

Operational and Future Spaceborne SAR Sensors

How I get SAR Data

Software Tools

Operational and Future Spaceborne Sensors

ERS-1 and 2 SAR

JERS-1 SAR

RADARSAT-1

SRTM

ENVISAT ASAR

ALOS PALSAR

TerraSAR-X

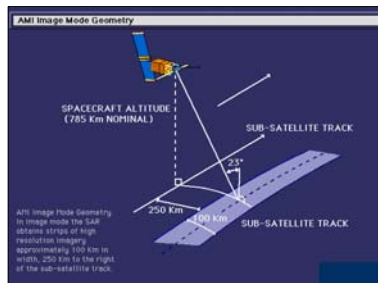
RADARSAT-2

COSMO-SkyMed

RISAT

SENTINEL-1

ERS-1 and 2 SAR



Agency	European Space Agency
Frequency	C-band
Polarization	VV
Ground Resolution	25 m
Acquisition Mode	Stripmap (Image)
Swath	100 km
Repeat cycle	35 days
Launched	1991-2000 / 1995
Further Information	http://www.esa.int

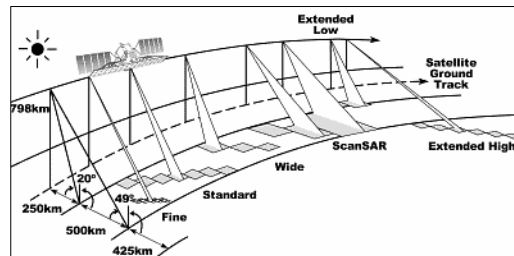
Note that the joint use of ERS (Earth Remote Sensing Satellite) -1 and ERS-2 SAR is called ERS-Tandem mode. In this particular case, ERS-1 and ERS-2 SAR data have been acquired time-shifted by 24 hours. For almost 5 years this atypical acquisition mode made it possible to collect repeat-pass interferometric (InSAR) data used mainly for the generation of Digital Elevation Model data.

JERS-1 SAR



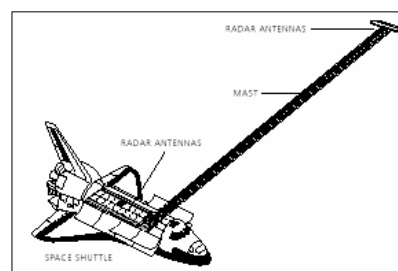
Agency	Japan Aerospace Exploration Agency
Frequency	L-band
Polarization	HH
Ground Resolution	20 m
Acquisition Mode	Stripmap (Image)
Swath	70 km
Repeat cycle	44 days
Launched	1993-1998
Further Information	http://www.eorc.jaxa.jp

RADARSAT-1



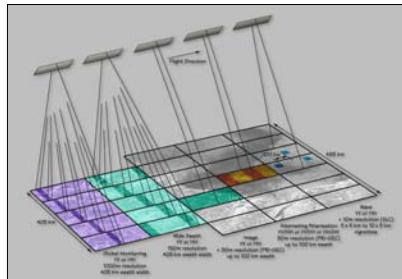
Agency	Canadian Space Agency
Frequency	C-band
Polarization	HH
Ground Resolution	10 to 100 m
Acquisition Modes	Stripmap (Fine, Standard, Wide) and ScanSAR
Swath	50 to 500 km
Repeat cycle	24 days
Launched	1995
Further Information	http://www.rsi.ca

Shuttle Radar Topographic Mission (SRTM)



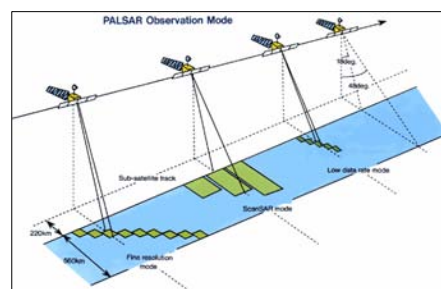
Agency	NASA/JPL & DARA/ASI
Frequency	X- and C-band
Polarization	VV
Ground Resolution	20 to 30 m
Acquisition Modes	Stripmap
Swath	30 to 350 km
Mission length	11 days
Launch	2000
Further Information	http://srtm.usgs.gov

ENVISAT ASAR



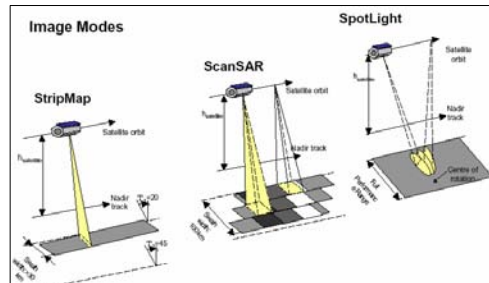
Agency	European Space Agency
Frequency	C-band
Polarization	HH or VV or HH/HV or VV/VH
Ground Resolution	15 to 1000 m
Acquisition Modes	Stripmap (Image), AP, ScanSAR (Wide Swath, Globe)
Swath	100 to 405 km
Repeat cycle	35 days
Launch	2001
Further Information	http://www.esa.int

