Sentinel-1

Sentinel-1A and Sentinel-1B satellites carry C-band SAR instruments to provide an all-weather, day-and-night supply of imagery of Earth's entire surface every 6 days.

Coverage Maps

Click here for monthly updates of the coverage maps.

Instrument

Parameter	Value
Launches	● Sentinel-1C: Vega-C rocket, launched on 5 Dec.2024, from Kourou, French Guiana ● Sentinel-1B: Soyuz rocket, launched on 25 April 2016, from Kourou, French Guiana ● Sentinel-1A: Soyuz rocket, launched on 3 April 2014, from Kourou, French Guiana
Orbit	Polar, sun-synchronous at an altitude of 693 km
Revisit Time	Six days with two-satellite constellation of Sentinel-1A and 1B. Before 1B launched, the revisit time for Sentinel-1A alone was 12 days.
Instrument	C-band synthetic aperture radar (SAR) at 5.405 GHz
Operational Modes	● Interferometric wide-swath (IW) at 250 km and 5×20 m resolution, using a form of ScanSAR imaging called Terrain Observation with Progressive Scans SAR (TOPSAR). In these modes, data is collected by cyclically observing, then switching the antenna beam between multiple adjacent sub-swaths. ● Wave (WV) images of 20×20 km and 5×5 m resolution (at 100 km intervals) ● Stripmap (SM) at 80 km swath and 5×5 m resolution ● Extra wide swath (EW) of 400 km and 20×40 m resolution, using TOPSAR
Polarization	● Supports operation in single polarization (HH or VV) and dual polarization (HH+HV or VV+VH) ● Polarization is implemented through one transmit chain (switchable to H or V) and two parallel receive chains for H and V polarization ● SM, IW, and EW are available in single (HH or VV) or dual polarization (HH+HV or VV+VH) ● WV is single polarization only (HH or VV)
Receiving stations	SAR data: Svalbard, Norway; Matera, Italy; Maspalomas, Spain; and via laser link through EDRS (European Data Relay System)
Telemetry, tracking, and command	via Kiruna, Sweden
Main applications	Monitoring sea ice, oil spills, marine winds and waves, land-use change, land deformation, and responding to emergencies such as floods and earthquakes

Parameter	Value
Mission	Developed, operated, and managed by various ESA establishments
Life	Minimum of seven years
Satellites	2.8 m long, 2.5 m wide, 4 m high with 2×10 m-long solar arrays and a 12 m-long radar antenna
Mass	2300 kg (including 130 kg fuel)
Funding	ESA Member States and the European Union Prime contractors: Thales Alenia Space, Italy, for the satellite; Airbus Defense and Space, Germany, for the SAR instrument

SAR Modes

Links in the table below open to ESA's website for more information.

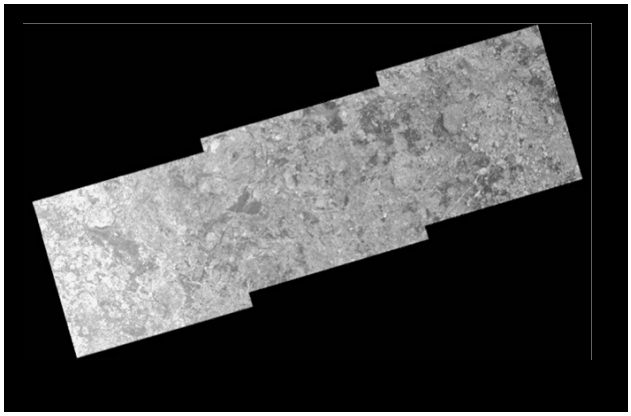
SAR Mode	Details
Interferometric Wide Swath **(IW)**	Acquired with TOPSAR. Default mode over land; 250km swath width; 5m-x-20m ground resolution.
Extra Wide Swath **(EW)**	Acquired with TOPSAR. using 5 sub-swaths instead of 3, resulting in lower resolution (20m-x-40m). Intended for maritime, ice, and polar-zone services requiring wide coverage and short revisit times.

