

National Aeronautics
and
Space Administration



EARTHDATA

Get Ready for NISAR Using NISAR Data in GIS

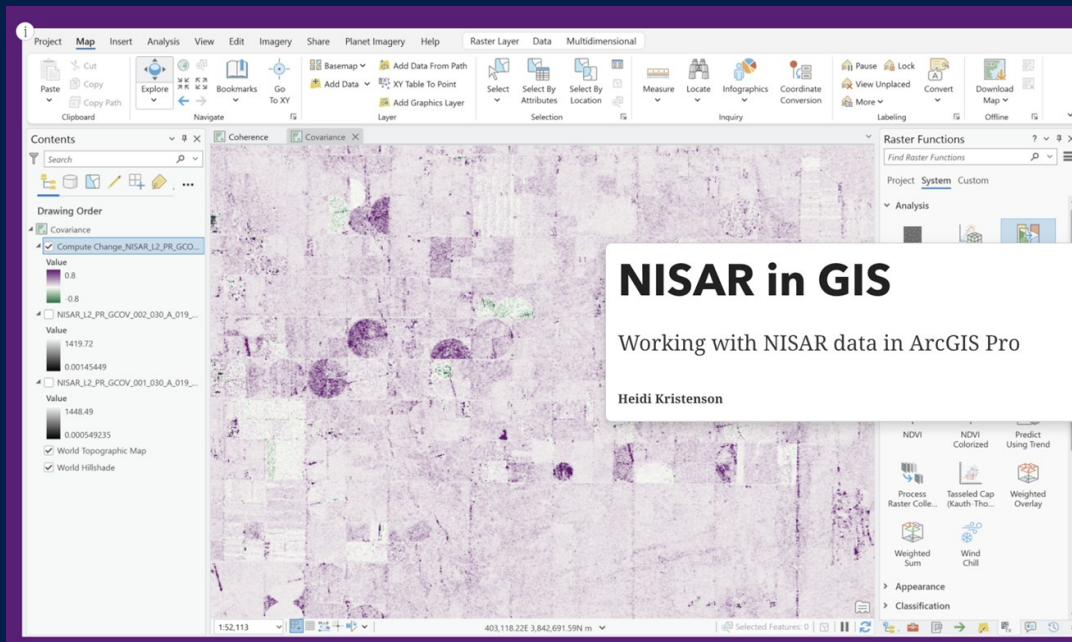
Alaska Geosummit 04/09/2025

Jacquelyn Smale

Alaska Satellite Facility

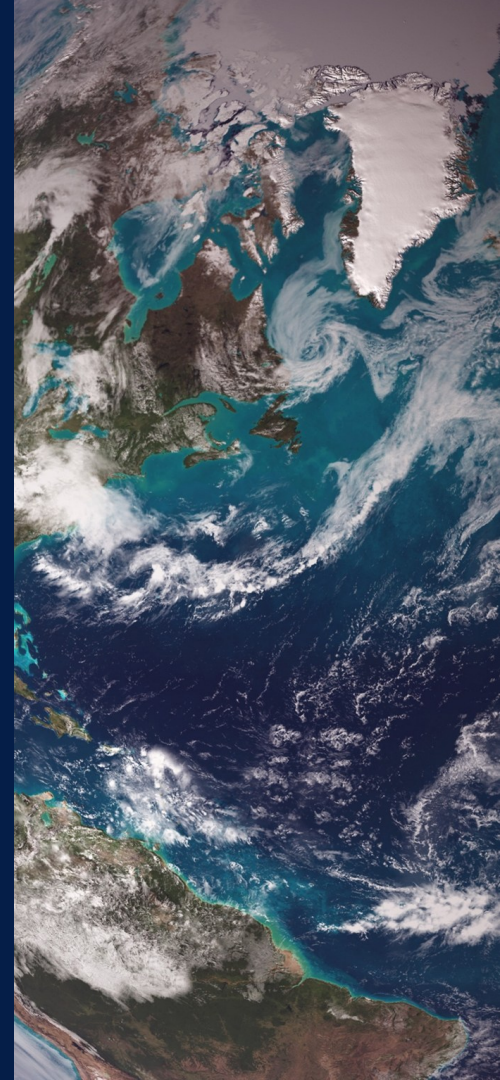


All information is also available in our NISAR StoryMap



Working with SAR has advantages

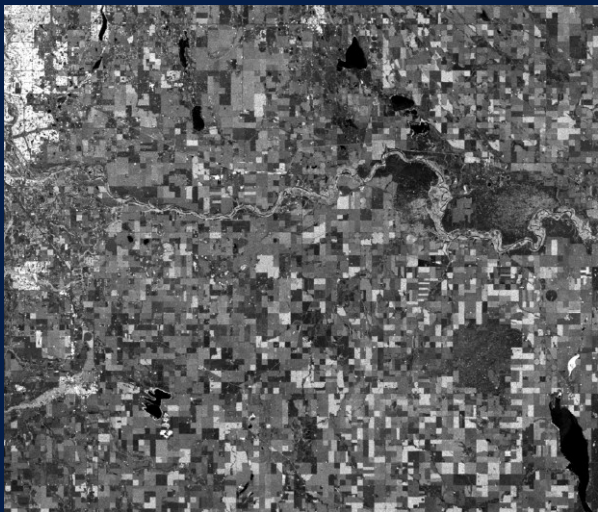
- Signal penetrates cloud and smoke
 - Monitor areas prone to cloud cover
 - Reliable imaging even with fires or storms
- Not reliant on daylight
 - Time series consistent
- Measures surface deformation



