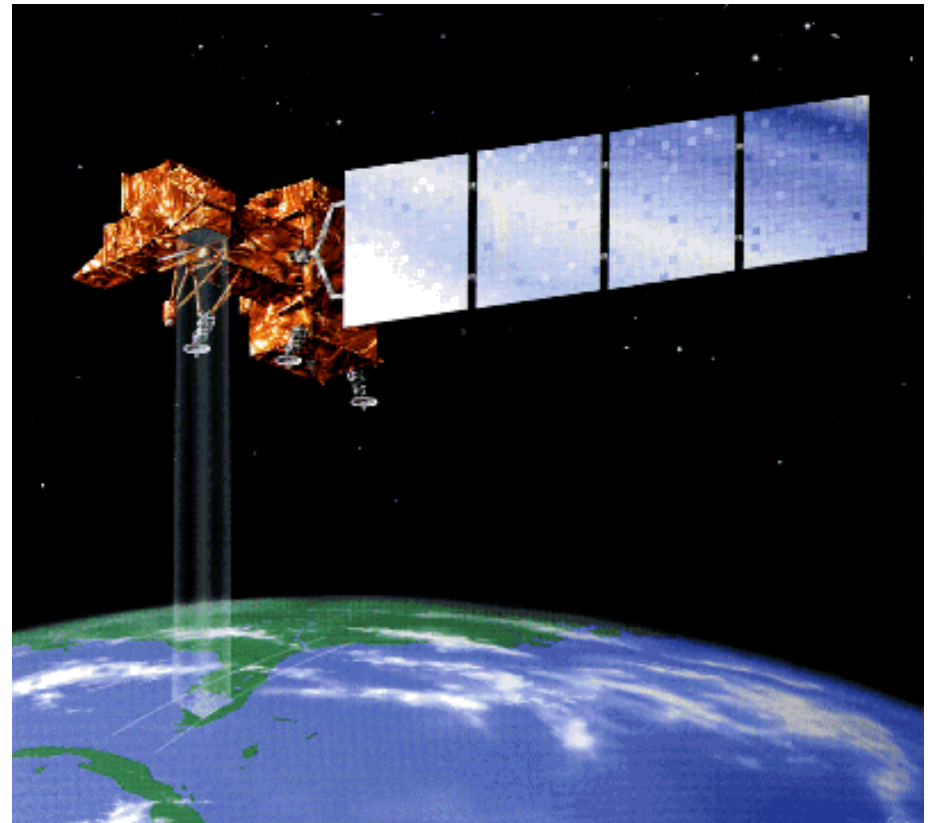


Major Satellite Systems

- High spatial resolution
 - Quickbird, IKONOS, OrbView-3, SPOT-5 PAN, IRS-P6
- Medium spatial resolution
 - Landsat-5 TM, Landsat-7 ETM+, ASTER, SPOT
- Low spatial resolution
 - MODIS, ENVISAT, GOES, AVHRR, MSS

LANDSAT

- First started by NASA in 1972 but later turned over to NOAA
- Since 1984 satellite operation and data handling are managed by a commercial company EOSAT
- LANDSAT-7 launched in 1999; developed scan line error in 2003
- Only 5 is still working; outdated



