

An Introduction to SAR and Its Applications

Part 3: An Overview of SAR Data Sources and Tools

Dr. Franz J. Meyer (University of Alaska Fairbanks, Alaska Satellite Facility),
Heidi Kristenson (Alaska Satellite Facility)

November 20, 2024

Training Outline

Part 1

Introduction to
Synthetic Aperture
Radar (SAR)

November 6, 2024

11:30 am - 01:30 pm
EST (UTC-5:00)

Part 2

Introduction to
Interferometric SAR
(InSAR)

November 13, 2024

11:30 am - 01:30 pm
EST (UTC-5:00)

Part 3

An Overview of SAR
Data Sources and
Tools

November 20, 2024

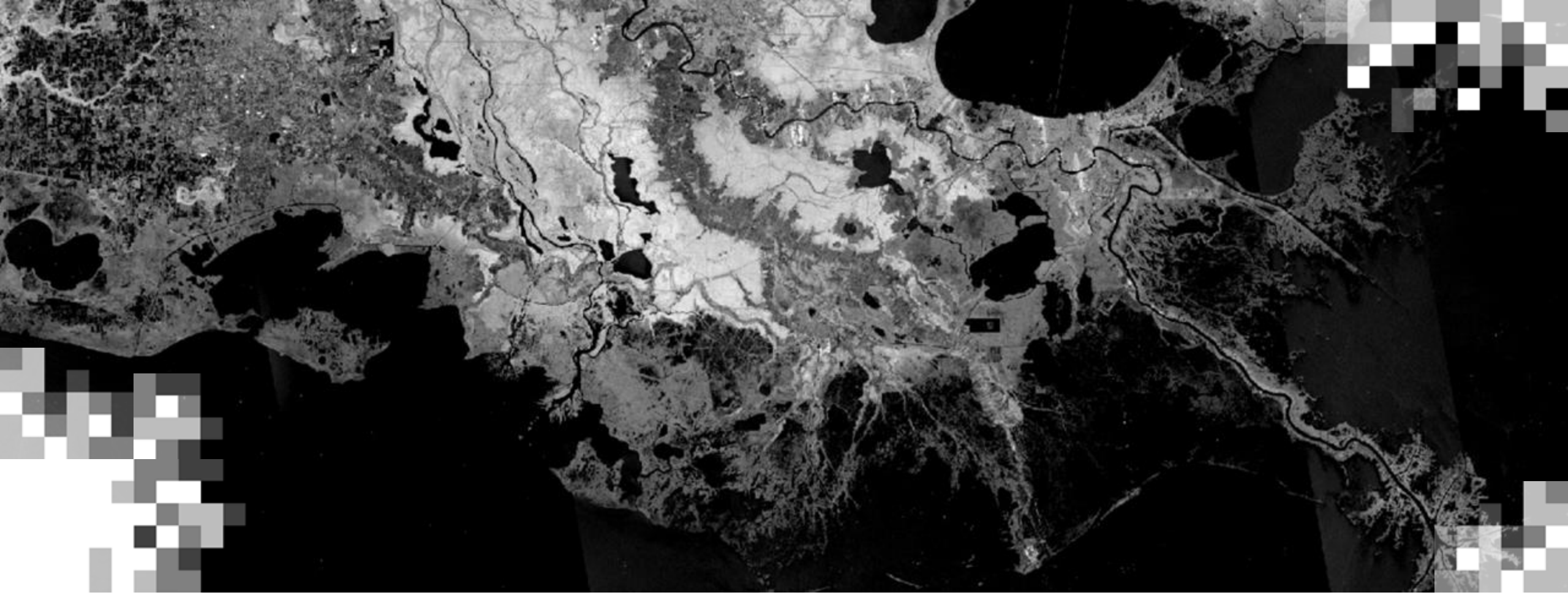
11:30 am - 01:30 pm
EST (UTC-5:00)

Homework

Opens November 20 – Due December 4 – Posted on Training Webpage

A certificate of completion will be awarded to those who attend all live sessions and complete the homework assignment(s) before the given due date.





An Introduction to SAR and Its Applications
Part 3: An Overview of SAR Data Sources and Tools

Review of Prior Knowledge

- Synthetic Aperture Radar (SAR) uses an active microwave sensor to image the Earth's surface.
 - Different sensor configurations, including wavelength and polarization, provide different information about surface characteristics.
 - Surface parameters that influence the radar signal are related to moisture and structure.
- SAR datasets include both amplitude and phase components.
 - Amplitude is used to generate imagery that displays the intensity of radar backscatter.
 - Phase indicates the distance between the sensor and the surface and is the basis of interferometric SAR (InSAR), which can be used to identify and quantify surface deformation.
- SAR imagery has distortions caused by the side-looking geometry of SAR acquisitions.
 - Radiometric Terrain Correction adjusts for both geometric and radiometric distortions, allowing SAR imagery to align with other geospatial datasets.



How to Ask Questions

- Please write your questions in the 'Q&A' window, which you can find in the bottom right under the three '...'. We will address them at the end of this session.
- Feel free to enter your questions during the presentation. We will try to answer all of the questions during the Q&A session at the end of this webinar.
- The remaining questions will be answered in the Q&A document, which will be posted to the training website in approximately one week.



Session 3 Objectives

By the end of Session 3, participants will:

- Understand the role of the Alaska Satellite Facility (ASF) within NASA's Earthdata organization
- Be aware of the range of SAR data ASF serves, particularly analysis-ready products
- Know how to search for SAR data available from ASF
- Know how to access analysis-ready SAR datasets from ASF, including archived products and customized products generated on demand

Part 3 – Trainers

Dr. Franz J. Meyer

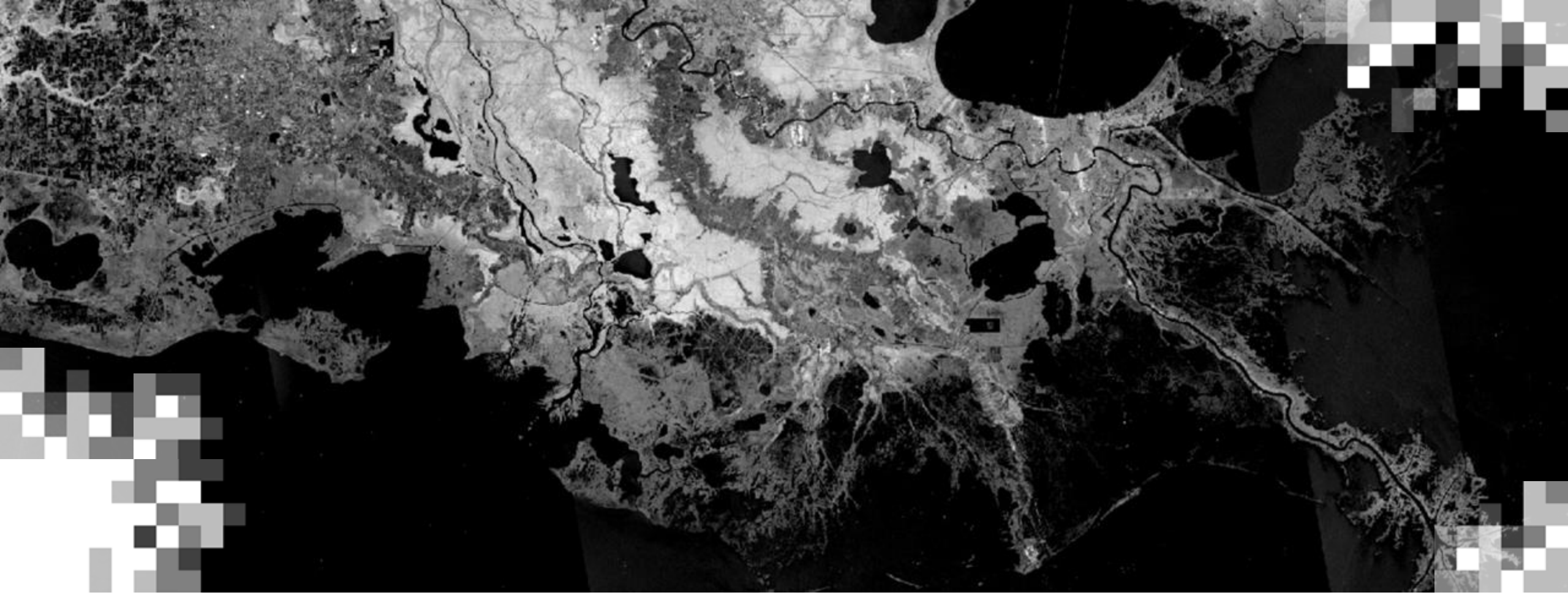
Professor of Remote Sensing, UAF
Chief Scientist, ASF



Heidi Kristenson

Senior GIS Specialist
ASF





Part 3:
Introduction to the Alaska Satellite Facility (ASF)

