

# NASA-ISRO Synthetic Aperture Radar (NISAR) global, free, L-band, high- resolution, frequent repeat data for Natural Resource Management Applications

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**April 30 – May 2, 2019 USFS-NASA Applications Workshop**

# How can NISAR data be used by USFS?

## Mission focus:

- Ecosystems:
  - Agriculture
  - **Forests**
  - **Disturbance**
  - **Wetlands**
- Solid Earth:
  - **Landslides**
  - **Volcanos**
  - Earthquakes
  - Subsidence/Hydrology

## Value-Added

- **Soil Moisture**
- Critical Infrastructure
- Floods
- Oceans:
  - Sea Ice
  - Oil Spills

## Information Products that can be derived from NISAR:

- Biomass\*
- Disturbance detection\*
- Soil moisture
- Disturbance classification
- Inundation/surface water extent\*
- Wetland extent in vegetated areas
- Water stage (i.e. level) change in time

\* Algorithms being developed by NISAR Science Team and Project – run only over cal/val sites, no allocated funds for regular production

# How is NISAR preparing for USFS needs?

Description	NISAR Activity
Community Assessments	2014 Applications Workshop: Identify NISAR Application Focus Areas
	2015 Applications Workshop: Define Community Engagement
	Area-Specific Workshops: Application Requirements
Project Studies	Urgent Response: Latency vs. Accuracy
Tutorials	SERVIR SAR Handbook + handouts
	ARSET Webinar Series
	SAR Education Workshop
Early Engagement	Applications Working Groups (includes Early Adopters)
	NISAR Envoy
Use Cases/ Case Studies	DEVELOP studies
Posters/ Informationals	Low Latency NISAR for NRT
	AGU NISAR Applications Plan
	21 Whitepapers/2-pg Glossies
Data Workshops	Follow-on Area-Specific Workshops
Community Contact List	Email Listserv



# Area-Specific Workshops: Application Requirements



**Arming Forest Management with Information  
from NISAR Remote Sensing Data**  
USFS-NASA Meeting  
1 Thomas Circle Plaza, DC  
(RSVP [Natasha.Stavros@jpl.nasa.gov](mailto:Natasha.Stavros@jpl.nasa.gov))

**Workshop Objectives**

- Identify high impact applications for integrating NISAR into Forest Ecosystem Applications, where high impact is defined as a function of:
  - feasibility to meet application requirements within NISAR observation plan and latency
  - feasibility of user community to use/ingest
  - maturity of algorithms for operational deployment
- Develop a roadmap to realizing integration of SAR into decision support for high-priority and high-feasibility Ecosystem applications
  - feasibility studies
  - challenges (e.g., working groups needed)
  - information product development
- Identify early engagers (analogous to “early adopters”) to help develop information products and distribute

**Agenda**

**DAY 1: Wednesday, June 13, 2018**

7:30 - 8	Arrival & Sign-In	
8 – 8:15	Workshop Welcome	Alex Moad (USFS) and Natasha Stavros (NISAR Deputy Applications Lead for Ecosystems)
8:15-8:30	NASA Welcome	Craig Dobson, NISAR Program Scientist (NASA/HQ/Earth Science Division)
8:30- 9	USFS Remote Sensing Overview	Everett Hinkley, USFS National Remote Sensing Program Manager
9 – 9:30	USGS Remote Sensing Overview	Greg Snyder, Chief of Earth Observation Requirements, Capabilities and Analysis Branch
9:30 – 9:45	Break - Coffee/Tea Provided	
9:45-11:15	NISAR Mission Overview and Forest Structure, Biomass, and Disturbance	Sassan Saatchi, NISAR Science Team, JPL/CalTech and Josef Kelldorfer, NISAR Science Team, Earth BigData
Information Product Requirements – Sassan Saatchi facilitating		
11:15-12:00	USFS Forest Inventory and Analysis	Ron McRoberts, USFS
	USFS/USGS SilvaCarbon	Bradley Reed, USGS
	USFS Geospatial Technology and Applications Center	Brad Quayle, GTAC manager
12:10 – 1:10	Lunch	

Sponsoring Agency Mission, Organization, Funding, Collaborations

NISAR Overview

Community Information Needs Assessment independent of what NISAR will provide (Agency/Org template)

Identify Interagency/Org Information Product Needs (discussion)

Determine which ones NISAR could fulfill (ST response)

Current State of SAR Algorithms for Information Needs (Agency/Org template)

