Jet Propulsion Laboratory
California Institute of Technology

NISAR Spacecraft Concept Overview:
Design challenges for a proposed flagship dual-frequency SAR Mission

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Pre-decisional – for Planning and Discussion Purposes Only

Shared Effort – Progress for All*
Sāṁjhā prayāsa - sabakā vikāsa

On-Orbit Configuration

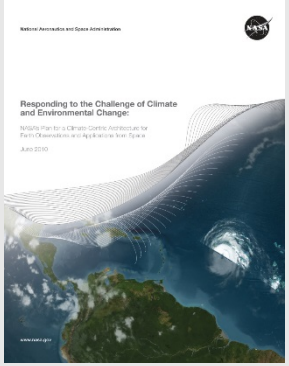
- Spacecraft Bus System (ISRO)
  - I3K heritage bus with modifications
- Radar Payload System
  - L-band SAR (NASA)
  - S-band SAR (ISRO)
- Engineering Payload System (NASA)
  - Payload Communication Subsystem (PCS)
    - Ka-band high-rate transmitter
  - GPS Payload (GPSP)
  - Solid State Recorder (SSR)
  - Payload Data Subsystem (PDS)
  - Power Distribution Unit (PDU)
- Launch vehicle (ISRO)
  - Geosynchronous Satellite Launch Vehicle (GSLV) Mark-II (4-meter fairing)

ISRO
NASA

*Title of official joint US-India statement published by the White House

Science Overview

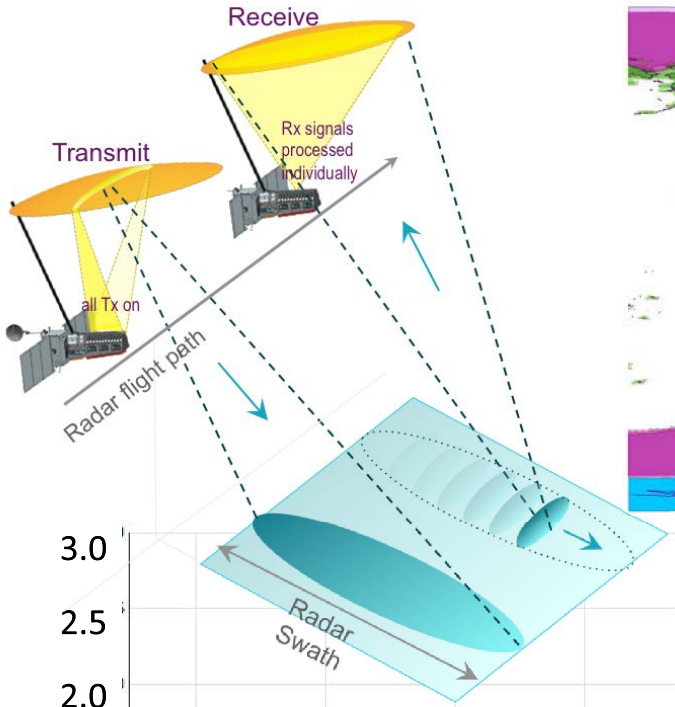
- NRC Decadal Survey recommended a DESDynI Mission for near-term launch to address important scientific questions of high societal impact.
- NASA's Climate Architecture identified the radar's important role in climate (cryosphere and carbon) and water cycle science.