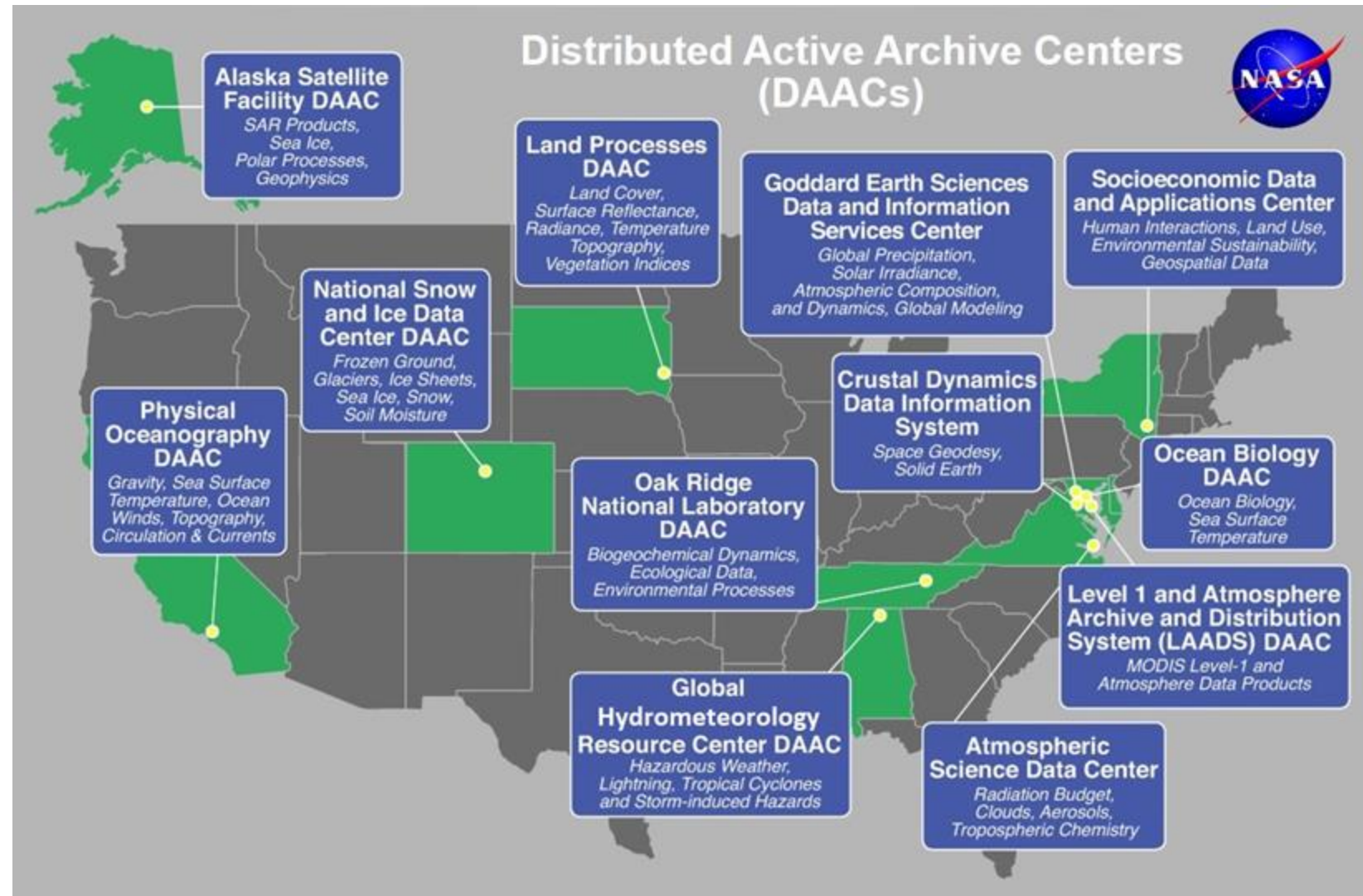
The Alaska Satellite Facility (ASF) is One of 12 NASA DAACs

DAACs are custodians of NASA mission data and ensure that data will be easily accessible to users.

Reliable, robust services to the science and applications communities

User Engagement:

- Chief Scientist
- User Working Group
- User Support



The NASA Alaska Satellite Facility (ASF) DAAC

- **ASF is NASA Distributed Active Archive Center (DAAC) for Synthetic Aperture Radar Data**
 - Established in 1991 as the prime U.S. downlink and processing center for SAR data
 - Operates 3 antennas for command uplink and data downlink of NASA and non-NASA remote sensing satellite systems
- **Currently, ASF is housing about 23PB of SAR data in its archives, most of which in the Amazon Web Service Cloud → All data is available for immediate download.**



SCAN ME

41 Years of SAR Data (Since '78)
<https://search.asf.alaska.edu>



NISAR DAAC (All L0 – L2 data)



Host of
Global Sentinel-1 Archive

Visit ASF @ www.asf.alaska.edu



ASF provides access to modern SAR sensors that provide regularly sampled, free-and-open SAR data on a global scale.

Sentinel-1



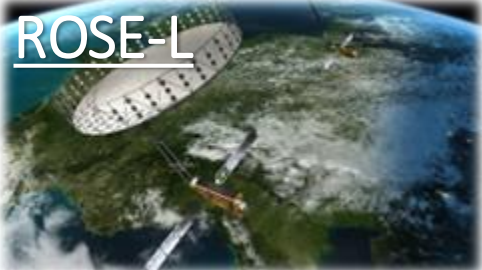
Frequency:
C-band
Launch Date:
2015 & 16

NISAR



Frequency:
L-band
Launch Date:
Spring 2025

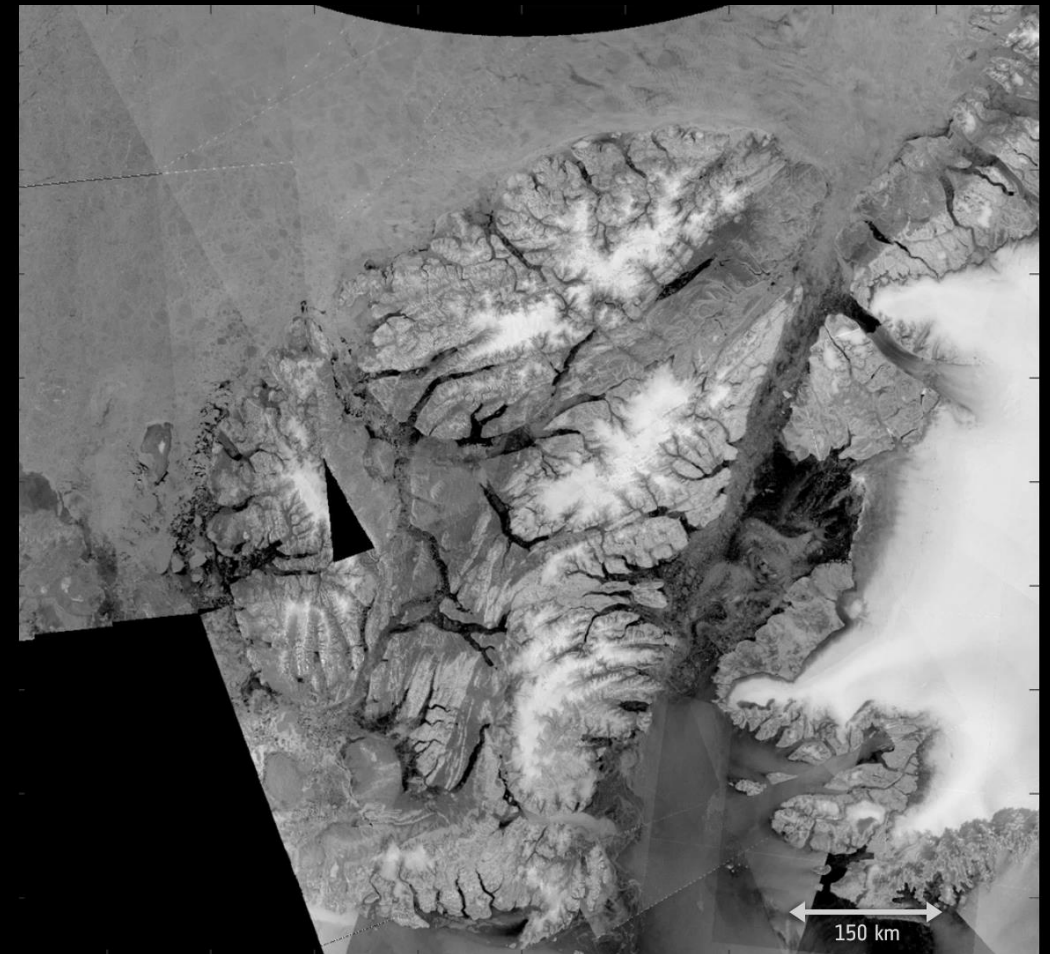
ROSE-L



Frequency:
L-band
Launch Date:
TBD



October 2016
November
December
January 2017
February
March
April
May



Arctic Sea Ice Export through Nares Strait

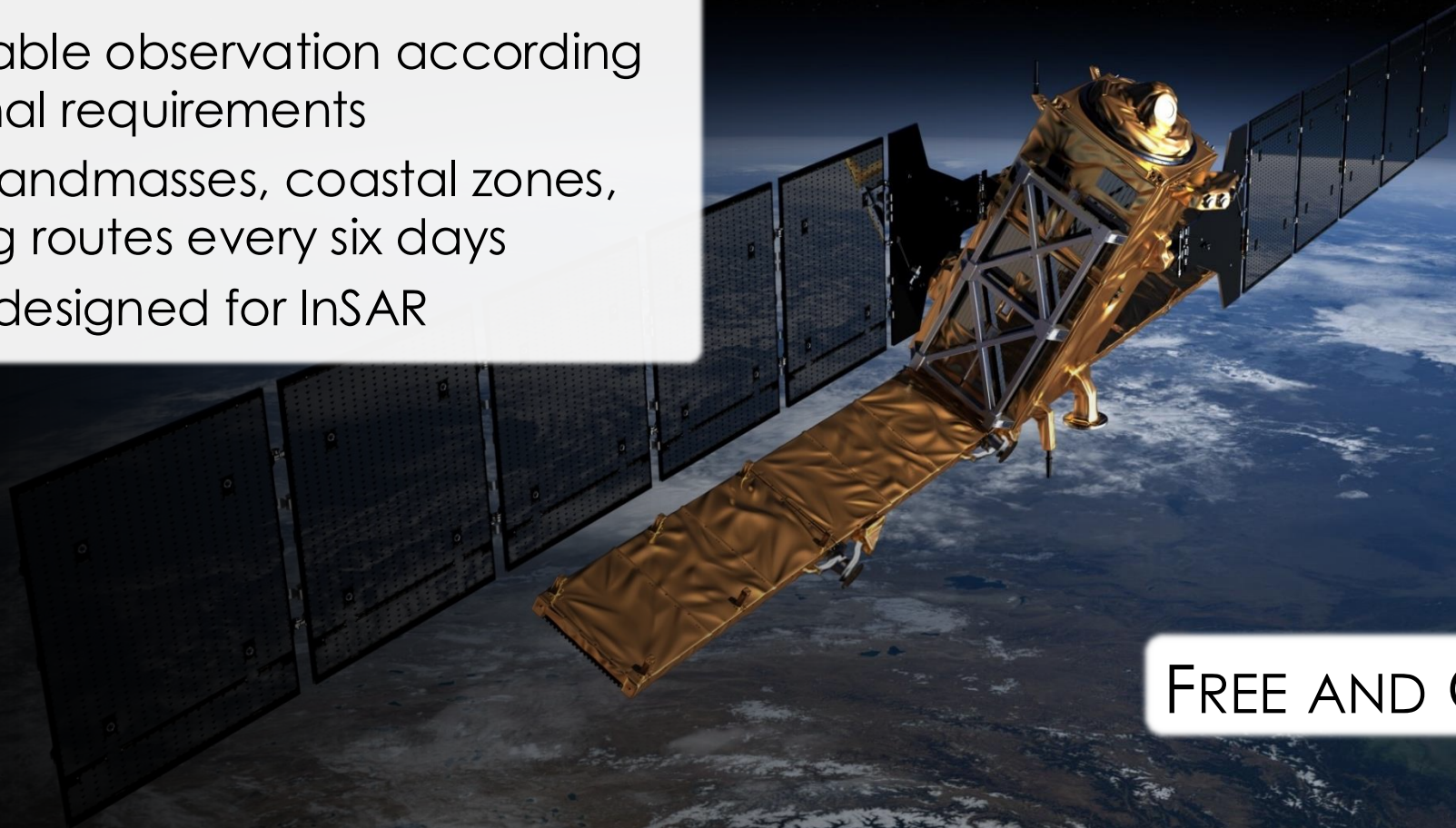
Copyright contains modified Copernicus Sentinel data (2016–17), processed by David Small



ASF hosts data from the Sentinel-1 Constellation.

