National Aeronautics and Space Administration

NISAR

Press Kit / July 2025

www.nasa.gov

Table of Contents

Introduction

NISAR Press Kit

Our home planet is constantly changing in a variety of ways — some subtle, others dramatic. The NISAR mission will enable us to comprehensively monitor Earth’s land and ice surfaces, building a detailed record of large and small changes over time.

Short for NASA-ISRO Synthetic Aperture Radar, NISAR will help scientists better understand processes involved in natural hazards and catastrophic events, such as earthquakes, volcanic eruptions, and landslides. The NISAR satellite’s cloud-penetrating ability will help the urgent-response communities during weather disasters such as hurricanes, storm surge, and flooding. It will also provide key global Earth observations such as changes in ice sheets, glaciers, and sea ice, as well as improve understanding of how deforestation, permafrost loss, and fires affect the carbon cycle.

A collaboration between NASA and the Indian Space Research Organisation (ISRO), NISAR is targeted for launch on July 30, 2025. The mission will lift off from Satish Dhawan Space Centre in Sriharikota, on India’s southeastern coast.

5 Things to Know About NISAR

A trailblazing mission, NISAR will provide a trove of scientific information about Earth’s processes, gathering unprecedented amounts of data. The mission has also broken new ground with its collaboration between teams of scientists and engineers separated by more than 9,000 miles and 13 time zones. Here are five key things to know about this ambitious mission and its wide-reaching goals:

1. The mission will study key changes in Earth's land and ice.

The NISAR mission capitalizes on the capabilities of synthetic aperture radar to study Earth's land and ice. The system works by transmitting microwave signals to Earth and then receiving the signals reflected from the surface below, in this case via a massive 39-foot (12-meter) radar antenna reflector that resembles a massive snare drum. By interpreting the ways in which the surface has altered the return signal compared to what was transmitted, researchers can discern physical characteristics about the surface. Then, by passing over the same locations on the planet twice every 12 days, they can determine how those characteristics have changed over time. And unlike optical sensors, NISAR will be able to "see" through clouds and light rain, as well as in darkness and light.

Amazon rainforest. Credit: USDA

Full Image

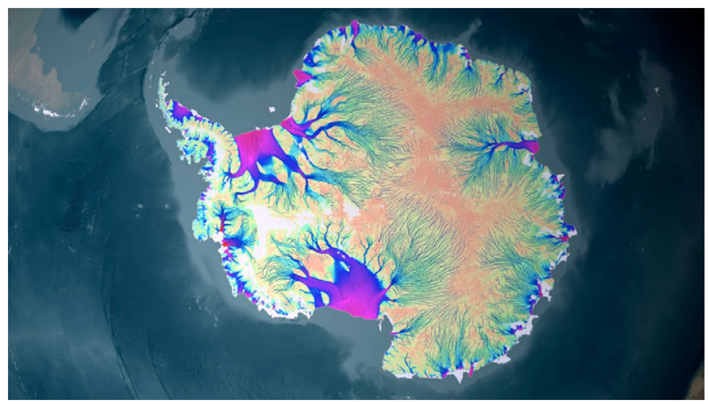
Glacier Peak volcano, Washington. Credit: USGS

Full Image

The mission will use these capabilities to address a variety of science questions, among them: How much carbon are the Amazon and Congo rainforests holding, and how are these important forests changing over time? How fast are mountain glaciers advancing or retreating, and how will melting glaciers affect water supplies and flooding for downstream populations? What miniscule changes can be seen in Earth's crust before and after an earthquake, volcanic eruption, or other natural disaster, and how could that information help assess the risk and mitigate the impact of disasters?

NISAR: Tracking Earth's Changes From Space (Mission Overview
bit.ly/4hXXpmh

2. The NISAR spacecraft will carry the most advanced radar system ever launched as part of a NASA or ISRO mission.



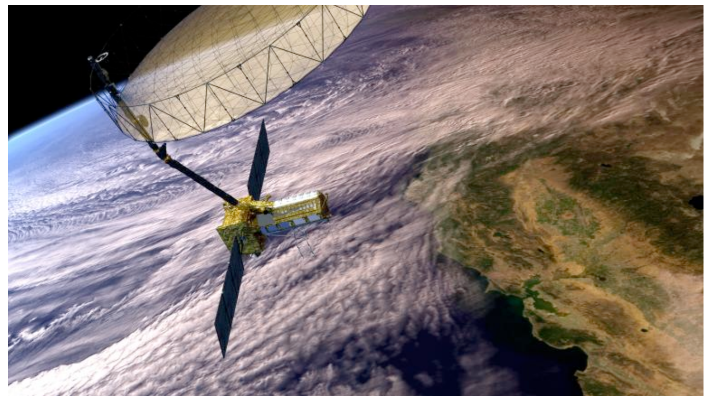
Visualization of Antarctic ice motion. Credit: NASA/GSFC SVS | Full Image

The NISAR mission is more powerful than prior synthetic aperture radar missions, and it will monitor parts of Earth not previously covered. About the length of a pickup truck, the satellite's main body contains engineering systems and a first-of-its-kind dual-radar payload — an L-band system with a 10-inch (25-centimeter) wavelength and an S-band system with a 4-inch (10-centimeter) wavelength. Each system's signal is sensitive to different sizes of features on Earth's surface, and each specializes in measuring different attributes, such as moisture content, surface roughness, and motion. These characteristics are important for studying a variety of natural surface conditions, such as the amount of soil moisture available for vegetation to thrive or if permafrost has thawed.

