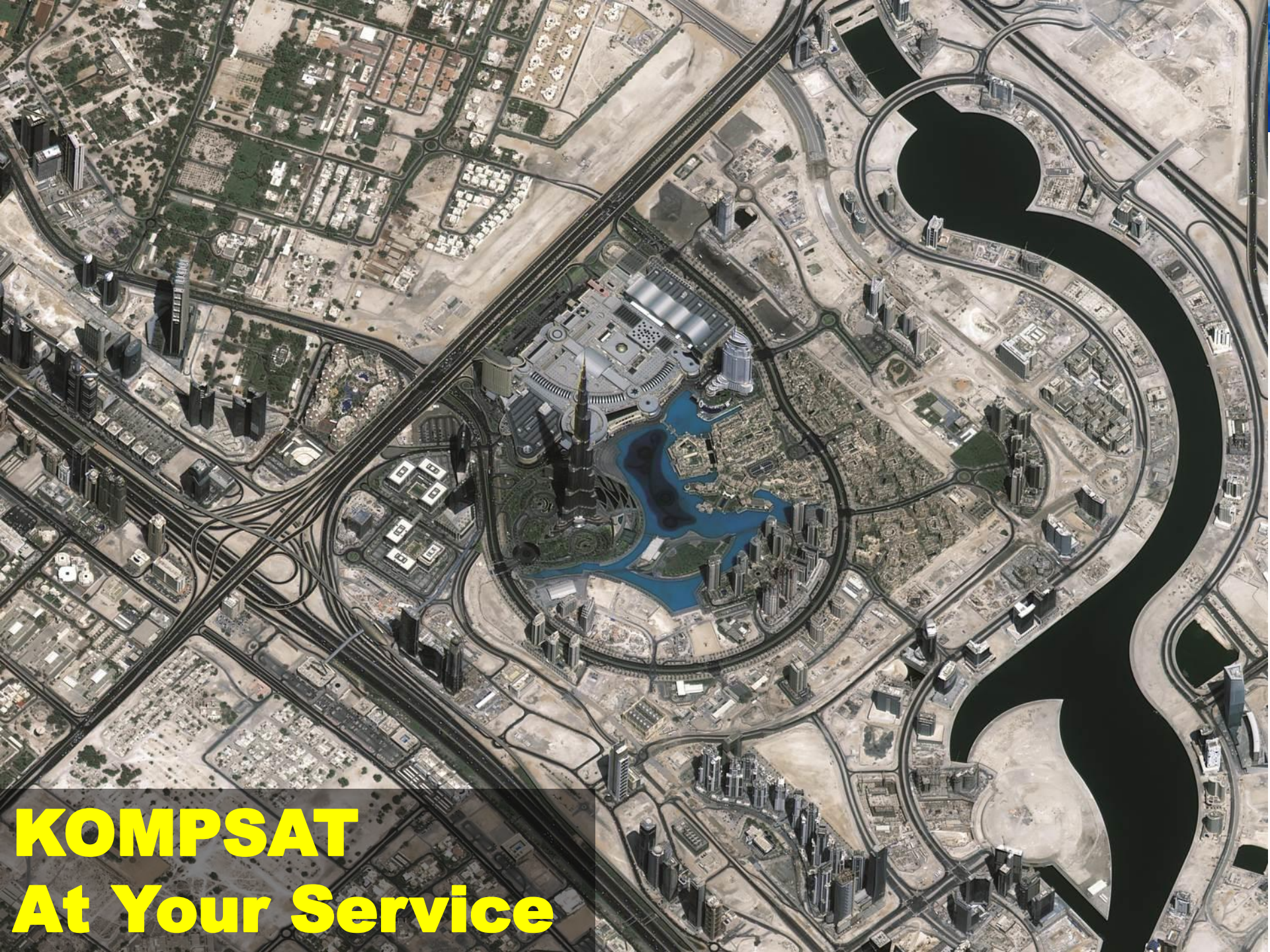
II. Satellites Overview



March, 2015
SI Imaging Services



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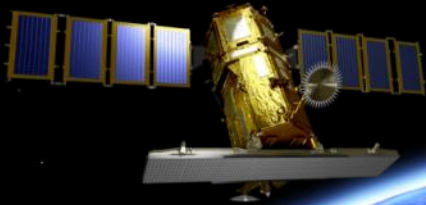


KOMPSAT
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KOMPSAT Series

❖ KOMPSAT

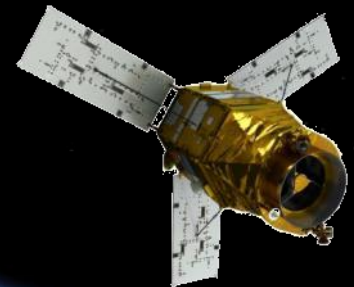
- National program
- Developed and operated by KARI (Korea Aerospace Research Institute)
- Dual use : Government & commercial
- Worldwide imagery distribution by SI Imaging Services



KOMPSAT-5
Design lifetime : 5 years
2013.10.22 ~
1.0 m SAR Payload
LTAN : 6:00 (18:00)



KOMPSAT-2
Design lifetime : 3 years
2006.7.28 ~
1.0 m EO Payload
LTAN : 10:50



KOMPSAT-3
Design lifetime : 4 years
2012.5.18 ~
0.7 m EO Payload
LTAN : 13:30

KOMPSAT-2 Specifications

Launch	28 July, 2006	
Ground Sampling Distance	PAN : 1.0 m @altitude 685 km(nadir) MS : 4.0 m @altitude 685 km(nadir)	
Swath Width	15 km (nadir)	
Spectral Bands	PAN : 500 ~ 900 nm MS1 (Blue) : 450 ~ 520 nm MS2 (Green) : 520 ~ 600 nm MS3 (Red) : 630 ~ 690 nm MS4 (NIR) : 760 ~ 900 nm	
Location Accuracy	< 50.9 m CE90 (measured)	
Tilt Angle	Roll(-30~30 deg.)	
Data Quantization	10 bit / pixel	
Orbit	Sun Synchronous Orbit - Altitude : 685 km - Inclination : 98.127 deg. - MLTAN : 10:50 AM	
Duty	20% per orbit	



Quirinópolis, Brazil



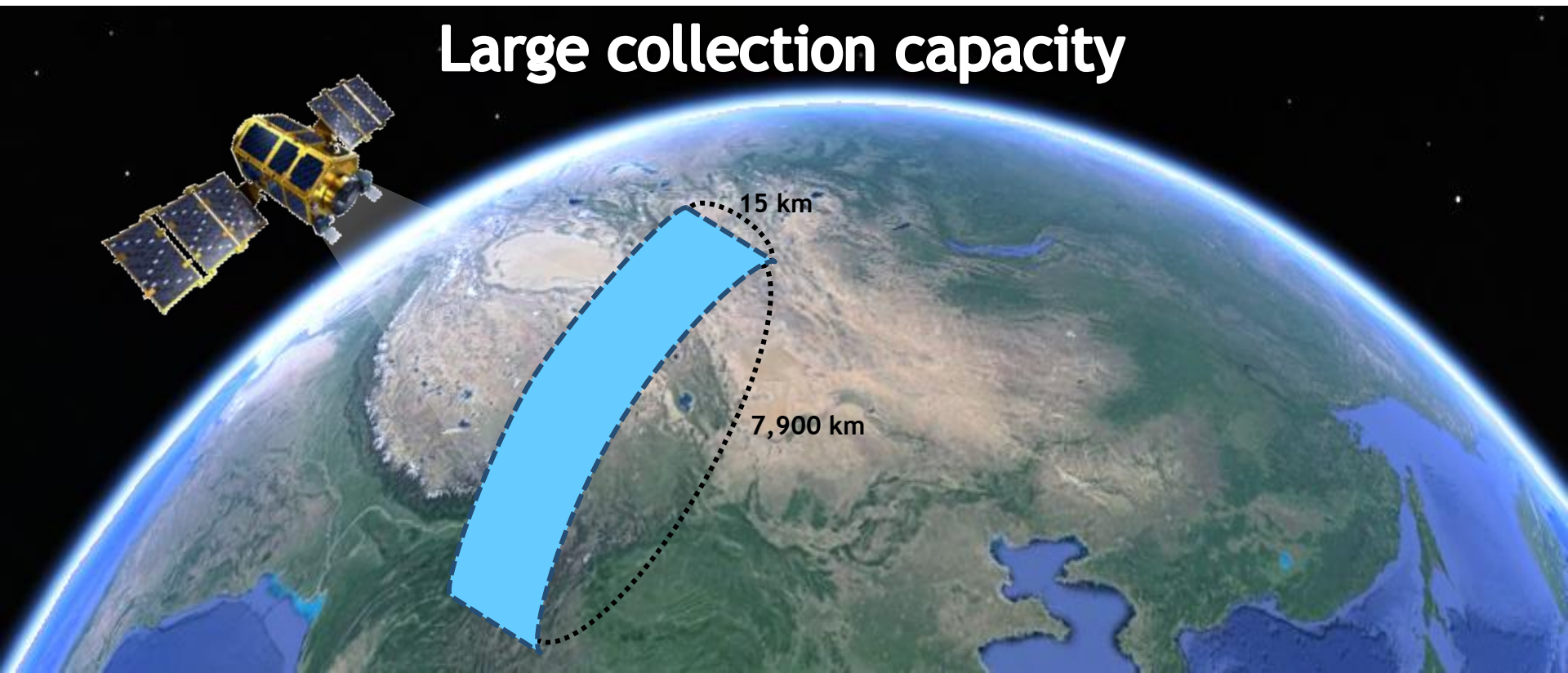
Tokyo, Japan

Mapping Large Area

❖ KOMPSAT-2: Higher duty cycle

- 20% per orbit (about 18 minutes per orbit)
- Max 15 km x 7900 km per orbit (about 118,500 km²)

Large collection capacity



KOMPSAT-3 Specification

Launch	17 May, 2012
Ground Sampling Distance	PAN : 0.7 m @altitude 685 km(nadir) MS : 2.8 m @altitude 685 km(nadir)
Swath Width	16 km (nadir)
Spectral Bands	PAN : 450 ~ 900 nm MS1 (Blue) : 450 ~ 520 nm MS2 (Green) : 520 ~ 600 nm MS3 (Red) : 630 ~ 690 nm MS4 (NIR) : 760 ~ 900 nm
Location Accuracy	< 40.6 m CE90 (measured)
Tilt Angle	Roll(-45~45 deg.) / Pitch(-30~30 deg.)
Data Quantization	14 bit / pixel
Orbit	Sun Synchronous Orbit - Altitude : 685.13 ± 1 km - Inclination : 98.14 ± 0.05 deg. - MLTAN : 13:30 +10/-15 min
Duty	10% per orbit