- **Sentinel-1 (2014–Today): First SAR Satellite System with Operational Mission**
 - Regular, reliable observation according to operational requirements
 - Imaging all landmasses, coastal zones, and shipping routes every six days
 - Specifically designed for InSAR

FREE AND OPEN DATA!



Sentinel-1 Constellation – Acquisition Concept



- Sentinel-1 uses a constellation of two sensors (Sentinel-1A and B) to achieve:
- 6-day sampling over Europe and selected hazard locations
 - 12-day sampling globally

Sentinel-1B had a failure in Dec 2021.

Replacement satellite (Sentinel-1C) planned for late 2024.



ASF Will Provide Access to Upcoming NASA-ISRO SAR (NISAR) Mission

LAUNCH IN EARLY 2025

First spaceborne L- and S-band SAR

Full global coverage in 12 days

150 petabytes of Earth observation data/year

ALL DATA FREE AND OPEN!

**ASF &
NISAR**

NISAR Data Center
NISAR Ground Station
NISAR Science Team Member



ASF hosts its rapidly growing free-and-open SAR archive in the cloud.

**ASF SAR
DATA
ARCHIVE**

2014

1PB

**ASF SAR
DATA
ARCHIVE**

2024

23PB

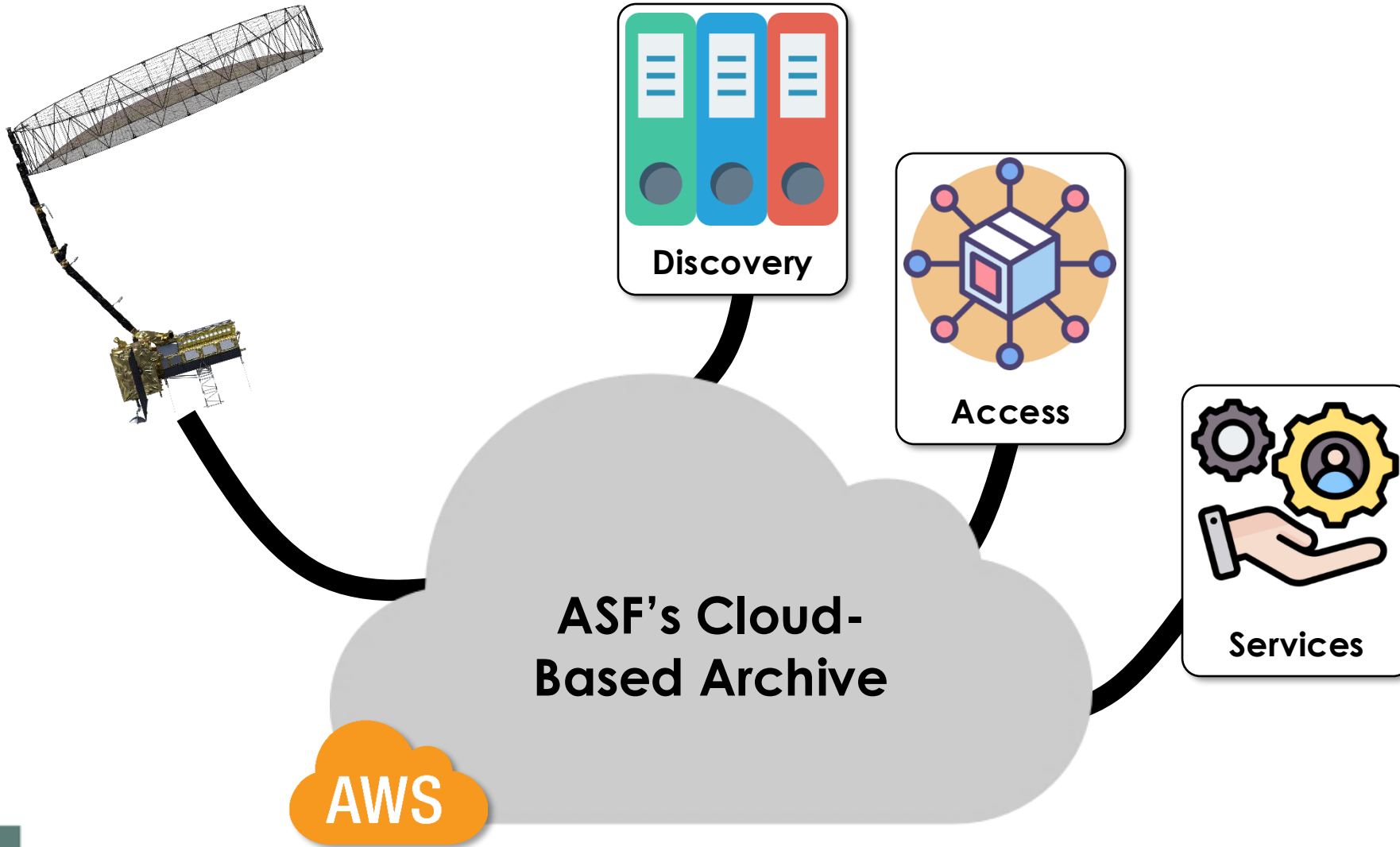
**ASF SAR
DATA
ARCHIVE**

2028

~180PB



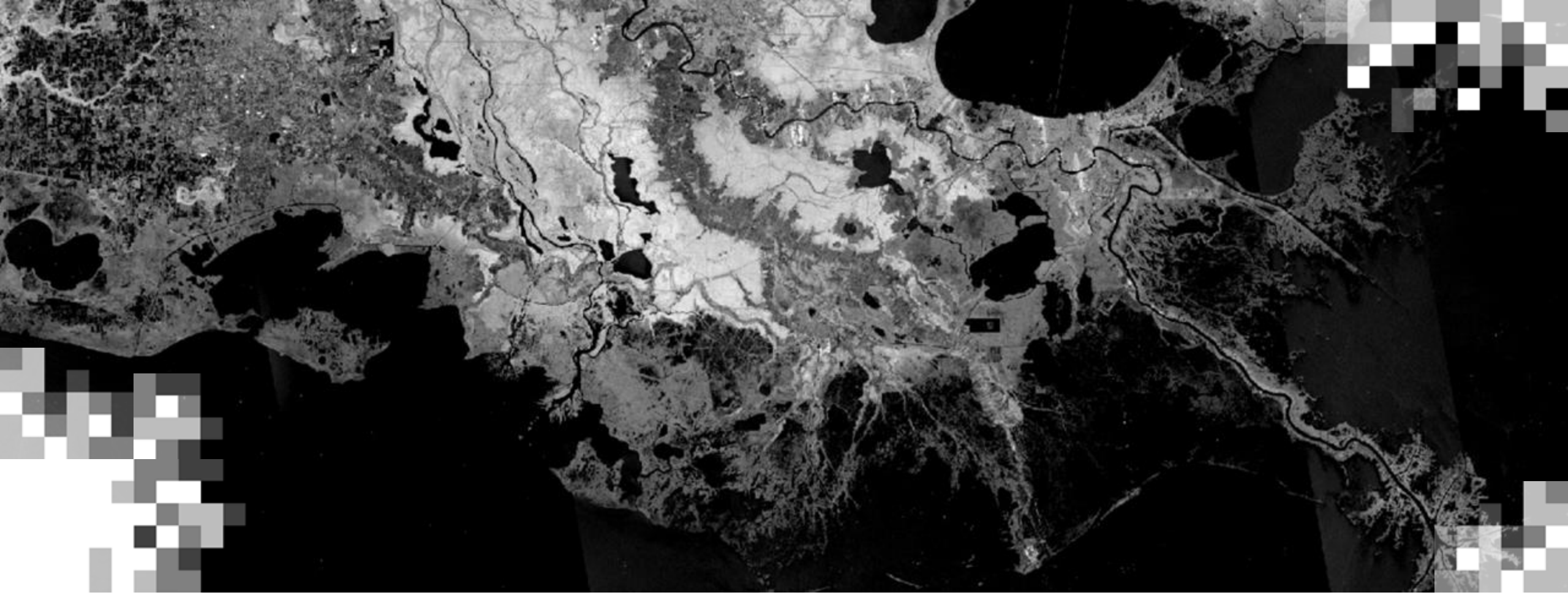
ASF has developed efficient mechanisms for users to access and work with its growing SAR data archive.



Next: Heidi Kristenson

- ASF Data Access
- ASF Custom Processing Services





Part 3:
Datasets Available from ASF

SAR Data Available from ASF

- Partner Agencies:
 - NASA, ESA, JAXA, CSA
- Different Platforms:
 - Satellite-Borne
 - Airborne
 - Mounted on Space Shuttle
- Range of Sensor Configurations:
 - Band (Wavelength)
 - Mostly C and L
 - Some P and X
 - Polarizations
 - Beam/Acquisition Modes
- Repeat Intervals Vary
- Access Options:
 - [Search and Download Options:](#)
 - Map-Based Web Interfaces
 - Programmatic Methods
 - All data can be downloaded.
 - Some datasets can also be [accessed directly from cloud storage](#).



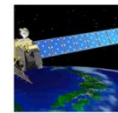
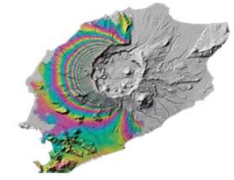
SAR Data from ASF: Missions

- Continuous Coverage
 - First spaceborne SAR mission
 - Seasat: 1978
 - Currently Active Missions:
 - Sentinel-1: 2014-Present
 - ALOS-2: 2014-Present (coming soon)
 - Many different missions since the 1990s
 - ERS-1: 1991-1997, ERS-2: 1995-2011
 - JERS: 1992-1998
 - RADARSAT-1: 1995-2008
 - ALOS PALSAR: 2006-2011
 - SMAP: 2015
- Discrete Missions:
 - SIR-C: 1994 (on Space Shuttle Endeavour)
 - AIRSAR: 1988-2004
 - UAVSAR: 2008-Present

Synthetic Aperture Radar Data

OPEN SAR DATA

These SAR datasets are Open Data and available to download at **no cost**.



ALOS PALSAR

A JAXA (Japan Aerospace Exploration Agency) L-band satellite sensor active 2006-2011. Data coverage includes all of the Americas and many areas worldwide, with a 46-day repeat cycle.



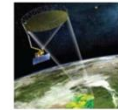
ERS-2

An ESA C-band satellite active 1995-2011. Data coverage is primarily within the ASF and McMurdo ground station masks, with a 35-day repeat cycle.