When operating together, the two radars will collect data synchronized in time and location, extending the sensitivity of the measurements to objects on the surface in a broad range of sizes. For example, S-band data will allow more accurate characterization of shorter plants, such as bushes and shrubs, while L-band data will sense taller vegetation, like trees. NISAR will operate in a Sun-synchronous orbit, with its radar antennas pointed in a configuration that will also offer unprecedented coverage of Antarctica. This is crucial for studying the motion, deformation, and melting of the Antarctic ice sheet as it breaks up and melts into the ocean.

3. The spacecraft's two radars will produce the most data ever generated on a daily basis by a NASA or ISRO Earth mission.

The two radars aboard the spacecraft will generate about 100 petabytes of data products over the course of NISAR's three-year prime mission, or about 80 terabytes per day. That's about enough data to fill about 150 512-gigabyte hard drives in a day. Due to the sheer volume of information that the satellite will transmit to Earth, NISAR's data will be processed, stored, and distributed via the cloud. It will be available for anyone to use, free of charge, in keeping with NASA open-science principles. All S-band and L-band data will also be available to Indian government users through ISRO's National Remote Sensing Centre.



Artist's concept of NISAR in orbit over California. Credit: NASA/JPL-Caltech | Full Image

4. The mission belongs to a long line of Earth-observing SAR instruments and will contribute to NASA's and ISRO's legacy of studying our home planet.

NASA's Seasat, developed at the agency's Jet Propulsion Laboratory in Southern California and launched in 1978, was the first-ever spaceborne synthetic aperture radar instrument used for science observations. Since then a series of these systems has operated on aircraft and in space, studying Earth's surface to advance studies in an array of science areas.

Similarly, ISRO launched a series of synthetic aperture radar missions, including Radar Imaging Satellite (RISAT-1) in 2012 and RISAT-1A in 2022, to support a wide range of applications in India. The NISAR mission will provide continuity of data, as well as something unique: wide-swath, high-resolution dual-band radar data.

NISAR joins a great observatory of NASA Earth satellites studying our oceans, land, ice, atmosphere, and vegetation to create a dynamic, 3D view of our home planet.

Visualization of Earth's Eastern Hemisphere. Credit: NASA/Reto Stöckli, based on NASA and NOAA data *Full Image*

5. This is the first-ever hardware collaboration between NASA and ISRO on an Earth-observing mission.

The idea for NISAR originated with the 2007 National Academy of Sciences decadal survey, which identified the need for greater insight into ecosystems, solid Earth, and cryosphere sciences. In subsequent years, ISRO and NASA began discussing the potential of a joint, dual-frequency radar mission to address each agency's Earth science priorities, and in 2014 they signed an agreement to collaborate on NISAR.

Engineers and technicians from ISRO and NASA JPL pose with the NISAR satellite under assembly in June 2023 at ISRO's U R Rao Satellite Centre in Bengaluru, India. Credit: VDOS-URSC | Full Image

NISAR features components developed on opposite sides of the planet by ISRO and NASA JPL engineers working together, even through a global pandemic. The S-band radar was built at ISRO's Space Applications Centre in Ahmedabad and transported in March 2021 to JPL, which had been building the L-band radar. For the next two years, JPL and ISRO engineers integrated and tested the two systems, and in March 2023, the combined instrument payload made the journey to ISRO's Satellite Integration & Testing Establishment facility in the southern Indian city of Bengaluru.

After integration with a modified ISRO I3K spacecraft bus and rigorous testing, the satellite was transported to Satish Dhawan Space Centre on India's southeastern coast. It is set to launch aboard an ISRO Geosynchronous Satellite Launch Vehicle rocket. The ISRO Telemetry, Tracking and Command Network facility in Bengaluru and JPL's Earth Orbiting Missions Operations Center will manage satellite operations based on the requirements provided by a team of NASA and ISRO scientists.

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Products and Events

News Releases, Features, Advisories, Blogs, and Status Reports

Mission news, updates, and feature stories from NASA about the NISAR mission will be available at nasa.gov/nisar.

Progress reports from NASA on NISAR's road to launch, including the latest information on launch dates, can be found on the NASA blog for this mission: science.nasa.gov/blogs/nisar.

ISRO's NISAR website can be found at isro.gov.in/NISARSatellite.html.

Interviews with U.S. NISAR mission team members may be arranged by calling the NASA JPL newsroom at **818-354-5011** or filling out this form.

Video and Images

B-roll and animations for media and public use are available at bit.ly/nisarrawvideo.

Embeddable NISAR videos are also available at JPL's YouTube channel.

Additional images related to the NISAR mission are available at the NASA Image and Video Library, Planetary Photojournal, and this press kit's Gallery section.

Read NASA's image use policy.

Media Events

A prelaunch briefing open to accredited news media will take place in the days shortly before launch. Additional media availabilities are also expected in that time period.

All news briefings will be livestreamed.

Live Launch Feed

A live video broadcast will incorporate key launch activities from ISRO and commentary. The first launch opportunity is targeted for July 30, 2025.

How to Watch

Watch key coverage on NASA+. Learn how to watch NASA content through a variety of platforms, including social media at nasa.gov/ways-to-watch.

Programming will also be streamed live on the agency's website nasa.gov/live, YouTube.com/NASA, YouTube.com/NASAJPL, the NASA app, and NASA social media channels. (On-demand recordings will be available on YouTube after the live events have finished.)

For more information about NASA's live programming schedule, visit plus.nasa.gov/scheduled-events.

On-Site Media Logistics

Members of the news media who would like to cover the NISAR launch in person at either the ISRO launch site in India or at NASA JPL must be accredited in advance.