SAR components include amplitude and phase

Amplitude

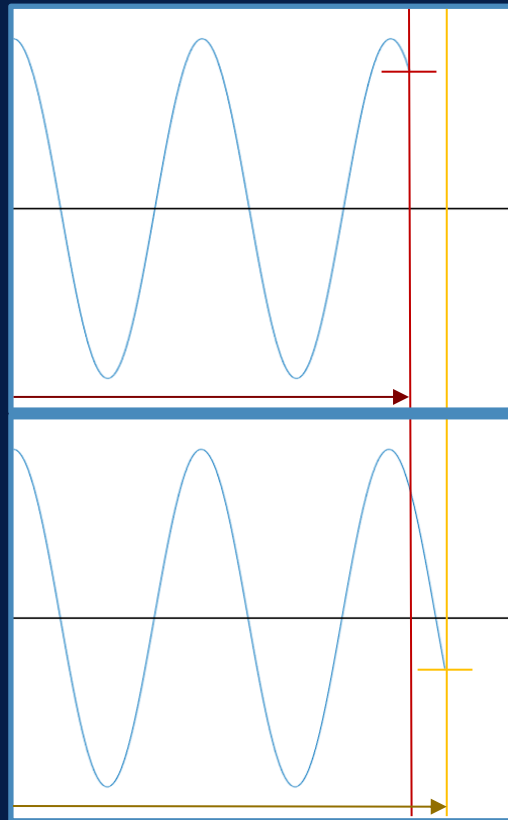
How much of the sent signal returns to the sensor (backscatter)



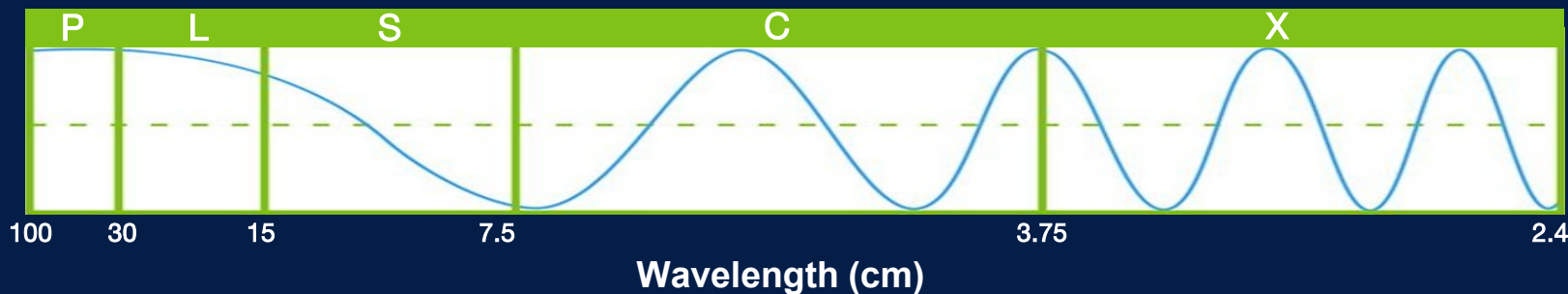
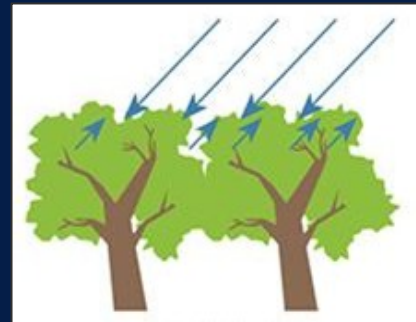
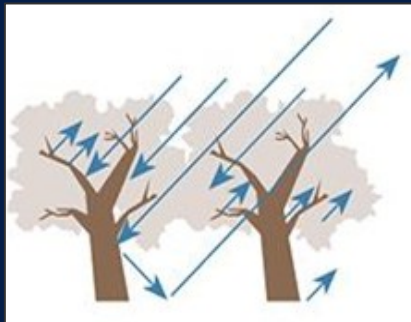
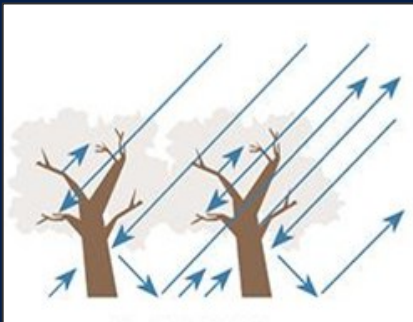
Phase

Location of the signal along its wave cycle when it returns to the sensor

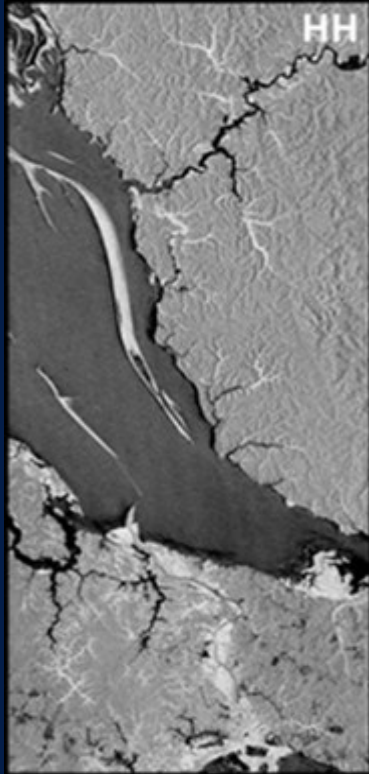
- Proxy for distance
- Basis of SAR interferometry