Source: <http://www.sci-ctr.edu.sg/ssc/publication/remotesense/landsat.htm>

LANDSAT Thematic Mapper

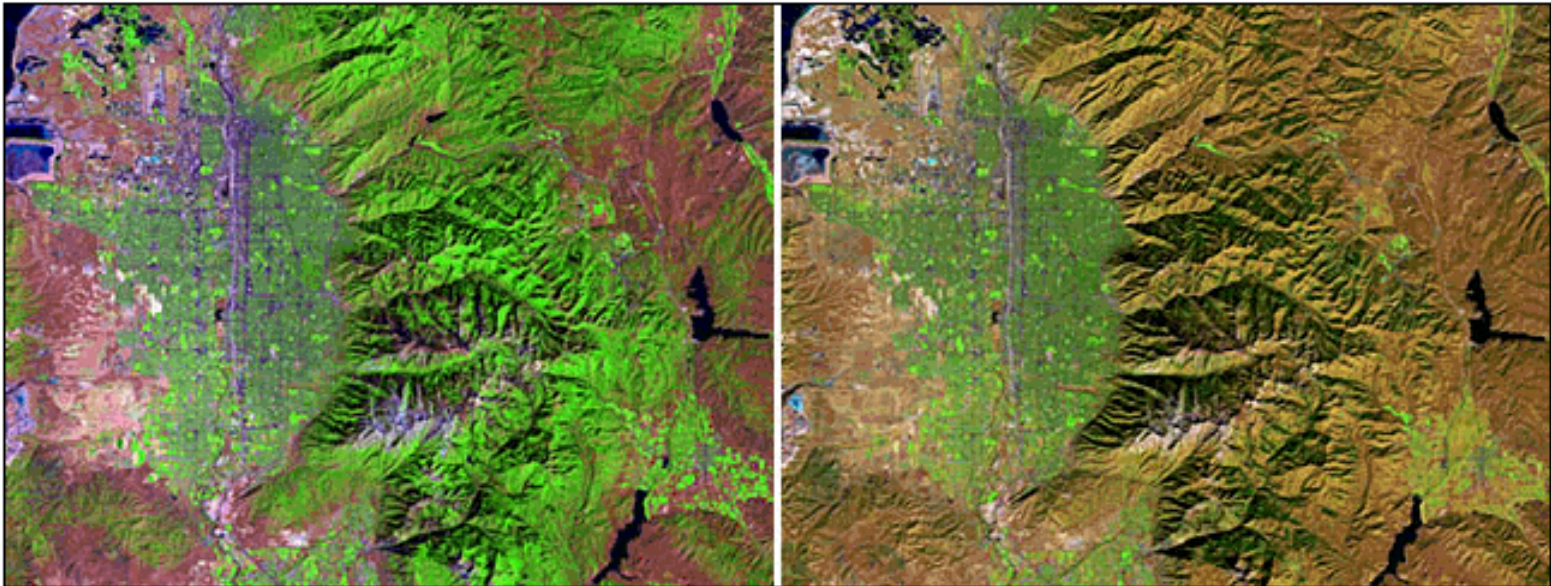
- Spatial and spectral resolution
- Radiometric resolution: 8 bits (256 DN's)
- Temporal resolution: 16 days.

	Band	Wavelength (µm)	Resolution (m)
Blue	1	0.45 - 0.52	30
Green	2	0.52 - 0.60	30
Red	3	0.63 - 0.69	30
Near IR	4	0.76 - 0.90	30
SWIR*	5	1.55 - 1.75	30
Thermal IR	6	10.40 - 12.50	120
SWIR*	7	2.08 - 2.35	30

* Mid infra red

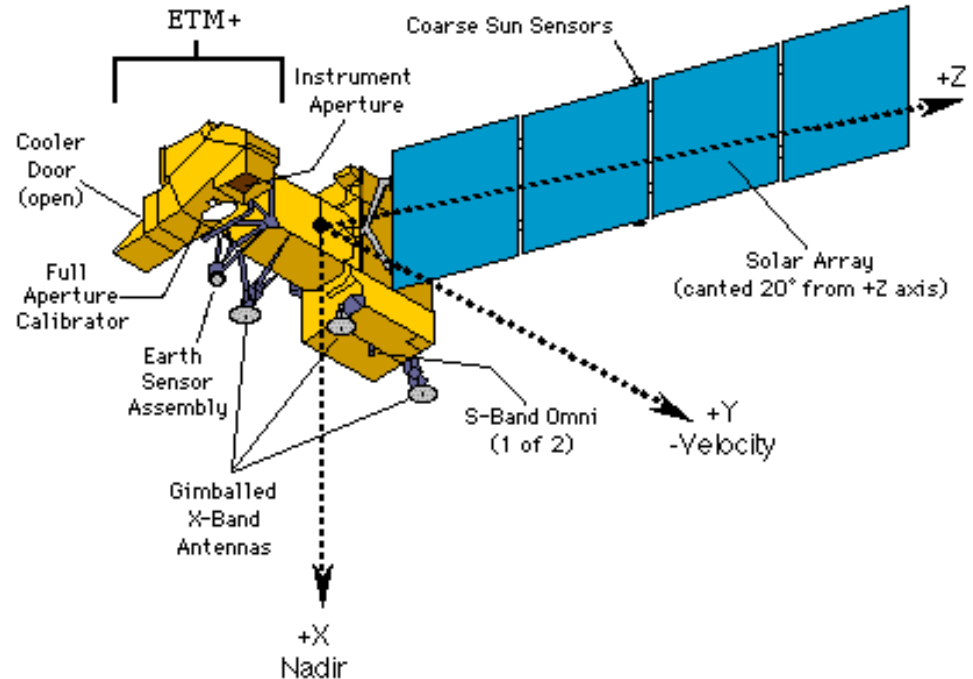
LANDSAT TM

- An example: August 14, 1999 (left) and October 17, 1999 (right) images of the Salt Lake City area
- Differences in color due to growing season