UAVSAR

A NASA L-band airborne sensor active 2008-present. Data coverage over North, Central, and South America, Greenland, and Iceland.



SMAP

A NASA L-band satellite sensor active April-August 2015. Data coverage is worldwide, with a 3-day repeat cycle.



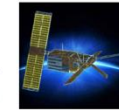
RADARSAT-1

A CSA (Canadian Space Agency) C-band satellite active 1995-2013. Data from ASF are available through 2008. Data coverage is worldwide, with a 24-day repeat cycle.



Sentinel-1

An ESA (European Space Agency) C-band satellite constellation active in 2014-present. Data coverage is worldwide, with a 6-12 day repeat cycle.



ERS-1

An ESA C-band satellite active 1991-2000. Data coverage is primarily within the ASF and McMurdo ground station masks, with a 35-day repeat cycle.



AIRSAR

A NASA C-band, L-band, and P-band airborne sensor active 1988-2004. Data coverage is primarily over the United States.



Seasat

A NASA L-band satellite was active in 1978. Seasat was one of the first earth-observing orbital sensors. Coverage is primarily over northern oceans, with a 17-day repeat cycle.



[Learn more about the SAR missions supported by ASF](#)

Coming Soon: NISAR!
Due to Launch Early 2025

[Learn More About the Mission](#)



Sentinel-1

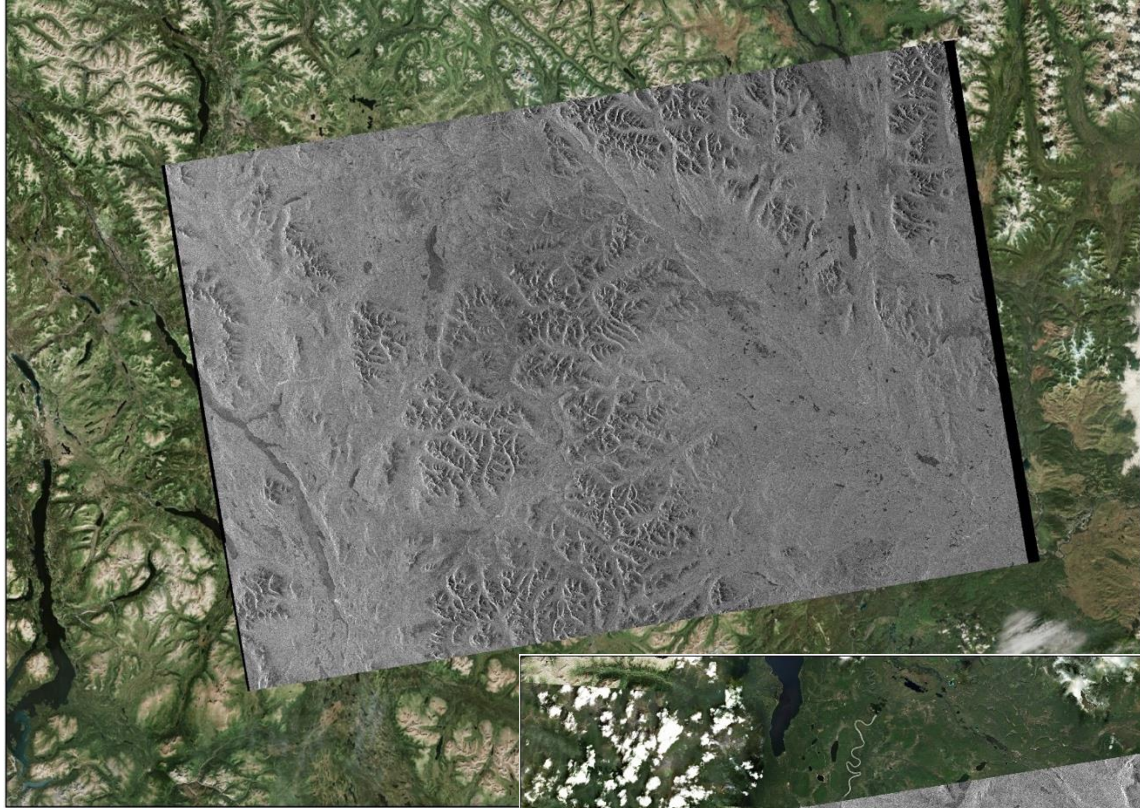
- European Space Agency (ESA) and European Commission (EC)
 - Copernicus Initiative
- Global Coverage with C-band SAR
 - 2-satellite constellation
 - Sentinel-1A launched 2014, 1B launched 2016
 - Sentinel-1B mission ended December 2021
 - 1A is nearing its end
 - 1C due to launch December 2024
 - 1D launch to be determined
 - Each with 12-day return cycle, orbiting 180° apart (when 2 satellites are in orbit)
 - Some areas have coverage every 6 days (Europe, EU areas of interest)
 - Polar regions can have even more frequent coverage due to polar orbit
- New data available to download within 3 days of acquisition (usually < 24 hours)
- Free and easy to download raw data and Level-1 products (GRD, SLC)



[Sentinel-1 Mission Website](#)

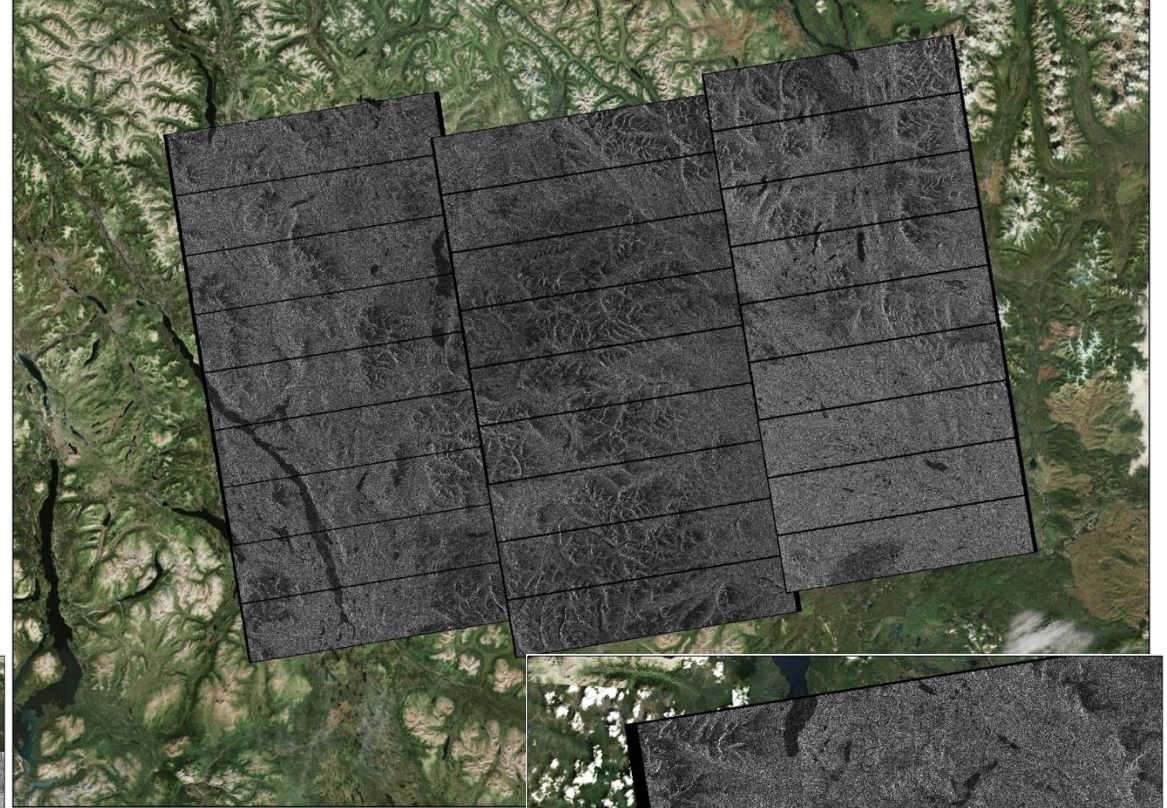
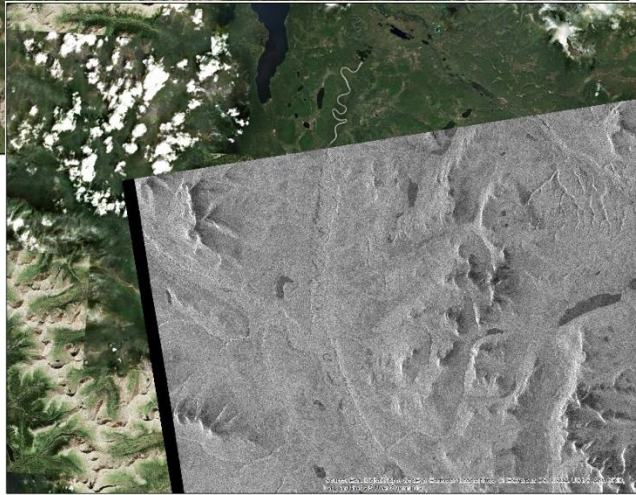