SAR Decision Support Integration Lessons Learned

Community Specific Roadmap to Launch (discussion)

Optional: Working Group and Cal/Val (discussions)

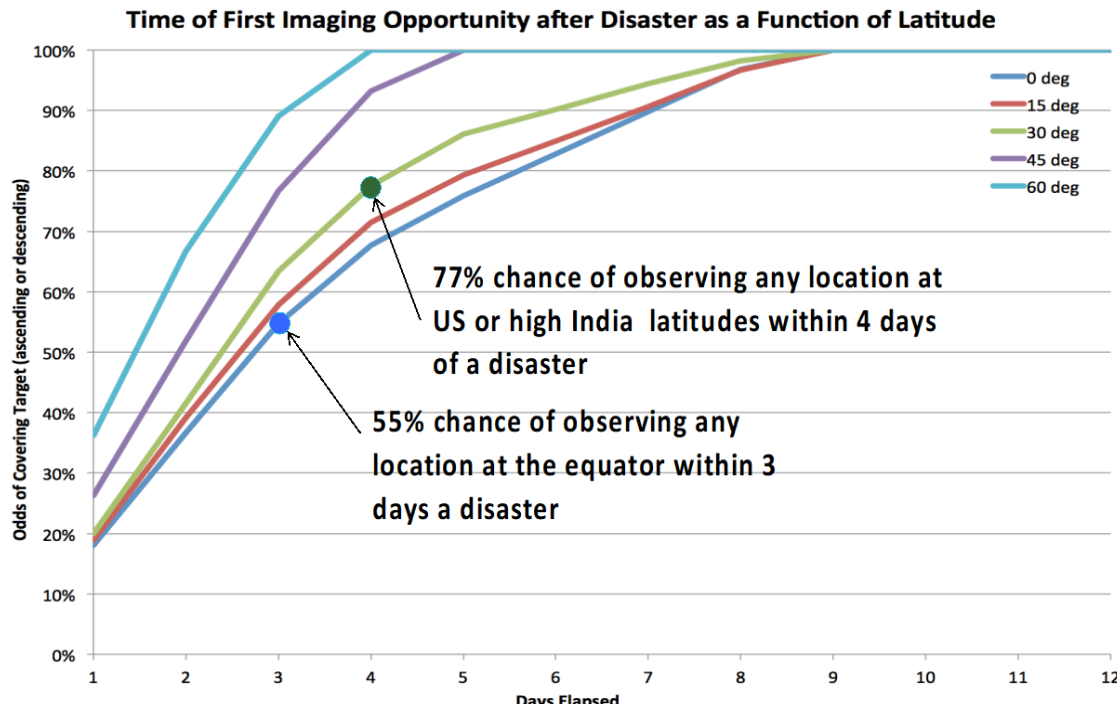
Information Product Requirements continued		
1:20 – 1:35	World Wildlife Fund	Naikoa Aguilar-Amuchastegui
1:35- 1:50	Timber Industry Consulting	Zack Parisa, SilvaTerra
1:50 – 2:05	USGS Forestry and Ecosystems	Kurtis Nelson
2:05 – 2:25	World Resources Institute	Mikaela Weisse
2:25-2:45	Conservation International	Max Wright
2:45-3:10	BLM	Chris Cole
3:10-3:25	World Bank	Andres B. Espejo
3:25 – 3:40	Break - Coffee/Tea Provided	
3:40 – 4:00	Follow-up Q&A with all speakers – Open Discussion	
4:00-4:15	National Park Service	Brandon Lemire
4:15- 4:30	Technical Response to Information Requirements Discussion	Josef Kelldorfer, NISAR Science Team, Earth BigData
4:30-5:10	R&D Needs to Address Identified Technical Gaps	Gerald Bawden (NASA/HQ)

