

IRS – 1C & 1D Satellites

IRS (Indian Remote Sensing) has multispectral bands similar to those of Spot and Landsat. Coverage is not worldwide. The strength of IRS on the 1998 high resolution market is the acquisition of **black and white images with a 5.8 meter resolution**. Rural cadastre, communication networks, urban fabric, - perspectives for using these images are evident, especially for **wide ortho-rectified scenes of 70 by 70 km**. The other strong point of IRS is the acquisition of **color images with a 23 meter resolution**. The price of this data is very low, particularly in view of **the large size of the images** (140 x 140 km).

General Information Sheet

Launch date : 1995 (1C), 1997 (1D),
Project manager : *NRSA (India)*
Spectral sensitivity : *Visible, near and thermal infra-red*

Sensor/ image	PAN	LISS III	WIFS
Resolution	5,8 m	23 m (70 m on thermal band)	188 m
Image size (Km)	70 x 70	140 x 140	800 x 800
Frequency of pass	24 days	24 days	24 days
Coverage	Europe, North America, Eastern and Central Asia	Europe, North America, Eastern and Central Asia	Europe, North America, Eastern and Central Asia

IRS-1C ; The Indian Remote Sensing Satellite IRS-1C was successfully launched into polar orbit on December 28, 1995 by a Russian launch vehicle. Its sensors were activated in the first week of January 1996.



The Indian Remote Sensing Satellite IRS-1D was successfully launched into polar orbit on September 29, 1997 by a PSLV launch vehicle. Its sensors were activated in the middle of October 1997.



Key Parameters of the IRS-1C Sensors

	PAN		LISS-III	WiFS
Spatial Resolution	5.8 m	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	23 m 23 m 23 m 70 m	188 m 188 m
Swath-width	70 km	all Bands	142 km	810 km
Radiometric Resolution, Quantization	6 bit	all Bands	7 bit	7 bit
Spectral Coverage	500 - 750 nm	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	520-590 nm 620-680 nm 770-860 nm 1550-1700 nm	620-680 nm 770-860 nm
Focal Length	982 mm	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	347.367 mm 347.367 mm 347.367 mm 301.043 mm	56.47 mm 56.47 mm
CCD Arrays (no. of arrays * no. of elements)	3 * 4096	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	1 * 6000 1 * 6000 1 * 6000 7 * 300	2 * 2048 2 * 2048
CCD Size	7 μ m x 7 μ m	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	10 μ m x 7 μ m 10 μ m x 7 μ m 10 μ m x 7 μ m 26 μ m x 26 μ m	13 μ m x 13 μ m 13 μ m x 13 μ m
Integration Time	0.88364 ms	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	3.6047 ms 3.6047 ms 3.6047 ms 10.8142 ms	28.8378 ms 28.8378 ms
Cross Track Field of View (FOV) for Single Pixel (radian)	0.0000071	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	0.0000288 0.0000288 0.0000288 -	0.0002302 0.0002302

Key Parameters of the IRS-1D Sensors

	PAN		LISS-III	WiFS
Spatial Resolution	5.8 m	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	23 m 23 m 23 m 70 m	188 m 188 m
Swath-width	63 - 70 km	all Bands	127 - 141 km	728 - 812 km
Radiometric Resolution, Quantization	6 bit	all Bands	7 bit	7 bit
Spectral Coverage	500 - 750 nm	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	520-590 nm 620-680 nm 770-860 nm 1550-1700 nm	620-680 nm 770-860 nm
Focal Length	974.8 mm	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	346.411 mm 346.411 mm 346.411 mm 300.177 mm	56.57 mm 56.57 mm
CCD Arrays (no. of arrays * no. of elements)	3 * 4096	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	1 * 6000 1 * 6000 1 * 6000 7 * 300	2 * 2048 2 * 2048
CCD Size	7 µm x 7 µm	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	10 µm x 7 µm 10 µm x 7 µm 10 µm x 7 µm 26 µm x 26 µm	13 µm x 13 µm 13 µm x 13 µm
Integration Time	0.8836458 ms	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	3.6047576 ms 3.6047576 ms 3.6047576 ms 10.8142728 ms	28.83806 ms 28.83806 ms
Cross Track Field Of View (FOV) for Single Pixel (radian)	0.0000072	Band 2 (green) Band 3 (red) Band 4 (NIR) Band 5 (SWIR)	0.0000289 0.0000289 0.0000289 -	0.0002298 0.0002298

IRS-1C/1D Data Products

Since 1996 Euromap has systematically acquired IRS data from the European footprint of the Neustrelitz ground station. Simultaneously acquired PAN, LISS-III and WiFS data are recorded whenever possible. Our archive of a nearly cloud free coverage can be processed into 5 m natural colour products.