Image Quality

Users of Sentinel data may see quality issues like those on the following pages. Users are encouraged to submit examples of image-quality issues to uso@asf.alaska.edu.

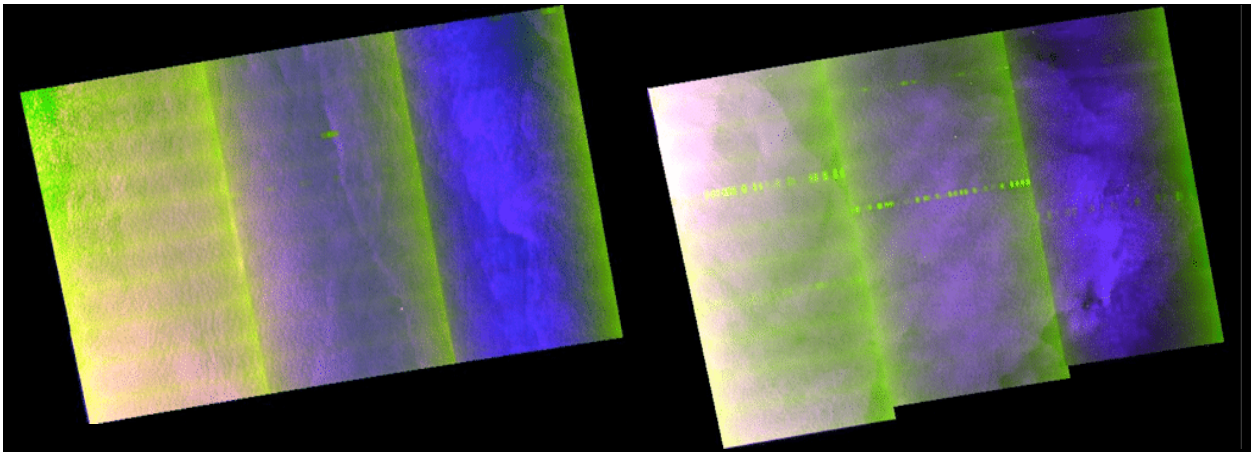
Browse images affected by map projection

When an image granule is located above 65° latitude, the browse image can appear to be oriented and shaped differently than its outline in Vertex. The browse image is a geocoded JPEG displayed in a polar stereo map projection at latitudes above 65° in either hemisphere. The Vertex map always displays a granule in a Mercator projection. The examples show a Vertex map outline of a granule in the Arctic Ocean and an associated browse image. The browse image also is an example of stepped ends



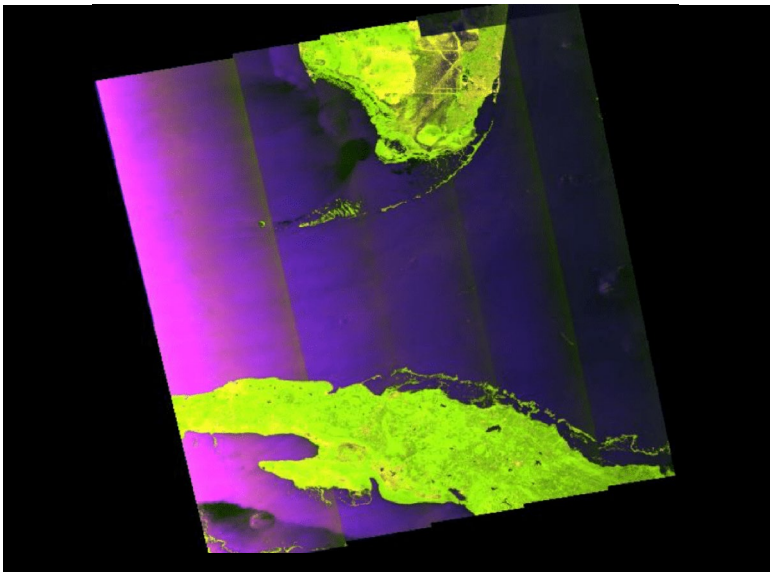
Images from data close to the noise floor