**DAY 2: Thursday, June 14, 2018**

7:30 - 8	Arrival & Sign-In	
Examples of how SAR could be integrated into existing Decision Support Workflows		
8:15 – 8:50	Biomass/Forest Inventory and Analysis	Hans-Erik Andersen, USFS
8:50 – 9:30	Fire Modeling	Mark Finney, USFS FARSITE
9:30 – 10:15	Forest Cover Monitoring	Naiara Pinto, JPL
10:15 – 10:30	Break - Coffee/Tea Provided	
10:30 – 11:00	SERVIR	Africa Flores, NASA SERVIR
11:00 -11:20	Ecosystem Structure Monitoring	Michele Slaton, USFS Region 5 Remote Sensing Lab
11:20-12:00	Forest monitoring activities in Gabon	Ghislain Mousanovu, AGEOS Gabon
12:00 – 1:30	Lunch	
1:30 – 4:10	Detailed Sector requirements (Josef KelIndorfer, facilitate group discussion): <ul style="list-style-type: none"><li>Do any of the products serve multiple Organizations/Agencies/Applications requirements?</li><li>What do the final products look like? Variables? Spatial and temporal resolution? Accuracy? Latency? Time Series? Raster?</li><li>What is the best way to deliver the final product? Data format? Distribution Platform?</li><li>What is the best way to get from NISAR radar products to Forest final products?</li><li>How do we put that in place?</li></ul>	
4:10 - 4:40	NASA Applied Science Program Overview	Woody Turner, Ecological Forecasting Applied Science Program Manager (NASA/HQ)
4:40 – 5:00	Next Steps and Wrap-Up	Craig Dobson (NASA/HQ/Earth Science)

# Urgent Response Capability

Products	Requirement	Current Best Estimate	Urgent Response
L0	24 Hours	12 Hours	2 Hours
L1	9 Days	1 Day	4 Hours
L2	9 Days	2 Days	6 Hours