The following introduces the data types with their basic properties.

Sensor	Resolution	Colour
Merge	5 m	natural + infrared
PAN	5 m	black & white
LISS-III	23 m	multispectral
WiFS	180 m	multispectral

For detailed descriptions of these products please see the relevant pages. The standard delivery time for small and medium sized orders varies between three and ten working days. Data from areas outside the European footprint, gathered by stations such as Shadnagar in India, Norman in USA, Dubai in the UAE, Bangkok in Thailand and others, are also available via Euromap.

IRS PAN Products

With 5 m resolution and products covering areas up to 70 km x 70 km IRS PAN data provide a cost effective solution for mapping tasks up to 1:25'000 scale.



IRS-1D PAN, Munich suburbs, 11-Aug-1998

Default Parameters

	System Corrected		Radiometrically Corrected
	North Oriented	Path Oriented	Path Oriented
Map Projection	UTM	SOM	-
Ellipsoid	WGS 84	International 1909	-
Product Resolution (m)	5.0	5.0	5.8
Resampling	Cubic Convolution	Cubic Convolution	-
Available Formats	Fast Format, Super Structure BSQ	Fast Format, Super Structure BSQ	Super Structure BSQ + TIFF

	+ TIFF	+ TIFF	
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For a list of available map projections, ellipsoids and so on please check the order form.

Typical Values and Product Samples

Coverage Size (km)	Value	System Corrected		Radiometrically Corrected
		North Oriented	Path Oriented	Path Oriented
70 x 70	Size (MB)	275	225	3 * 58
	Size (Pixel)	17'000 x 16'000	15'000 x 14'000	3 * 4'096 x 14'798
23 x 70	Size (MB)	135	90	58
	Size (Pixel)	8'000 x 15'000	5'000 x 17'000	4'096 x 14'798
	Sample	-	-	74 MB in Super Structure BSQ¹⁾
23 x 23	Size (MB)	33	24	20
	Size (Pixel)	6'000 x 6'000	5'000 x 5'000	4'096 x 4'606
	Sample	37 MB in Fast Format¹⁾	31 MB in Super Structure BSQ¹⁾	-

IRS LISS-III Products

IRS LISS-III data are well suited for agricultural and forestry monitoring tasks. Because of their simultaneous acquisition with IRS PAN data and the availability of a synthetic blue band, LISS-III data are ideal for colouring IRS PAN products.



IRS-1D LISS-III, Wasserburg a. Inn, Bavaria, 11-Aug-1998

Default Parameters

	System Corrected		Radiometrically Corrected
	North Oriented	Path Oriented	Path Oriented
Map Projection	UTM	SOM	-
Ellipsoid	WGS 84	International 1909	-
Product Resolution (m)	25.0	25.0	23.5 70 (band 5)
Resampling	Cubic Convolution	Cubic Convolution	-
Available Data Formats	Fast Format, Super Structure BSQ + TIFF	Fast Format, Super Structure BSQ + TIFF	Super Structure BSQ

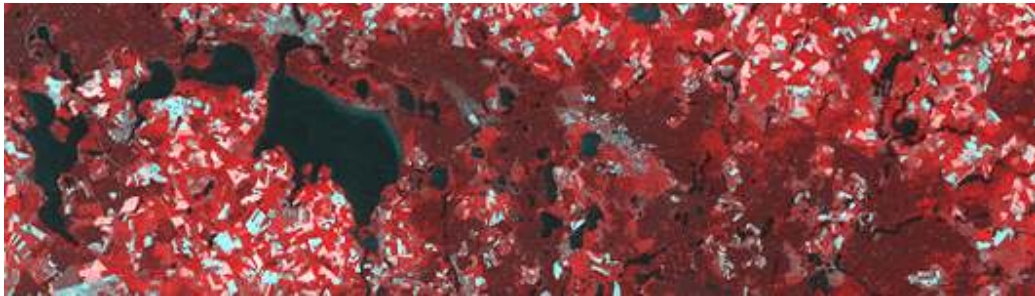
LISS-III data are delivered as 3 band products (2=green, 3=red, 4=NIR). Band 5 (SWIR) is an add-on to the product, free of charge, provided whenever possible. For a list of available map projections, ellipsoids and so on please check the order form.