SAR bands interact with Earth's surface differently

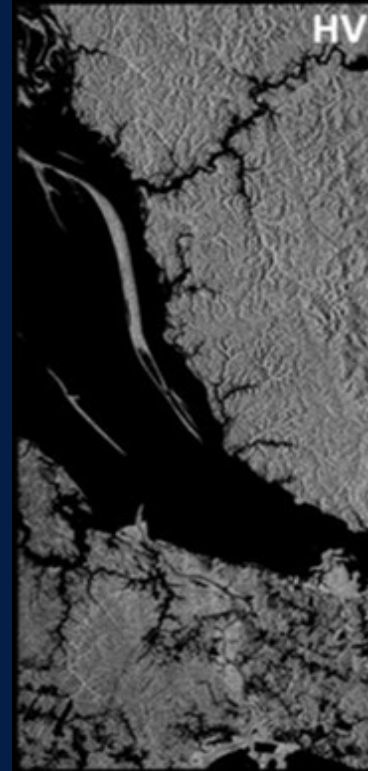
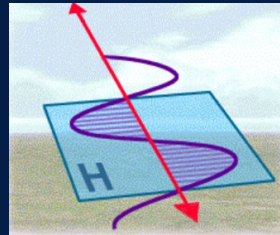


SAR signal can be co-polarized or cross polarized



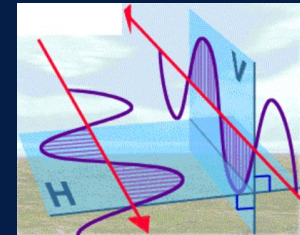
Co-polarized

HH - Horizontal transmit and receive



Cross polarized

HV - Horizontal transmit and vertical receive



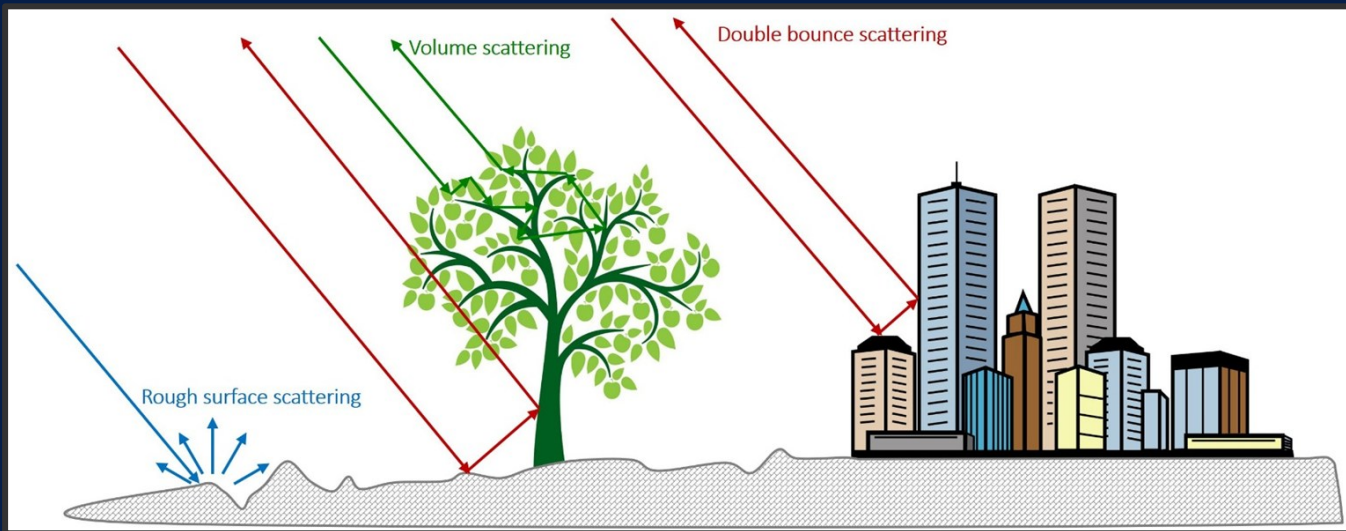
Polarization scatters depending on surface

