URSI AP-RASC 2019, New Delhi, India, 09 - 15 March 2019

The NISAR Mission – An NASA/ISRO Space Partnership Supporting Global Research and Applications

Paul A. Rosen[(1)], Raj Kumar[(2)]
(1) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, 91109, USA, e-mail: parosen@jpl.nasa.gov
(2) Space Applications Centre, Ahmedabad, India; e-mail: rksharma@sac.isro.gov.in

Since the 2007 National Academy of Science "Decadal Survey" report [1], NASA has been studying concepts for a Synthetic Aperture Radar (SAR) mission to determine Earth change in three disciplines – ecosystems, solid earth, and cryospheric sciences. NASA has joined forces with the Indian Space Research Organisation (ISRO) to fulfill these objectives. The NASA-ISRO SAR (NISAR) mission is now in development for a launch readiness in late 2021. The mission's primary science objectives are codified in a set of science requirements to study Earth land and ice deformation, and ecosystems, globally with 12-day sampling over all land and ice-covered surfaces throughout the mission life. The US and Indian science teams share global science objectives; in addition, India has developed a set of local objectives in agricultural biomass estimation, Himalayan glacier characterization, and coastal ocean measurements in and around India. Both the US and India have identified agricultural and infrastructure monitoring, and disaster response as high priority applications for the mission.

With this range of science and applications objectives, NISAR has demanding coverage, sampling, and accuracy requirements. The system requires a swath of over 240 km at 3-10 m SAR imaging resolution, using full polarimetry where needed. Given the broad range of phenomena and wide range of sensitivities needed, NISAR carries two radars, one operating at L-band (24 cm wavelength) and the other at S-band (10 cm wavelength). The system uses a new "scan-on-receive" ("SweepSAR") technology at both L-band and S-band, that enables full swath coverage without loss of resolution or polarimetric diversity. Both radars can operate simultaneously. The L-band system is being designed to operate up to 50 minutes per orbit, and the S-band system up to 10 minutes per orbit. The orbit will be controlled to within 300 m for repeat-pass interferometry measurements. This unprecedented coverage in space, time, polarimetry, and frequency, will add a new and rich data set to the international constellation of sensors studying Earth surface change. In this talk, we will describe the mission's characteristics, utilizing its unique sensors in support of time-series analysis of the dynamic changes of Earth's surface.

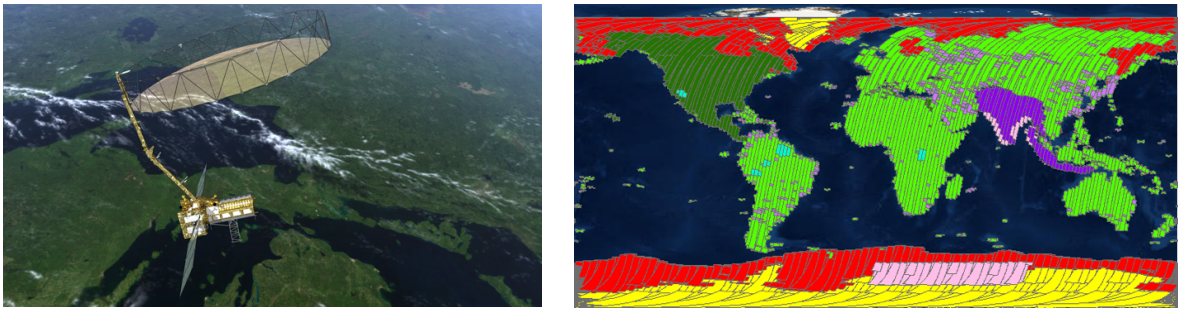

Figure 1. Left: Visualization of NISAR in orbit; Right: Notional NISAR coverage plan over its 12-day repeat cycle, where colors indicate different radar modes, including global ascending and descending L-band coverage of land and ice covered surfaces and joint L- and S-band SAR observations over India and surroundings. This pattern of observation is repeated every 12-days over the life of the mission.

1. Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond, Ed. by Committee on Earth Science and Applications from Space, National Research Council, National Academies Press, ISBN 978-0-309-10387-9, 2007