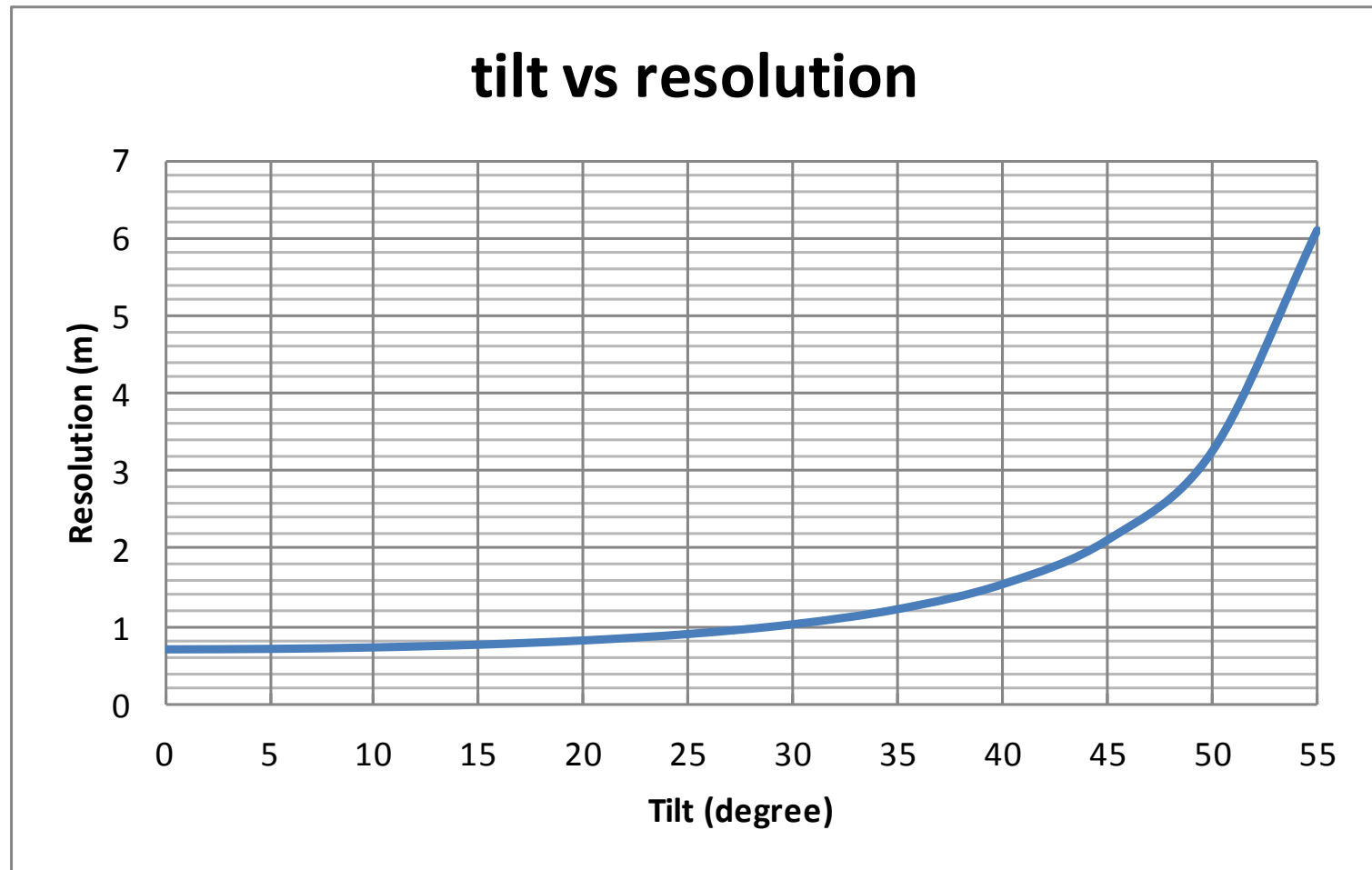




Rang Yai, Thailand

Very High Resolution

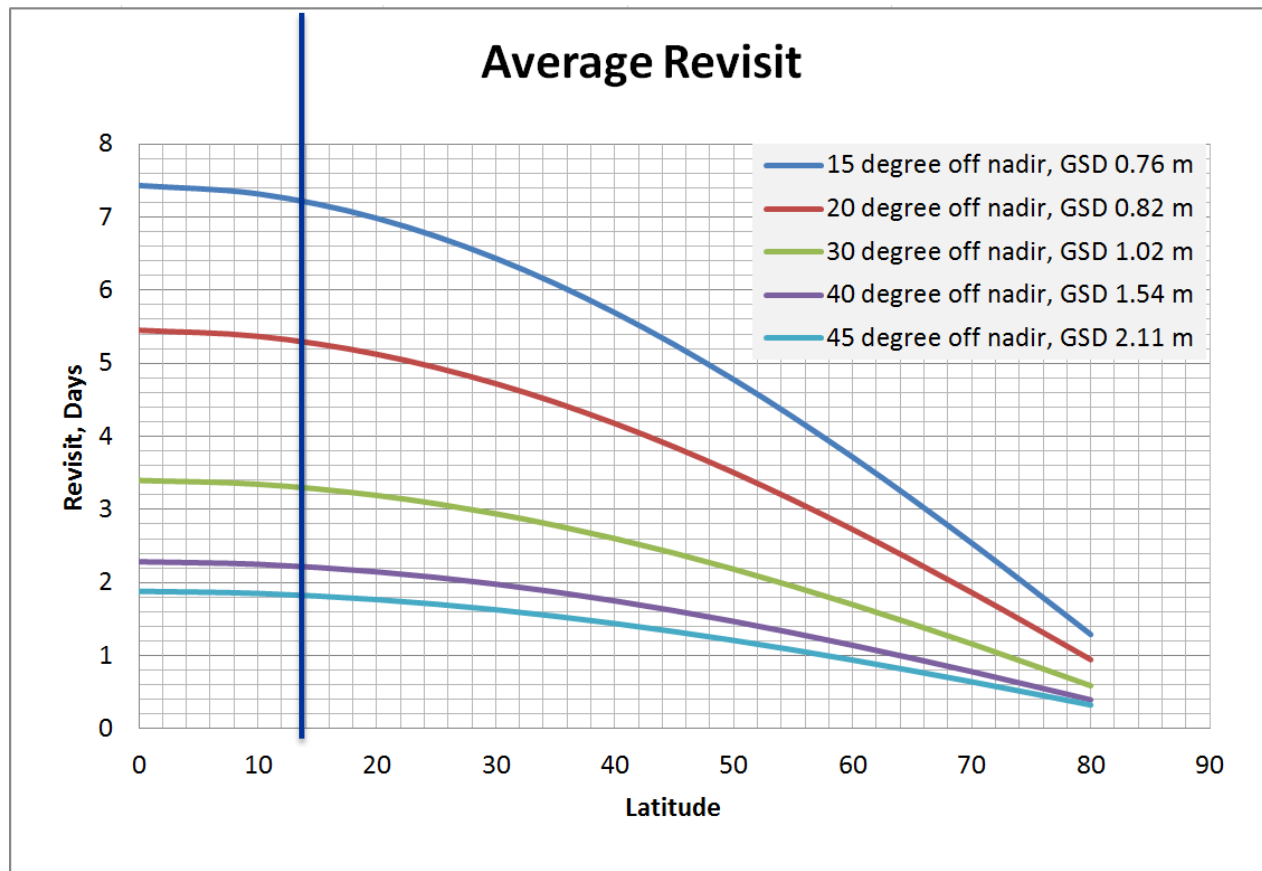
❖ 70 cm Ground Resolution



Revisit Characteristics

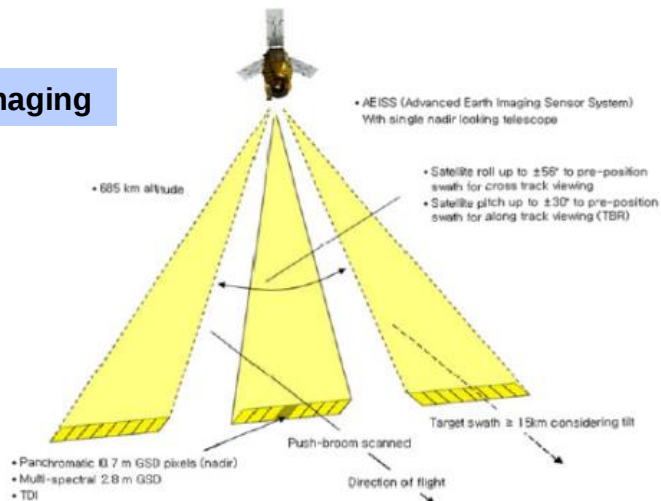
❖ Consider 30 degree of roll tilt

- 3.3 days over area on 14 degree of latitude

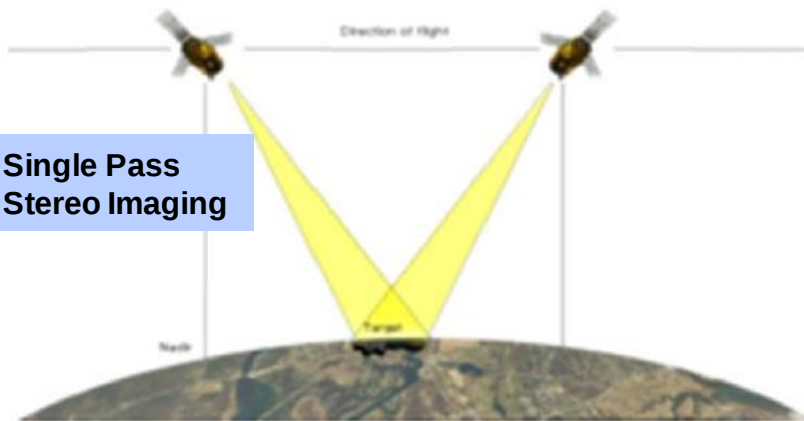


Imaging mode

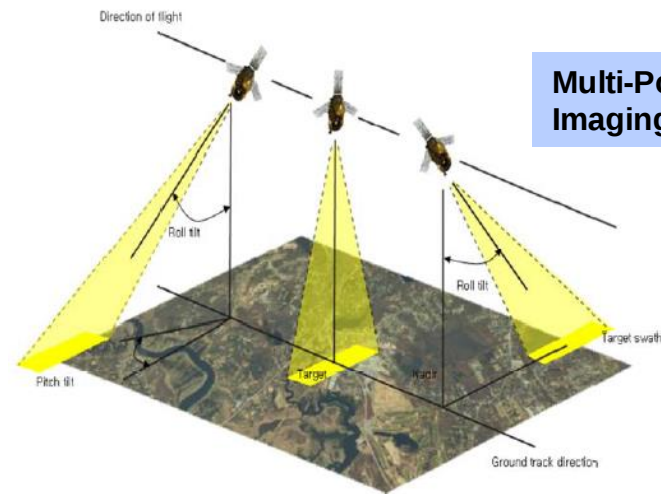
Strip Imaging



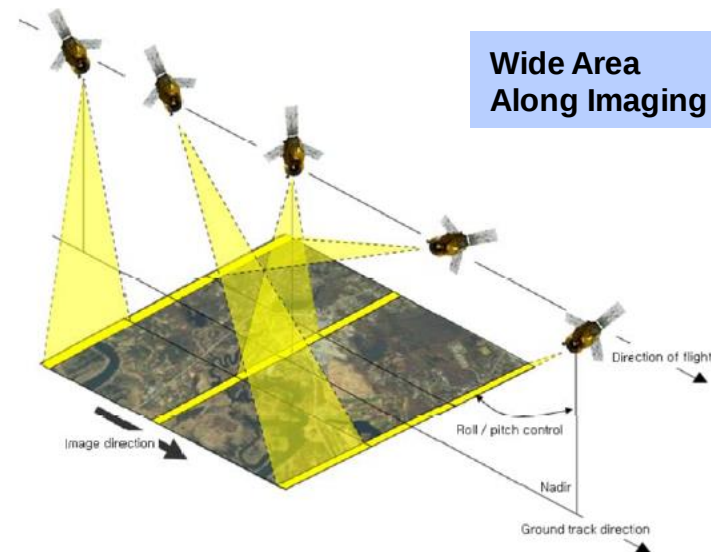
Single Pass Stereo Imaging