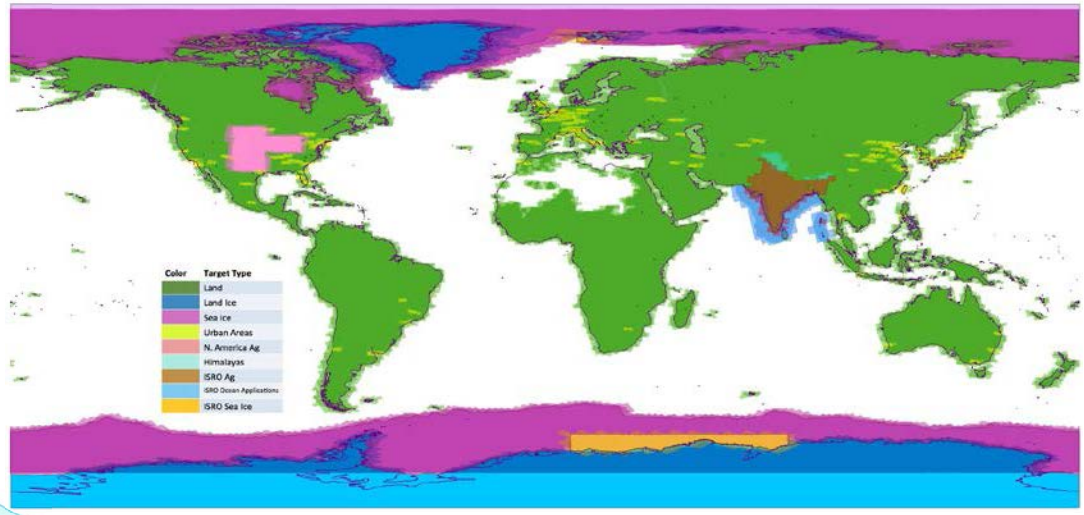


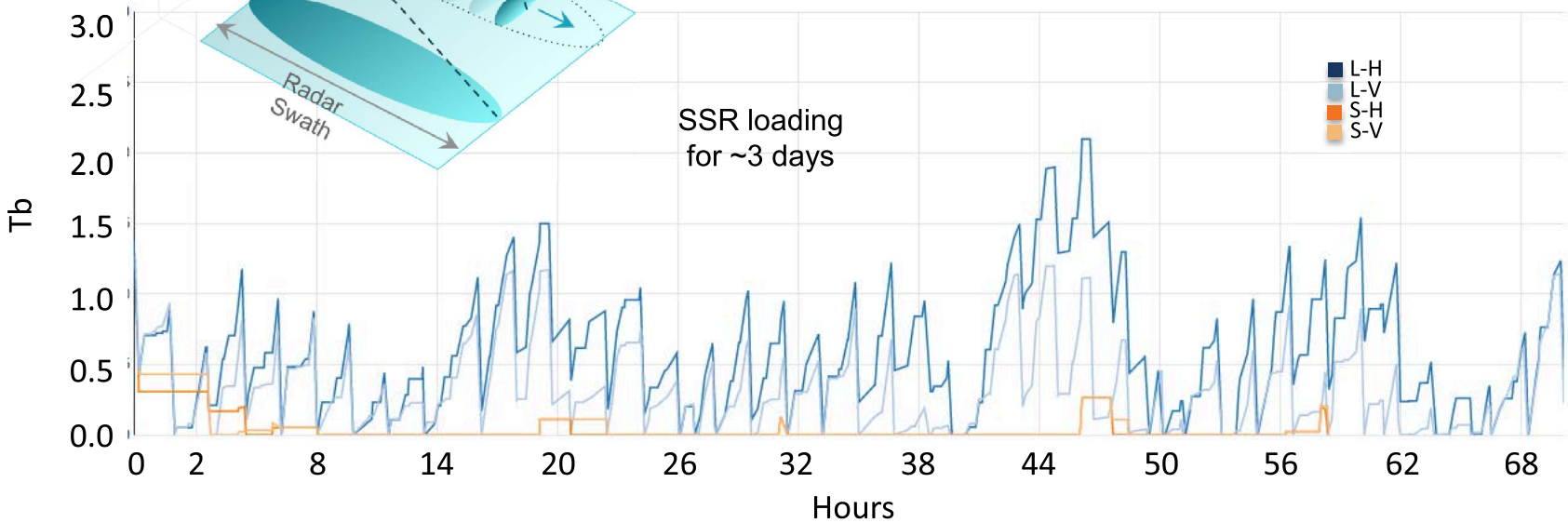
- **Dynamics of Ice: Ice sheets, Glaciers, and Sea Level**
  - *Will there be catastrophic collapse of the major ice sheets, including Greenland and West Antarctic and, if so, how rapidly will this occur?*
  - *What will be the resulting time patterns of sea-level rise?*
  - *How are alpine glaciers changing in relation to climate?*
- **Ecosystems and Biomass Change**
  - *How do changing climate and land use in forests, wetlands, and agricultural regions affect the carbon cycle and species habitats?*
  - *What are the effects of disturbance on ecosystem functions and services?*
- **Solid Earth Deformation: Hazard Response**
  - *Which major fault systems are nearing release of stress via strong earthquakes?*
  - *Can we predict future eruptions of volcanoes?*
  - *What are optimal remote sensing strategies to mitigate disasters and monitor/manage water and hydrocarbon extraction and use*
- **Coastal Processes: India**
  - *What is the state of important mangroves?*
  - *How are Indian coastlines changing?*
  - *What is the shallow bathymetry around India?*
  - *What is the variation of winds in India's coastal waters?*

