CSRSR

SPOT Evolution

Sensor Category: Along-track Scanner

Swath Width: 60 km (117 km), View Angle: ±27°

Orbital (Target) Revisit Period: 26 days (~3-4days)

Equatorial Crossing Time: 10:30 AM

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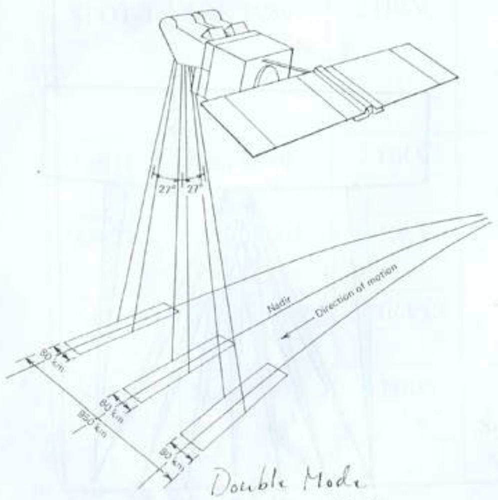
Note: SPOT – System Pour 1'Observation de la Terre

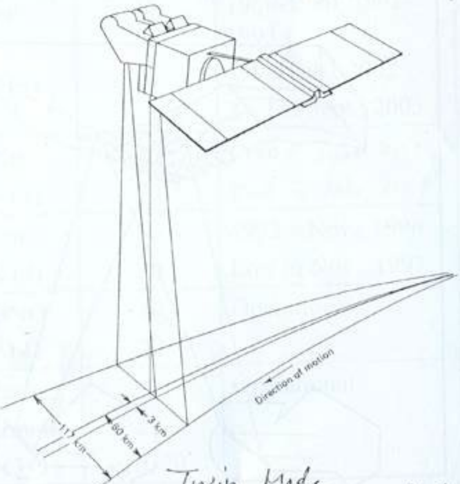
HRV – Haute Resolution Visible

HRVIR – Haute Resolution Visible and Infrared

HRG – High Resolution Geometric

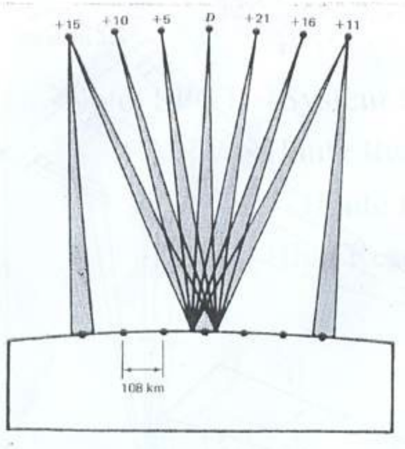


Double Mode
(PAN + XS)

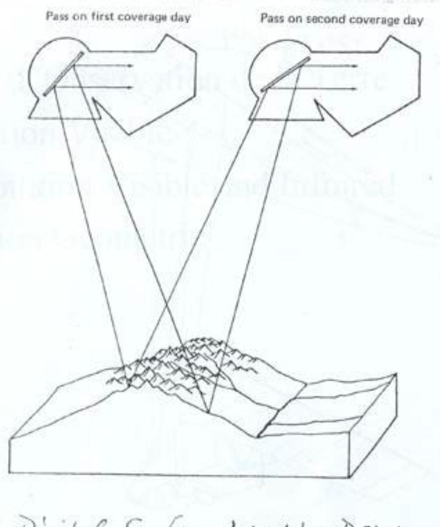


Twin Mode
(PAN, or XS)

2.12.6



(1) Reduce Target Revisit Time



(2) Digital Surface Model (DSM)

2.12.7

Advantages

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S/C	Launch	Sensor	No. of Bands	Resolution (m)	End of Service/ Status
SPOT-1	Feb., 1986	2 HRV	Pan MS (3)	10 20	1986-1990, 1992-1993 1994-Feb., 2002 End in Sept., 2003
SPOT-2	Jan., 1990	2 HRV	Pan MS (3)	10 20	1990 – June, 2009 End in July, 2009
SPOT-3	Sept., 1993	2 HRV	Pan MS (3)	10 20	1993 – Nov., 1996 Lost in Nov., 1997
SPOT-4	March, 1998	2 HRVIR	MONO MS(4)	10 20	Operational
SPOT-5	May, 2002	2 HRG	Pan Supermode MS (3+1)	5 2.5 10, 20	Operational

