

DRAGONESS

WP 2:

**Review and utilization of spaceborne systems
(for marine monitoring)**

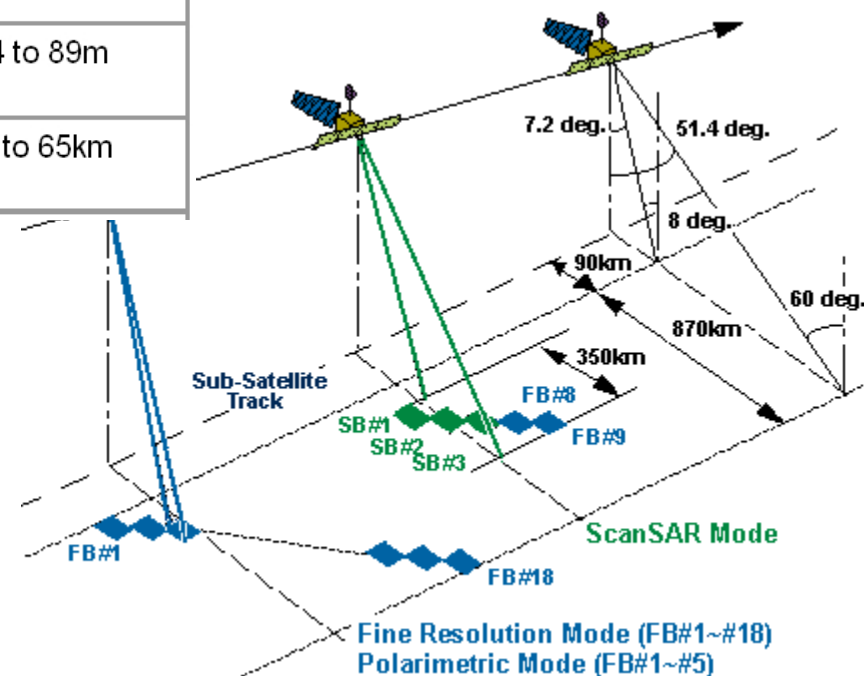
**Spaceborne SAR sensors : PALSAR, TerraSAR-X,
Cosmo/SkyMed**

Spaceborne SAR sensors

	<i>SIR-C/X-SAR</i>	<i>ERS-2</i>	<i>RADARSAT</i>	<i>ENVISAT</i>	ALOS (PALSAR)	TerraSAR-X
General						
Country	USA Germany and Italy	Europe	Canada	Europe	Japan	Deutschland
Agency	NASA/DLR/DARA	ESA	CSA/USA	ESA		
Spacecraft	Shuttle	ERS-2	(dedicated)	(Envisat)		
Launch date	Apr '94, Oct '94	1995	Nov '95	2002	Jan. 2006	Juni. 2007
Design lifetime	10 days	2-3 years	5 years	5 years		
Radar						
Band [wavelength (cm)]	L,C; X	C [5.7]	C [5.7]	C [5.7]	L-Band	X-Band
Frequency (GHz)	1.25, 5.3, 9.6	5.3	5.3	5.3	~24 cm	~3 cm
Antenna	arrays + WG(X)	WaveGuide	WG array	Phased array	Phased array	Phased array
Size (m), lengthxheight	12x(3, 0.75, 0.4)	10x1	15x1.5	-		
Polarization	quad-pol L+C; XVV	VV	HH	VV + HH	exp. vollpol. Modus	exp. vollpol. Modus
Incident angle (degrees)	15 - 55	23	< 20 - > 50	20 - 50		
Range resolution (m)	10 - 30	26	10 - 100	~ 25	7 - 100	1.5 - 3.5
Azimuth resolution (m)	30	28	9 - 100	~ 25		1 - 16
Looks	~4	6	1 - 8	~ 4		
Swath width (km)	15 - 60	100	10 - 500	100 (500)		
Recorder on board?	Y (+ D/L)	N	Y	Y		
Processing (Optical, Digital)	D	D	D	D		
Noise equivalent σ^0 (dB)	-40 < -28	-24	-23	-		
Mission						
Altitude (km)	225	~780	~800	~700		
Inclination (degrees)	57	98.5	98.6	98.5		
Sun synchronous?	N	Y	Y	Y		
Down-link data rate (MB/sec)	45 (TDRS)	105	74 - 105	~ 105		
Repeat cycle (days)	nil	35	24	35	46	11
Operation time per orbit (min)	(60 h, total)	10	20	10 +		

