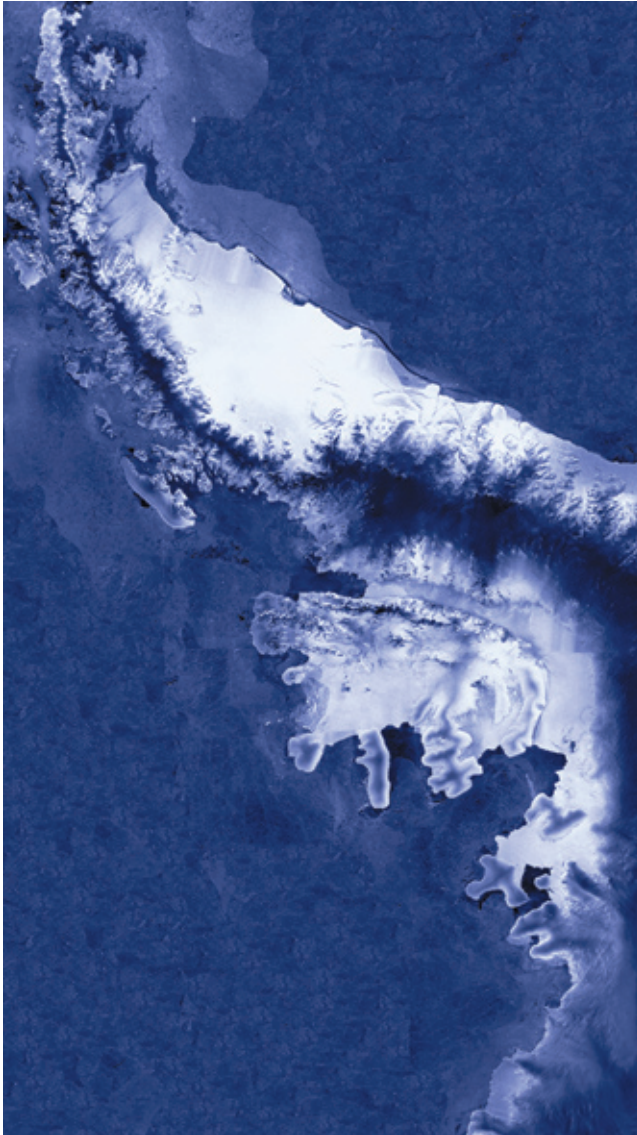




Products
& Services

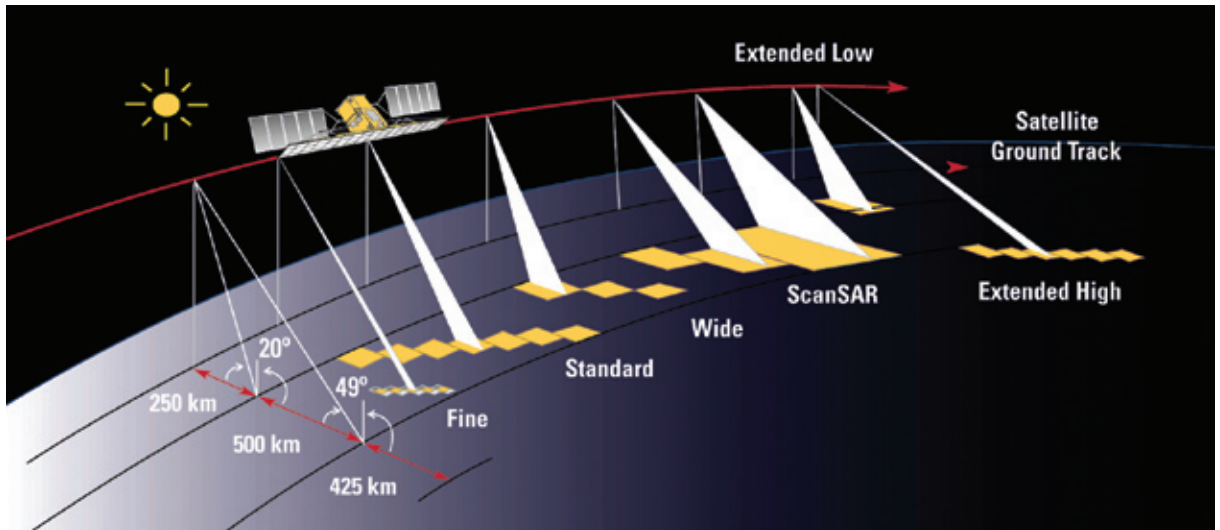
RADARSAT

SYNTHETIC APERTURE RADAR SATELLITE FROM CANADA



RADARSAT is Canada's first Earth Observation satellite and the world first operationally oriented radar satellite. Thanks to its single frequency and its different beam modes and positions, RADARSAT is able to meet all the requirements for a continuous and complete Earth monitoring and management. The Radarsat antenna operates in the C band microwave frequency (5.3 Ghz / 5.6 cm), which is able to penetrate clouds and precipitation. Radarsat transmits and receives with horizontal orientation (HH polarisation). Variations (backscatter) in the return signal are the results of changes in surface roughness and topography as well as physical properties such as moisture content and electrical properties.

Technical Summary	Satellite	Launch Date	End Mission	Altitude	Inclination	Repeat Cycle	Sensors
	RADARSAT-1	4-Nov-95	operational	798 Km	98.6°	24 days	SAR



Acquisition Modes and Reference Systems

The Radarsat satellite has seven SAR imaging options, or beam modes. Each beam mode offers a different area coverage (from circa 50*50 Km/scene to circa 500*500 km/scene) and resolution (from 8 m to 100 m). The Radarsat instrument also offers a range of incidence angles (see figure) from 10° - 59° (always right-looking from the satellite position) on fixed positions allowing you to choose from a selection of beam positions within each beam mode.