Satish Dhawan Space Centre, Sriharikota, India

Limited media opportunities and access to ISRO facilities may be available for accredited media. International media (non-U.S. citizens) should coordinate with:

G Harikrishnan
(91) 81398-61505
g_harikrishnan@isro.gov.in

U.S.-based media (U.S. citizens and permanent residents) seeking access to the launch site in India, as well as any members of either U.S. or international media interested in interviews with NASA representatives, should contact:

Andrew Wang
626-379-6874 (cell)
andrew.wang@jpl.nasa.gov

Jet Propulsion Laboratory, Southern California

A limited number of media can be accommodated at NASA JPL for media activities around launch day. NASA will release advisories with additional information about activities and accreditation information closer to launch.

Accredited news media can arrange on-site interviews by contacting:

Jane J. Lee
626-491-1943 (cell)
jane.j.lee@jpl.nasa.gov

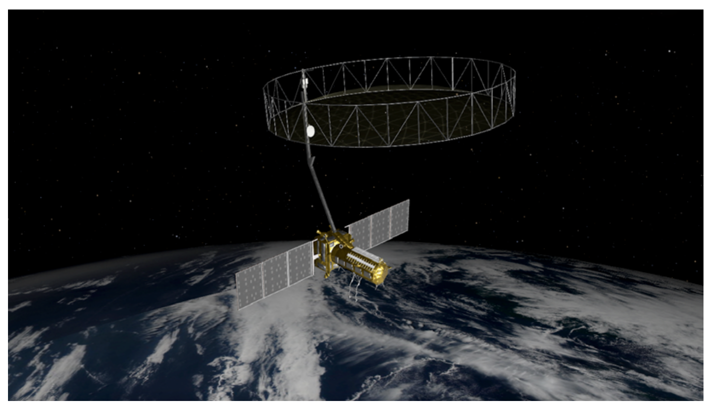
Media without credentials can call the NASA JPL newsroom at **818-354-5011** to see if off-site interviews can be arranged.

Additional Resources on the Web

Online and PDF versions of this press kit will be available at go.nasa.gov/nisarpresskit.

Find additional information about the mission at nisar.jpl.nasa.gov.

An interactive real-time 3D visualization of NISAR in its planned orbit is available at go.nasa.gov/eyesonnisar.



3D visualization of NISAR spacecraft in orbit. Credit: NASA/JPL-Caltech | Full Interactive Experience

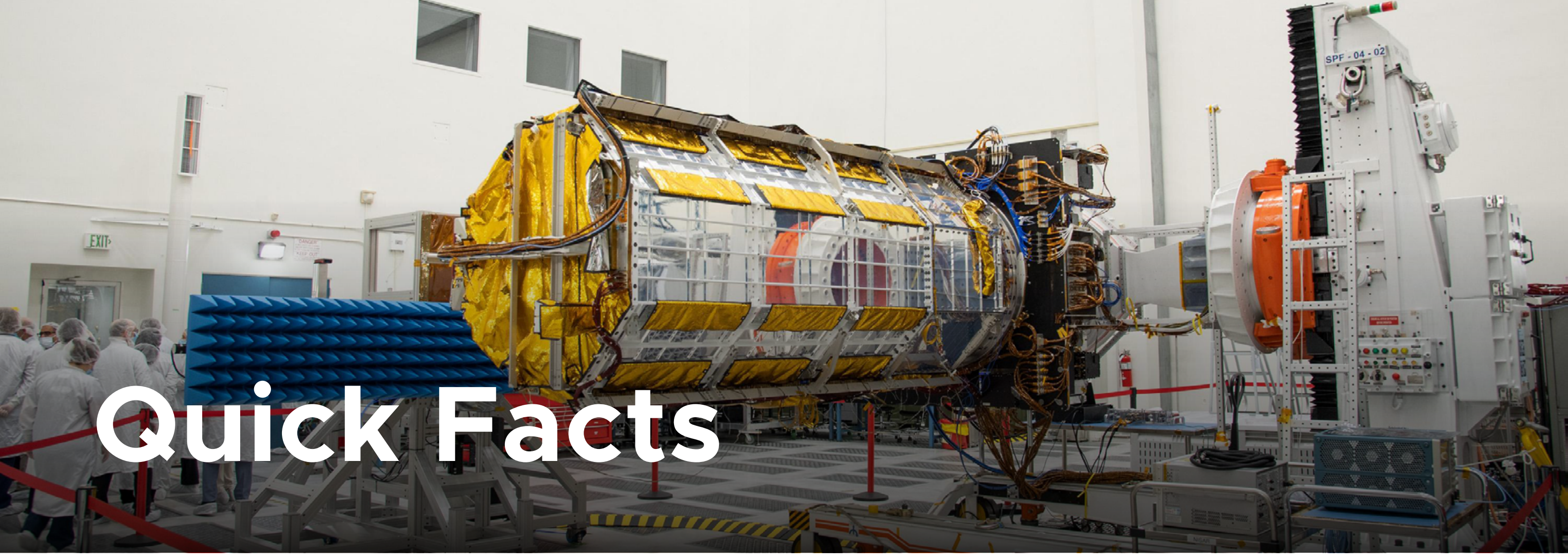
Social Media

Join the conversation and get updates from these accounts:

- **X:** @NASAEarth, @NASAJPL, and @NASA
- **Facebook:** NASAEarth, NASAJPL, and NASA
- **Instagram:** @NASAEarth, @NASAJPL, and @NASA

Additional updates from ISRO can be found at:

- **X:** @ISRO
- **Facebook:** ISRO
- **Instagram:** @isro.dos



Quick Facts

Mission Name

National Aeronautics and Space Administration-Indian Space Research Organisation Synthetic Aperture Radar (NISAR)