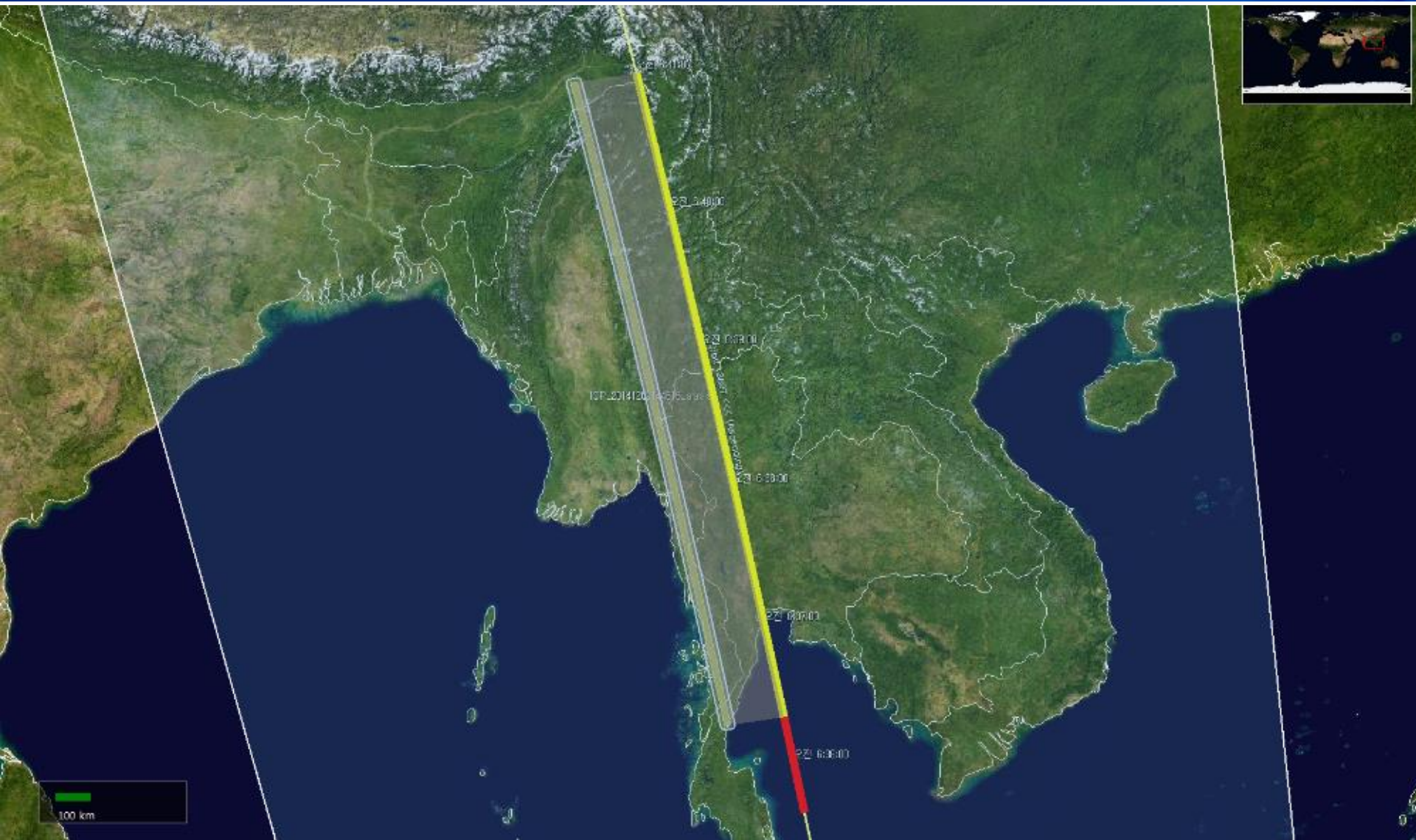
Multi-Point Imaging

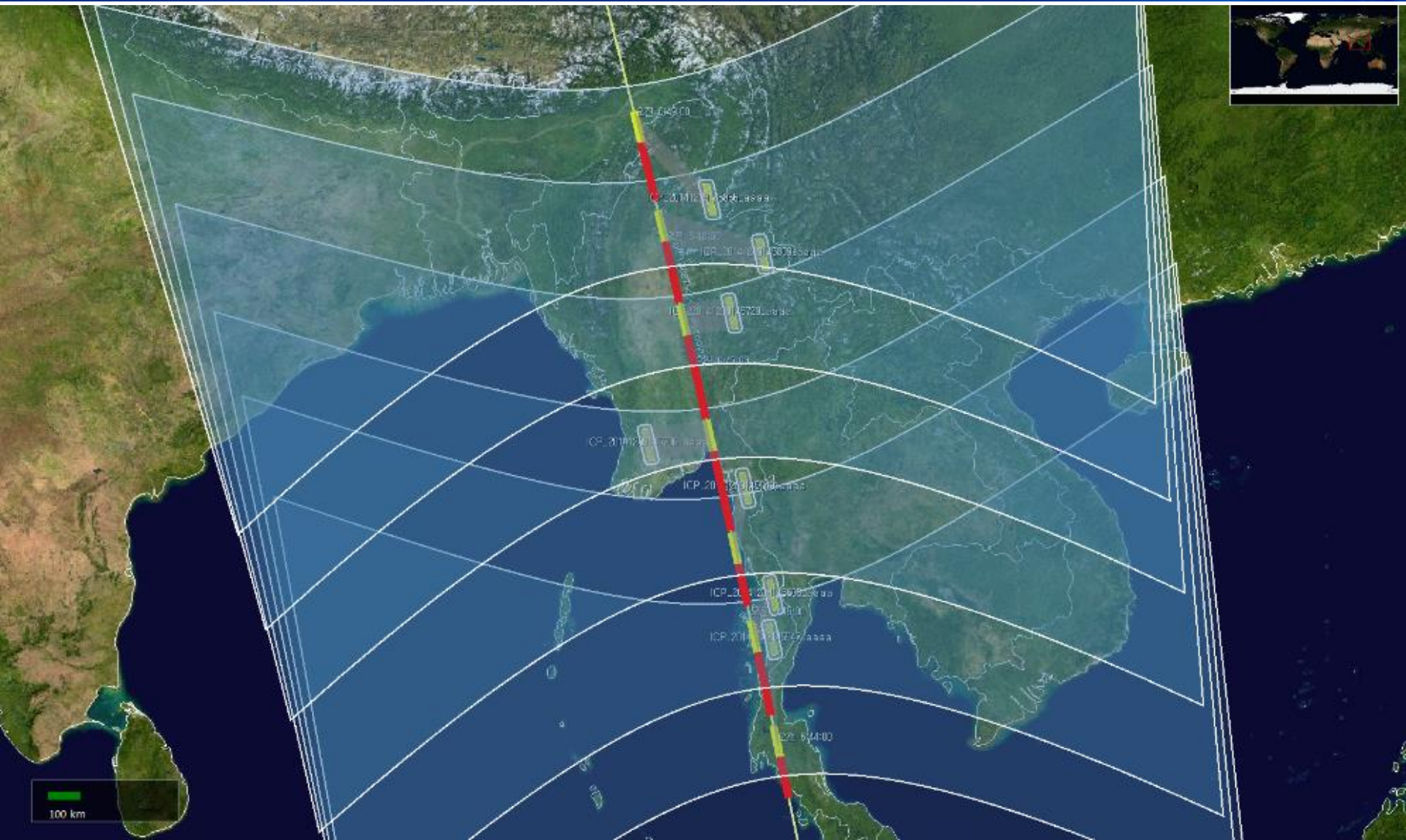


Wide Area Along Imaging

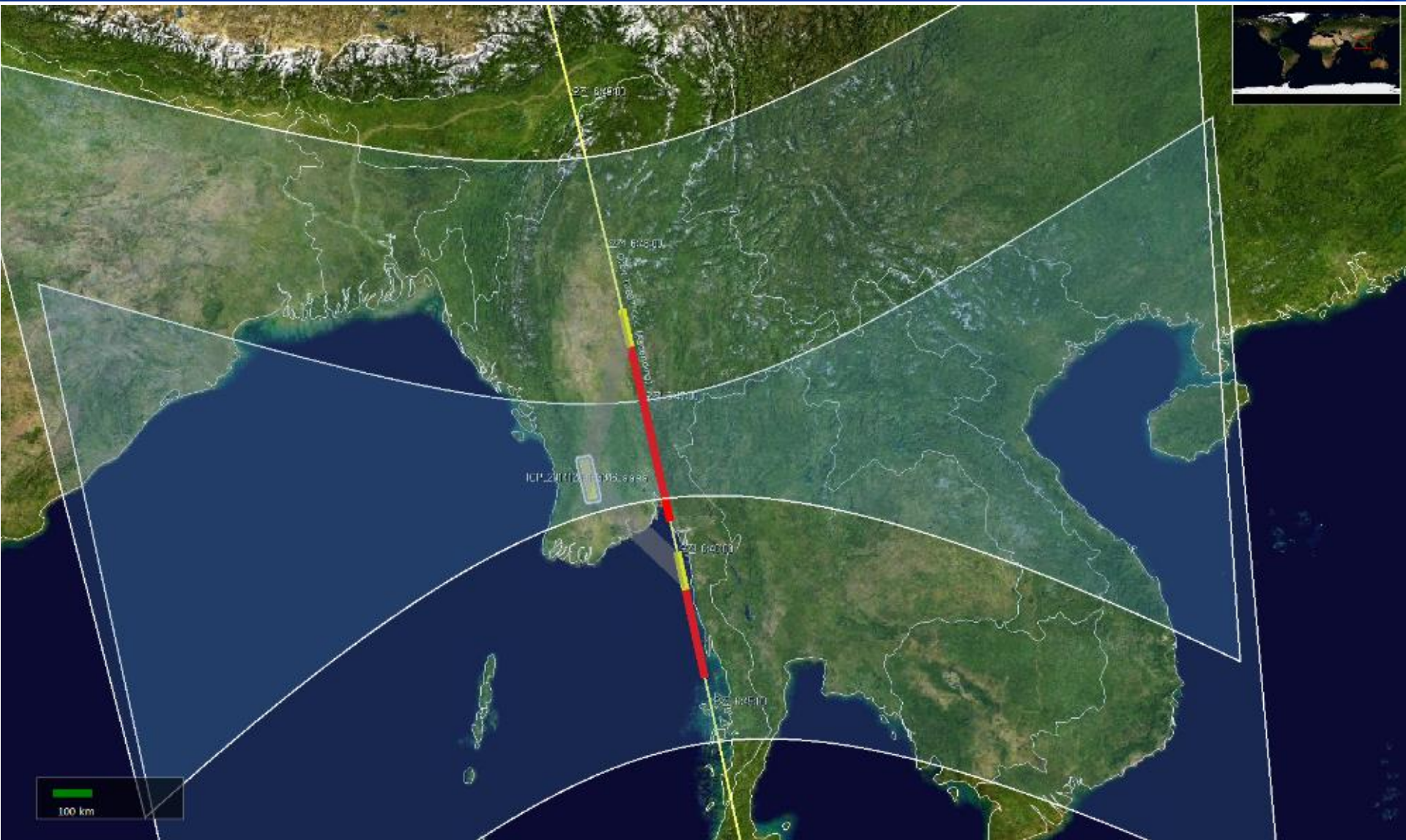


Long Strip Imaging Simulation

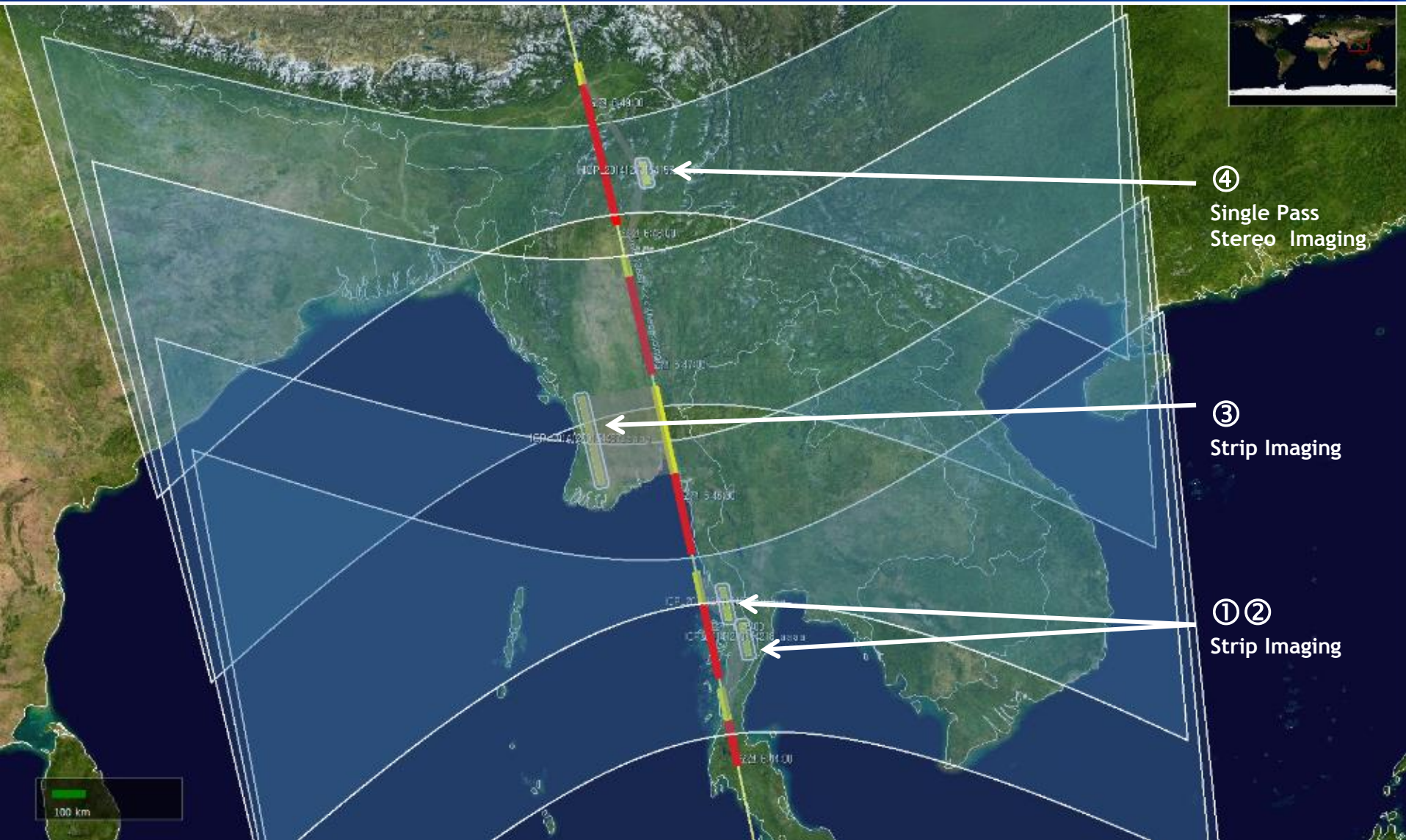




Single Pass Stereo Simulation



Combination of Imaging Mode

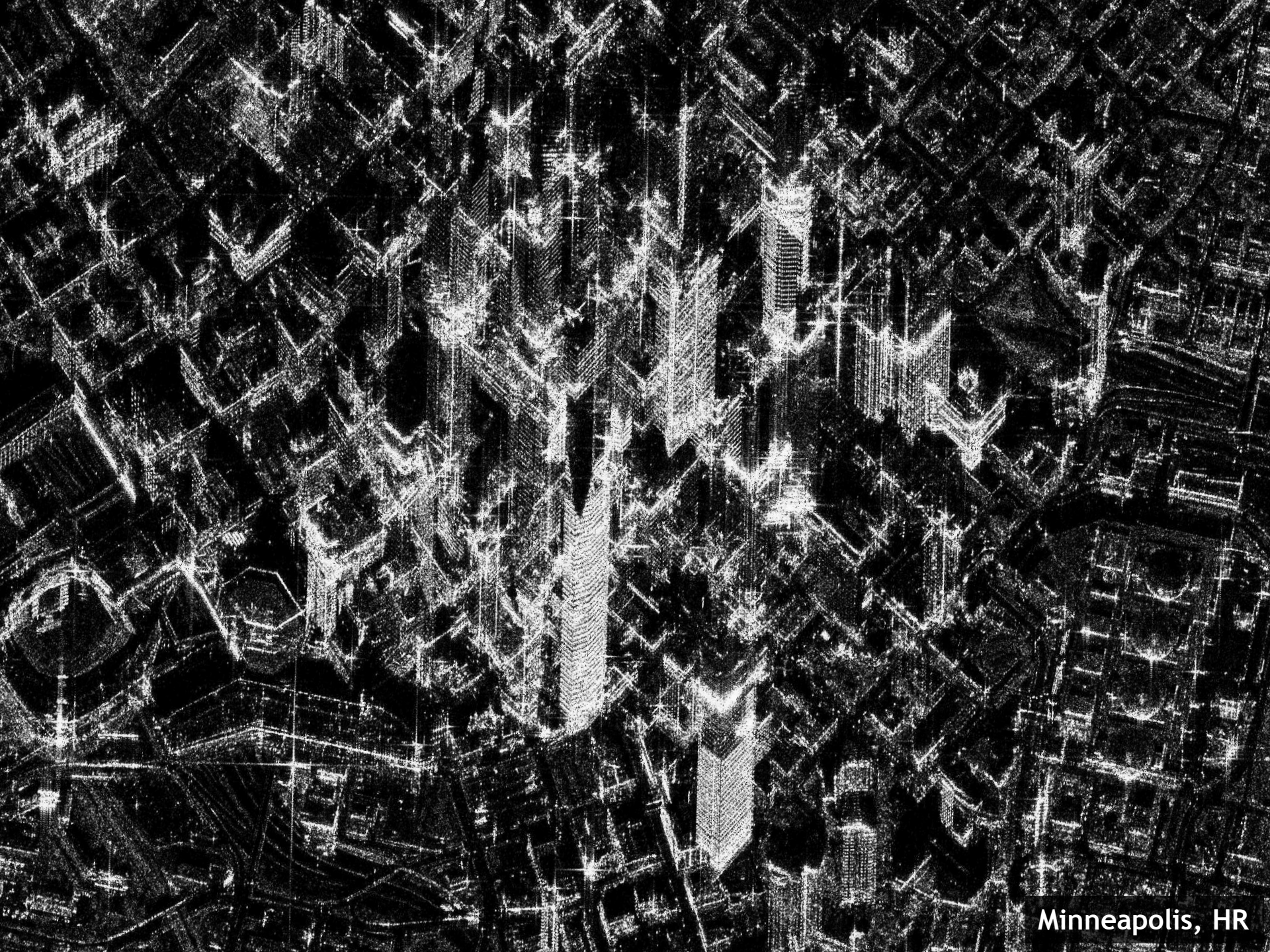


KOMPSAT-5 Specification

Launch	22 August, 2013
Payload	Synthetic Aperture Radar (SAR)
Frequency	9.66 GHz (X-band)
NESZ	≤ 17 dB
Radiometric Accuracy	≤ 1 dB