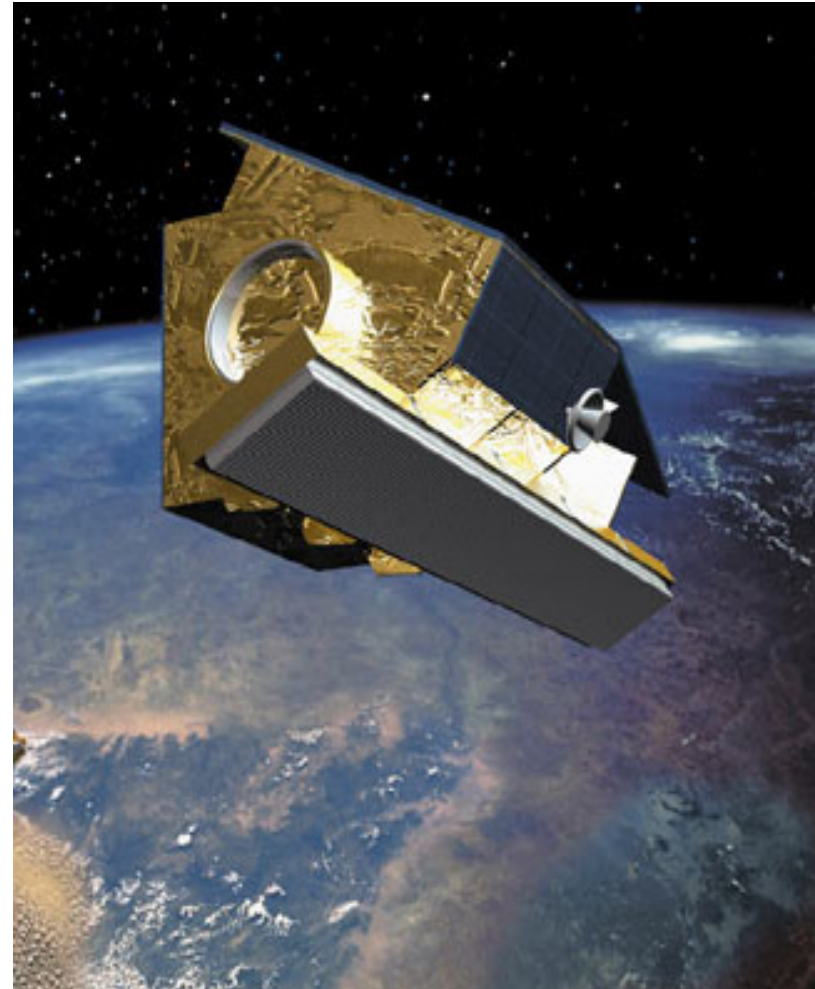
ALOS (Daichi): L-band SAR PALSAR

Mode	Fine		ScanSAR	Polarimetric (Experimental mode)*1
Center Frequency	1270 MHz(L-band)			
Chirp Bandwidth	28MHz	14MHz	14MHz,28MHz	14MHz
Polarization	HH or VV	HH+HV or VV+VH	HH or VV	HH+HV+VH+VV
Incident angle	8 to 60deg.	8 to 60deg.	18 to 43deg.	8 to 30deg.
Range Resolution	7 to 44m	14 to 88m	100m (multi look)	24 to 89m
Observation Swath	40 to 70km	40 to 70km	250 to 350km	20 to 65km



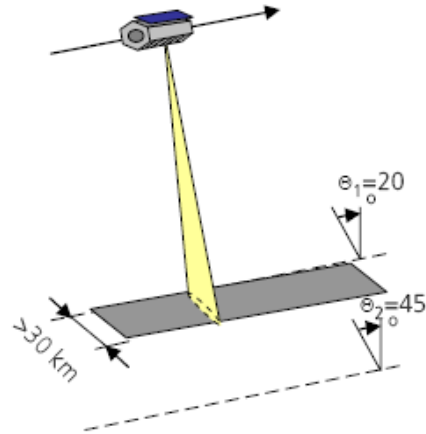
German TerraSAR-X mission

- Launched 15.6.2007
- Private Public Partnership
- Specialities:
- Very flexible instrument
 - Up to 1 m resolution
 - Second satellite (TanDEM-X) in construction
 - High resolution digital global elevation model