Satellite

- **Length of spacecraft bus and radar instrument payload:** about 18 feet (5.5 meters)
- **Length of solar panels:** two deployable arrays, each just over 18 feet (5.5 meters)
- **Radar antenna reflector diameter:** about 39 feet (12 meters)
- **Boom length for radar antenna reflector:** about 30 feet (9 meters)
- **Satellite launch mass, including onboard propellant:** about 5,250 pounds (2,380 kilograms)

Science Instruments

L-band synthetic aperture radar system; S-band synthetic aperture radar system (SAR)

Power

Two deployable motorized solar arrays totaling about 250 square feet (23 square meters) in area provide about 5 kilowatts of power; the satellite has a 180-amp-hour battery

Attitude and Propulsion

- **Sensors:** star sensor; Sun sensor; sensors for inertia, velocity, and position
- **Actuators:** four reaction wheels; 11 11-newton and four 1-newton hydrazine thrusters; three magnetic torque rods
- **Fuel:** 103-gallon (390-liter) tank with 584 pounds (265 kilograms) of hydrazine propellant

Telecommunications

- **2.88 Gbps Ka-band system:** downlink tracking and engineering telemetry and science instrument data to the Indian Space Research Organisation (ISRO) Ka-band ground station
- **4.0 Gbps Ka-band system:** downlink to NASA ground stations
- S-band system will provide uplink of commands from the ground and downlink of some telemetry

Mission

Launch Date

Targeted for July 30, 2025

Updates from ISRO: isro.gov.in and x.com/isro
Updates from NASA: science.nasa.gov/blogs/nisar

Launch Site

Satish Dhawan Space Centre, Sriharikota, India

Launch Vehicle

ISRO Geosynchronous Satellite Launch Vehicle

Mission Duration

Three-year prime mission

Coverage of Earth

NISAR will cover the land and ice surfaces of Earth between 77.5 degrees north latitude and 87.5 degrees south latitude twice every 12 days.

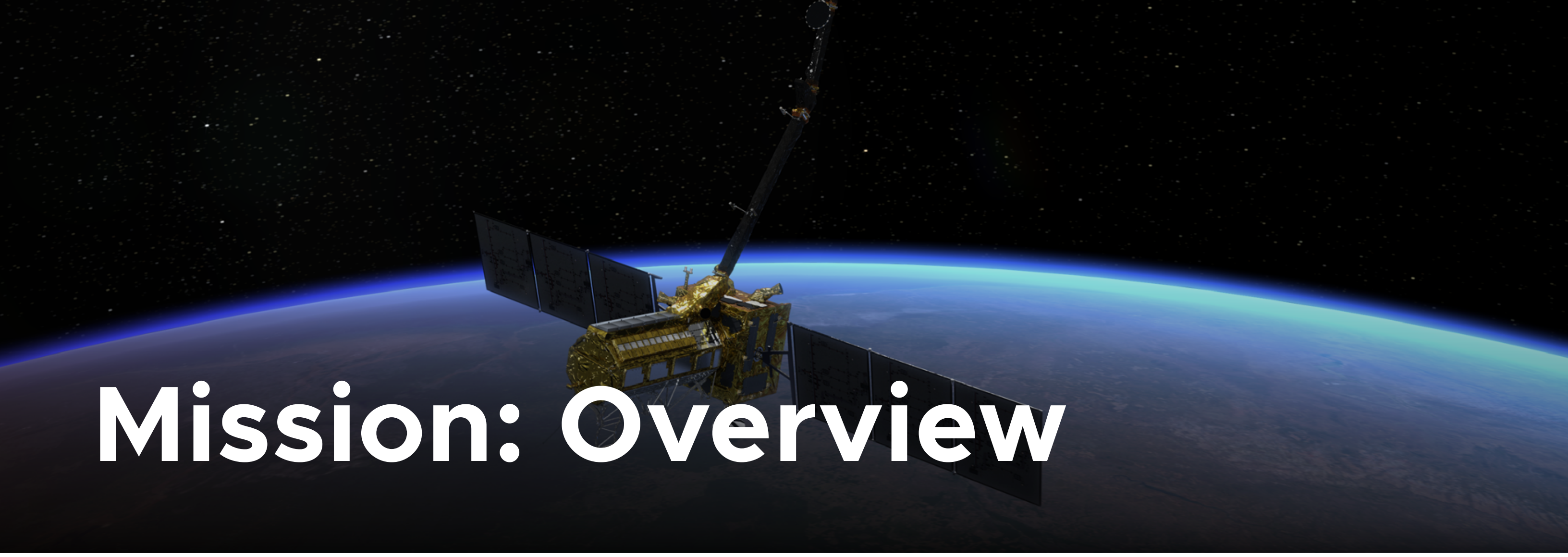
Program

International Collaboration

A collaboration between NASA and ISRO, NISAR marks the first time the two agencies have cooperated on hardware development for an Earth-observing mission. NASA provided the mission's L-band instrument, the radar antenna reflector, the deployable boom, and an engineering payload. Leading the U.S. component of the project is JPL, which is managed for NASA by Caltech in Pasadena, California. The S-band instrument, along with its data-processing algorithms, were developed at ISRO's Space Applications Centre at Ahmedabad. The U R Rao Satellite Centre in Bengaluru, which leads the ISRO component of the mission, has provided the spacecraft bus, and ISRO is also providing the launch vehicle, associated launch services, and satellite mission operations.

