

*Uniquely Capturing the Earth in Motion*

## **Agency Needs**

# **Convergence/Divergence Discussion**

Paul Rosen

Jet Propulsion Laboratory

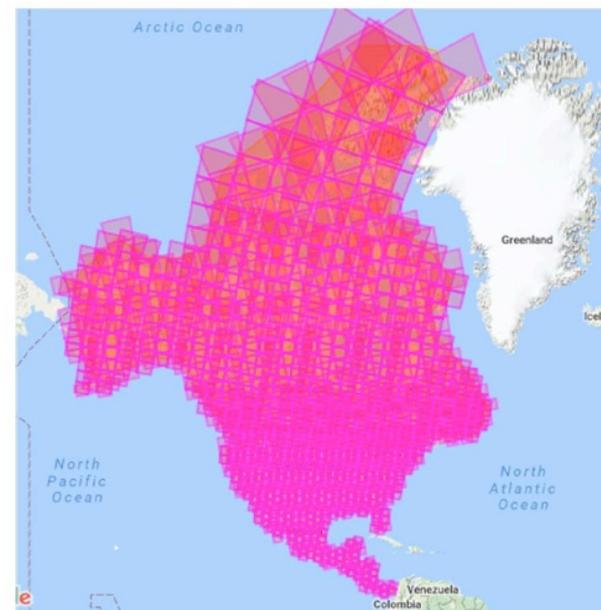
California Institute of Technology

NISAR Project Scientist

SDC Architecture Study Lead

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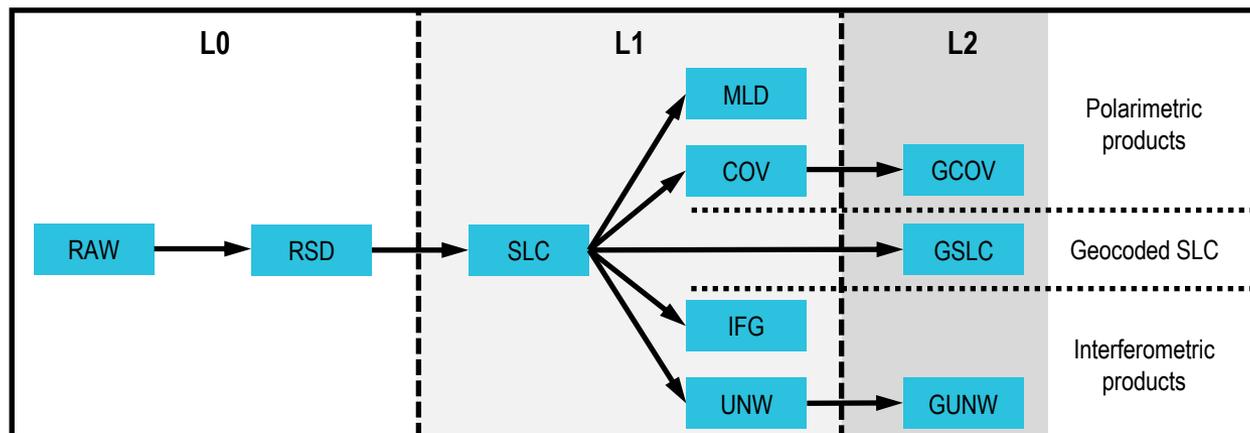
- As a result of the 2016 SNWG recommendations, the NISAR project was directed to augment the downlink system to accommodate higher bandwidth and more polarization diversity over North America
- Since augmentation start in 2018, the NISAR project at JPL and the NASA Near Earth Network teams have
  - **Increased the planned average downlink capacity from 26 Tb/day to 35 Tb/day**
  - Developed a mission plan to operate over North America (and Hawaii) with greater polarimetric diversity and wider bandwidth consistent with meeting the baseline NISAR science requirements
  - Studied the impact of these changes on overall observatory utilization and resource constraints
- Adding Soil Moisture Global Product starting this year
- SNWG Community Engagement
  - SAR Tutorial in March 2020
  - Mini-Workshop in July 2020 during next round of SNWG inputs



**NEN AS4  
Antenna at  
ViaSat Facility**

**One of NEN  
Augmentations  
for SNWG**

- What does the additional data downlink enable?
  - Finer resolution in one dimension
    - Full image resolution was  $\sim 15 \text{ m} \times 7 \text{ m}$ , now  $\sim 7 \text{ m} \times 7 \text{ m}$
    - Typical product resolution requires spatial averaging of at least  $2 \times 2$  pixels to reduce speckle noise
      - Product resolutions of  $15 \text{ m} \times 15 \text{ m}$  or coarser can be expected, depending on requirements
  - Full-quad pol data acquisition has an impact on science acquisition plan (see next presentation on NISAR Capabilities)
  - Still fundamentally dual-pol HH/HV data at full resolution
    - Quad-pol data collected in selected eco sites (takes 24 days to fully cover)
  - Low-resolution band at VV/VH polarization under consideration, but has science implications