DESDynI Radar Objectives + ISRO Science = NASA-ISRO Synthetic Aperture Radar (NISAR)

Science Observation Plan

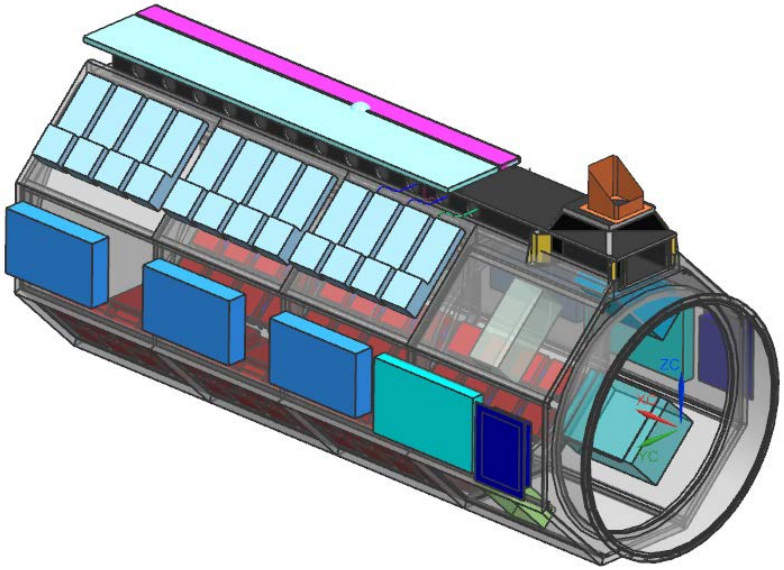


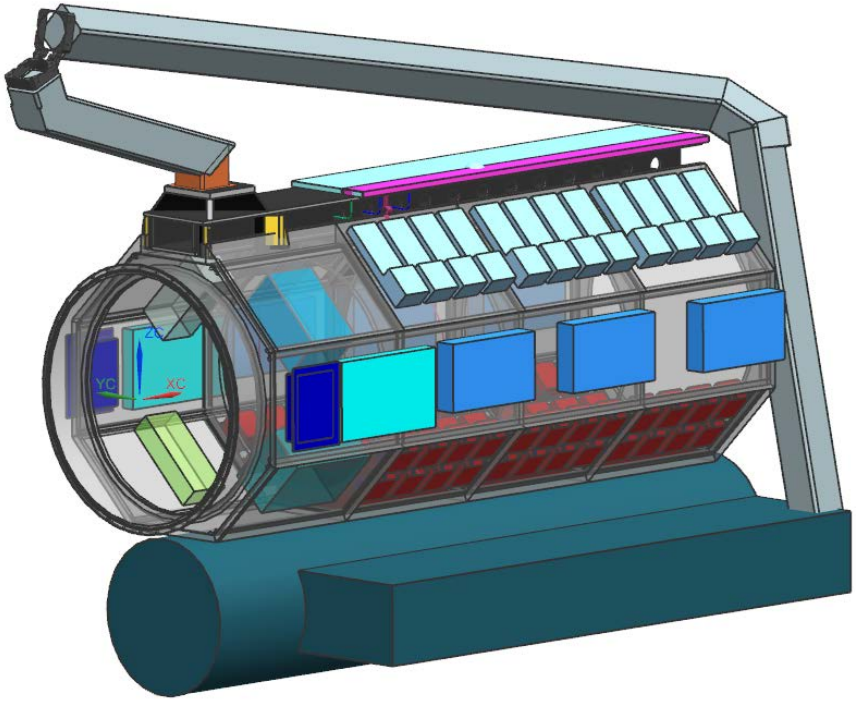




NISAR would provide complete coverage of the globe every 12 days

L-/S-Band Radar Payload Configuration