Sentinel-1 Level-1 Products



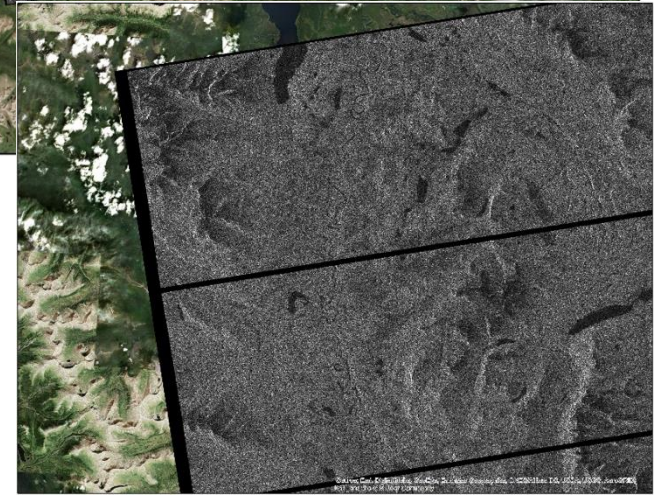
GRD

Ground Range
Detected



SLC

Single Look
Complex



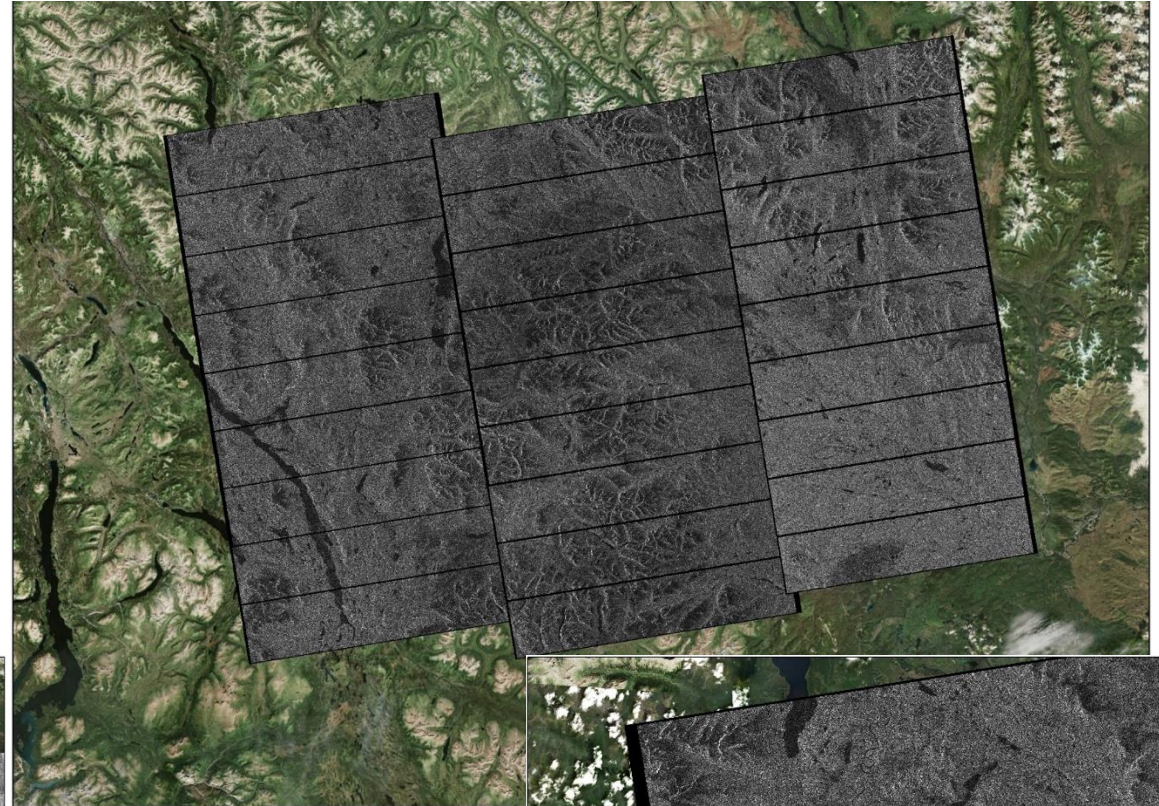
Sentinel-1 GRD

Suitable for Amplitude Applications

- Suitable source image for RTC correction
- Easy to use in GIS environment
 - ✓ Pixels are in ground-detected geometry
 - ✓ Georeferenced, easy to reproject
 - ✓ Square pixels
- Single image file for each polarization
 - ✓ Overlapping pixels are combined
- Smaller file size

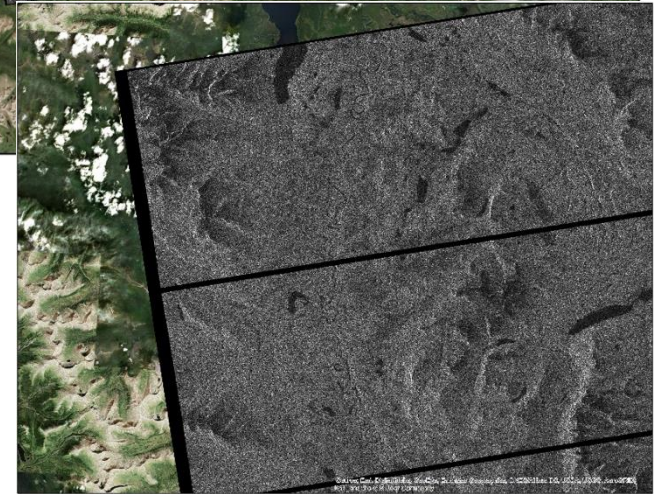
GRD

Ground Range
Detected



SLC

Single Look
Complex



Sentinel-1 SLC

Suitable for Amplitude Applications

- Suitable source image for RTC correction
- Easy to use in GIS environment
 - ✓ Pixels are in ground-detected geometry
 - ✓ Georeferenced, easy to reproject
 - ✓ Square pixels
- Single image file for each polarization
 - ✓ Overlapping pixels are combined
- Smaller file size

GRD

Ground Range
Detected

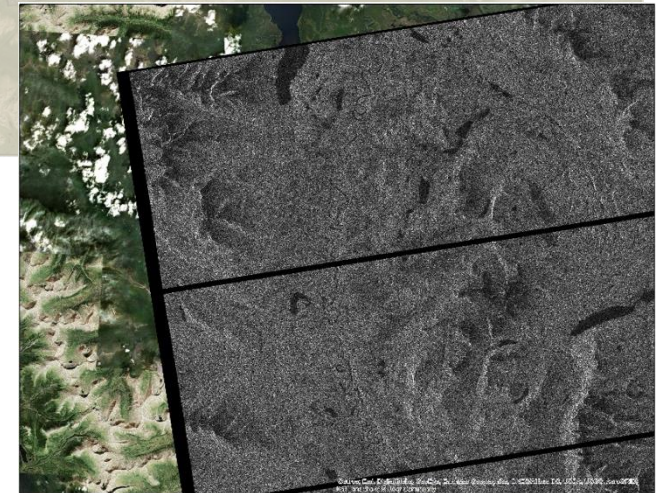


Necessary for Interferometry

- Remains in slant-range geometry
- Phase data is retained
 - ✓ Required for generating interferograms
 - ✓ Suitable for other workflows requiring phase
- Separate image file for each subswath
- Full extent of each burst, including overlap
 - ✓ Black line grid indicates burst boundaries

SLC

Single Look
Complex



Analysis-Ready Products from ASF

The screenshot shows the ASF Data Search Vertex interface. The search results list the following products:

Product Name	Description	Period	Icon
Sentinel-1	Sentinel-1 includes twin satellites that each carry C-band synthetic aperture radar (SAR), together providing all-weather, day-and-night imagery of Earth's surface.	2014 to Present	Satellite
S1 Bursts (beta)	Sentinel-1 BURST products are the individual radar pulse responses that make up the 3 sub-swaths of every Sentinel-1 SLC product.	2014 to Present	Satellite
OPERA-S1	Sentinel-1 RTC backscatter products providing near-global coverage, as well as Sentinel-1 CSLC products covering North America.	2014 to Present	Satellite
ALOS PALSAR	PALSAR was developed to contribute to the fields of mapping, precise regional land-coverage observation, disaster monitoring, and resource surveying.	2006 to 2011	Satellite
ARIA S1 GUNW	NISAR-format Level 2 standardized Sentinel-1 Interferogram products generated by JPL's Advanced Rapid Imaging and Analysis (ARIA) project.	2014 to Present	Satellite
UAVSAR	Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) is specifically designed to acquire airborne repeat-track SAR data for differential interferometric	2008 to Present	Aircraft

Annotations on the screenshot:

- A blue box highlights the "Sentinel-1" and "S1 Bursts" entries, with a callout box containing the text "Available On Demand".
- A red box highlights the "OPERA-S1" entry, with a callout box containing the text "New!".
- A yellow box highlights the "ALOS PALSAR" and "ARIA S1 GUNW" entries, with a callout box containing the text "Pre-Processed".

- **Sentinel-1**
 - On Demand RTC
 - On Demand InSAR
- **Sentinel-1 Bursts**
 - On Demand InSAR
- **OPERA S1 RTC**
 - Since Oct. 4, 2023
 - Near-Global
 - Forward Processing
- **ALOS PALSAR**
 - 2006-2011
 - Subset of Data has Pre-Processed RTC
- **ARIA S1 GUNW**
 - InSAR Products
 - Limited Locations
 - On Demand Soon
- **UAVSAR**
 - Airborne Sensor
 - Limited Space/Time



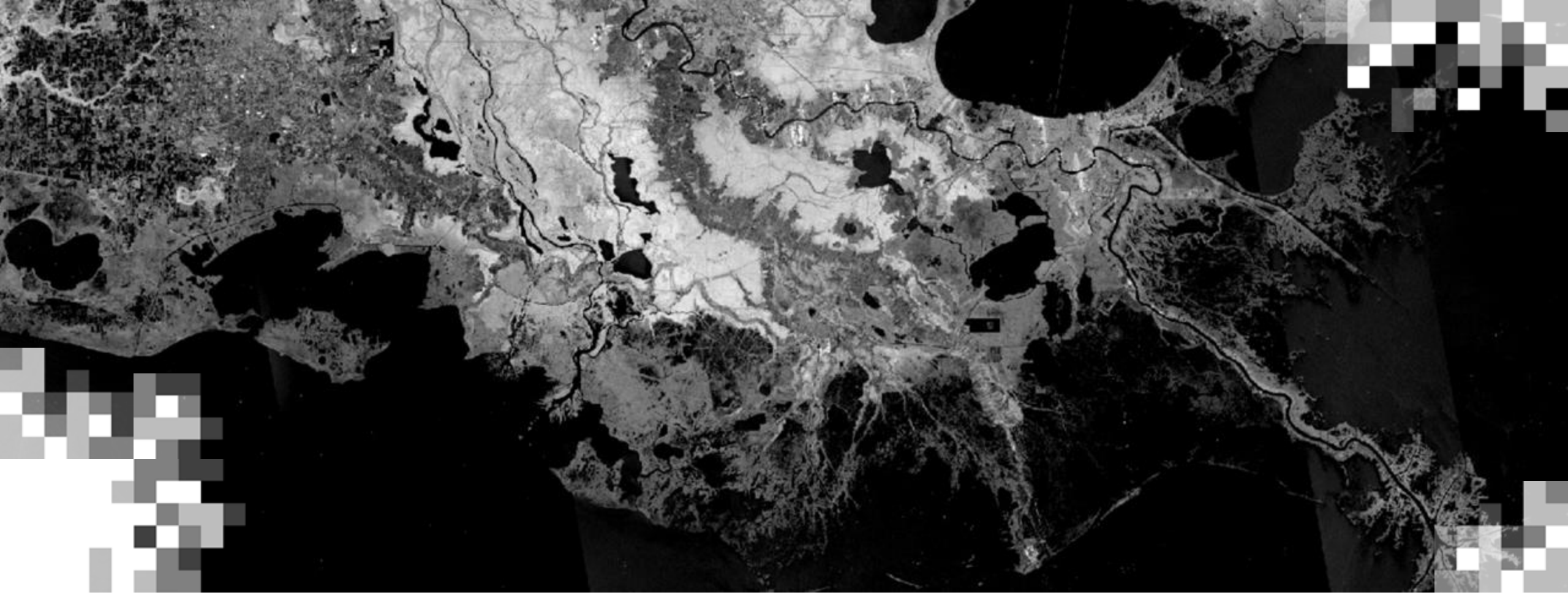
NISAR

- Due to launch 2025 – Earliest possible window is February
- Joint venture between NASA and Indian Space Research Organisation (ISRO)
- L-Band:
 - Greater penetration through canopy and soil than C-band
- Also has an S-band sensor (12 cm wavelength) – limited spatial coverage
- 12-day average repeat cycle
 - Complement to Sentinel-1 C-Band
- **Analysis-ready products will be produced as part of the mission, and readily available for use/download.**
 - [Sample Data Products available from JPL](#)
 - [Guidance for working with these sample products available from ASF](#)