LANDSAT 7

- Uses a new sensor called Enhanced Thematic Mapper Plus (ETM+)
- Stressed continuity with LANDSAT 4 and 5 in that uses similar orbit and repeat patterns, as well as a similar 185 km swath width for imaging



Source: http://ftpwww.gsfc.nasa.gov/IAS/handbook/handbook_htmls/chapter2/chapter2.html

Enhanced Thematic Mapper Plus

- Characteristics of ETM+: Band wavelength spectrums are slightly different from LANDSAT 5 TM

LANDSAT-7 ETM+ BAND CHARACTERISTICS					
Band Number	Nominal spectrum	Spectral Range (μ)	Ground Resolution (m)	Data Lines Per Scan	Data Line Length (bytes)
1	Blue	.450 to .515	30	16	6,600
2	green	.525 to .605	30	16	6,600
3	red	.630 to .690	30	16	6,600
4	Near IR	.775 to .900	30	16	6,600
5	mid IR	1.550 to 1.750	30	16	6,600
6	Thermal IR	10.40 to 12.50	60	8	3,300
7	mid IR	2.090 to 2.35	30	16	6,600
8	panchromatic	.520 to .900	15	32	13,200

LANDSAT TM: applications

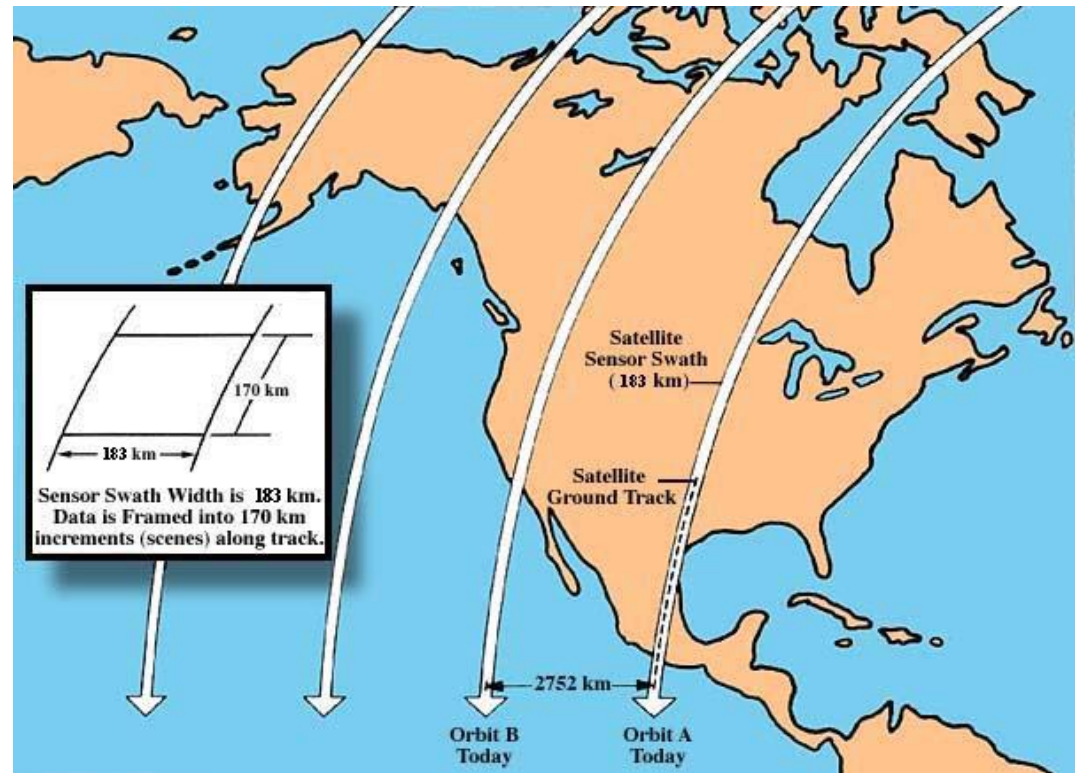
Band	Nominal Spectral location	applications
1	Blue	Water body penetration, soil-water discrimination, forest type mapping, cultural feature ID
2	Green	Green reflectance peak of veg, for veg ID and assessment of vigor, cultural feature ID
3	Red	Chlorophyll absorption region, plant species differentiation, cultural feature ID
4	Near infra red	Veg types, vigor and biomass content, delineating water bodies, soil moisture assessment
5	mid infra red (1.55-1.75 μm)	Veg moisture, soil moisture, diff of soil from clouds
6	Thermal infra red	Veg stress analysis, soil moisture, thermal mapping
7	mid infra red(2.08-2.35 μm)	Discriminating mineral and rock types, veg moisture