Radar Payload resource utilization is a driver for observatory design

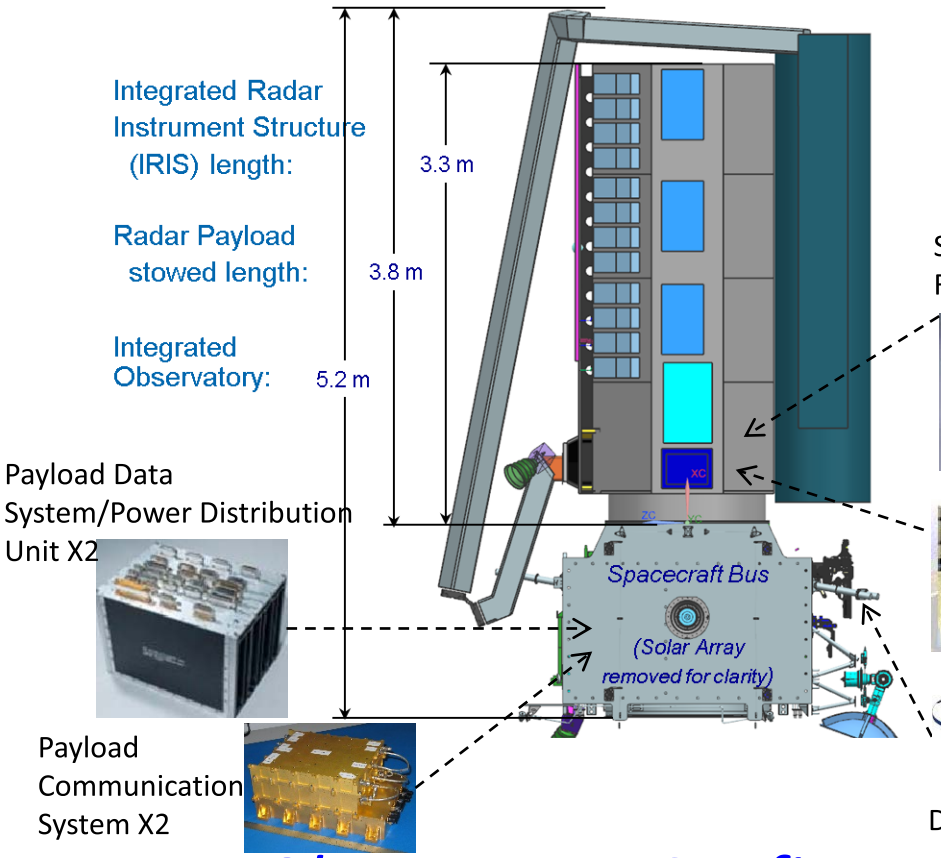
CBE Mass: 775 kg (L-band), 180 kg (S-band)

CBE Peak Power: 1200 W (L-band), 2500 W (S-band)

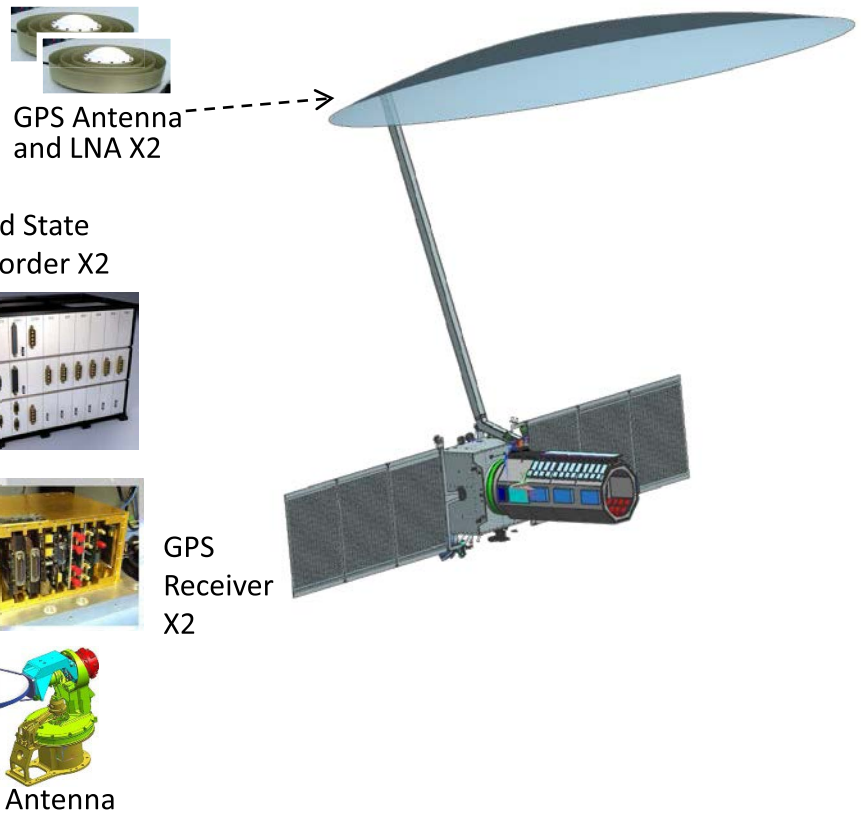
Peak Data Rate: 2.4 Gbps (L-band), 2.5 Gbps (S-band)