Typical Values and Product Samples

Coverage Size (km)	Value	System Corrected		Radiometrically Corrected
		North Oriented	Path Oriented	Path Oriented
140 x 140	Size (MB)	4 * 50 = 200	4 * 35 = 140	3 * 38 + 5 = 119
	Size (Pixel)	7'000 x 6'700	6'000 x 6'000	6'000 x 6'000 2'160 x 2'100 (band 5)
	Sample	-	-	87 MB, Super Structure BSQ ¹⁾
70 x 70	Size (MB)	4 * 12 = 48	4 * 9 = 36	-
	Size (Pixel)	3'500 x 3'300	3'000 x 2'900	-
	Sample	57 MB, Super Structure BSQ ¹⁾	46 MB, Fast Format ¹⁾	-

IRS WiFS Products

The revisit capability of only 5 days and the product coverage size of 800 km x 800 km make WiFS products a valuable source for application fields such as flood and snow melt monitoring.



IRS-1D WiFS, lake district, Mecklenburg-Western Pomerania, 19-May-1999

Default Parameters

	System Corrected		Radiometrically Corrected
	North Oriented	Path Oriented	Path Oriented
Map Projection	-	Lambert Conformal Conic	-
Ellipsoid	-	International 1909	-
Product Resolution (m)	-	180	180
Resampling	-	Cubic Convolution	-
Available Data Formats	-	Fast Format, Super Structure BSQ + TIFF	Super Structure BSQ + TIFF

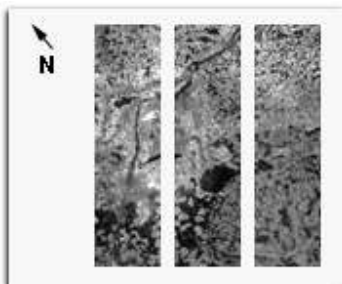
For a list of available map projections, ellipsoids and so on please check the order form.

Typical Values and Product Samples

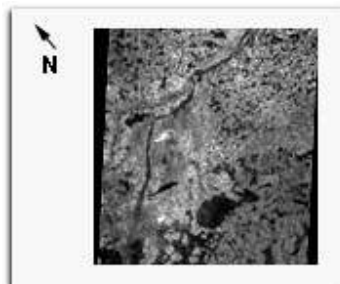
Coverage Size (km)	Value	System Corrected		Radiometrically Corrected
		North Oriented	Path Oriented	Path Oriented
800 x 800	Size (MB)	-	2 * 21 = 42	2 * 19 = 38
	Size (Pixel)	-	4'300 x 4'900	4'300 x 4'900
	Sample	-	50 MB, Fast Format ¹⁾	38 MB, Super Structure BSQ ¹⁾

Processing Levels

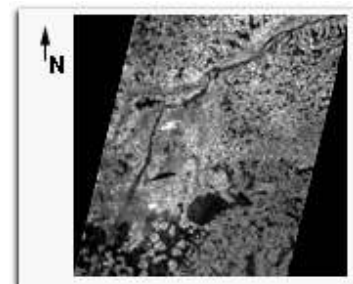
IRS standard data products are offered with two processing levels - radiometrically corrected and system corrected. System corrected is the higher level, which includes the radiometric and geometric correction of the data.



Radiometrically corrected



System corrected, path oriented



System corrected, north oriented

Radiometric Correction

During the radiometric correction, distortions arising due to the non-uniform response of the detectors and the failure of specific detector elements will be corrected. The results are stored as integer values with eight or ten bit resolution.

Geometric Correction

The geometric correction takes care of several system dependent geometric distortions. This includes earth rotation effects, sensor focal plane detector geometry, optical axis alignment with respect to the spacecraft attitude reference, multi-band and multi-array misregistration and altitude and attitude variations.

Geometric corrections are performed using a dynamic model representing the imaging geometry. By using this model, an image to ground mapping is achieved. The result is

projected into a path oriented or north oriented output image space by employing the user specified map projection and a resampling method.