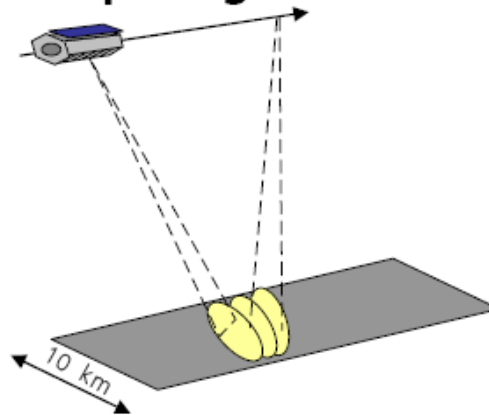
TerraSAR-X imaging modes:

Stripmap



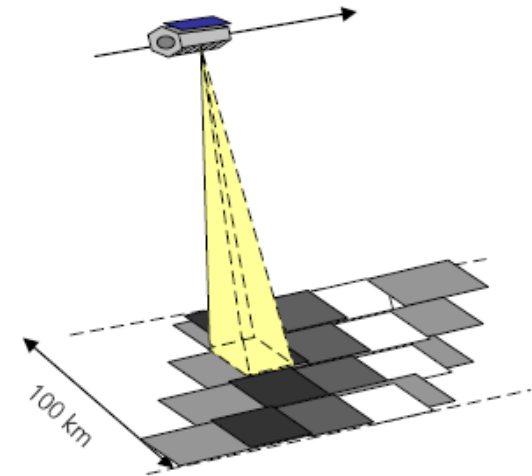
Swath width	30 km (15 - 30 km in dual pol)
Acquisition length	max. ca. 1650 km
Incidence angle range (~27 beams)	20° - 45° full perf. 15° - 60° access
Azimuth resolution	3 m
Ground range resolution	1.7 - 3.5 m (@45°-20°)
NESZ	~ -23 dB

High Res./Sliding Spotlight



Scene extension	10/5 km (az) x 15 km (rg)
Incidence angle range (~ 100 beams)	20° - 55° full perf. 15° - 60° access
Azimuth resolution	2/1 m
Ground range resolution	1.5 - 3.5 m (@55°-20°)
NESZ	-30 dB .. -19 dB

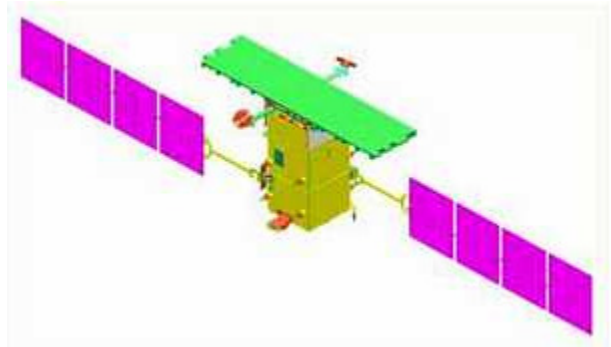
ScanSAR



Number of sub-swaths	4
Swath width	100 km
Acquisition length	max. ca. 1650 km
Incidence angle range (~27 beams)	20° - 45° full perf. 20° - 60° access
Azimuth resolution	16 m
Ground range resolution	1.7 - 3.5 m (@45°-20°)

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COSMO-SkyMed



COSMO-SkyMed (Constellation of Small Satellites for Mediterranean basin Observation) was planned as a constellation of four Synthetic Aperture Radar satellites for primarily military surveillance, but with products made available to civilian users as well.

Modes of operations

- 1) **Spotlight / Frame: Spot observation area: 10 km x 10 km, resolution under 1 m**
- 2) **HIMAGE / Stripmap: Swath width: 40 km, resolution 3-15 m**
- 3) **WideRegion / ScanSAR: Swath width: 100 km, resolution 30 m**
- 4) **HugeRegion / ScanSAR: Swath width: 200 km, resolution 100 m**
- 5) **Ping Pong / Stripmap: Swath width: 30 km, resolution: 15 m**

Orbit: 622 km, inclination 97.90 deg, period: 97.20 min

Cosmo-SkyMed 1 launched on 8 June 2007

Cosmo-SkyMed 2 :launched on 9 December 2007

Frequency: X-band