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Landsat Data Gap Study Team Activities

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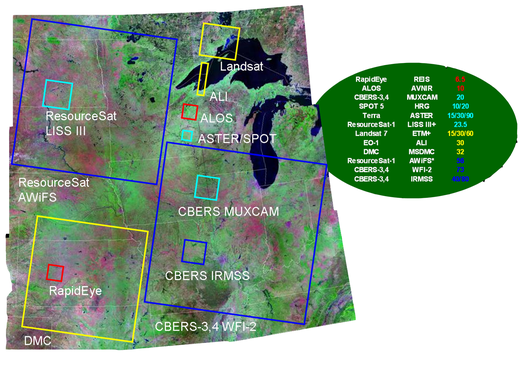
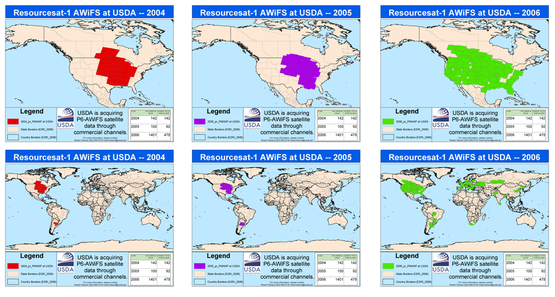
Landsat Data Gap Background

The Landsat suite of satellites has collected the longest continuous archive of multi-spectral data of any land-observing space program. From the Landsat program's inception in 1972 to the present, the Earth science user community has benefited from a historical record of remotely sensed data. The archive of Landsat data constitutes the longest continuous record of satellite-based observations and, as such, is an invaluable resource for monitoring global change and the use of Earth observations in decision making tools that benefit society. Potentially, the capabilities of currently operational Landsat satellites will be lost before the launch of the follow-on Landsat Data Continuity Mission (LDCM), thus producing a gap in the Landsat data record and the National Satellite Land Remote Sensing Data Archive (NSLRSDA).

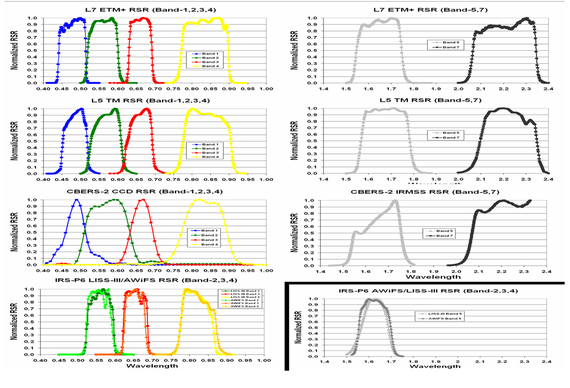


Landsat Data Gap Study Team

In anticipation of a gap, the federal agencies responsible for Landsat program management, National Aeronautics and Space Administration (NASA) and Department of Interior (DOI) U.S. Geological Survey (USGS), convened a Landsat Data Gap Study Team (LDGST). The Study Team assessed the basic characteristics of multiple systems and identified sensors aboard the China-Brazil Earth Resources Satellite (CBERS-2), and the Indian Remote Sensing (IRS-P6) Resource Sat-1 satellite as the most promising sources of Landsat-like data. The sensors include the combination of CBERS-2 Infrared Multi-spectral Scanner (IRMSS) and High Resolution Charged Coupled Device (HRCCD), as well as the IRS-P6 Advanced Wide Field Sensor (AWiFS) and IRS-P6 Linear Imaging Self Scanning Sensor (LISS-III).



Relative Spectral Response (RSR) Profiles



China-Brazil Earth Resources Satellite (CBERS-2)