NISAR Observatory Configuration

Launch Configuration

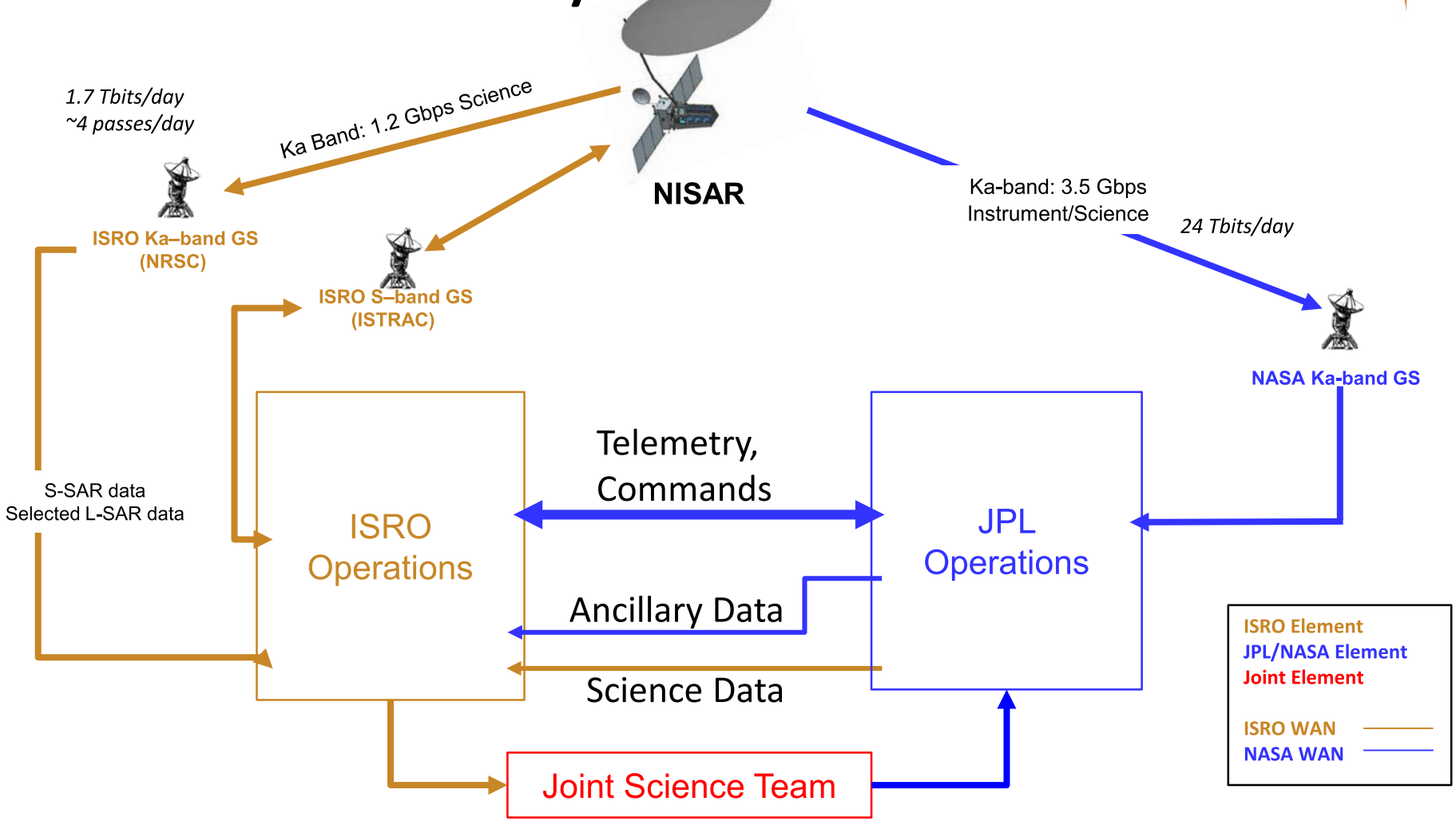


Deployed On-Orbit