2.12.5

High Resolution (≤ 2m) Optical Satellites

	Satellite	Launch	Sensors/ Spectral Bands	Swath (km)	Resolution (m)
美	IKONOS-2	Sept. 1999	Pan (1, 0.45 – 0.90 μm)	11.3	0.82
			MS (4, 0.45 – 0.90 μm)	11.3	3.2
以	EROS-A	Dec., 2000	Pan (1, 0.5 – 0.9 μm)	12.5	1.8
美	QuickBird-2	Oct., 2001	Pan (1, 0.45 – 0.9 μm)	16.5	0.61
			MS (4, 0.45 – 0.89 μm)	16.5	2.5
台	Formosat-2	May, 2004	Pan (1, 0.46 – 0.89)	24	2
			MS (4, 0.46 – 0.90)	24	8
以	EROS-B	April, 2006	Pan (1, 0.5 – 0.9 μm)	7	0.7
韓	KOMSAT-2	July, 2006	Pan (1, 0.50 – 0.90 μm)	15	1
			MS (4, 0.45 – 0.90 μm)	15	4
美	WorldView-1	Sept., 2007	Pan (1, 0.45 – 090 μm)	17.6	0.5
美	GeoEye-1	Sept., 2008	Pan (1, 0.45 – 0.80)	15.2	0.41*
			MS (4, 0.45 – 0.92)	15.2	1.65*
美	WorldView-2	Oct., 2009	Pan (1, 0.45 – 0.90 μm)	16.4	0.46*
			MS (8, 0.40 – 1.05 μm)	16.4	1.80*

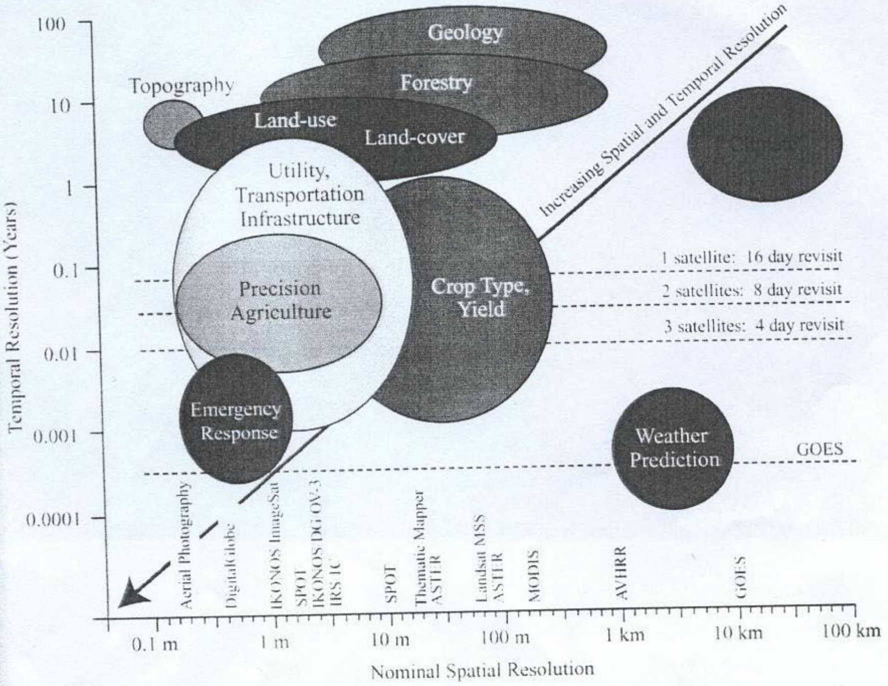
註：僅限於美國國內使用，國際間，單波段及多波段地面解析率分別為 0.5 米及 2.0 米。

High Resolution (≤ 2m) SAR Satellites

Satellite	Launch	Band	Polarization	Swath (km)	Resolution (m)
Terra SAR	June, 2007	X	Single (HH or VV)	5 – 100	1 – 16
			Dual (HH / VV)	5 – 30	2 – 6
Radarsat-2	Dec., 2007	C	Single (HH or VV or HV), Dual (HH / HV, VV /VH)	18 – 500	1 – 100m
			Polarimetry (HH, VV, HV)	25	5 – 25