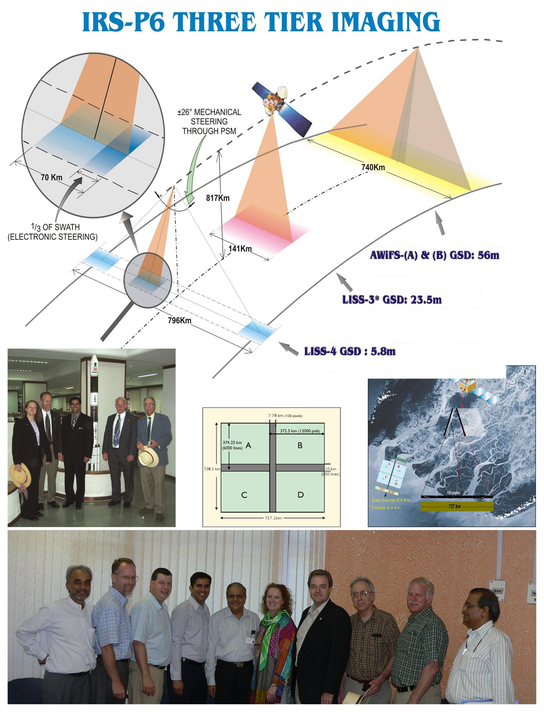
The second China-Brazil Earth Resources Satellite (CBERS-2) was launched in October 2003. The spacecraft carries identical payload as CBERS. It carries three remote sensing instruments: the High Resolution CCD Camera (HRCCD), the Infrared Multi-spectral Scanner (IRMSS), and the Wide Field Imager (WFI). The CCD camera and the WFI operate in the VNIR regions, while the IRMSS mainly operates in the SWIR. The three instruments are used together to provide images with different resolution and coverage.

CBERS-2 Specifications

Parameter	HRCC	IRMSS	WFI
Spectral Bands (µm)	0.51 - 0.73 (PAN)	0.50 - 1.10 (PAN)	0.63 - 0.69
	0.45 - 0.52	1.55 - 1.75 (SWIR)	0.76 - 0.90
	0.52 - 0.59	2.08 - 2.35 (SWIR)	
	0.63 - 0.69	10.4 - 12.5 (TIR)	
	0.77 - 0.89		
Spatial Resolution	20 m	80 m (PAN & SWIR) 160 m (TIR)	260 m
Swath Width (FOV)	113 km (8.32°)	120 km (8.78°)	885 km (60°)
Temporal Resolution	26 days	26 days	3-5 days
Cross-Track Pointing	±32°		
Data Rate	2 x 53 Mbit/s	6.13 Mbit/s	1.1 Mbit/s
Carrier Frequency (X-band)	8.103 and 8.321 GHz	8.216 GHz	8.203 GHz
EIRP	43 dBm	39.2 dBm	31.8 dBm
Modulation	QPSK	BPSK	QPSK
Tracking Beam Frequency	8.196 GHz	8.196 GHz	8.196 GHz

ResourceSat-1 (IRS-P6)

The Indian Remote Sensing ResourceSat-1 satellite (IRS-P6) is a three-axis body-stabilized satellite. It has an operational life of five years, in a near-polar, Sun-synchronous orbit, at a mean altitude of 817km. Its payload consists of three sensors: Medium Resolution Linear Imaging Self-Scanner (LISS-III), Advanced Wide Field Sensor (AWiFS), and a high-resolution multi-spectral Linear Imaging Self-Scanner camera (LISS-IV). All three sensors work on the 'push-broom scanning' concept, using linear arrays of Charge Coupled Devices (CCDs). In this mode of operation, each line of image is electronically scanned and contiguous lines are imaged by the forward motion of the satellite. Unique to the ResourceSat-1 is that these three sensors with different resolutions and swath widths are on the same platform.



Resourcesat-1 Specifications

	LISS-IV	LISS-III	AWiFS
Resolution (m)	5.8	23.5	56
Swath (km)	23.9 km (Mx) 141km	740 km	
Spectral Bands (µm)	B2: 0.52-0.59 B3: 0.62-0.68 B4: 0.77-0.86	B2: 0.52-0.59 B3: 0.62-0.68 B4: 0.77-0.86 B5: 1.55-1.70	B2: 0.52-0.59 B3: 0.62-0.68 B4: 0.77-0.86 B5: 1.55-1.70
Quantization (bits)	7	7	10
Integration Time (msec)	0.877714	3.32	9.96
No. of gains	Single gain	Four for B2,3,4	Single gain
Sensor	Pushbroom	Pushbroom	Pushbroom
CCD Arrays	1 * 12288	1 * 6000	2 * 6000
CCD Size (µm)	7 µm x 7 µm	10 µm x 7 µm	10 µm x 7 µm
Focal Length (mm)	982	347.5	139.5
Cross-track FOV for pixel (radiance)	0.0000071	0.0000288	0.0000717
Power (W)	216	70	114
Weight (kg)	169.5	106.1	103.6
Data Rate (MBPS)	105	52.5	52.5
Repeat Cycle (days)	5	24	5