Rough surface scattering

$$|S_{VV}| > |S_{HH}| > |S_{VH}| \text{ or } |S_{HV}|$$

Double bounce scattering

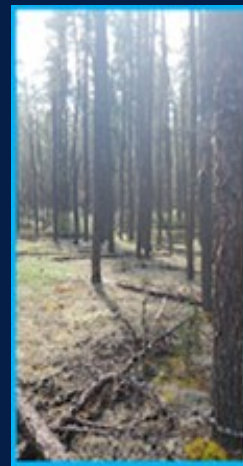
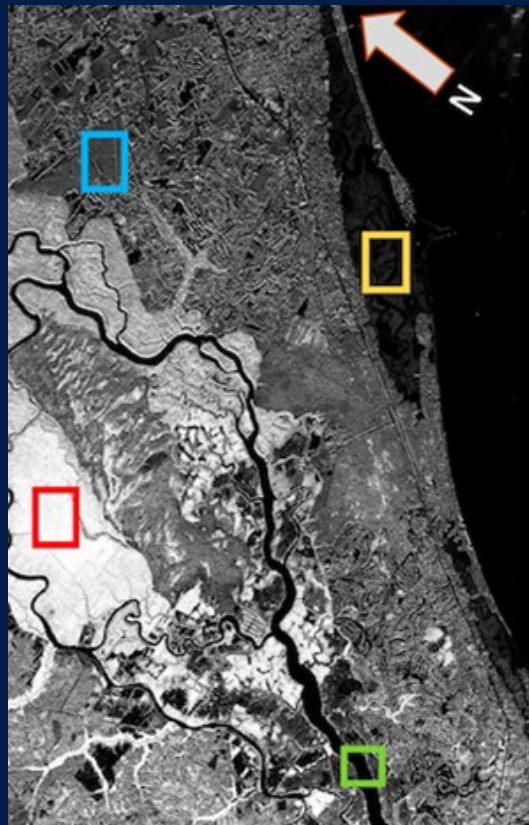
$$|S_{HH}| > |S_{VV}| > |S_{VH}| \text{ or } |S_{HV}|$$

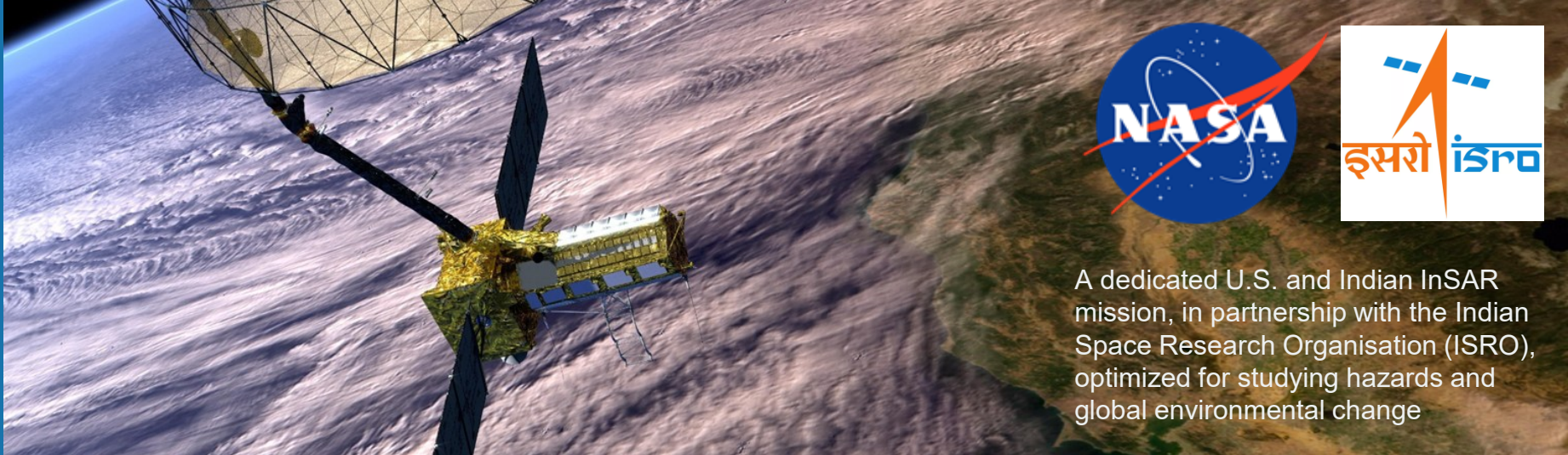


Volume scattering

Main source of $|S_{VH}|$ and $|S_{HV}|$

SAR data can help map flood extent





A dedicated U.S. and Indian InSAR mission, in partnership with the Indian Space Research Organisation (ISRO), optimized for studying hazards and global environmental change

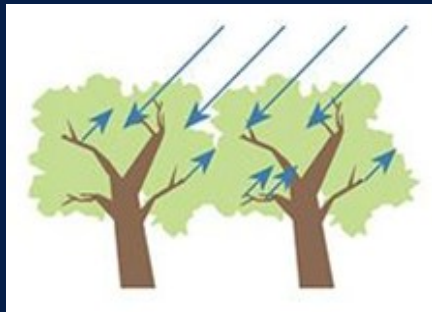
**Due to launch
June 2025**

- Data will be free and open to the public
- Mission will produce analysis-ready products
 - Suitable for GIS analysis with no additional processing

NISAR will carry L and S band channels

Band	Wavelength	Polarizations	Availability
L-Band	24 cm	May provide quasi-quad pol (HH/HV and VV/VH)	Dual pol available for global observations every cycle Potential for quad-pol over India and the US
S-Band	9 cm	May provide quad pol (HH, HV, VV, VH)	Available for India May not be globally available