Incidence Angles	20 ~ 45 deg. (nominal, 304 km coverage) 45 ~ 55 deg. (extended, additional 186 km coverage)
Orbit	Sun Synchronous, Dawn-dusk orbit • Altitude : 550 km • Inclination : 97.6 deg. • Local Time : 6 AM and 6 PM
Duty	2 minutes per orbit
Image Mode	• Spotlight (HR) • Strip (ST) • ScanSAR (WS)



Bangkok, Thailand



Minneapolis, HR

Imaging Capability

❖ Duty: 2 minutes per orbit

- HR: ~ 300 scenes / day
- ST: ~ 377,000 km² / day
- WS: ~ 1,258,000 km² / day

❖ Incidence angles

- 20 ~ 45 deg (nominal, 304 km coverage),
- 45 ~ 55 deg (extended, additional 186 km coverage)

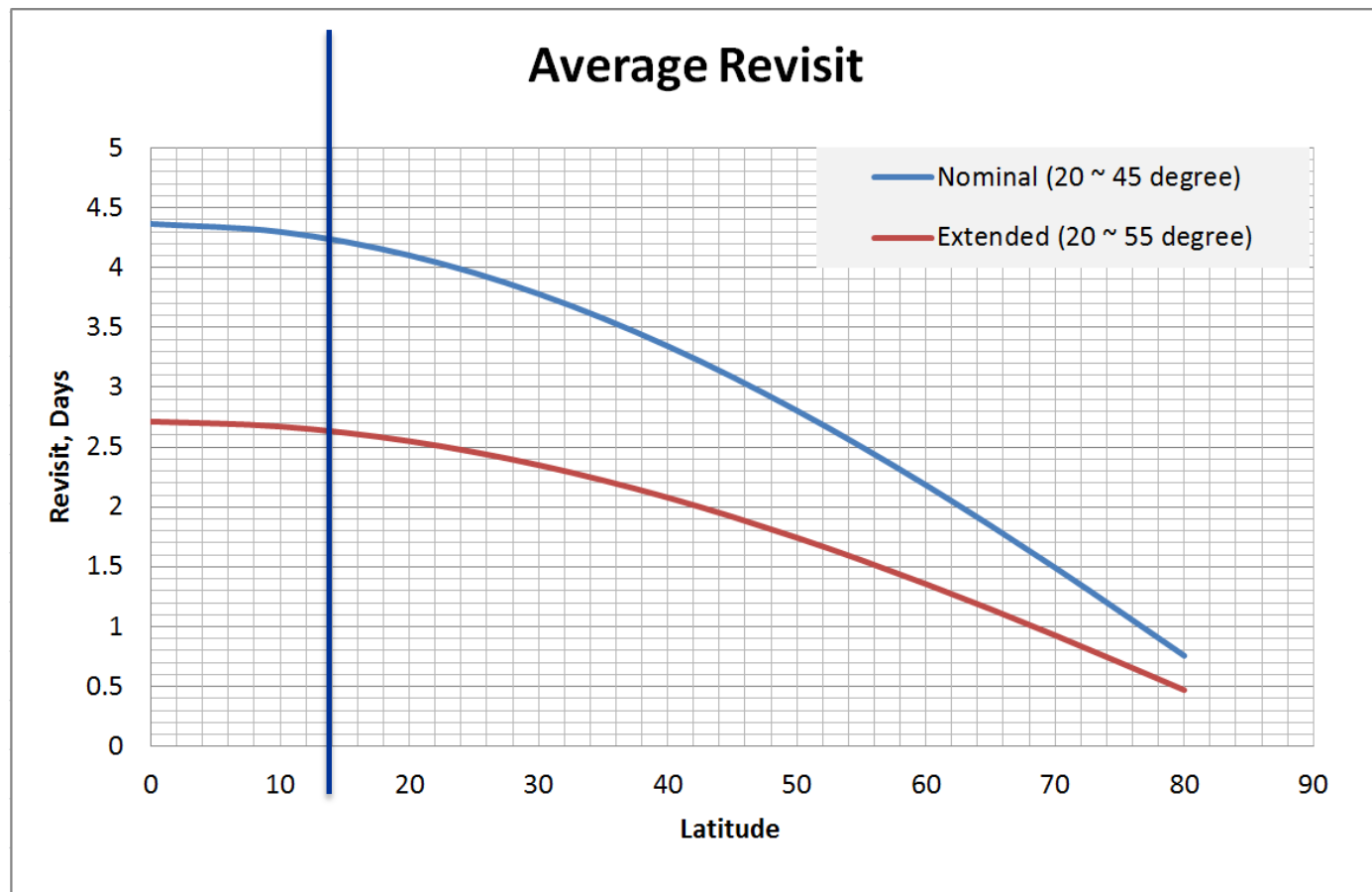
❖ Imaging performance at 45 degree incidence angle

	Range Resolution	Azimuth Resolution	Swath	Remark
Spotlight Mode (HR)	1 m	1 m	5 km	5 km x 5 km
Strip Mode (ST)	3 m	3 m	30 km	
ScanSAR (WS)	20 m	20 m	100 km	

Revisit Characteristics

❖ Consider one side looking

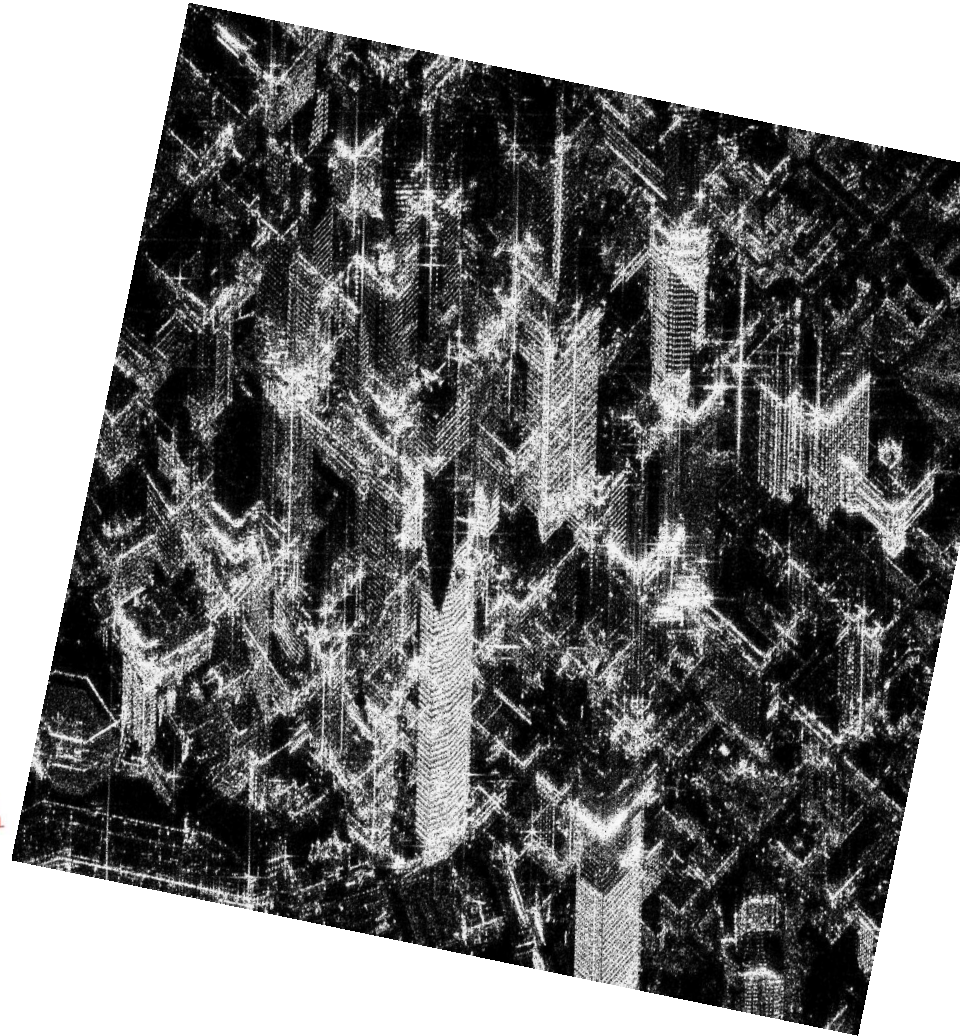
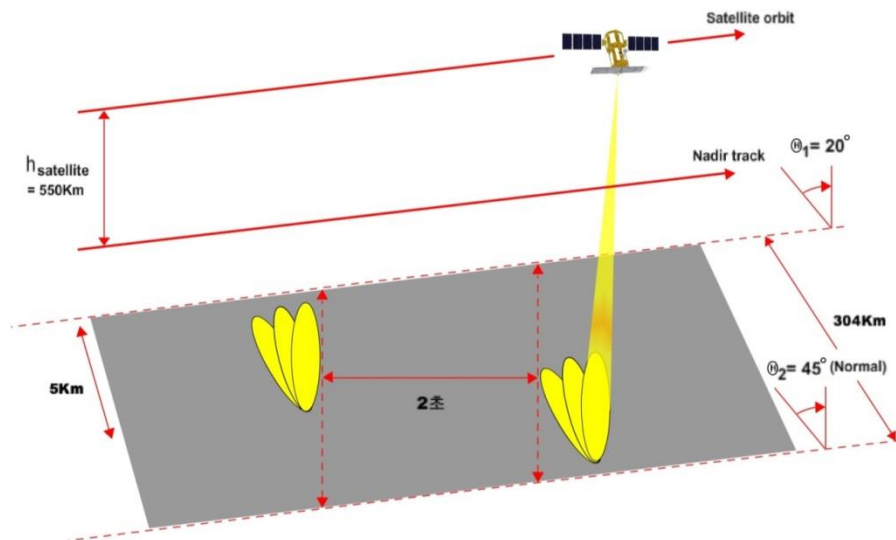
- 4.2 days over AOI on 14 degree of latitude