LANDSAT

- Its repeat cycle is about 16 days and always crosses equator at around 10 AM.
- Orbit takes about 99 minutes (14.5 per day)
- Distance between ground tracks of consecutive orbits is 2752 km at equator because of the earth's rotation
- By following earth's rotation with each pass, it can keep crossing the equator at the same time

LANDSAT

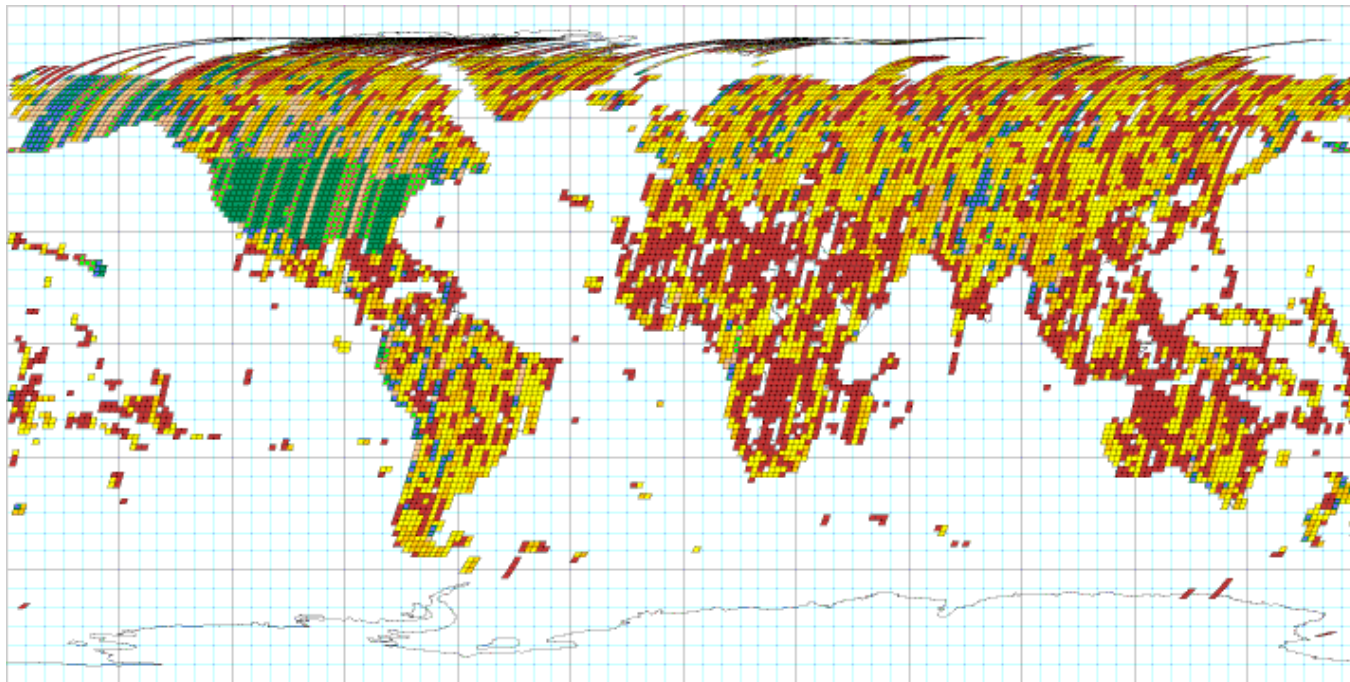
- Swath is 183 km wide, although that includes overlap, since data frame is 170 km
- 233 orbits, for each 16-day cycle



Source: http://eosims.cr.usgs.gov:5725/DATASET_DOCS/landsat7_dataset.html

LANDSAT 7

- LANDSAT 7 has an excellent mission coverage archive



Number of times each Path/Row is represented in the Landsat 7 archive.



Source: http://ftpwww.gsfc.nasa.gov/IAS/handbook/handbook_htmls/chapter6/chapter6.html