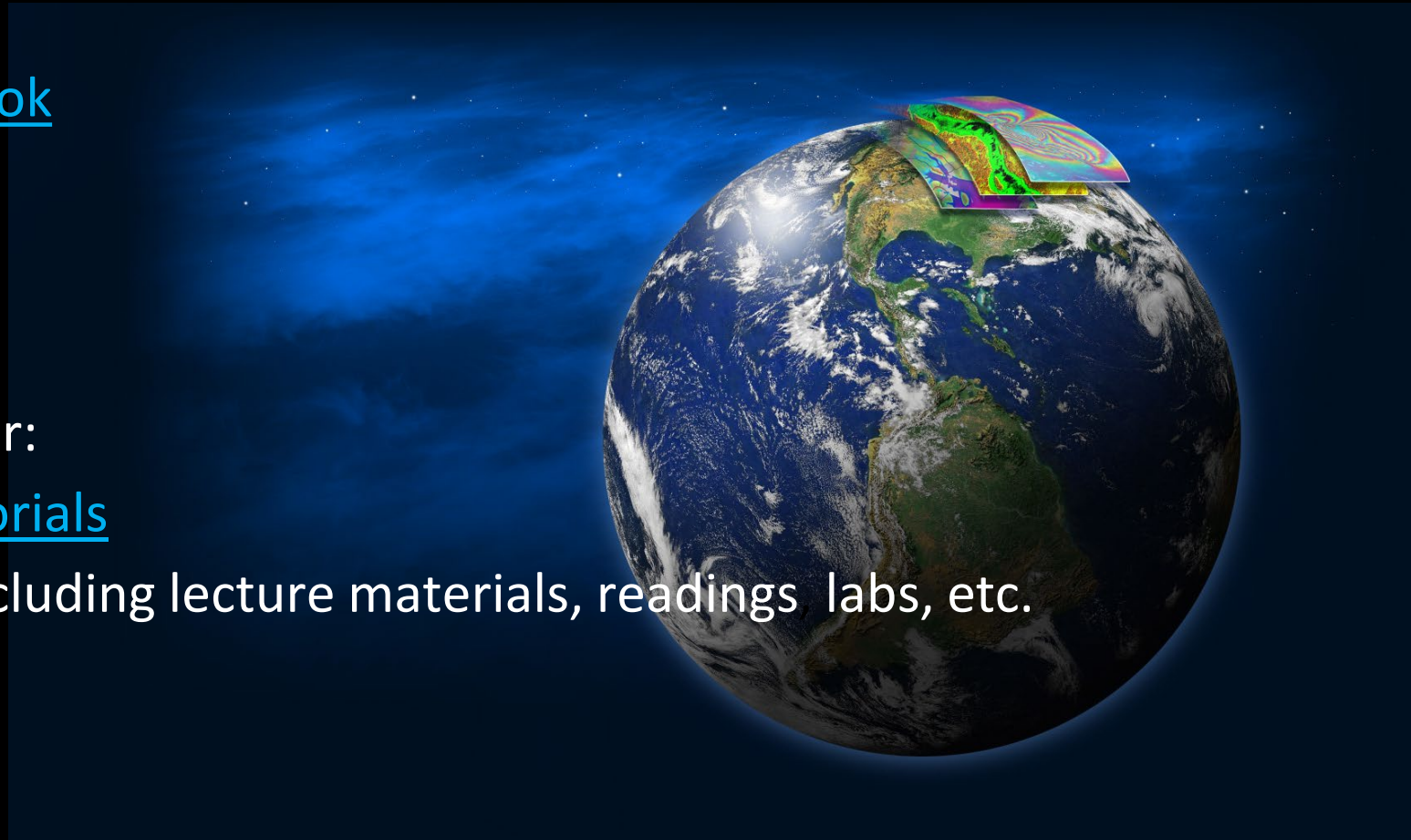


## Upcoming Plans for Urgent Response

- Develop detailed Urgent Response Plan in conjunction with HQ ASP/Disasters
- Implement an automated Urgent Response request system (Needs funding)
- Coordinate use of the request system with response agencies

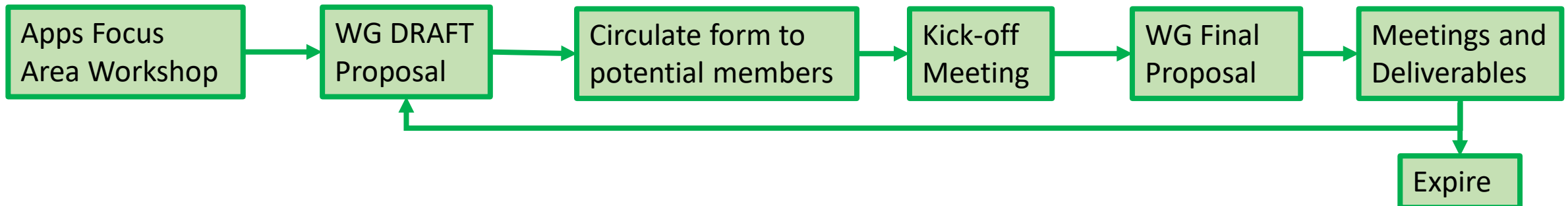
# Library of Educational Resources

- ARSET
  - [Introduction to Synthetic Aperture Radar](#)
  - [Advanced Webinar: Radar Remote Sensing for Land, Water, & Disaster Applications](#)
- SERVIR
  - [Biomass Estimation Handbook](#)
  - One-Pagers:
    - SAR-Vegetation indices
    - Pre-processing steps
  - Movie: SAR explained
- NASA Data Active Archive Center:  
Alaska Satellite Facility [SAR Tutorials](#)
- [Free and open SAR Semester](#) including lecture materials, readings labs, etc.



# Early Engagement: Working Groups

- Purpose: to provide
  - a forum for connecting targeted applications communities and NISAR experts
  - feedback to NISAR of the utility of the data beyond the core science objectives
- Activities defined at creation may include calibration and validation, capacity building, or L3+ product development specific to the identified application area
- WG must have deliverables, timelines, roles, and cadence of meetings. Deliverables can include trade study, report, product (software or L3+ data product), education module, etc.