Imaging Modes – HR (1/2)

❖ Spotlight (HR)

- GSD : 1 m
- Swath : 5 km
- Scene size : 5 km x 5 km



Imaging Modes – HR (2/2)

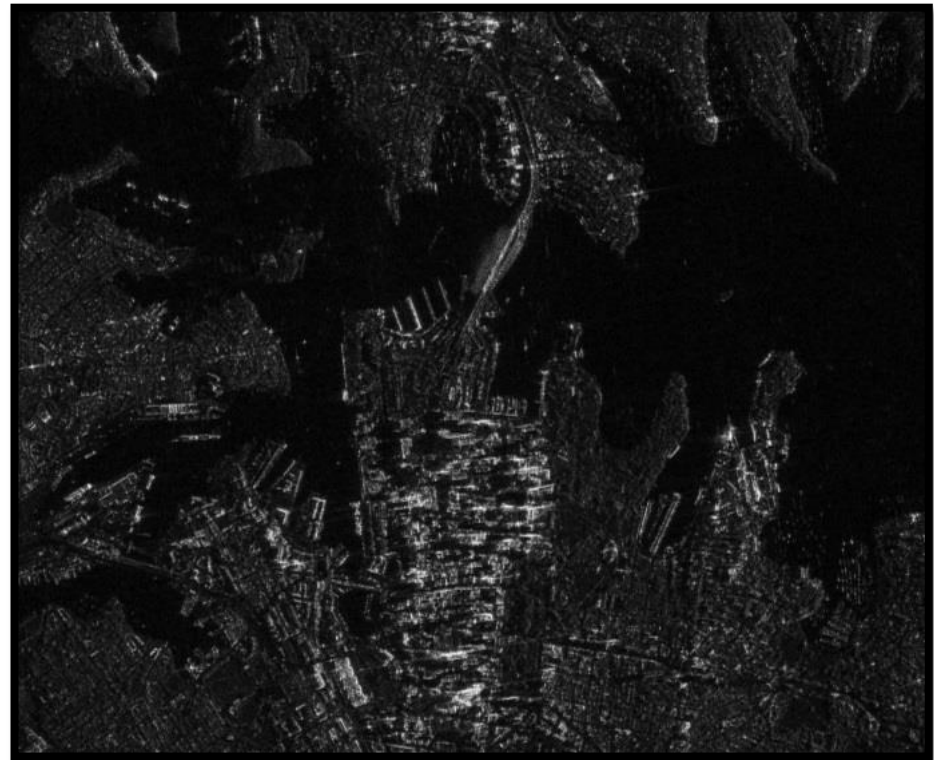
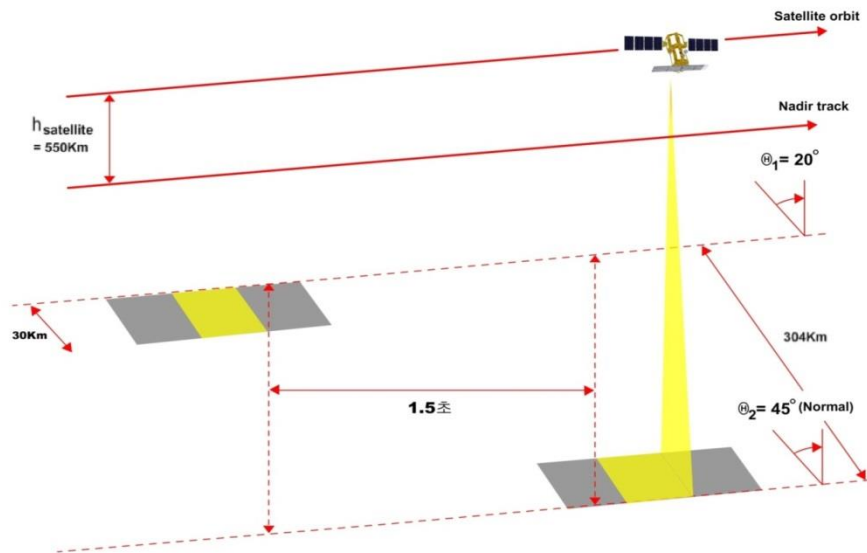
Beam	Incidence angle @ center	Resolution (m)		Swath (km)
		azimuth	range	
HR-1	20.55	1.0	2.0	5.0
HR-2	22.20	1.0	1.9	5.0
HR-3	23.90	1.0	1.8	5.0
HR-4	25.55	1.0	1.7	5.0
HR-5	27.14	1.0	1.6	5.0
HR-6	28.72	1.0	1.6	5.0
HR-7	29.61	1.0	1.5	5.0
HR-8	31.32	1.0	1.4	5.0
HR-9	32.75	1.0	1.4	5.0
HR-10	33.92	1.0	1.3	5.0
HR-11	35.10	1.0	1.3	5.0
HR-12	36.07	1.0	1.3	5.0
HR-13	37.22	1.0	1.2	5.0
HR-14	38.36	1.0	1.2	5.0
HR-15	39.43	1.0	1.2	5.0

Beam	Incidence angle @ center	Resolution (m)		Swath (km)
		azimuth	range	
HR-16	40.38	1.0	1.2	5.0
HR-17	41.53	1.0	1.2	5.0
HR-18	42.60	1.0	1.1	5.0
HR-19	42.94	1.0	1.0	5.0
HR-20	43.91	1.0	1.0	5.0
HR-21	44.75	1.0	1.0	5.0
HR-22	45.71	1.0	1.4	5.0
HR-23	46.90	1.0	1.4	5.0
HR-24	47.92	1.0	1.6	5.0
HR-25	48.93	1.0	1.7	5.0
HR-26	49.90	1.0	1.7	5.0
HR-27	50.89	1.0	2.0	5.0
HR-28	51.91	1.0	2.2	5.0
HR-29	52.77	1.0	2.2	5.0
HR-30	53.65	1.0	2.5	5.0
HR-31	54.55	1.0	2.7	5.0

Imaging Modes - ST (1/2)

❖ Strip (ST)

- GSD : 3 m
- Swath : 30 km
- Acquisition length : < 830 km



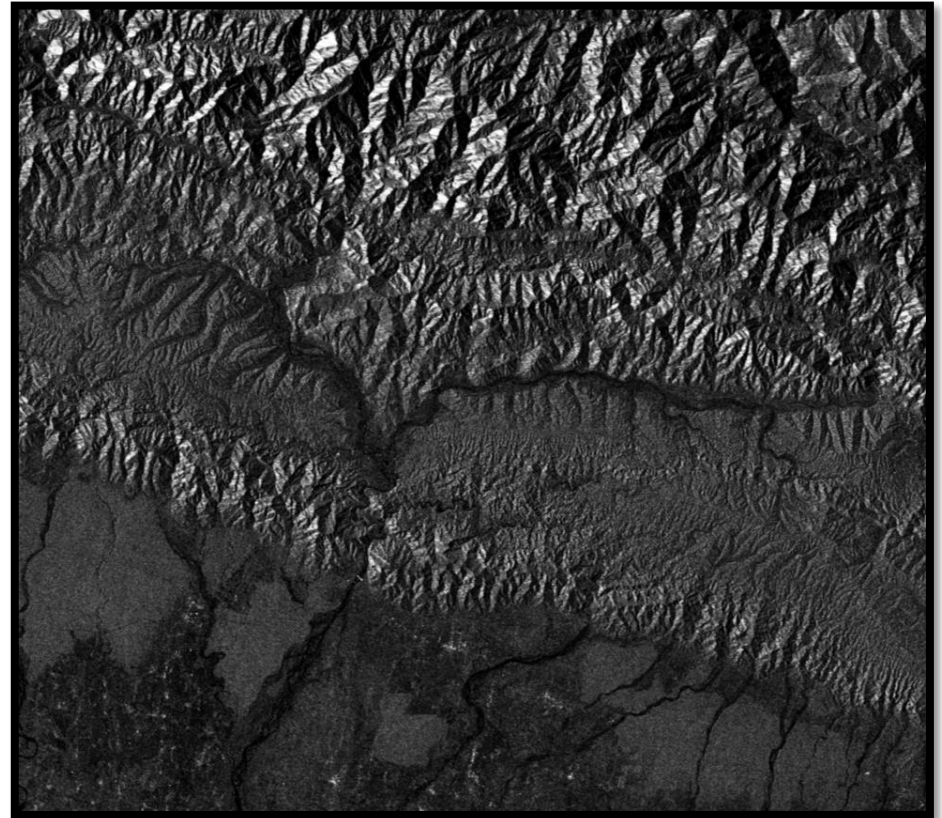
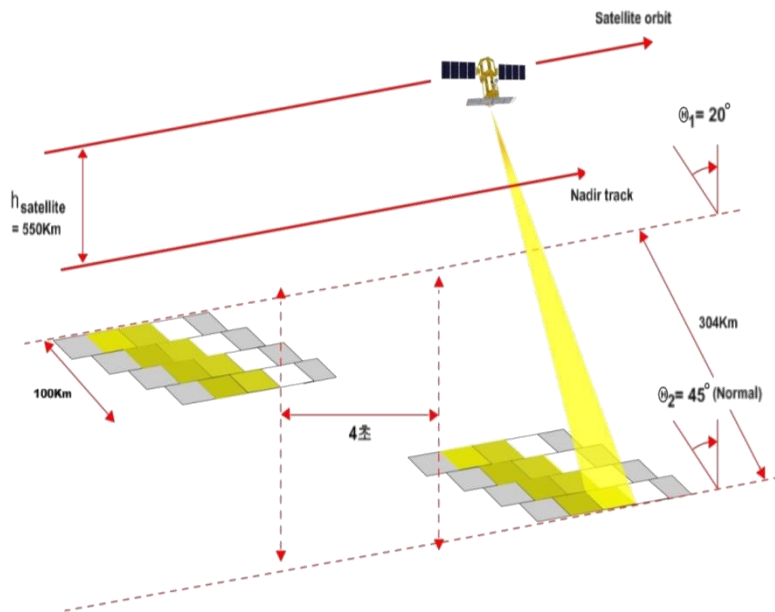
Imaging Modes - ST (2/2)