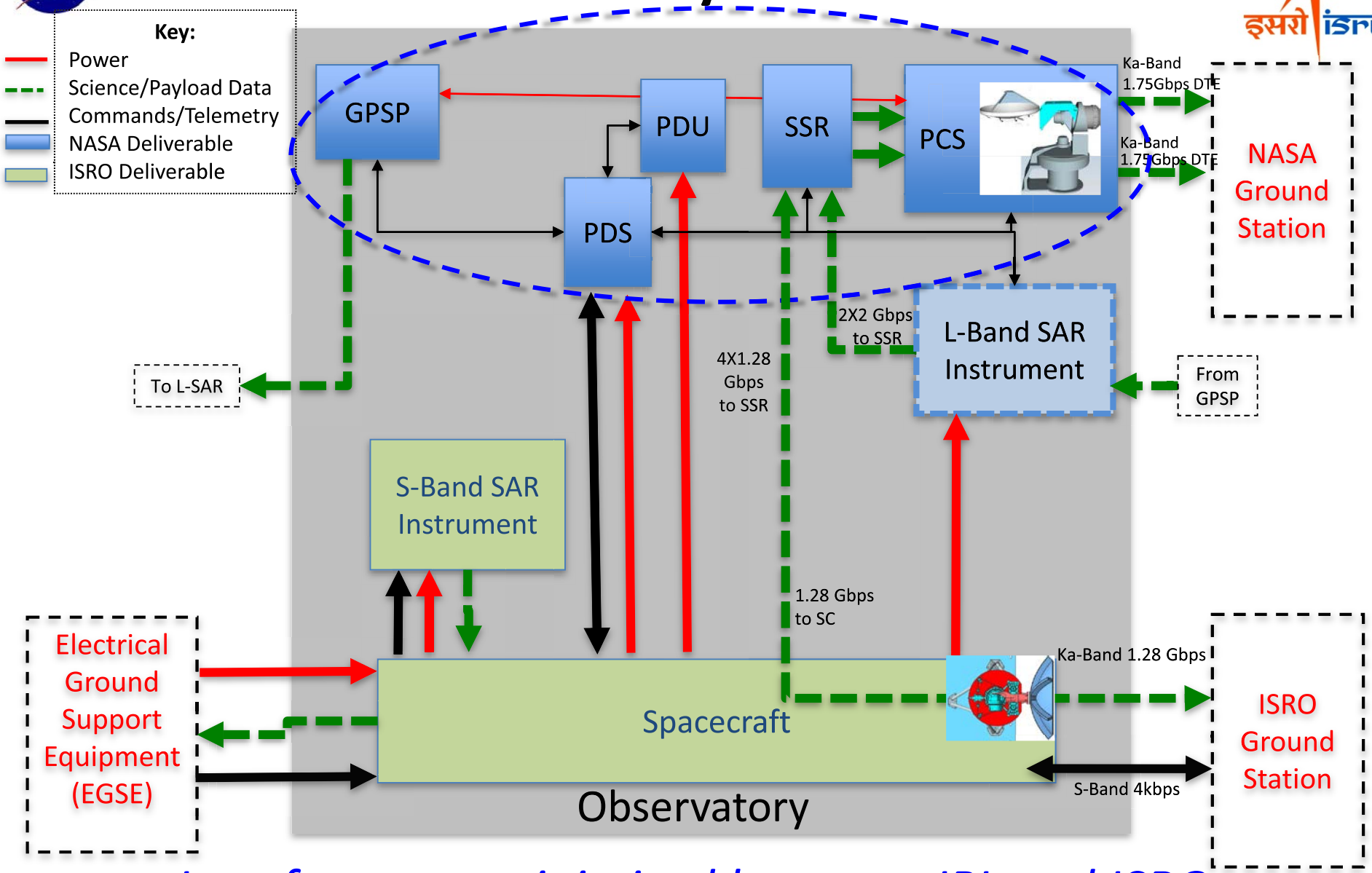
Observatory Configuration is a design driver for launch vehicle and spacecraft