2.12.9

Spatial and Temporal Resolution for Selected Applications

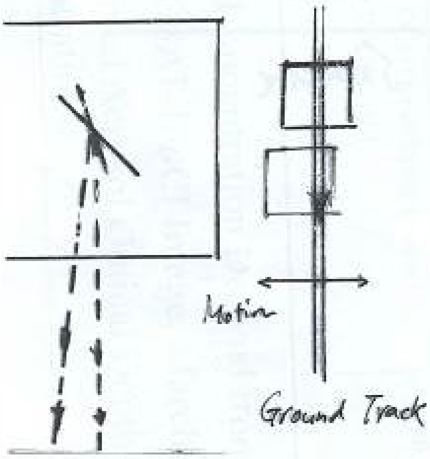


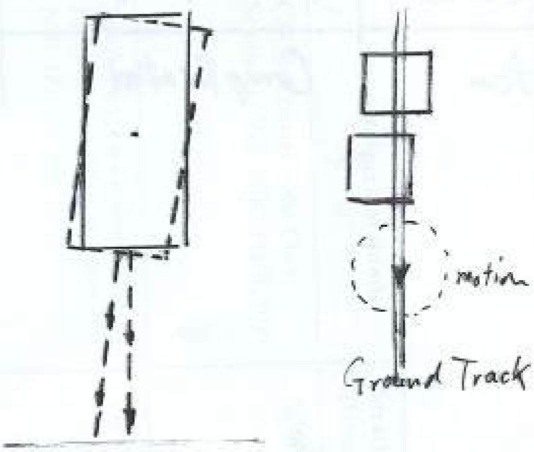
Color Plate 1-1 The nominal spatial and temporal resolution characteristics for selected applications are presented. When conducting a remote sensing project, there is usually a trade-off between spatial and temporal resolution requirements. Generally, as temporal resolution requirements increase, it is usually necessary to lower the spatial resolution requirements so that the amount of remote sensor data collected does not become unmanageable. Fortunately, many applications that require very detailed spatial information (e.g., land-use mapping) normally do not require high temporal resolution data (i.e., data collected once every five to ten years may be sufficient). There are exceptions to these general rules. For example, precision agriculture, crop yield investigations, traffic studies, and emergency response applications sometimes require very high spatial and temporal resolution remote sensor data. The volume of data collected can create serious data management and analysis problems. There are also trade-offs with the other resolutions (e.g., spectral, radiometric, polarization) that may need to be considered.

2. 12. 11

Off-Nadir Viewing

1. Mirror Rotation → SPOT Series
2. Body Rotation → High Resolution Satellites





Motion Time ~1 sec
Data Loss ~ 7 Km

Motion Time ~5-10 sec
Data Loss 35~70 Km

2.12.12

	Mirror Rotation	Body-Rotation
Motion	Across-Track	Cone
Time	Short (~1 sec)	Long (~5~10 sec)
Data Loss	small (~7 Km)	Large (~35-70 Km)
System	Complicated	Simple

2.12.13

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2.2 Ocean

Satellite	Launch	Sensors/Spectral Bands	Swath (Km)	Resolution (m)	Notes
Nimbus-7	Oct., 1978-Dec., 1986	CZCS (Coastal Zone Color Scanner) / VIS, NIR, THIR, (6)	1,566	825	Ocean Color (Chlorophyll, Sediment, Salinity), Temperature.
OrbView-2	Aug., 1997	SeaWiFS (Sea-viewing Wide-Field-of-View Sensor) / VIS , NIR, (8)	2,800	1,130	Ocean Color, Phytoplankton, Cycles of Carbon, Sulfur & Nitrogen
FORMOSAT-1	Jan., 1999-June, 2004	OCI (Ocean Color Imager) / VIS (5), NIR	700	800	Atmospheric Aerosols Chlorophyll, Ocean Color.

See Fig.5 Chlorophy II a Concentration Derived from SeaWiFS, October, 2005

Fig.6 Upper: FORMOSAT-1/OCI Image, March 26, 1999

Lower: (a) Derived Aerosol Optical Depth (b) Derived Total Concentration

Data Downlink from Satellite to Ground

I. Within ground station footprint

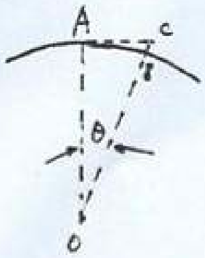
1. Real-time downlink

2. Delayed downlink
   · Store data on-board and downlink later
   (1) later in the same orbit
   (2) later in the next orbit

II. No ground station — store data on-board;

(1) and downlink to other ground station

(2) transmit the data to Communication satellite & re-transmit to ground Communication Station



$\overline{BC} = H$, $\overline{CA} = \overline{CB} = R_E = 6378$ km

$\overline{OC} = R_E + H$, if $H \ll R_E$

$\cos\theta \simeq 1 - \frac{\theta^2}{2} \simeq \frac{OA}{OC} \simeq 1 - \frac{H}{R_E}$

$\theta \simeq \sqrt{2H/R_E}$ $\quad (1 + \frac{H}{R_E})^{-1}$

$\widehat{AB} = R_E \cdot \theta \simeq \sqrt{2 R_E \cdot H} = 113 \sqrt{H(km)}$ km

~~$\frac{1}{(1 \pm x)^n} \simeq 1 \mp n x$~~ if $x \ll 1$

"

$(1 \pm x)^n \simeq 1 \pm n \cdot x$

2.15.c