Budget

NASA investment for project formulation, development, and mission operations: $1.1589 billion
ISRO investment for development, launch operations, and mission operations: INR (₹) 7.88 billion



Mission: Overview

The NISAR satellite will orbit Earth for at least three years, using its sophisticated radar systems to scan nearly all the planet's land and ice surfaces twice every 12 days. NASA and the Indian Space Research Organisation (ISRO) will jointly operate the spacecraft and gather science of high priority to both the U.S. and India. Mission data will be of interest not only to scientists, but also to farming communities and people affected by earthquakes, deforestation, volcanic eruptions, land subsidence, and sea level rise. The data will inform society's responses to urgent challenges posed by natural disasters and environmental changes. It will also support monitoring of infrastructure such as dams, bridges, and roadways.

Launch

ISRO is responsible for preparing the NISAR satellite for launch and for launching the satellite into orbit. NASA's Launch Services Program, based at Kennedy Space Center, is providing supplemental support on technical aspects of the launch.

Launch Site and Vehicle

The NISAR satellite will launch aboard an ISRO Geosynchronous Satellite Launch Vehicle. The three-stage vehicle is about 170 feet (52 meters) tall with a payload fairing 13 feet (4-meters) in diameter. The rocket will lift off from Satish Dhawan Space Centre, Sriharikota, on the southeastern coast of India.

For more information on the launch site, visit shar.gov.in.

A GSLV rocket prepared for launch at ISRO's Satish Dhawan Space Centre. Credit: ISRO | Full Image

Launch Date and Timing

The exact launch date of NISAR will be determined by ISRO and announced closer to launch. Updates from ISRO will be available at isro.gov.in and x.com/isro; NASA updates on NISAR's road to launch are available at science.nasa.gov/blogs/nisar.

The launch window opens at 5:40 p.m. IST (12:10 p.m. UTC or 8:10 a.m. EDT) and is 10 minutes long. Both the launch time and the launch window will remain the same for subsequent days.

Key Events After Launch

The specific launch events, including separation of stages and satellite, will be updated on the ISRO website closer to the launch date. For more information, visit: isro.gov.in/NISARSatellite.html.

Commissioning Phase

After launch, the mission team will begin a commissioning phase that is expected to last about 90 days. During this period, they will check out spacecraft systems and deploy the boom and giant radar antenna reflector. The performance of the radar instruments will also be assessed against specifications.

Science Operations

Science operations begin after completion of the commissioning phase. Calibration and validation activities, in which teams ensure the satellite's science instruments are collecting data properly, occur during the first five months of science operations.

The NISAR satellite will operate in a Sun-synchronous orbit with an inclination of 98.4 degrees, covering Earth's Northern and Southern hemispheres. In this type of polar orbit, the spacecraft maintains a fixed orbit orientation with respect to the Sun: It will visit the same spot on Earth at the same local time twice every 12 days. This regularity will enable scientists to compare how particular regions change over time.

The spacecraft will orbit at an altitude of 464 miles (747 kilometers), circling Earth about 14 times per day. NISAR will cover nearly all our planet's land and ice surfaces, and the instruments will be pointed so that they provide unprecedented coverage of the Southern Hemisphere. With a prime mission of three years, NISAR will downlink about 35 terabits of unprocessed L-band data and 4 to 6 terabits of S-band data per day.

Mission: Spacecraft

Spacecraft and Ground System

The complexity of the NISAR spacecraft has required close collaboration between U.S. and Indian teams. NASA provided the L-band radar, one of the observatory's two science instruments. NASA also provided a key engineering payload, which includes a high-rate communication subsystem for science data, GPS receivers, a solid-state recorder, a power distribution unit, and a payload data subsystem. NASA's Jet Propulsion Laboratory leads the U.S. component of the project on behalf of the agency.

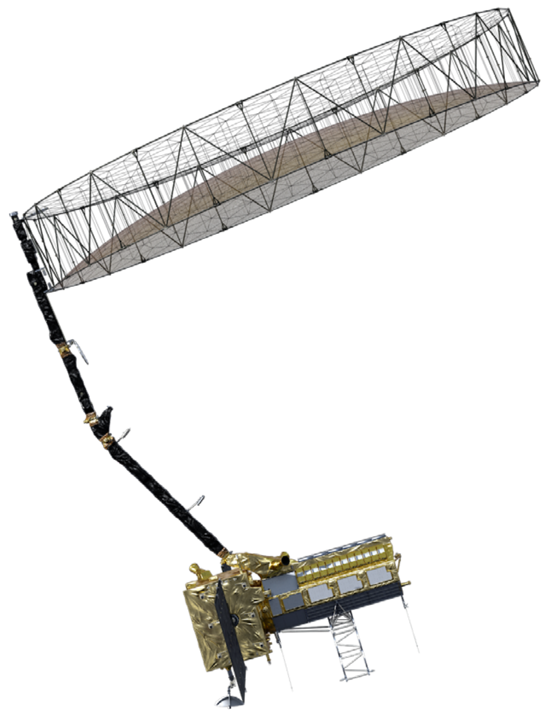
The Indian Space Research Organisation (ISRO) provided the spacecraft bus and most of the engineering subsystems, including the power systems, thermal management systems, onboard computer, actuators, and sensors. The other science instrument, the S-band radar, was also contributed by ISRO. Mission operations are collaborative, with some activities led by ISRO and others by NASA JPL, depending on the subsystem. Highlights of key spacecraft components and engineering activities are described below.