# Early Engagement: NISAR Envoy

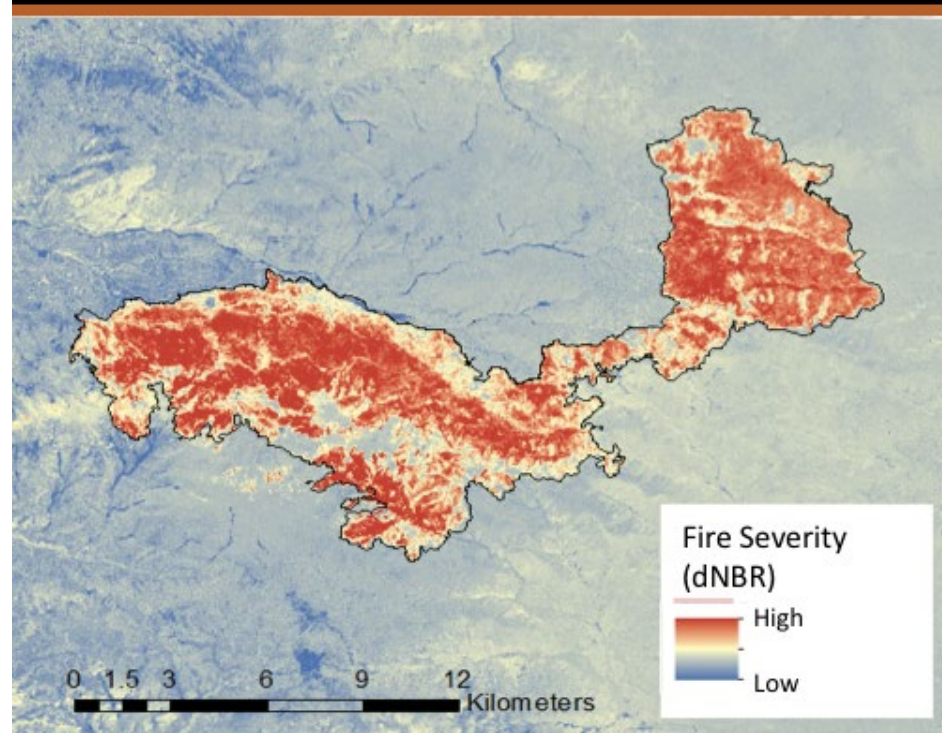
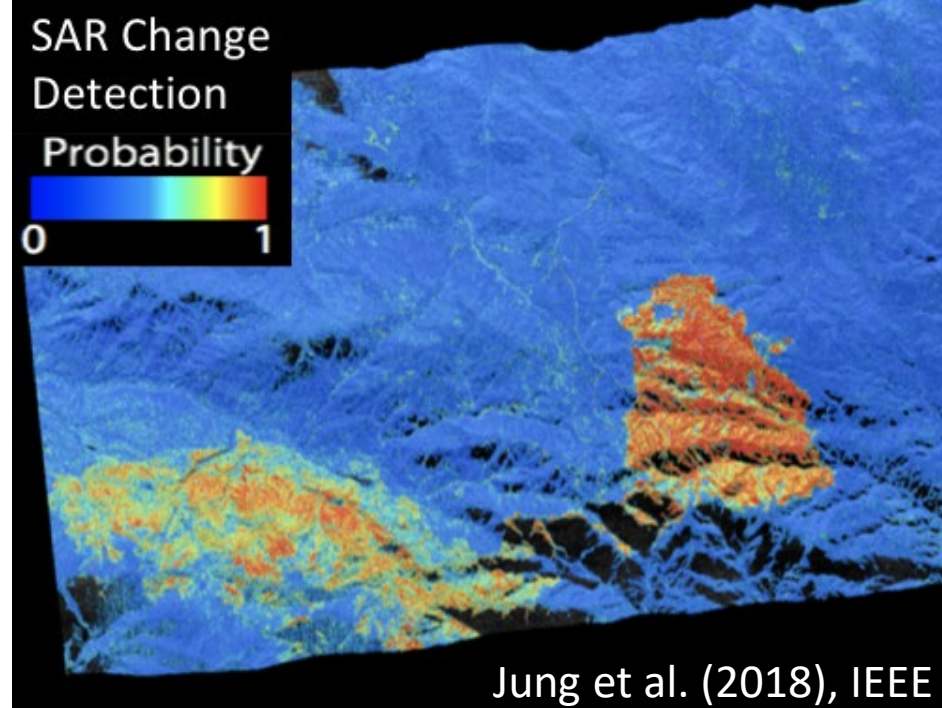
- Volunteer-based community with experience working with SAR applications
- Envoys
  - help respond to inquiries about how they have used SAR for specific applications (research or decision support)
  - discuss NISAR as an upcoming source of openly-available, public data at meetings where they are already presenting using NISAR-provided slides
  - help identify willing partners for further engagement through conversations about NISAR at professional meetings
- A list of envoy members will be posted on the NISAR applications website



# Use Case/ Feasibility Studies

- Use Cases (outside of core NISAR science)
  - UAVSAR 2015 Lake Fire, Jung et al. (2018), IEEE
  - Clear cut and selective logging, Southern Louisiana
  - Palm oil mapping, Tropics
- DEVELOP
  - 10 week agency-defined feasibility study for integrating Earth observations with 3-6 highly-qualified undergrad/graduate students (COST: \$0)
  - Feasibility studies:
    - USGS NEIC Disaster Damage Proxy Mapping Tools
    - NPS Santa Monica Mountains and Oak Dieback
    - USDA ARS Crop Classification (2 terms)
    - BLM Black Rock Playa Conservation
    - FWS Alaska Wetlands Inventory (2 terms)
    - Groundwork - New Orleans urban development and flood extent
    - City of Toronto - Lake Ontario Disasters
    - Minnesota - Great Lakes water resources and wetlands