[NISAR Mission Website](#)





Part 3:
Search & Discovery of SAR Data

ASF Data Search: Specialized for SAR

The screenshot displays the ASF Data Search interface. At the top, the search criteria are: Search Type: Geographic Search, Dataset: Sentinel-1, Area of Interest: WKT POLYGON((-86.988 41.73). The search results show 1,000 of 54 files. The interface includes a map view showing the search area over a satellite image of the United States, with a yellow and red bounding box. Below the map, there is a list of 27 scenes (54 of 54 files) with columns for scene ID, date, and download status. The selected scene is S1B_IW_GRDH_1SDV_20200527T233217_20200527T233242_02_1774_02953A_2D69, which is a Sentinel-1 C-Band image. The scene details panel shows the following information: Start Time: 05/27/20, 23:32:17Z; Stop Time: 05/27/20, 23:32:42Z; Beam Mode: IW; Flight Direction: ASCENDING; Polarization: VV+VH; Absolute Orbit: 21774; Path: 48; Frame: 138. The scene is available in two formats: L1 Single Look Complex (SLC) (4.58 GB) and L1 Detected High-Res Dual-Pol (GRD-HD) (977.83 MB). The interface also includes a search bar, a list of filters, and a feedback button.



Explore and access/download ASF's data holdings

Programmatic Access

- [asf_search Python Package](#)
- [ASF Search API](#)



Spanish Language Support in Vertex

NASA | EARTHDATA | Other DAACs | Feedback

ASF Data Search Vertex

Tipo de Búsqueda: Búsqueda Geográfica | Conjunto de Datos: Sentinel-1 | Área de Interés: WKT | Filtros

BUSCAR

1,000 de 19,337,379 Archivos

On Demand | Descargas | Ayuda | Español | hjkristenson

Mira Nuestros Tutoriales

Tenemos una colección de videos para ayudarlo a aprender y usar Vertex al máximo.



Buscar Ayuda

Aprende lo básico

Aprenda rápidamente los conceptos básicos de Vertex Data Search con esta serie de introducción.

- 1 Búsqueda Geográfica**
Búsqueda geográfica básica práctica
- 2 Búsqueda de Lista**
Lista básica de procedimientos Buscar
- 3 Resultados de la Búsqueda**
Revisar resultados de búsqueda

Todos Los Tutoriales

Amplíe sus habilidades con nuestra lista completa de tutoriales de búsqueda de datos de Vertex.

- Definición de búsquedas de datos
- Uso de resultados de búsqueda
- Características avanzadas

[00:00 Introduction 00:11 Event Search Techniques in Vertex](#)
[1\) Getting an EOSDIS ID and Logging In - \(2:06\)](#)
[3\) Filtros de Búsqueda \(Spanish\) - \(3:30\)](#)
[5\) Saved Searches and Search History - \(4:21\)](#)

YouTube

Buscar Ayuda

Ayuda Y Tutoriales

- Tipos de Búsqueda**
Seleccione 'Geográfica' de la lista desplegable de tipos de búsqueda.
- conjuntos de datos**
Seleccione el conjunto de datos de interés. Si necesita más información sobre un conjunto de datos en particular, haga clic en el icono de ayuda en el selector de conjuntos de datos.

ASF Data Search Vertex

- Geographic
- List

Map Projections

- Sentinel-1 - 2014 to Present
- ALOS PALSAR - 2006 to 2011
- SIR-C (BETA) - 1994
- S1 InSAR (BETA) - 2014 to Present
- SMAP - 2015 to Present
- UAVSAR - 2008 to Present
- RADARSAT-1

Hecho



Earthdata Search: Find All EOSDIS Data (Including SAR)



Provides access to holdings from all the DAACs in EOSDIS

Programmatic Access

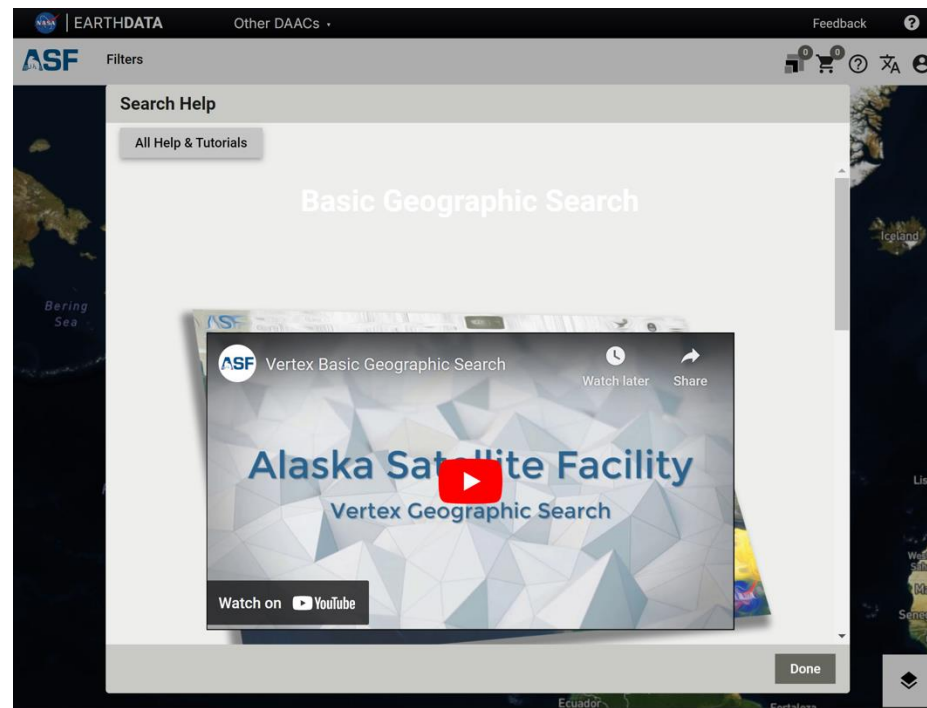
- [earthaccess](#) Python Package



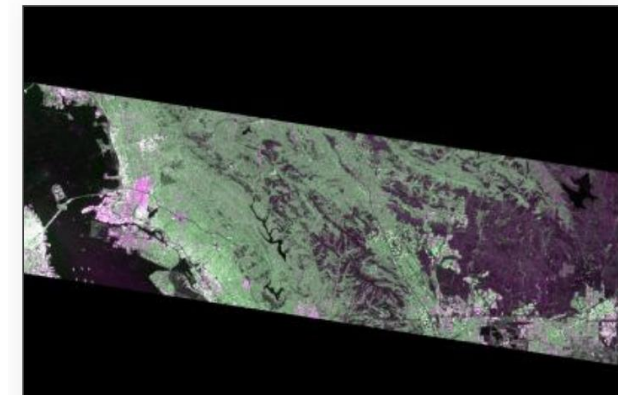
The image displays three screenshots of the Earthdata Search interface. The top-left screenshot shows a search for '141 Matching Collections' with filters for SAR data. The top-right screenshot shows a search for '5 Collections' of OPERA Radiometric Terrain Corrected SAR Backscatter. The bottom screenshot shows a detailed view of a SAR collection with a map overlay and a timeline.

DEMO!

[Vertex Video Tutorials](#)



[OPERA RTC-S1 Tutorial](#)