Spacecraft Bus

The spacecraft body, or bus, includes the command and communications systems for the instrument payload and was provided by ISRO. The bus hosts systems such as:

Radar Antenna Reflector and Boom

Nearly 40 feet (12 meters) in diameter and resembling a snare drum, the radar antenna reflector is mounted at the end of a 30-foot-long (9-meter-long) boom, which extends from the bus. Pre-deployment checkouts of the radar antenna reflector and boom, led by NASA JPL, are scheduled for 10 days after launch. The boom deployment commences 11 days after launch and takes four days to complete. The reflector deployment is planned to occur 17 days after launch, and the mission team has set aside a full day to complete this operation.



Digital rendering of the NISAR satellite with its boom and radar antenna reflector deployed. Credit: NASA/JPL-Caltech | Full Image

Electrical Power

This subsystem generates, stores, and distributes the power needed to operate the satellite, including the L-band and S-band radar systems. The power source is sunlight collected by the two solar arrays provided by ISRO. Measuring 6 feet (1.8 meters) wide and 7 feet (2.2 meters) long, each array consists of three panels mounted on opposite sides of the spacecraft bus. Combined, the arrays supply approximately 5 kilowatts of power when fully illuminated. The spacecraft bus also houses a 180 amp-hour lithium ion battery that can provide about 4 kW of power. The power, at 70 volts, is converted to 28 volts by a JPL-provided power distribution unit, which drives the JPL engineering payload.

Attitude and Orbit Control

To ensure NISAR's precise orientation in space, or attitude, the satellite will use star sensors, Sun sensors, and magnetometers. In addition, the satellite has gyroscopes and accelerometers for velocity and acceleration measurements. The ISRO-built attitude control system uses reaction wheels to control the satellite's attitude. Thrusters — small rocket engines used for in-flight corrections — of 1-newton and 11-newton magnitude provide needed changes to the satellite's orientation and trajectory. There is enough fuel aboard for five years of operations.

Ground Systems

Satellite Operations

Mission operations will be a joint NASA-ISRO effort, with both teams jointly developing the commands that will be sent to the spacecraft via the ISRO Telemetry Tracking and Command Network (ISTRAC) center in Bengaluru. ISTRAC will also monitor the spacecraft and downlink housekeeping telemetry.

For more information on ISTRAC, visit istrac.gov.in.

Science Data Processing

All science data will be written to the onboard solid-state recorder. From there, the data can travel down one of the two downlink paths.

All L-band science data will be downlinked via the onboard JPL-built Ka-band telecom system. The NASA downlink path will flow through one of four of the agency's Near Space Network Ka-band ground stations capable of receiving the data. They include stations located in Svalbard, Norway; Punta Arenas, Chile; Fairbanks, Alaska; and Wallops Island, Virginia. NASA's Goddard Space Flight Center in Greenbelt, Maryland, manages the Near Space Network. The agency's science data will be processed by the JPL Science Data System in the cloud and shared via NASA's Alaska Satellite Facility Distributed Active Archive Center.

Near Space Network antennas at the Alaska Satellite Facility in Fairbanks, Alaska. Credit: NASA | Full Image

All S-band science data and a subset of the L-band science data will be downlinked directly to ISRO's ground stations via the onboard ISRO Ka-band telecom system. There are two Ka-band ground stations capable of receiving the data: one in Shadnagar, India, and the other in Antarctica. The ISRO science data will be processed by the National Remote Sensing Centre in Hyderabad, India, and distributed through the Bhoonidhi portal.

For more information on ISRO's National Remote Sensing Centre, visit nrsc.gov.in. For more information on the Bhoonidhi portal, visit bhoonidhi.nrsc.gov.in.

Mission: Science

Overall Science Goals and Objectives

NISAR will provide a dynamic 3D view of Earth's land and ice in unprecedented detail. NISAR's dual radar systems, which will be able to gather data in any weather and in darkness or light, will enable scientists to measure the movement and changes in land and ice surfaces down to fractions of an inch.

NASA and ISRO's baseline scientific objectives for NISAR are to:

- Monitor and understand the physical processes associated with earthquakes, volcanic eruptions, landslides, and land subsidence
- Understand the dynamics of carbon storage and uptake in wooded, agricultural, wetland, and permafrost systems
- Understand the response of ice sheets and glaciers to rising temperatures and the resulting impacts on sea level rise, as well as the interaction of sea ice and weather patterns

NISAR is also intended to provide practical information to communities affected by changes to Earth's surface. The key community benefit objectives for NISAR are to:

- Understand the dynamics of water, hydrocarbon, and sequestered carbon dioxide reservoirs, which impact societies
- Provide agricultural monitoring capability to support sufficient food security objectives
- Apply NISAR's unique dataset to hazard identification and mitigation

- Provide information to support disaster response and recovery
- Understand coastal and ocean processes for regions in and around India
- Provide observations of relative sea level rise from melting land ice and land sinking, or subsidence

The areas of scientific focus for NISAR grew from the 2007 National Academy of Sciences decadal survey, which outlined the need for space-based monitoring and study of solid Earth dynamics, changes in ecosystems, and motion of the planet's frozen surfaces.

Solid Earth Measurements

Augustine Volcano, Alaska. Credit: USGS | Full Image

NISAR will monitor motion, stresses, and deformation of Earth's land surfaces to gain insight into natural hazards such as landslides, volcanic eruptions, and earthquakes. It will also track uplift and subsidence in aquifer systems, which will help researchers understand groundwater supplies. To support disaster response, the mission will expedite the processing of targeted imagery of affected areas.

Ecosystems Measurements

Kuskokwim River, Alaska. Credit: NASA/ Peter Griffith | Full Image

NISAR will offer unprecedented insights into changes in forests and wetlands — two ecosystems vital to regulating carbon in the atmosphere. Disruption of either ecosystem, whether gradual or sudden, can accelerate the release of carbon dioxide and methane, potentially affecting Earth's carbon cycle. The mission will also track changes in the extent and soil moisture content of agricultural lands.