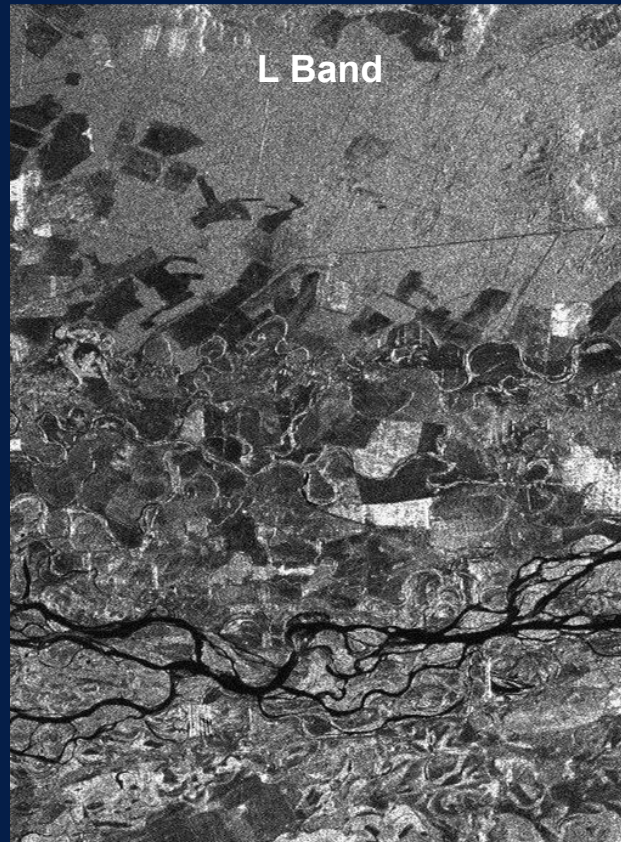
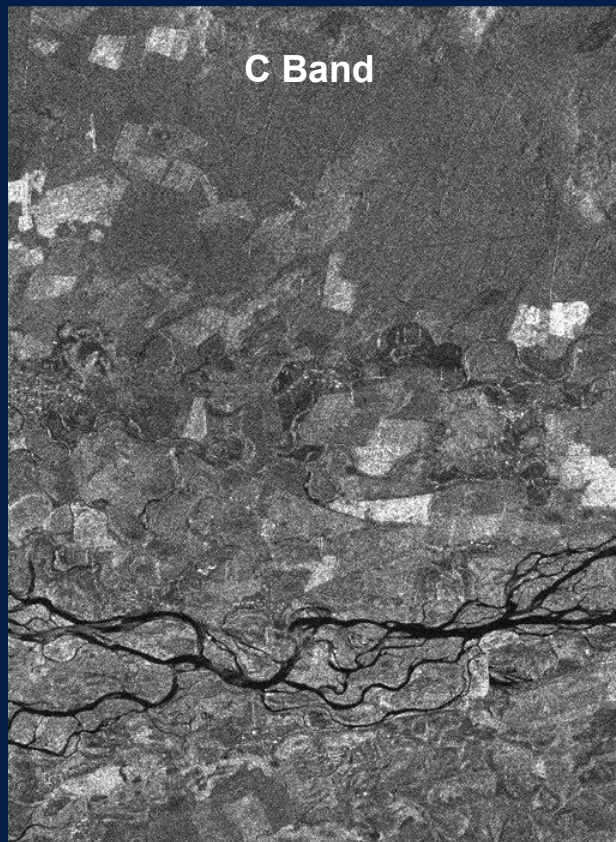
NISAR bands compliment Sentinel data