Mission System Architecture



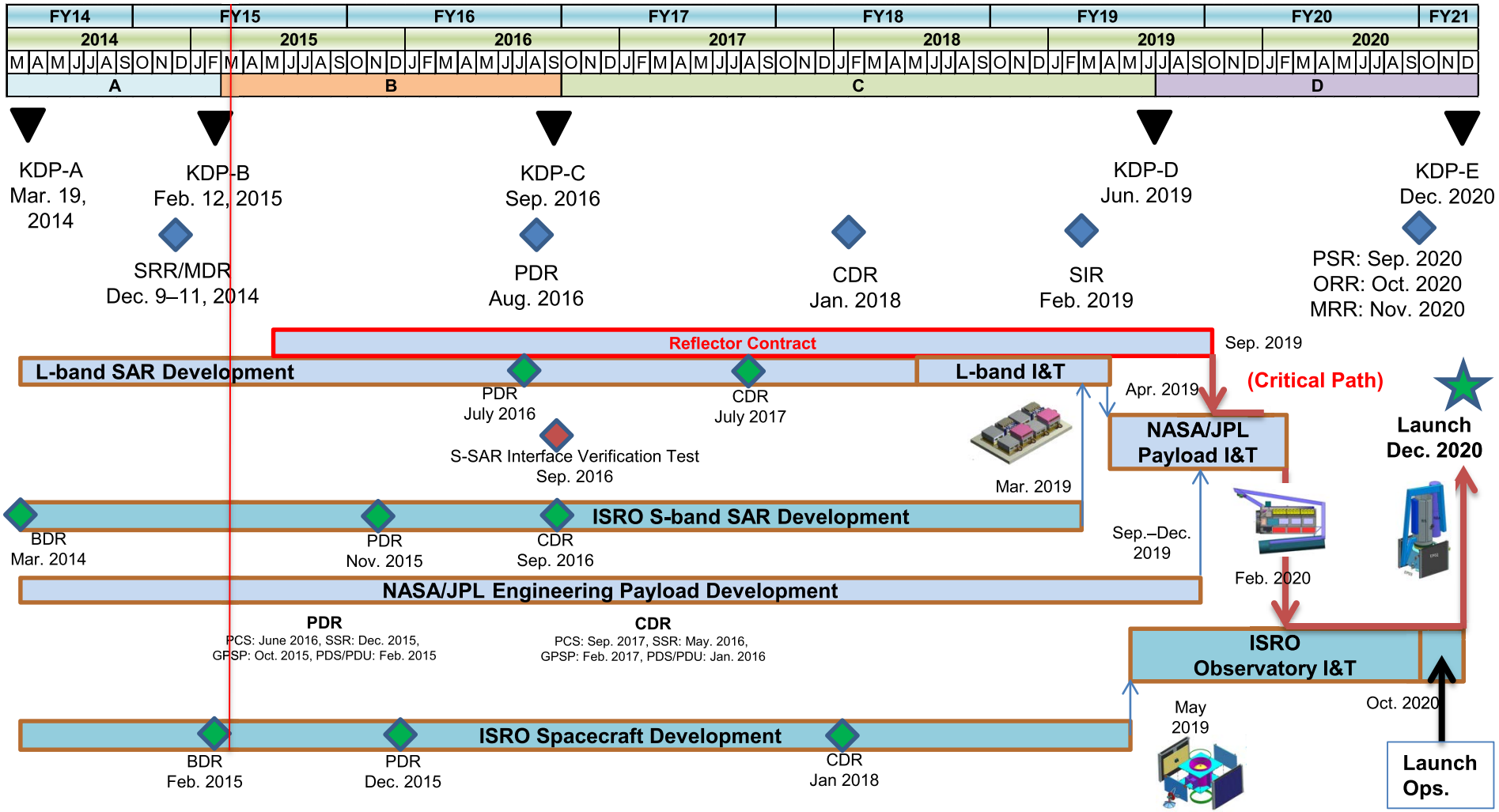
NISAR would be jointly operated by both NASA/JPL and ISRO