Ice Surface Measurements

Antarctic icebergs near the Larsen C ice shelf. Credit: NASA/Jefferson Beck

Full Image

NISAR will study the planet's ice-covered surfaces as they melt, move, and deform. The melting of the massive ice sheets covering Antarctica and Greenland has contributed about a third of global sea level rise, while the disintegration of mountain glaciers has added about the same share, in addition to affecting water supplies for billions of people. Meanwhile, the melting of polar sea ice can affect ocean circulation on a global scale.

Community Impact

Agricultural field in California. Credit: USGS | Full Image

The NISAR Early Adopters program includes more than 240 data users representing academic institutions, water management agencies, private businesses such as engineering companies, and other organizations from at least 30 U.S. states and 40 countries. Through workshops and other collaborative outreach activities, users learn how to access NISAR data and apply it to addressing their objectives.

The mission team is also organizing applications workshops, which bring together communities of researchers around their areas of study. There have been more than 10 sessions since 2014, in which participants have discussed how to use the data in real-world applications that benefit society.

Eyes on Infrastructure: How the NISAR Satellite Will Help Keep Communities Safer (Video) | bit.ly/4eMRcXv

Science Instruments

NISAR science instrument payload in a clean room at NASA's Jet Propulsion Laboratory. Credit: NASA/JPL-Caltech
Full Image

The NISAR satellite has two radar instruments to measure how Earth's surface changes over time. Able to see through clouds and any weather, each instrument bounces a specific frequency of microwave signal off the planet's surface and registers the characteristics of the return signal, including the strength, time delay, and polarization.

These measurements are used to create radar images. Through a technique called interferometry, researchers can compare snapshots taken of the same land or ice surface at different points in time to tell how that surface has moved or deformed.

The instruments also measure the return signal's polarization — whether it's waving vertically or horizontally — and use that information to determine electric and structural properties of the surface. In turn, those properties indicate the presence of water and geometric characteristics of a surface, such as roughness. Comparison of the same surface over time can reveal how these qualities change.

Synthetic Aperture Radar

Synthetic aperture radar, or SAR, is a technique that enables a radar system to obtain images finer in resolution than a space-based sensor could with an antenna of the same size. A space-based radar that does not use SAR would have to have an antenna 65,000 feet (20,000 meters) long to produce images of the resolution NISAR will produce with its 39-foot (12-meter) antenna reflector.

SAR achieves this finer resolution and higher image contrast by observing every point on the surface along its path many times, then combining those observations through computer processing. The satellite's individual pixels cover an area on the surface about 16 feet (5 meters) on each side; billions of pixels make up each image, spanning about 150 miles (240 kilometers) on a side.

Through careful alignment and the interferometric combination of images taken every 12 days over any spot on Earth, NISAR can precisely measure surface motion in the direction the radar is pointing. For example, using the data from NISAR, researchers will be able to detect vertical movement of about 0.4 inches (1 centimeter) over a plot of land or ice surface about the size of half a tennis court.

L-Band SAR

The "L" denotes the wavelength of the signal, which is around 10 inches (25 centimeters). Developed at NASA JPL, the L-band SAR can see through clouds and the leaves of a forest canopy, which can obstruct the view of other types of instruments. On NISAR, it will measure changes in the extent and density of forests, wetlands, and agricultural lands. In addition, it can measure displacement and deformation of land, and because the radar can also penetrate snow, it's useful for measuring glacier and sea ice velocity.

In addition to using L-band data to meet the mission's global science objectives, ISRO will leverage it to address a series of India's Earth science priorities, including coastal wind velocity, seafloor topography near Indian coasts, the shape and position of the country's coastlines, biomass measurements, geological features in the Himalayas and on the Deccan Plateau, and sea ice features in the Arctic and Antarctic.

S-Band SAR

The “S” denotes a signal wavelength of nearly 4 inches (10 centimeters). The S-band SAR is able to see through clouds. Although it is not able to penetrate as far into dense vegetation as an L-band SAR signal, it is sensitive to light vegetation. Being more sensitive to moisture in snow, it is also better than the L-band at detecting melting snowpack. The S-band instrument was developed at ISRO’s Space Applications Centre in Ahmedabad, India. NISAR will be the first satellite to simultaneously collect L-band and S-band radar data.

Management

The NISAR mission is a collaboration between NASA and Indian Space Research Organisation (ISRO) and marks the first time the two agencies have cooperated on hardware development for an Earth-observing mission. NISAR is jointly managed by a project director at ISRO and a project manager at the Jet Propulsion Laboratory, with programmatic oversight by NASA and ISRO. Lead scientists at JPL and ISRO manage a joint science team that guides the scientific planning and review of the mission.

JPL, which is managed for NASA by Caltech in Pasadena, California, leads the U.S. component of the project. The agency is providing the mission's L-band SAR, the radar antenna reflector antenna, the deployable boom, and an engineering payload, which includes a high-rate communication subsystem for science data, GPS receivers, a solid-state recorder, a power distribution unit, and a payload data subsystem.