Beam	Incidence angle		Resolution (m)		Swath (km)
	near	far	azimuth	range	
ST-1	19.00	22.30	3.0	7.9	32.9
ST-2	22.20	25.20	3.0	5.7	30.9
ST-3	24.20	27.20	3.0	5.8	31.8
ST-4	26.30	29.30	3.0	6.6	32.8
ST-5	28.80	31.60	3.0	5.4	30.8
ST-6	31.40	34.20	3.0	5.8	33.8
ST-7	34.00	36.60	3.0	5.8	32.7
ST-8	36.40	36.70	3.0	3.8	30.3
ST-9	38.60	41.00	3.0	4.7	33.3
ST-10	40.80	42.60	3.0	3.0	26.1
ST-11	42.20	44.10	3.0	3.3	30.0
ST-12	43.60	45.50	3.0	3.0	30.6
ST-13	45.40	47.10	3.0	3.4	28.5
ST-14	47.00	48.70	3.0	4.2	30.2
ST-15	48.70	50.20	3.0	4.2	28.1
ST-16	50.20	51.50	3.0	3.7	24.6
ST-17	51.50	52.80	3.0	4.3	27.4
ST-18	52.80	54.30	3.0	5.2	30.8
ST-19	54.00	55.20	3.0	5.0	25.0

Imaging Modes – WS (1/2)

❖ ScanSAR (WS)

- GSD : 20 m
- Swath : 100 km
- Acquisition length : < 830 km

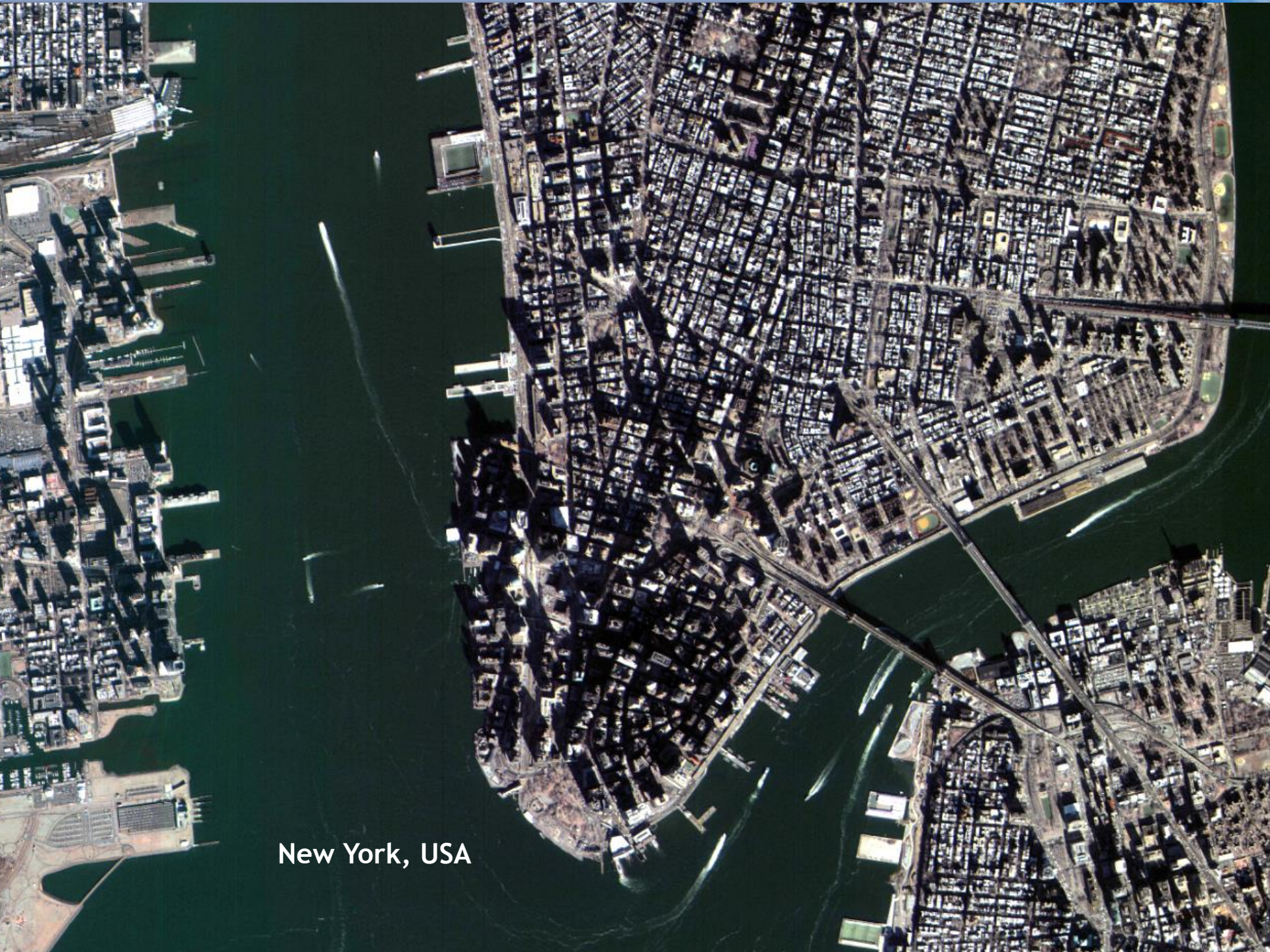


Imaging Modes - WS (2/2)

Beam	Incidence Angle		Resolution (m)		Swath (km)
	near	far	azimuth	range	
WS-1	19.00	29.29	19.8	19.4	107.1
WS-2	29.19	38.70	19.8	19.4	117.7
WS-3	38.60	45.86	19.8	19.4	114.2
WS-4	45.58	51.51	19.8	19.4	107.8
WS-5	50.21	55.16	19.8	19.4	99.9

DubaiSat-2 Specification

Launch	21 November, 2013	
Ground Sampling Distance	PAN : 1.0 m @altitude 600 km(nadir) MS : 4.0 m @altitude 600 km(nadir)	
Swath Width	12 km (nadir)	
Spectral Bands	PAN : 550 ~ 900 nm MS1 (Blue) : 450 ~ 520 nm MS2 (Green) : 520 ~ 590 nm MS3 (Red) : 630 ~ 690 nm MS4 (NIR) : 770 ~ 890 nm	
Location Accuracy	1,000m CE90(specification) / 150m CE90 (expectation)	
Tilt Angle	Roll & Pitch (-45~45 deg.)	
Data Quantization	10 bit / pixel	
Orbit	Sun Synchronous Orbit - Altitude : 600 km - Inclination : 97.8 deg. - LTDN : 10:30 AM	



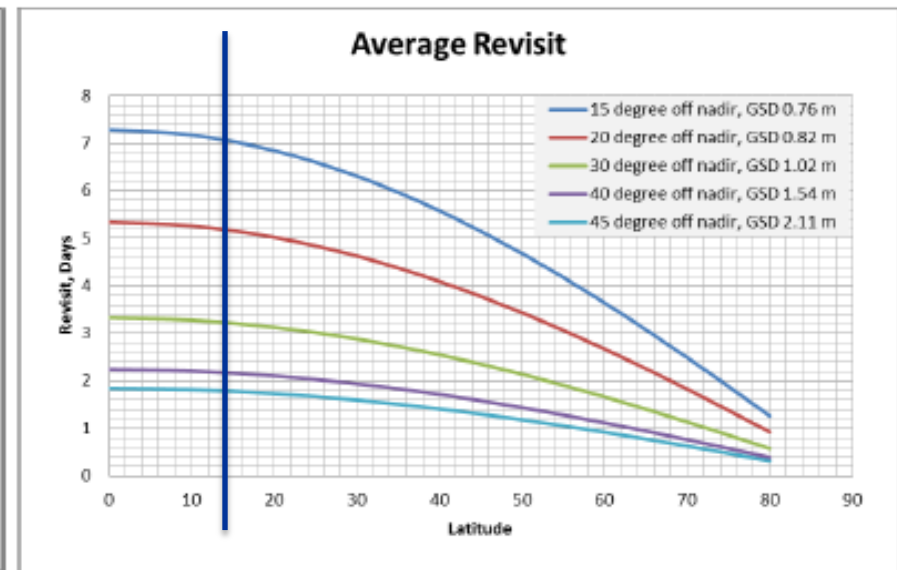
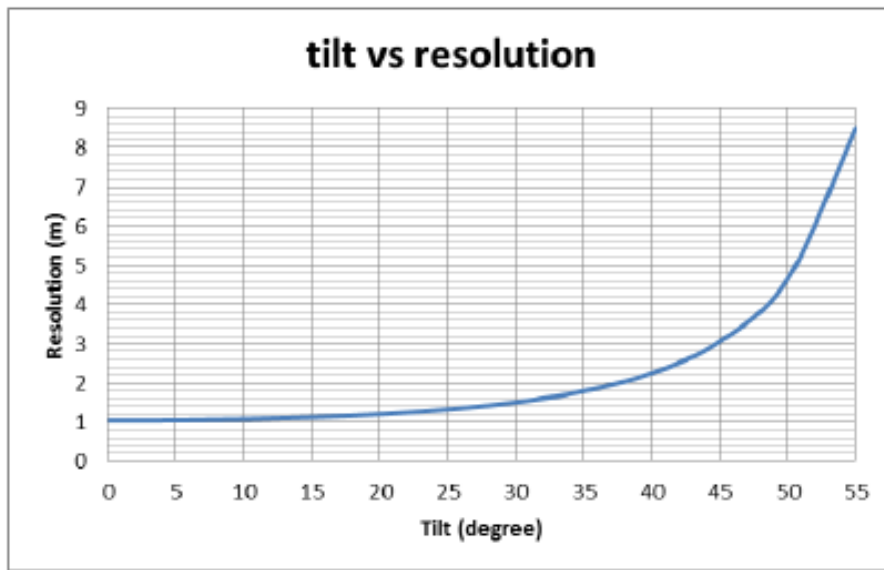
New York, USA