ALOS PALSAR



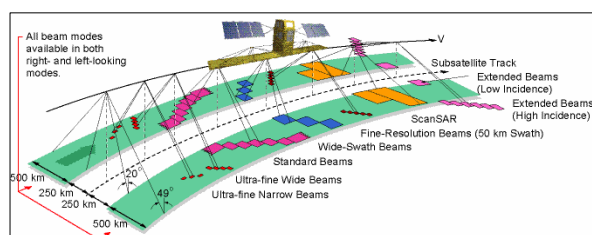
Agency	Japan Aerospace Exploration Agency
Frequency	L-band
Polarization	Single Pol, Dual Pol, Full Pol
Acquisition Modes	Stripmap (Fine) and ScanSAR
Ground Resolution	7 to 100 m
Swath	20 to 350 km
Repeat Cycle	44 days
Launch	2006
Further Information	http://www.eorc.jaxa.jp

TerraSAR-X



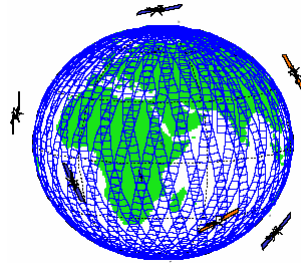
Agency	Infoterra, Germany
Frequency	X-band
Polarization	Single Pol, Dual Pol, Full Pol
Ground Resolution	1 to 16 m
Acquisition Modes	Stripmap, ScanSAR and Spotlight
Swath	15 to 60 km
Repeat cycle	11 days
Launch	2007
Further Information	http://www.terrasar.de

RADARSAT-2



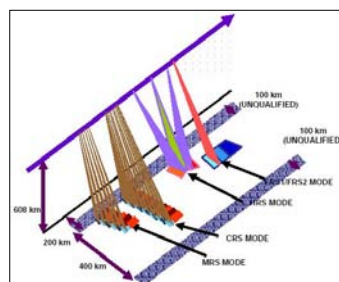
Agency	Canadian Space Agency and MacDonald Dettwiler (MDA)
Frequency	C-band
Polarization	Single Pol, Dual Pol and Full Pol
Ground Resolution	3 to 100 m
Acquisition Modes	Stripmap and ScanSAR
Swath	50 to 500 km
Repeat cycle	24 days
Launch	2007
Further Information	http://www.rsi.ca

COSMO-SkyMed



Agency	Agenzia Spaziale Italiana (ASI)
Frequency	X-band
Polarization	Single Pol, Dual Pol, Full Pol
Ground Resolution	1 to 100 m
Acquisition Modes	Stripmap, ScanSAR, and Spotlight
Swath	20 to 400 km
Repeat cycle	15 days
Launch	2007-2008 - Constellation of 4 satellites

Radar Imaging SATellite (RISAT)



Agency	Indian Space Agency
Frequency	C-band
Polarization	Single Pol, Dual Pol, Full Pol
Ground Resolution	2 to 50 m
Acquisition Modes	Stripmap, ScanSAR and Spotlight
Swath	10 to 240 km
Repeat cycle	? days
Launch	2008
Further Information	http://www.isro.org

SENTINEL-1

Nearly all European SAR satellite systems currently in orbit have their nominal lifetime terminating in 2008. Continuity of ESA SAR C-band data is vital to ensure effective exploitation of user investment and gaps in data availability will affect on-going monitoring programs.

The following 3 modes - relevant for land applications - are planned:

	<u>Stripmap</u>	Interferometric <u>ScanSAR</u>	Extra- <u>ScanSAR</u>
Azimuth Resolution (m)	5	< 20	< 80
Ground Range resolution (m)	4	< 5	< 25
Swath (km)	> 80	> 240	> 400
Polarization	HH-HV, VV-HV	HH-HV, VV-HV	HH-HV, VV-HV
Repeat Cycle (days)	14	14	14

How I get SAR Data and Products?