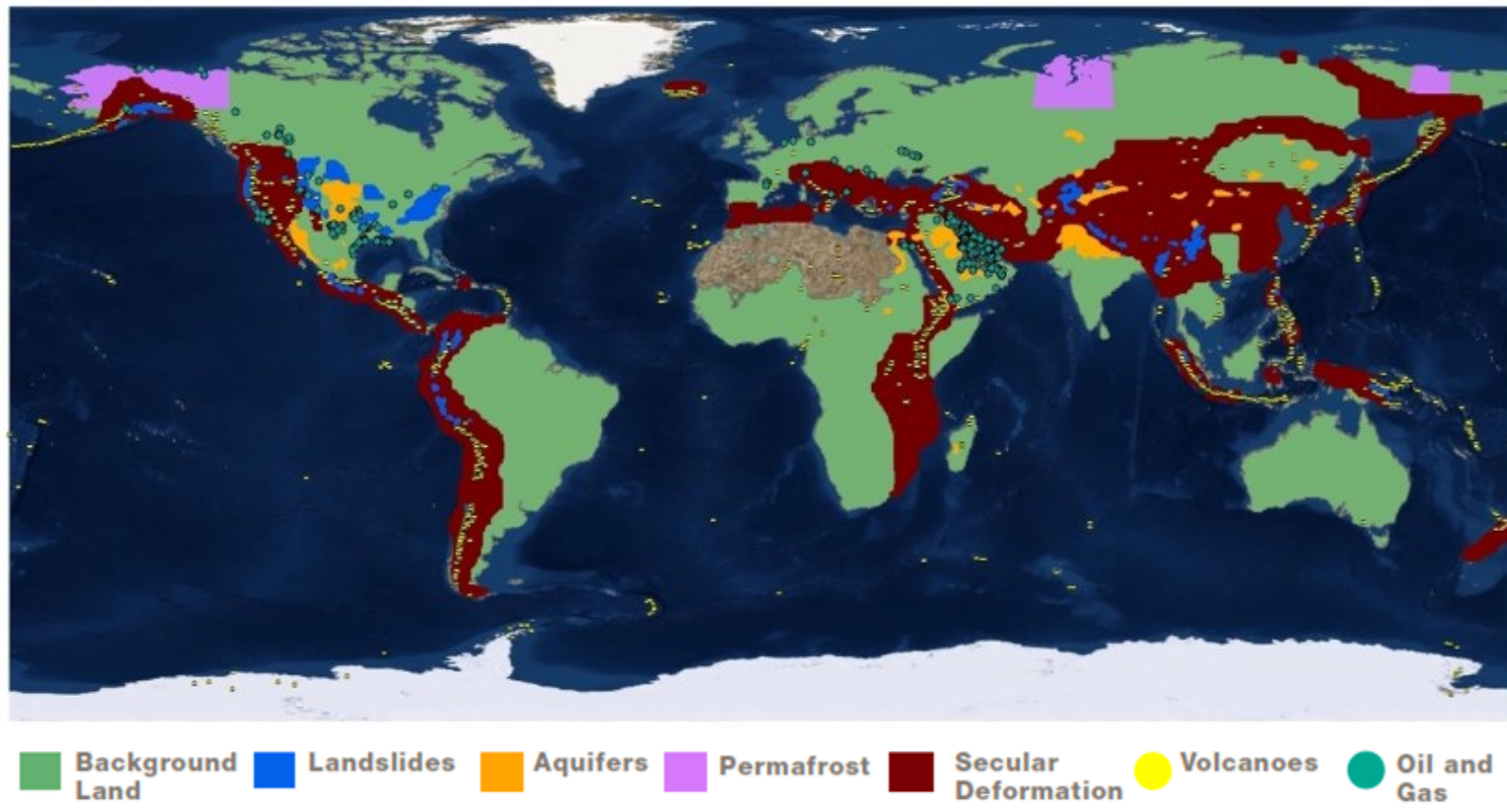
C-band Penetration



L-band Penetration



NISAR will target key solid earth processes

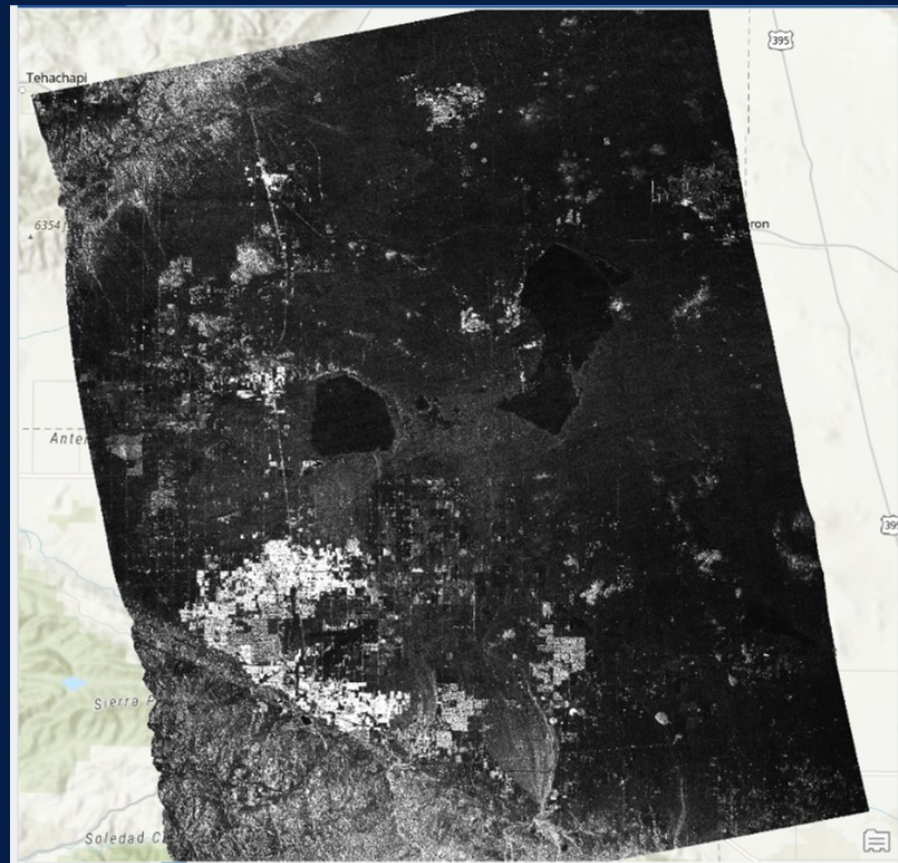


NISAR Data Will Be Analysis-Ready

Geocoded Covariance (GCOV)

Calibrated backscatter measurements corrected for radiometric and terrain distortions