<https://develop.larc.nasa.gov/project-archive.php>







# What are the implications of this effort for USFS? How will NISAR support USFS management needs?

That really depends on USFS:

- Community needs to prepare for NISAR found from our application focus area workshops direct the charge of working groups
- Working Group participation is voluntary
- Membership requires organization-funded participation
- Working Group objectives:
  - Facilitate and coordinate community effort to prepare for using NISAR data around common efforts/pain points
  - Capture and report community consensus/needs to NASA Programs
  - Enable lines of communication between NISAR project, NISAR Science Team, NASA, and the broader community
  - Have access to NISAR-like data from UAVSAR AM/PM campaign and Alaska Satellite Facility DAAC Get Ready for NISAR

# Additional Resources

National Aeronautics and  
Space Administration



NASA-ISRO SAR Mission (NISAR)

NASA-ISRO SAR (NISAR) Mission  
Science Users' Handbook



## NISAR Utilization Plan

4 September 2018

JPL D-102207

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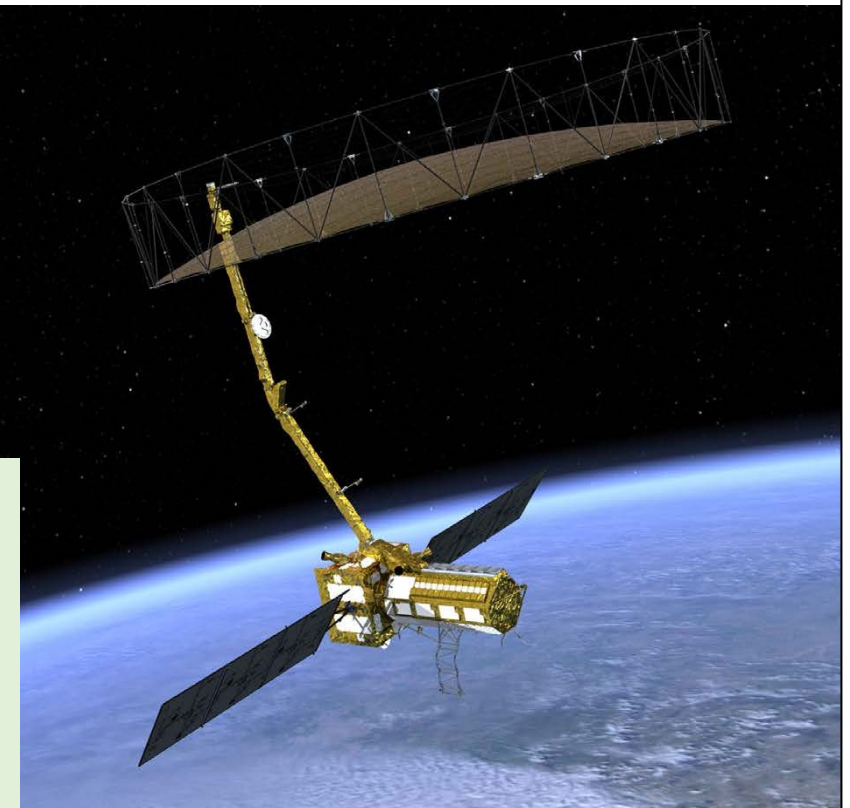
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How NISAR is engaging  
with user communities

- Research and Applications
- Mission Science Requirements
- Mission Design and CONOPS
- Flight System Characteristics
- Radar and Measurement Principles
- Data Products



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# Questions?



<https://nisar.jpl.nasa.gov/applications/>

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Back-Up

# Community Assessments

## 2014 Workshop

- Identified Observation needs of Applications in Solid Earth, Ecosystems and Cryosphere
- Identified need for SAR literacy and capacity building
- Informed Application Traceability Matrices

## 2015 Workshop:

- Informed Utilization Plan
- Need for Application Area Specific Workshops

Both workshops engaged key US agencies and applications communities



**2014 NISAR Applications Workshop: Linking Mission  
Goals to Societal Benefit**

October 28-29, 2014

Workshop Report



**2015 NISAR Applications Workshop:  
Applications Community Suggestions for Developing an  
Applications Plan**

October 13-15, 2015  
Workshop Report