StoryMap

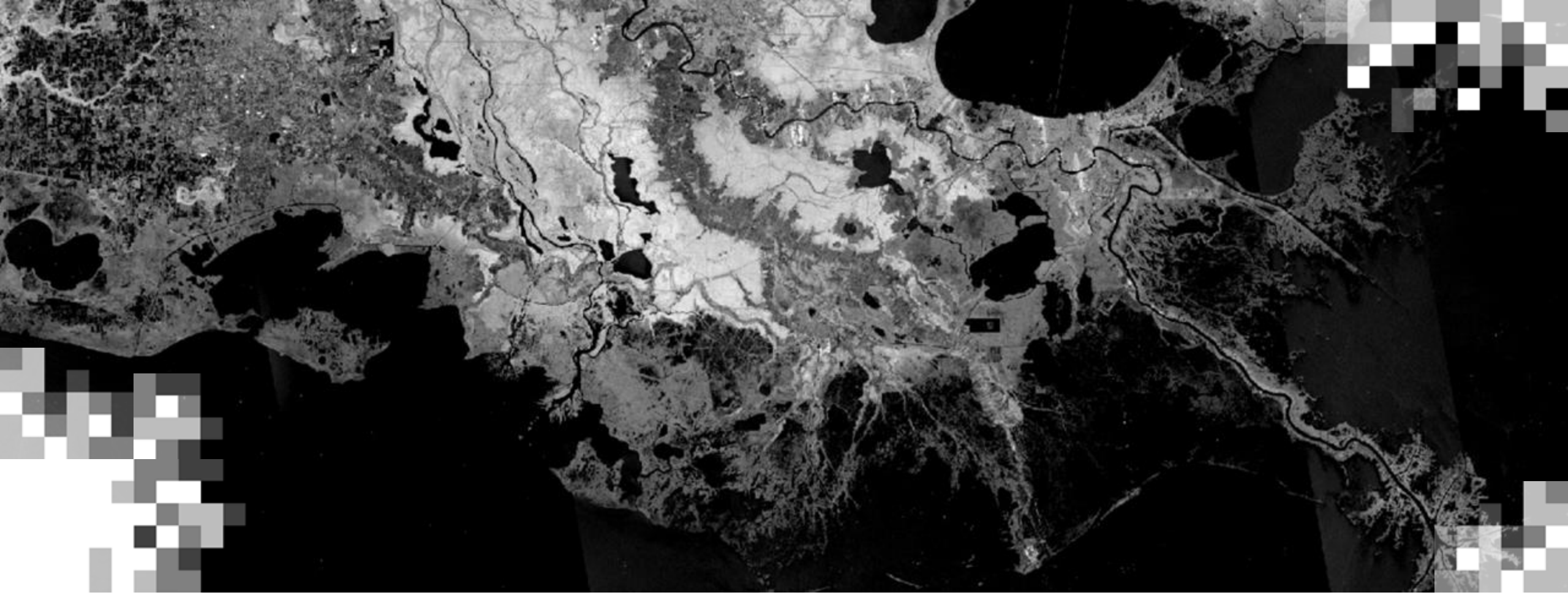
OPERA Sentinel-1 RTC

Cloud-Optimized Access for

Sentinel-1 Radiometric Terrain

Corrected SAR Backscatter Produ



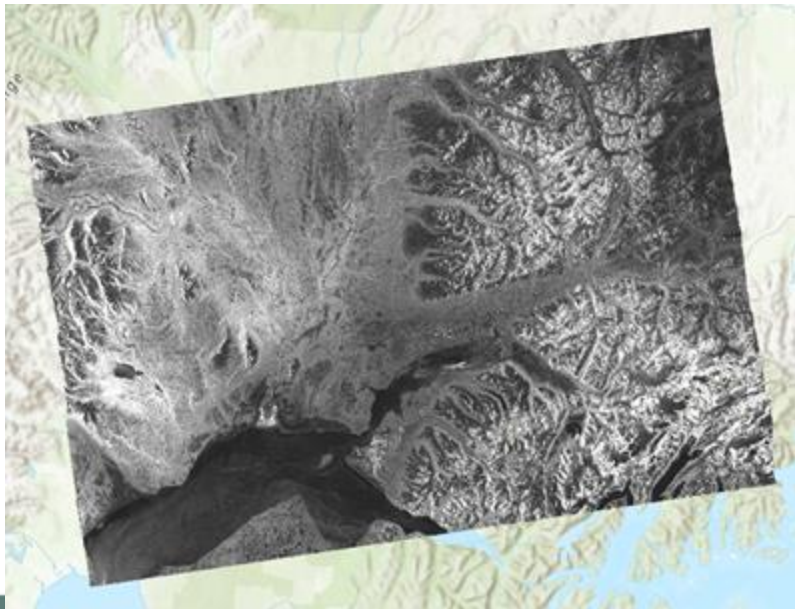


Part 3:
Ordering and Downloading On-Demand Products from ASF

On Demand Products for Sentinel-1

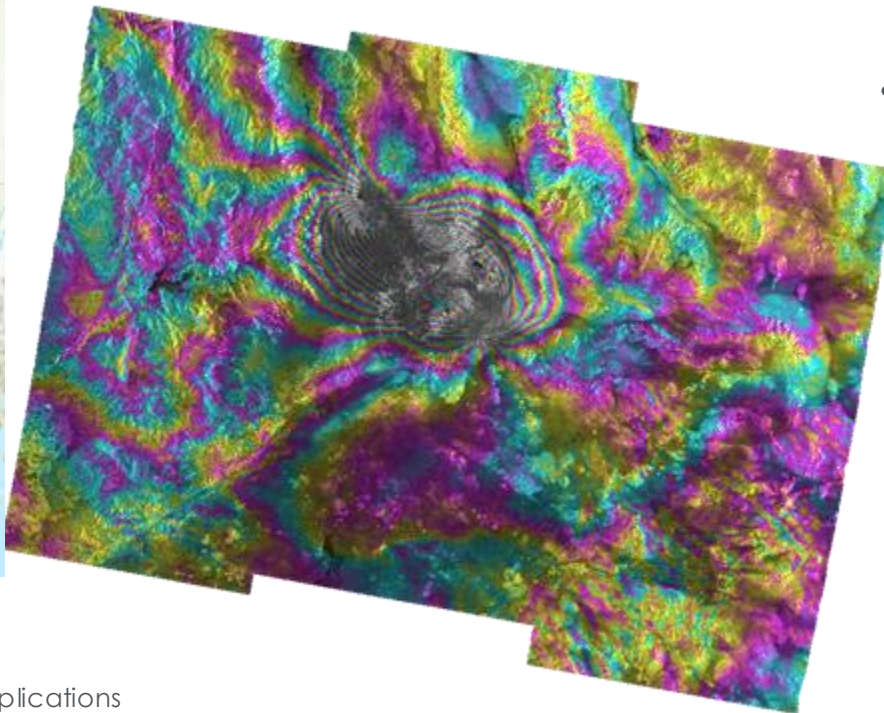
RTC

- Radiometric Terrain Correction
- Amplitude data in all available polarizations and RGB Decomposition
- Processed using GAMMA software
- Easy to use in GIS workflows



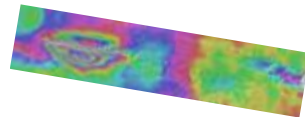
InSAR

- SAR Interferometry (phase differencing)
- Uses full Sentinel-1 SLC scenes
- Wrapped and unwrapped phase, coherence, displacement maps
- Processed using GAMMA software

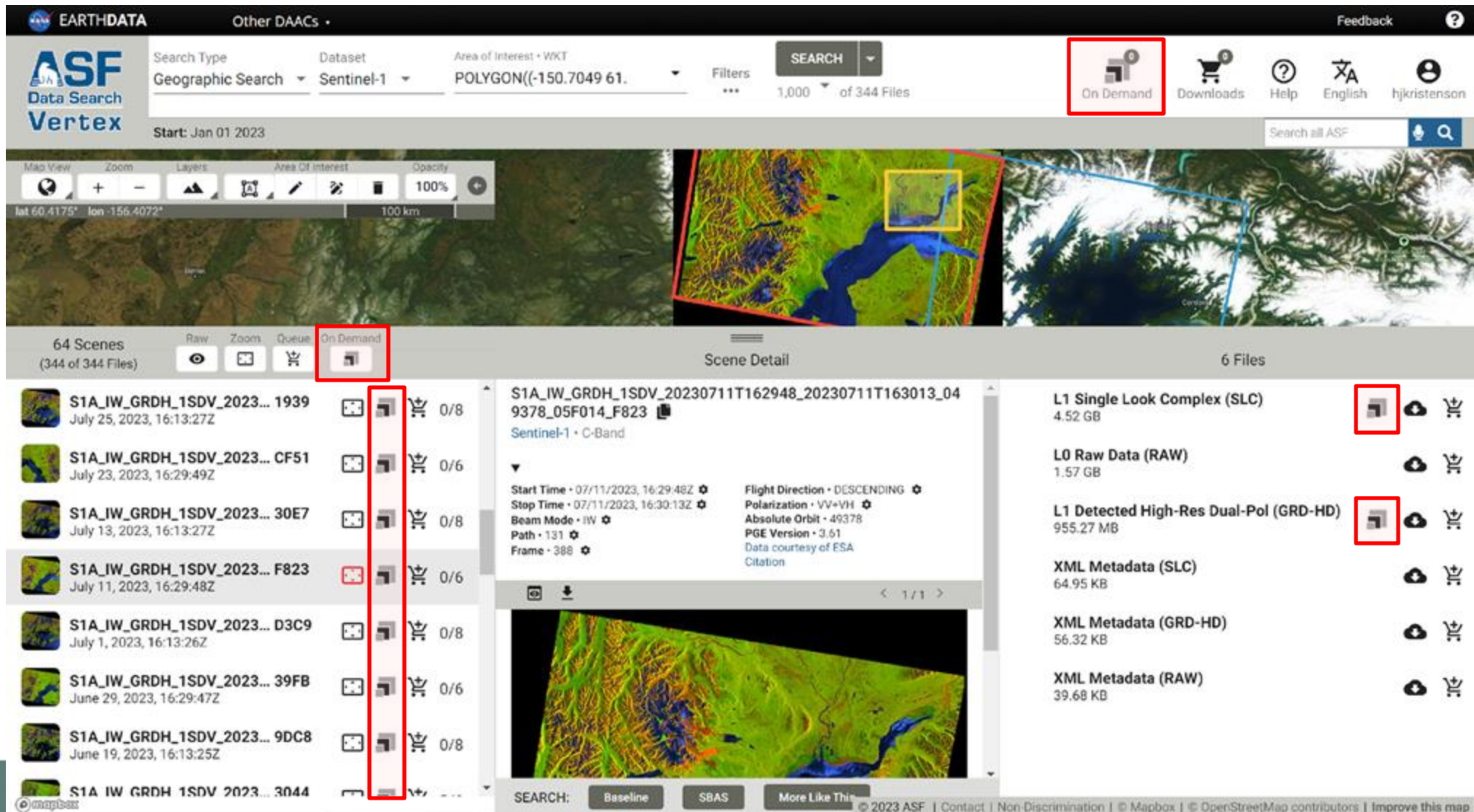


Burst InSAR

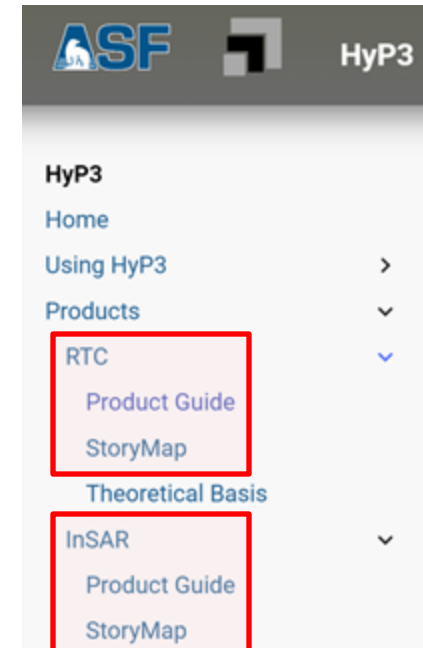
- SAR Interferometry (phase differencing)
- Processes single SLC bursts
- Wrapped and unwrapped phase, coherence, connected components
- Processed using ISCE2 software (open source)
- Multi-burst processing (merged bursts) coming soon!



On-Demand Processing with HyP3



The screenshot shows the ASF Data Search Vertex interface. At the top, there's a search bar with 'Geographic Search' selected, 'Sentinel-1' as the dataset, and a polygon area of interest. The search results show 1,000 of 344 files. A red box highlights the 'On Demand' icon in the top right. Below the search bar, there's a map view with a zoomed-in area of interest. A red box highlights the 'On Demand' button in the map view toolbar. The main content area shows a list of search results with columns for scene ID, date, and processing status. A red box highlights the 'On Demand' button for the first result. The scene detail view shows metadata for a specific scene, including start and stop times, flight direction, polarization, beam mode, path, and frame. A red box highlights the 'On Demand' button for the scene detail view. The file list on the right shows various processing products like L1 Single Look Complex (SLC), L0 Raw Data (RAW), L1 Detected High-Res Dual-Pol (GRD-HD), XML Metadata (SLC), XML Metadata (GRD-HD), and XML Metadata (RAW). A red box highlights the 'On Demand' button for the L1 Single Look Complex (SLC) product.



The ASF HyP3 navigation menu is shown on the right side of the slide. It includes links for Home, Using HyP3, Products, RTC, Product Guide, StoryMap, Theoretical Basis, InSAR, Product Guide, and StoryMap. A red box highlights the 'RTC' section, and another red box highlights the 'InSAR' section.