- Amplitude-based
- Similar to RTC or NRB products

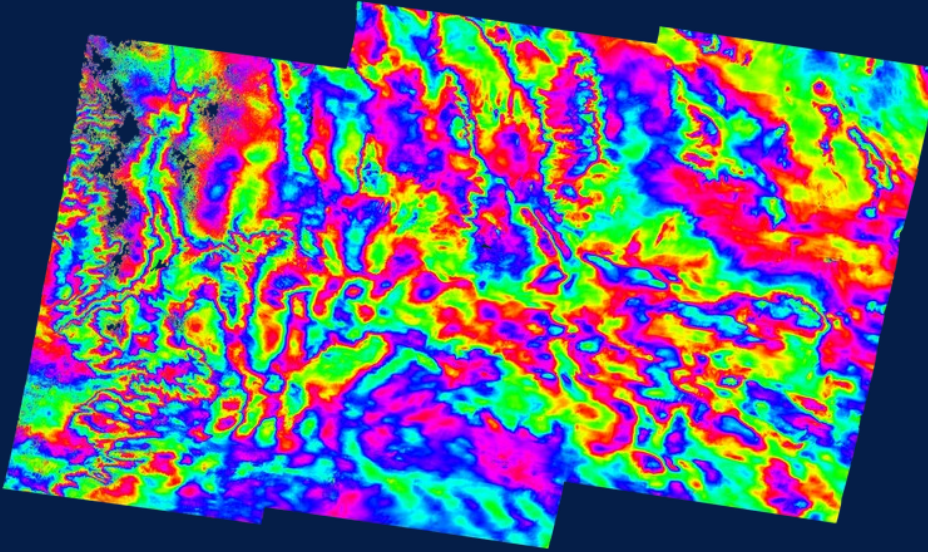


NISAR Data Will Be Analysis-Ready

Geocoded Unwrapped Interferograms (GUNW)

Nearest-neighbor InSAR products

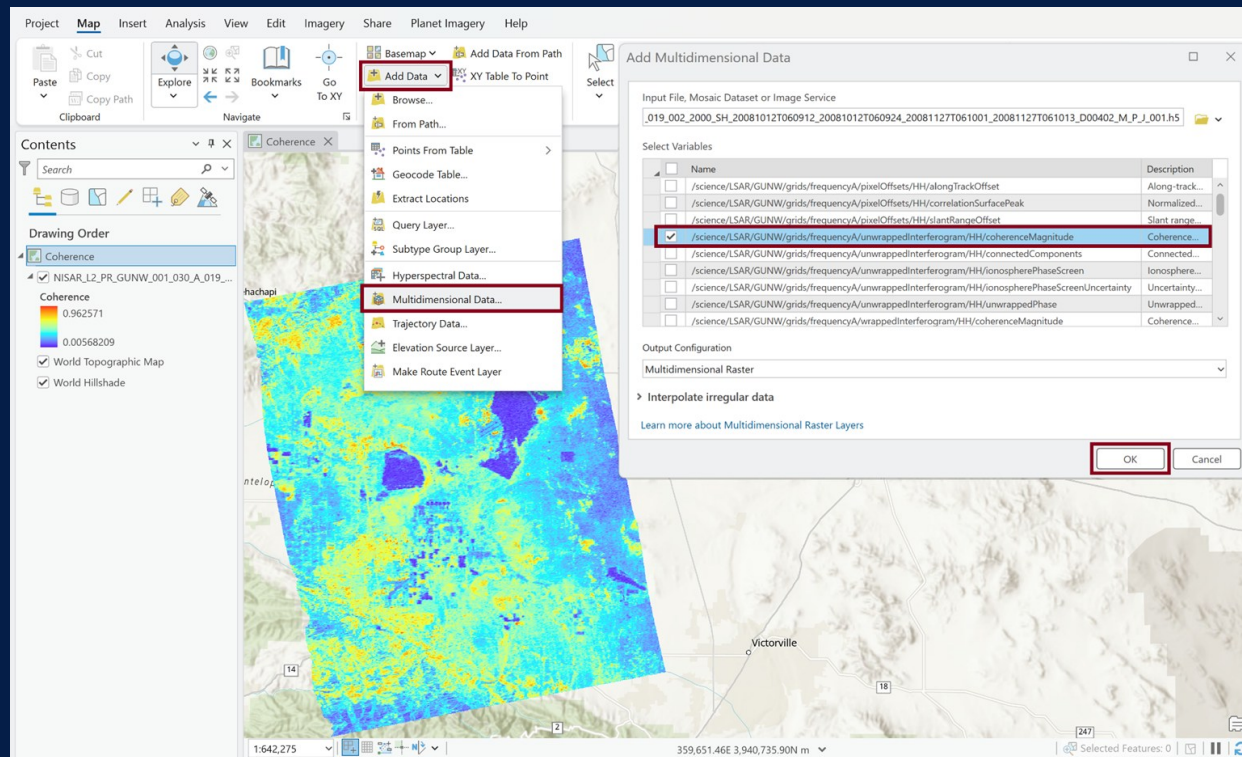
- Phase-based
- Product will include both the wrapped and unwrapped interferograms along with coherence products.