Observatory Interfaces



Interfaces are minimized between JPL and ISRO

NISAR Schedule



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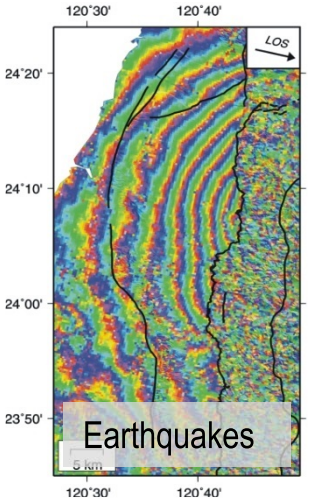
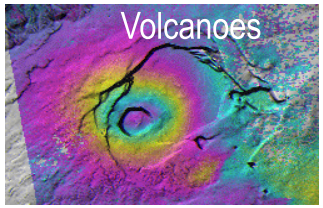
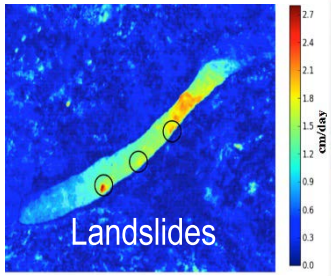
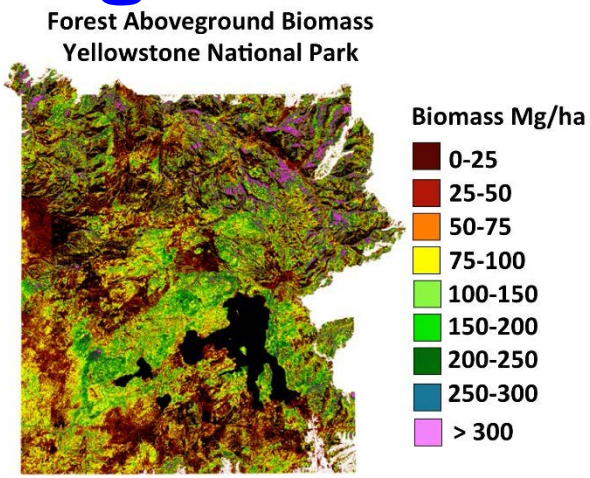
NISAR would forge new pathways in Surface Change Science



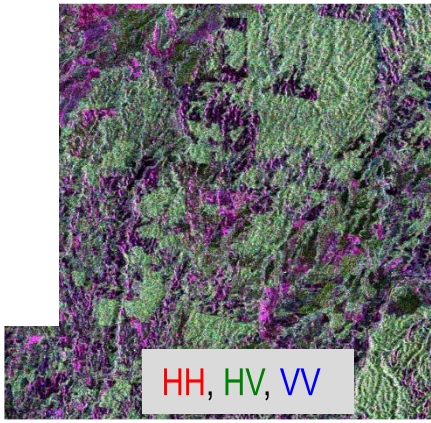




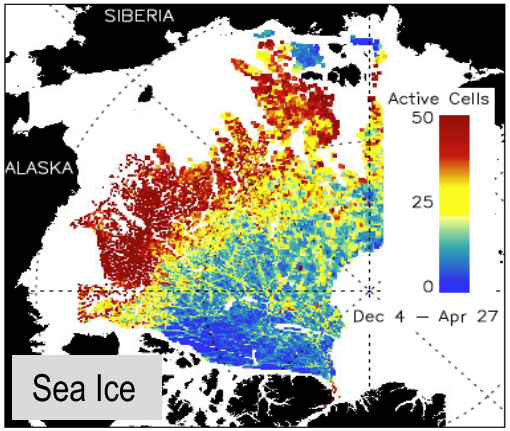
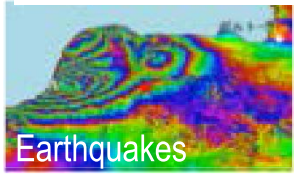
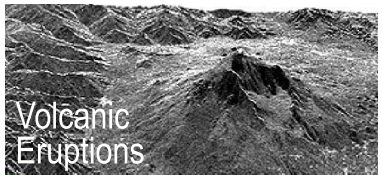
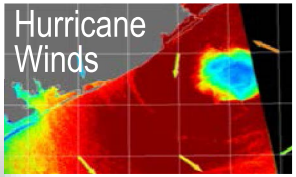
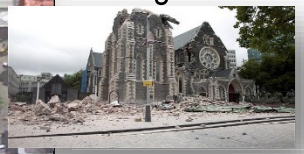
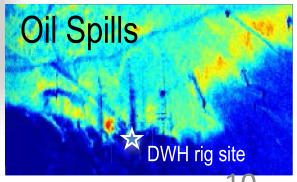
Deformation



Ecosystems



Cryosphere



Hazard Response/Applications