Paris, France



Orbit Characteristics

- ❖ Ground Repeat Cycle: 10 days (approx.)
- ❖ Average revisit: 3.2 days over area on 14 degree of latitude
- ❖ Maximum delay in imaging for a target latitude at 40 deg. is about 5 days with 35 deg. tilt after 5 consecutive day imaging opportunities

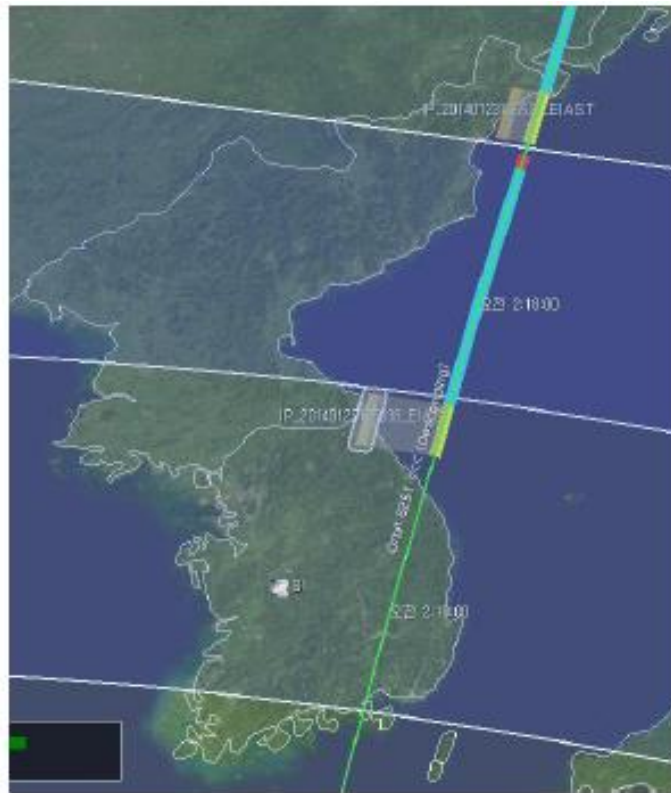


Revisit Characteristics

	Consecutive Days of Imaging (Day)						# of Imaging a year		
Roll Angle (deg.)	±20		±30		±35		±20	±30	±35
Target Latitude (deg.)	Min.	Max.	Min.	Max.	Min.	Max.			
0	1	2	2	3	3	4	60	98	124
10	1	2	2	3	3	4	61	101	124
20	1	2	3	4	3	4	67	108	130
30	2	3	3	4	4	5	72	117	138
40	2	3	3	4	4	5	93	157	199
50	2	4	4	5	4	6	133	220	269
60	3	4	6	12	7	>100	197	316	384

Imaging mode – Multi pointing

- ❖ α (depending on maneuver angle) + 45 sec. (stabilization)
- ❖ Nominal: two 10-second strips (one North, one South)



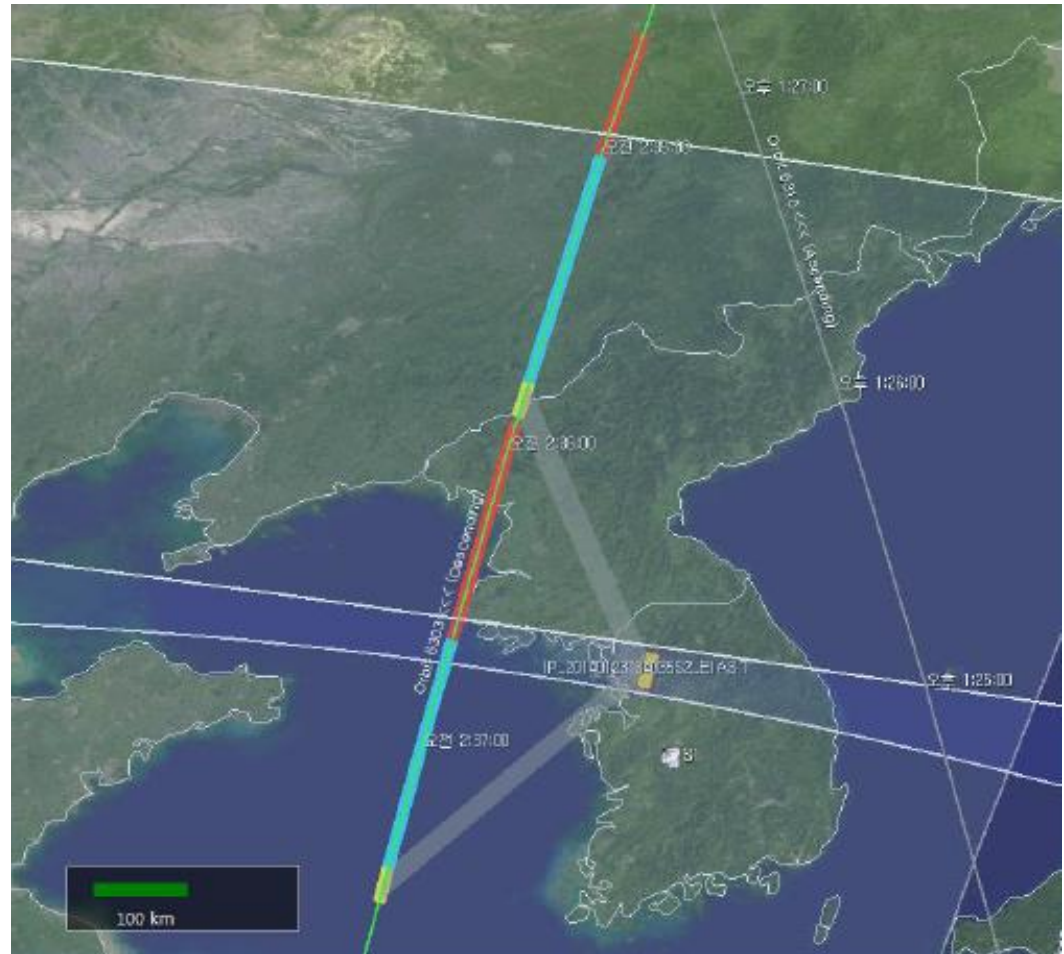
5°



30°

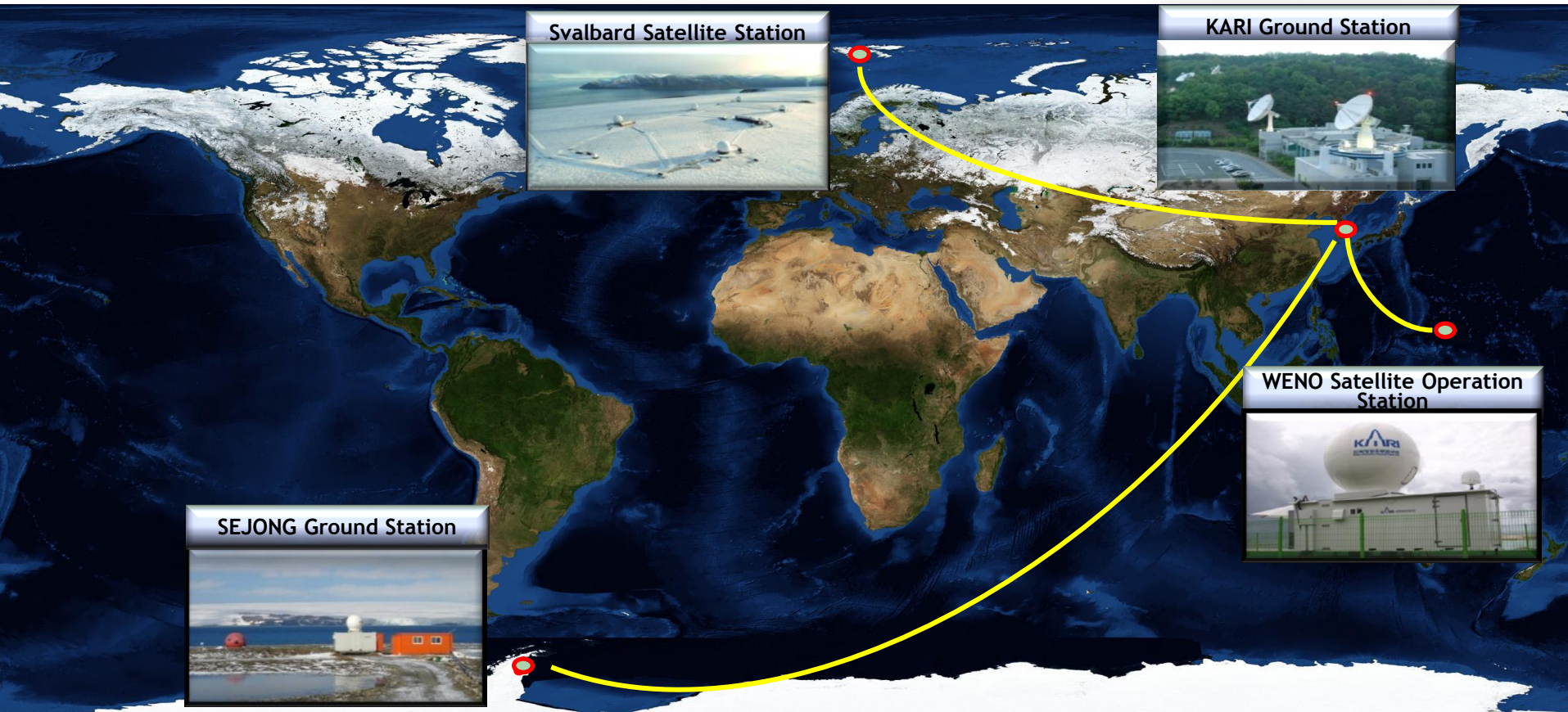
Single-pass Stereo Capability

- ❖ Time gap: 90 seconds
- ❖ Angle difference: $\pm 30^\circ$



Ground Stations of KOMPSAT

- ❖ Global ground stations for KOMPSAT data
- ❖ KARI ground station receives DubaiSat-2 data



**We Are
At Your Service**