Using NISAR data in ArcPro is streamlined

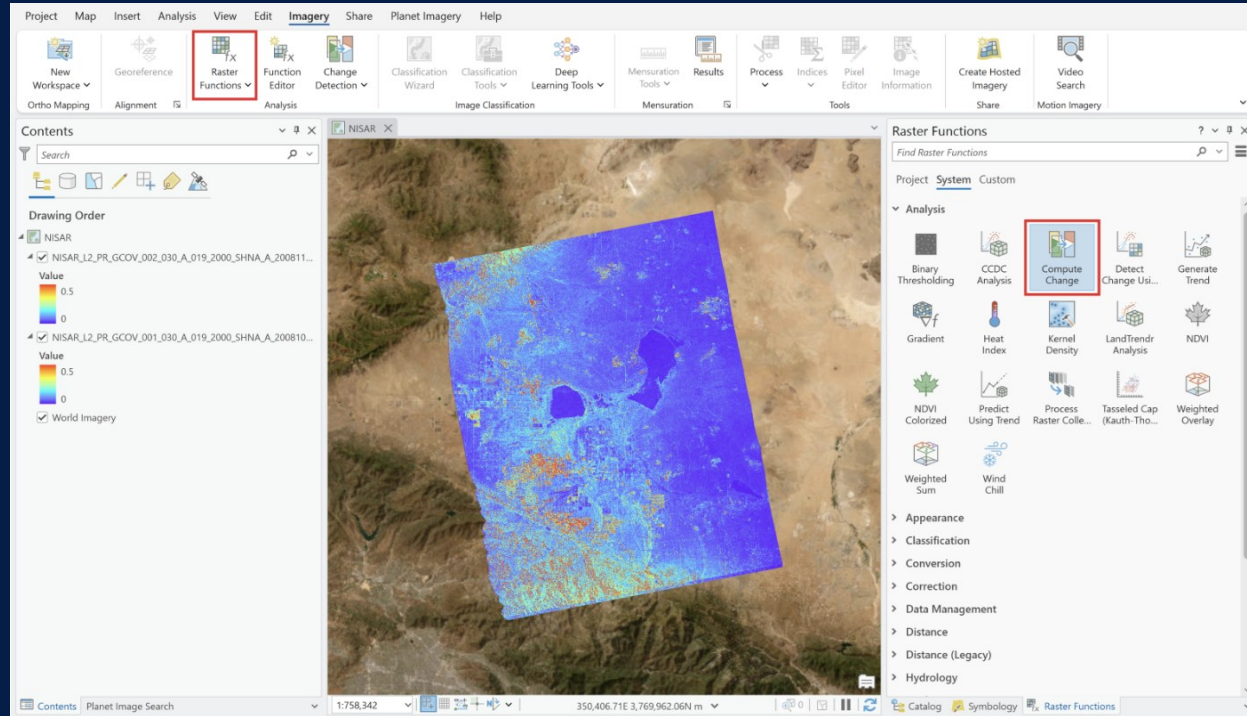
ArcGIS Pro version 3.4.0 and above will handle NISAR HDF5 files

- Add like any other multi-dimensional raster



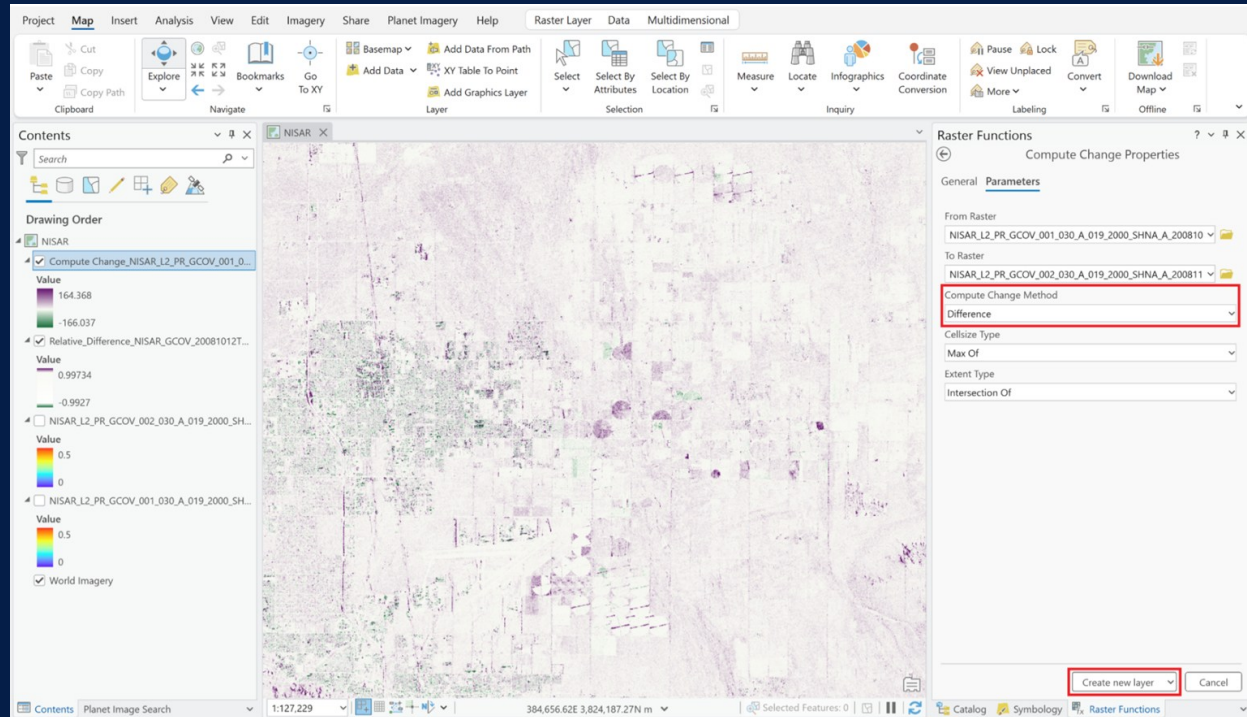
Raster functions work for NISAR data in ArcPro

Existing raster functions allow for applications like computing change detection between two GCOV rasters.



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StoryMap



Sample Data Suite



Working Guide



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