Images that contain a great deal of noise have often been processed close to the noise floor (the data closest to the point where it is too noisy to be useful). The noise can look like repeating lines across an image, something like horizontal window blinds, as in the left image below. Those repeating lines are not the same as the bright spots in these images, which appear in the image below and to the right as a line of repeated bright spots or bursts. Those bright bursts are image anomalies that are not yet well understood. Also visible in these images are beam seams (see the next section).



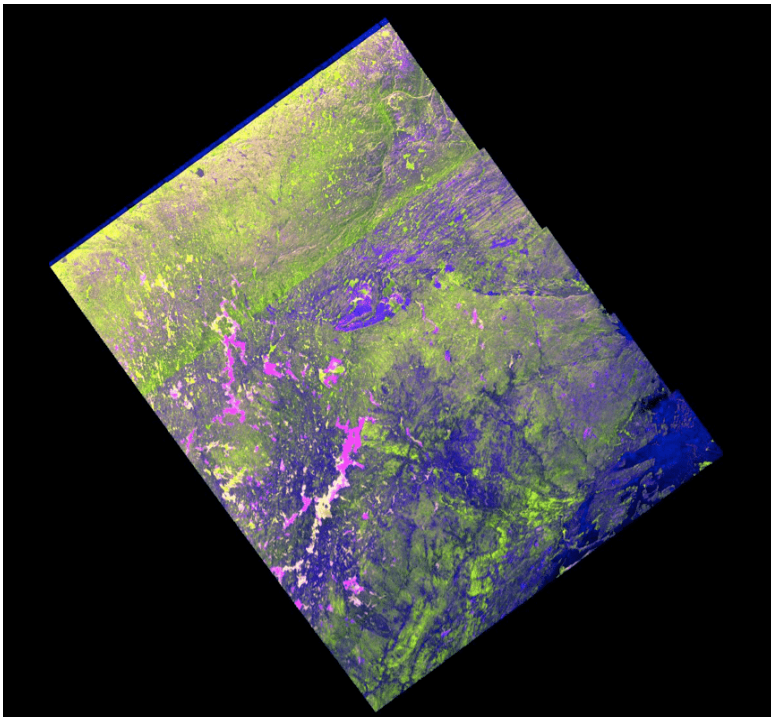
Beam seams

When one image is made up of several beams, the seams can show, particularly in dark data. Beam seams are visible in many of the images on this page, including the one to the right.



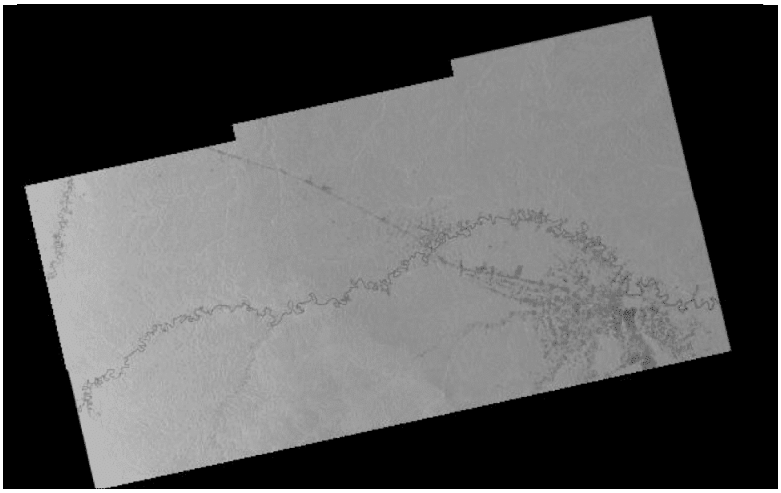
Offsets between channels

Beams that seem to have noisy or missing data at one end, such as the dark blue edge at the top of the image, have been processed in one channel more than another (such as the HV or VH channels).