DEMO!

[RTC On Demand Tutorial](#)



StoryMap

RTC On Demand!

Working with Radiometrically Terrain Corrected Sentinel-1 SAR datasets from the Alaska Satellite Facility

[InSAR On Demand Tutorial](#)

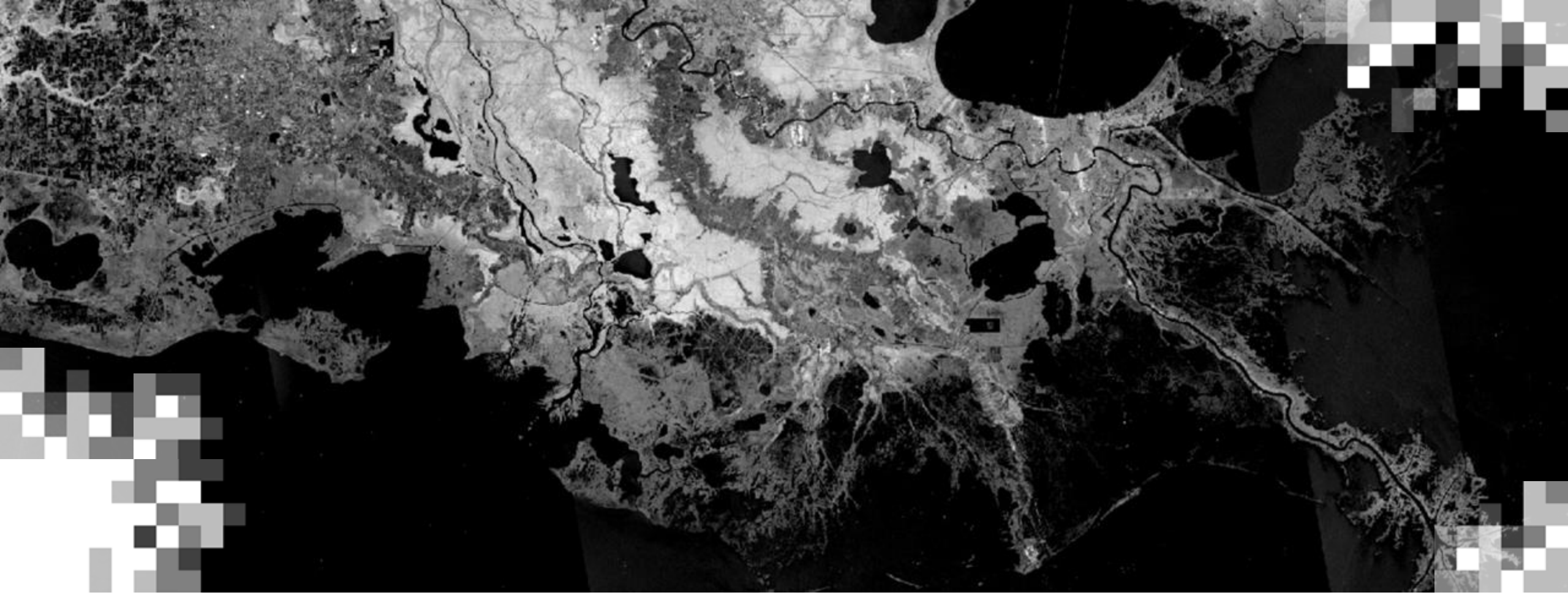


StoryMap

InSAR On Demand!

Ordering Sentinel-1 InSAR datasets from the Alaska Satellite Facility





Part 3:
Summary

Summary

- The Alaska Satellite Facility (ASF) is one of the 12 Distributed Active Archive Centers (DAACs) that comprise NASA's Earth Observing System Data Information System (EOSDIS).
 - ASF specializes in Synthetic Aperture Radar (SAR) data.
- ASF's holdings are free and easy to access.
 - Search and download using interactive map-based web interfaces.
 - Vertex for ASF's holdings, optimized for SAR searches: <https://search.asf.alaska.edu>
 - Earthdata Search for all of NASA's EO holdings: <https://search.earthdata.nasa.gov/search>
 - Search and download programmatically:
 - asf_search Python package or Search API, optimized for SAR searches
 - earthaccess Python package for all of NASA's Earth Observation holdings
- A range of analysis-ready SAR products are available from ASF.
 - Sentinel-1 Products:
 - OPERA RTC-S1 and ARIA GUNW InSAR available for download
 - On-demand RTC and InSAR processing also available for entire Sentinel-1 archive
 - UAVSAR products and ALOS PALSAR RTC available for limited areas



Resources – Part 3

ASF Data Search – Vertex

<https://search.asf.alaska.edu/>

Earthdata Search

<https://search.earthdata.nasa.gov/search>

ASF ArcGIS Online Homepage (StoryMap Tutorials)

<https://asf-daac.maps.arcgis.com/home/index.html>

On Demand (HyP3) Documentation

<https://hyp3-docs.asf.alaska.edu>

Vertex Documentation

<https://docs.asf.alaska.edu/vertex/manual/>

ASF Website

<https://www.asf.alaska.edu/>

Contact ASF

<https://www.asf.alaska.edu/contact/>

[EdX SAR Certificate](#)

(3 courses, can be taken individually)

[NASA EOSDIS Webinar: Introduction to SAR](#)

[NASA EOSDIS Webinar: SAR Applications in GIS](#)

[NASA EOSDIS Webinar: On-Demand Sentinel-1 RTC](#)

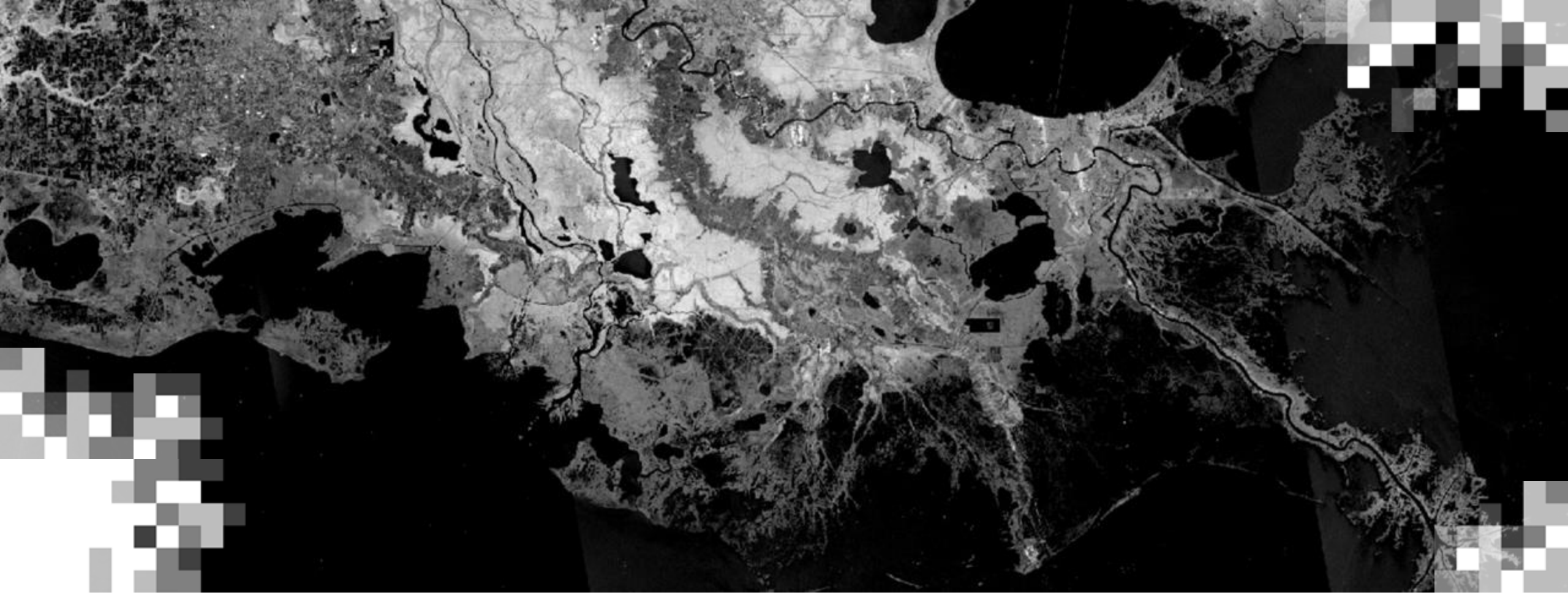
[NASA EOSDIS Webinar: On-Demand Sentinel-1 InSAR](#)

[SAR Handbook](#)

[ArcGIS Toolbox](#)

[Earthdata Login](#)





An Introduction to SAR and Its Applications
Summary

Training Summary

- In SAR the azimuth (along track) resolution is different from the range (across track) resolution.
- The three radar parameters are wavelength, polarization and incidence angle.
- The longer the wavelength the greater the penetration depth.
- The length of the wave will determine the interaction with the surface objects.
- Polarization provides information related to the structural characteristics of the objects on the surface.
- Incidence angle will influence the signal penetration into the target.
- The two surface parameters that influence the radar signal are structure and moisture.
- The main backscatter mechanisms are specular scattering, rough surface scattering, volume scattering and double bounce.
- Radar images have geometric distortions in areas of complex topography.
- Speckle is the graininess inherent in SAR images. It can be reduced through multi-looking or with a spatial or temporal filter.
- Radar can be used for different ecosystem studies such as mapping landcover, crops, wetland inundation, and soil moisture.



Training Summary

- SAR interferometry (InSAR) measures the distance from the satellite to the ground with high precision by using the phase of the reflected radar signals.
- Coherence of InSAR phase is sensitive to the surface or surface cover stability at the radar wavelength scale.
- Phase cycles in a repeat-pass interferogram show change in distance to ground by half the radar wavelength, 2.8 cm for Sentinel-1 and 12 cm for NISAR.
- New pre-processed InSAR products enable user analysis of interferograms with few additional steps.
- InSAR measurements of surface motion are useful for a variety of geological processes, some hydrological processes, dynamics of glaciers, and other effects that displace surface or large structures.



Homework and Certificates

- **Homework:**
 - One homework assignment
 - Opens on 11/20/2024
 - Access from the [training webpage](#)
 - Answers must be submitted via Google Forms
 - **Due by 12/04/2024**
- **Certificate of Completion:**
 - Attend all three live webinars (attendance is recorded automatically)
 - Complete the homework assignment by the deadline
 - You will receive a certificate via email approximately two months after completion of the course.



Contact Information

Trainers:

- Dr. Franz J. Meyer
 - fjmeyer@alaska.edu
- Heidi Kristenson
 - hjkristenson@alaska.edu

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Thank You!