The Radarsat satellite on the descending orbits crosses the equator at approximately 6:00 a.m. local time, and on the ascending orbits at 6:00 p.m. local time (+/- 15 minutes).

Radarsat is able to capture every 24 days the same image over the same area, but thanks to its unique features is possible to acquire images on a more frequent basis. For example, the ScanSAR beam mode can view a location as frequently as once a day in high latitudes, and in less than five days at the equator.

Data Availability

Radarsat can acquire SAR data from nearly any location in the world. Data collected by Radarsat is either directly transmitted to a local network station or stored on one of the 2 on-board tape recorders for later downlink to a Radarsat Canadian network station.

Radarsat downlinks its data to the network stations at different times than other Earth observation satellites (most of which use a mid-day orbit). Consequently, conflicts with other satellites are reduced for the network stations.

The 2 on-board tape recorders (OBRs) have 10 minutes of SAR on-time (alias 48 Standard beam mode images) per tape recorder. The OBRs are primarily used to store data over areas that do not have participating network stations. Only 1 tape recorder is used at a time; the second OBR acts as a back-up.

Data Reception Facilities

The Canada Centre for Remote Sensing (CCRS) operates two Canadian ground-receiving facilities, in Gatineau, Quebec, and Prince Albert, Saskatchewan. CCRS coordinates the acquisition services and is responsible for scheduling and reporting day-to-day operations. Imagery for public use is placed on the Web-accessible CEOCat browser and catalogue service.

International Data Reception Facilities

The network includes two American facilities: one in Fairbanks, Alaska, and one in MacMurdo, Antarctica. Other facilities have been incorporated to ensure coverage of the Earth's landmass in the U.S., the United Kingdom, Norway, Singapore, China, Australia, Korea, Japan, South Korea, and Saudi Arabia, Puerto Rico, Thailand, Brazil, Argentina, Turkey, Malaysia, Russia, and Kazakhstan.

Six portable ground stations in other parts of the world provide coverage opportunities for applications such as pollution control, oil and gas exploration, surveillance, and emergency response management.

Processing Levels

Three main categories of data products are available: Raw Data, Path-Oriented and Map-Oriented products.

Raw data

Signal Data (or Raw data) products are unprocessed radar signals (simply an unprocessed matrix of time delays) formatted to the level 0 CEOS format. Clients will require SAR processing capabilities to use these products.

Raw data products are available for all Radarsat beam modes.

Path-Oriented

These data products are oriented in the geometry of the swath. Points on the Earth are determined from the orbital data. These products are available for all 7 beams in CEOS format.

Single Look Complex

At the Single Look Complex processing level, data is stored in slant range, has been corrected for satellite reception errors, and includes latitude and longitude positional information. In addition, Single Look Complex data retains the optimum resolution available for each beam mode and the phase and amplitude information of the original SAR data. Data cannot be directly viewed as images by all software. Interferometric applications will benefit from this Radarsat product. Data from all beam modes, with the exception of ScanSAR, can be processed to this product.

Path Image

Path Image products are recommended for individuals and organizations experienced in image processing or for those who do not require an image in map projection geometry. Path Image processing aligns the scene parallel to the satellite's orbit path. The data is distributed in a 16-bit dynamic range. Latitude and longitude positional information is included in the data and represents the first, mid and last pixel positions of each line of data. Data from all beam modes can be processed to this product level. ScanSAR products are available only in 8 bit.

Path Image Plus

Path Image Plus uses smaller pixel spacing than Path Image to retain full Radarsat beam mode resolution. This will enhance your ability to make detailed analyses of point targets (e.g., ships, isolated buildings), linear features (e.g., pipelines, drainage networks), or to obtain subsequent spatial information if required. However, it will create a digital file that is considerably larger than a Path Image product. Data from all beam modes, with the exception of ScanSAR, can be processed to this product.

Map Oriented

These products provide map coordinates with "North Up" (map North). Points on the Earth are located more precisely by using GCPs. Geocoded products are available for all Radarsat single beam modes (i.e., all but ScanSAR beam modes).

Map Image

Map Image processing orients the scene with "North Up" and corrects the scene to a client-requested map projection. We offer these products in a wide variety of map projections (see Appendix D). The positional accuracy of the Map Image product depends on the terrain relief, beam mode, and the accuracy of the sensor-derived positional information. This product is ideal for those clients who lack the time to transform their image to fit a map projection. Data from all single beam modes can be processed to this product (i.e., all but ScanSAR beam modes). Map Image products are offered as 8-bit or 16-bit data products.

Precision Map Image

Precision Map Image processing orients the scene with "North Up" and may provide even greater positional accuracy than Map Image processing. Ground control points (GCPs) as well as a map projection are used to spatially align the scene. (Note: Suitably scaled maps or GCPs must be provided by the client for most areas outside of Canada.) Data from all single beam modes can be processed to this product (i.e., all but ScanSAR beam modes). Precision Map Image products are offered as 8-bit or 16-bit data products.

Ortho-Image

Ortho-Image processing removes terrain distortions inherent in satellite imagery, particularly in areas of high relief. The scene is oriented to a standard map projection, corrected with a DEM and GCPs. DEM and suitably scaled maps must be provided by the client as required.