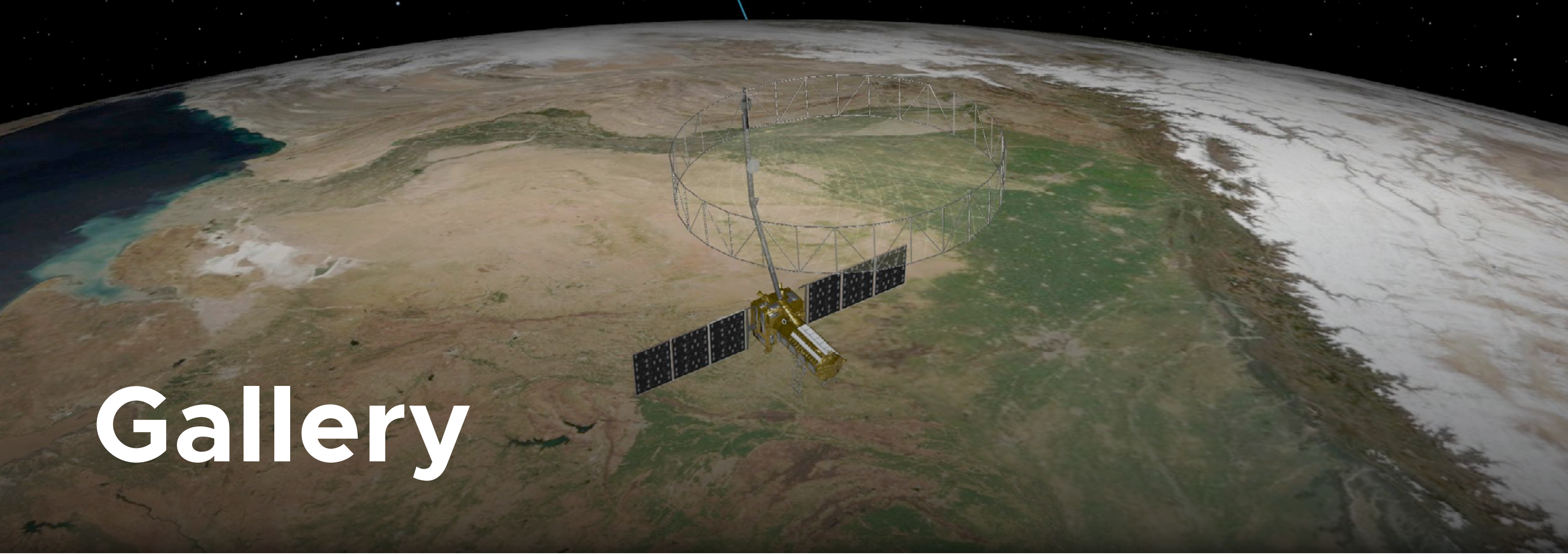
The Space Applications Centre — ISRO's lead center for payload development, located in Ahmedabad — provided the mission's S-band instrument and is responsible for its calibration, data processing, and development of science algorithms to address the scientific goals of the mission. U R Rao Satellite Centre in Bengaluru, which leads the ISRO component of the mission, is providing the spacecraft body, or bus, the launch vehicle (through ISRO's Vikram Sarabhai Space Centre), associated launch services (through ISRO's Satish Dhawan Space Centre), and satellite mission operations (through ISRO Telemetry Tracking and Command Network). The National Remote Sensing Centre in Hyderabad is primarily responsible for S-band data reception and operational products generation and dissemination.

At NASA Headquarters, **Sean Duffy** is the acting agency administrator. **Nicola Fox** is the associate administrator for the Science Mission Directorate. **Karen St. Germain** is the director of the Earth Science Division. **Sanghamitra Dutta** is program executive for NISAR, and **Gerald Bawden** is program scientist for the mission.

At NASA JPL, **Phil Barela** is the project manager, and **Paul Rosen** is the project scientist.

At ISRO, **V Narayanan** is the chairman, and **M Ganesh Pillai** is the scientific secretary. **M Sankaran** is the director of U R Rao Satellite Centre and **Nilesh M Desai** is the director of Space Applications Centre.

Chaitra Rao (U R Rao Satellite Centre) is the project director and **Rashmi Sharma** (Space Applications Centre) is the science team lead.



Gallery

Images

NASA Image and Video Library

NISAR images and videos from a NASA-wide library

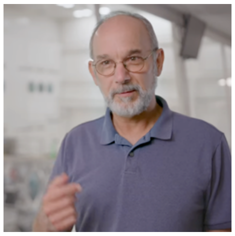
go.nasa.gov/4b4oGAI

Planetary Photojournal

NISAR images from the planetary image library managed by NASA's Jet Propulsion Laboratory

go.nasa.gov/4gF5iLR

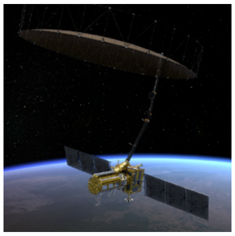
Web Videos



NISAR Mission Overview

Short video explainer about what NISAR will study and features of the spacecraft

bit.ly/nisaroverview

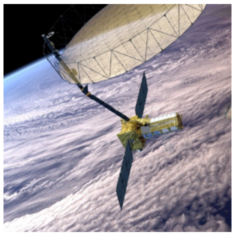


NISAR Video Playlist

Comprehensive list of JPL videos highlighting the NISAR mission

bit.ly/nisarvideos

Animations and Raw Videos

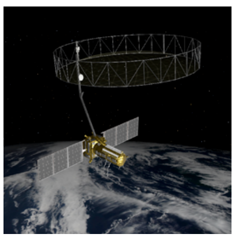


NISAR Mission Media Reels

Raw video of the spacecraft being built, interviews with team members, spacecraft animations

bit.ly/nisarrawvideo

Interactive Experience



NASA Eyes on the Earth

Interactive real-time 3D view of NISAR spacecraft in its planned science orbit

go.nasa.gov/eyesonnisar