ESA DESCW and EOLI Catalogue

RADARSAT Swath Planner Application

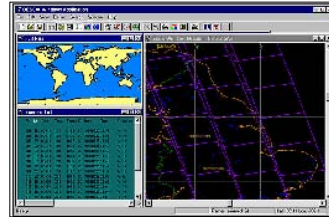
ESA Category-1 data

Commercial Data Providers

ESA DESCW and EOLI Catalogue

DESCW (Display Earth remote sensing Swath Coverage for Windows) and EOLI (Earthnet On-Line Interactive) are multi-mission software tools created for displaying the coverage over the Earth of following instruments:

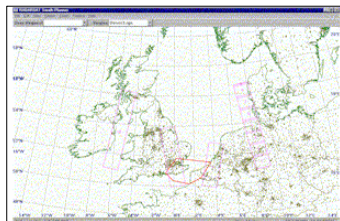
- ERS-1 SAR, and ATSR since launch
- ERS-2 SAR, and ATSR since launch
- LANDSAT-1,2,3,4 MSS since launch
- LANDSAT MSS since 1975
- LANDSAT TM from 1985 to 2002
- LANDSAT-7 ETM since 1999
- JERS-1 SAR, and VNIR from 1993 to 1998
- ENVISAT ASAR since launch
- ENVISAT MERIS since launch
- ENVISAT AATSR since launch



The two software tools and related documentations can be downloaded from <http://earth.esa.int/descw/> and <http://odisseo.esrin.esa.it/welcome.html>

RADARSAT Swath Planner Application

The RADARSAT SPA is a graphical tool that can be used to assist with the planning and acquisition of RADARSAT imagery. RADARSAT provides 25 image products, each differing in the size of the area imaged (beam mode) and/or the incidence angle (beam position) used. This flexibility makes the planning and ordering of RADARSAT data slightly more complex than that for other systems such as ERS, SPOT or LANDSAT.



The software and related documentation can be downloaded from <http://www.radarsolutions.dera.gov.uk/swath.html>

ESA Category-1 Data

The ESA distribution policy related to data obtained from the ERS and ENVISAT satellites foresees the data use for research and applications development in support of the mission objectives, including

- Research on long term issues of Earth System science
- Research and development in preparation for future operational use
- Certification of receiving stations as part of the ESA functions
- ESA internal use

For data distribution falling under Category 1 use, the data will be provided by ESA at reproduction cost or free of charge (to be waived by the Earth Observation Program Board).

After approval of the Category 1 Proposal ERS and ENVISAT data can be ordered at EOHelp@esa.int.

ESA Category-1 Data



The screenshot shows the ESA Earth Observation Principal Investigator Portal (EOPi) for Category-1 data users. The page features a navigation menu on the left with categories such as Exploitation, Results & News, Search, Focus on PI, Round table, AO Submission, Cat-1 & Open AOs, Previous AOs, Update & Reporting, Services, About this site, ESA Data Policy, FAQ, Related Links, How to get ESA data, and HOME. The main content area includes a welcome message, a search box, and a list of links for Category-1 data users, such as 'Category-1 cost for Envisat data', 'Category-1 cost for ERS data', 'Guidelines for the submission of proposals for Category-1', and 'Terms and Conditions for Category-1 data use'. A 'CAT-1' logo is also visible on the right side of the page.

Commercial Data Providers

ERS-1/2 SAR, JERS-1 SAR, RADARSAT-1, ENVISAT ASAR, ALOS PALSAR can be directly purchased by the official data providers:

- **EMMA** - represented by Eurimage
Customer Services
tel.: +39 06 406 94 1
fax: +39 06 406 94 232
e-mail: cust.services-staff@eurimage.com
<http://www.eurimage.com>
- **SARCOM** - represented by Spot Image
Sales Department
tel.: +33 562 194070
fax: +33 562 194055
e-mail: jean.bobo@spotimage.fr
<http://www.spotimage.com>

Public Domain Software Tools

- Basic Envisat SAR Toolbox <http://envisat.esa.int/services/best/>
- DORIS <http://www.geo.tudelft.nl/fmr/research/insar/>
- EnviView <http://envisat.esa.int/services/enviView/>
- ERS SAR Toolbox <http://earth.esa.int/STBX/>
- UNESCO-Bilko <http://www.unesco.bilko.org/>

Commercial Software Tools

SAR dedicated software

- DIAPASON <http://www.altamira-information.com>
- Earthview <http://www.pcigeomatics.com/products/atlantis.html>
- GAMMA <http://www.gamma-rs.ch>
- InfoPACK <http://www.infosar.co.uk>
- PulSAR <http://www.phoenixsystems.co.uk>
- SARscape <http://www.sarmap.ch>
- Vexcel <http://www.vexcel.com>

Software tools including SAR processing capabilities

- eCognition <http://www.definiens-imaging.com>
- ENVI <http://www.rsinc.com/envi/>
- ERDAS <http://www.erdas.com>
- ER Mapper <http://www.ermapper.com>
- GEOimage <http://www.geoimage.fr>
- PCI Geomatics <http://www.pcigeomatics.com>