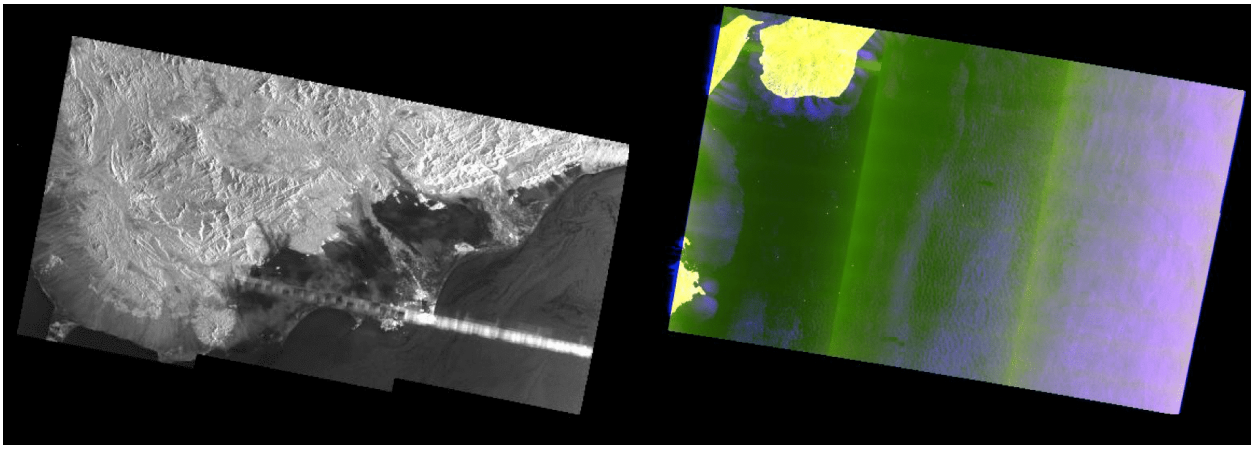
Stepped edges

Stepped ends, as in this image, are an artifact of the multi-beam scanning technology of TOPSAR and the way that ESA “slices” a data take into discrete, manageable units.



Bright burst

Bright bursts are processing anomalies that are not well understood. Bright bursts are in the upper left corner of the image below at left and in the light stripe across the image below right. Also visible in the image on the left are noise (window-blind effect), beam seams, and a bit of blue on the far left that may indicate an offset between channels.



Documents and Tools

Sentinel-1-Documents

Name	Description
Product Specification Document, ASF	Defines the ISO-compliant XML metadata for ESA's Sentinel-1A data.
Sentinel-1 SAR User Guide Introduction	High-level description of instrument modes and products. Also introduction to relevant application areas, information on data distribution, product formatting, and software tools available from ESA.
Sentinel-1 Technical Guide	Covers an in-depth description of the mission's products and algorithms as well as details of the SAR instrument and its performance.
Sentinel High Level Observation Plan, Issue 2, Revision 1	Provides the top-level operations plan of the Sentinel missions, including space and ground segments.
Sentinels POD Service File Format Specifications	Useful for InSAR. Users who consult this document may also want Precision State Vectors, available from ASF from 3 September 2015. The product handbook describes the products generated as part of the provisioning of the Copernicus POD Service.
Sentinel Document Library	The full document library is available on the ESA website.

Sentinel-1-Tools

Name	Description
ESA Sentinel App, for iOS and Android	Powerful visualization of Sentinel product availability. Track the satellites in real time over a 3D globe, see the last and next time they have been and will be over the user's location, and more.
HyP3-ISCE2	HyP3-ISCE2 is a burst-based Python package for creating burst InSAR products using ASF's burst SLC products. This Python package can be installed and run locally, or burst InSAR products can be requested through HyP3, ASF's on-demand processing tool.

ASF's Sentinel web page content is adapted from the European Space Agency Sentinel website.