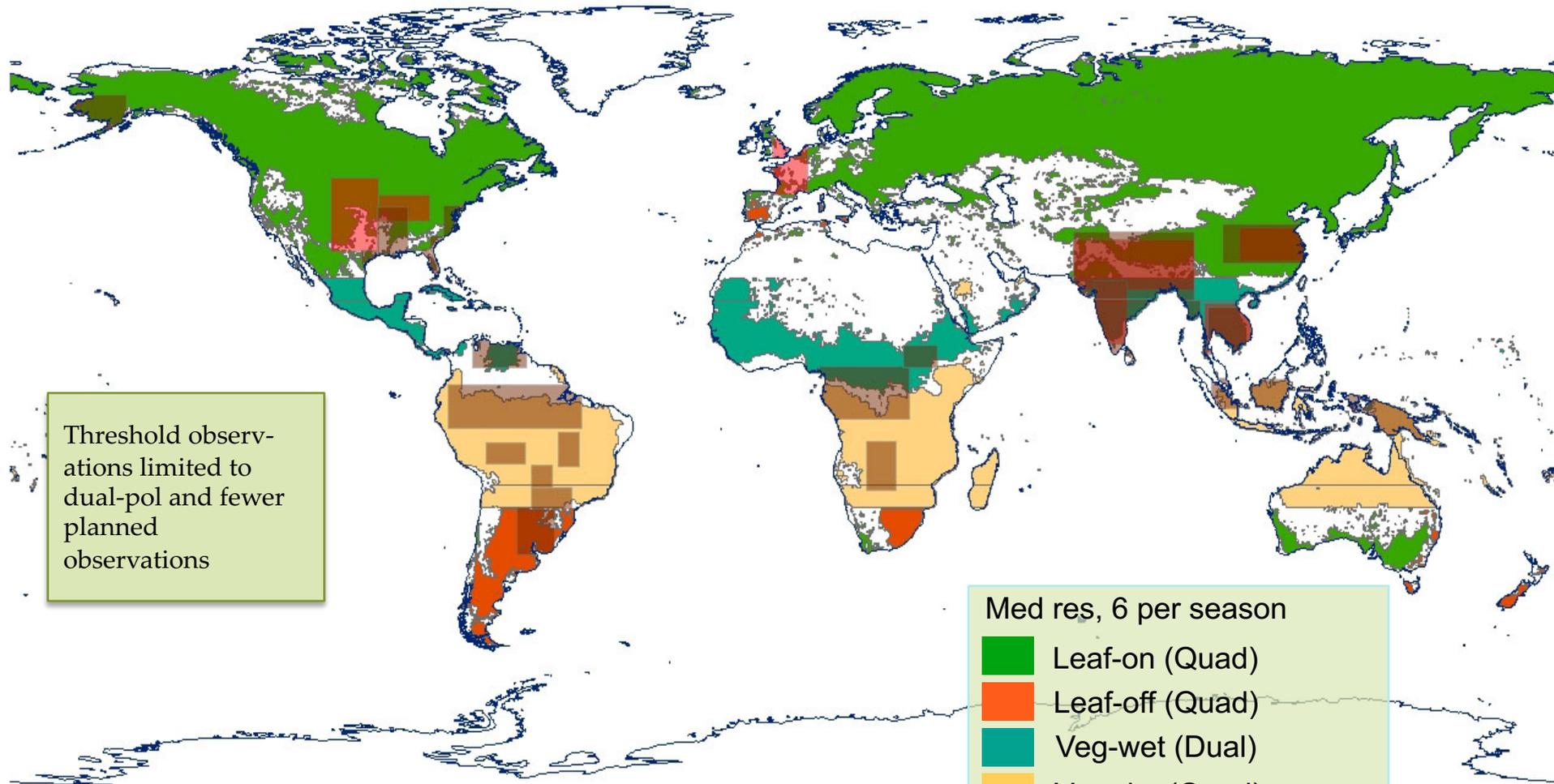
- Soil Moisture was a priority in 2016 SNWG needs assessment
- Funding was committed in 2019.
- Capability-driven proposal was to produce 200 m resolution soil moisture; 400 m over deserts (radar dark)
  - 2 global maps every 12 days – one from ascending orbits, one from descending orbits
  - Implies < 6 days average sampling of soil moisture
- Project is currently working with science team to define algorithm and select appropriate observational mode consistent with the science plan



# A NISAR Story on Needs Original Observation Plan for Ecosystems



# Ecosystems Baseline Observations – Multi-Pol Seasonal Sampling (c. 2013)



Threshold observations limited to dual-pol and fewer planned observations

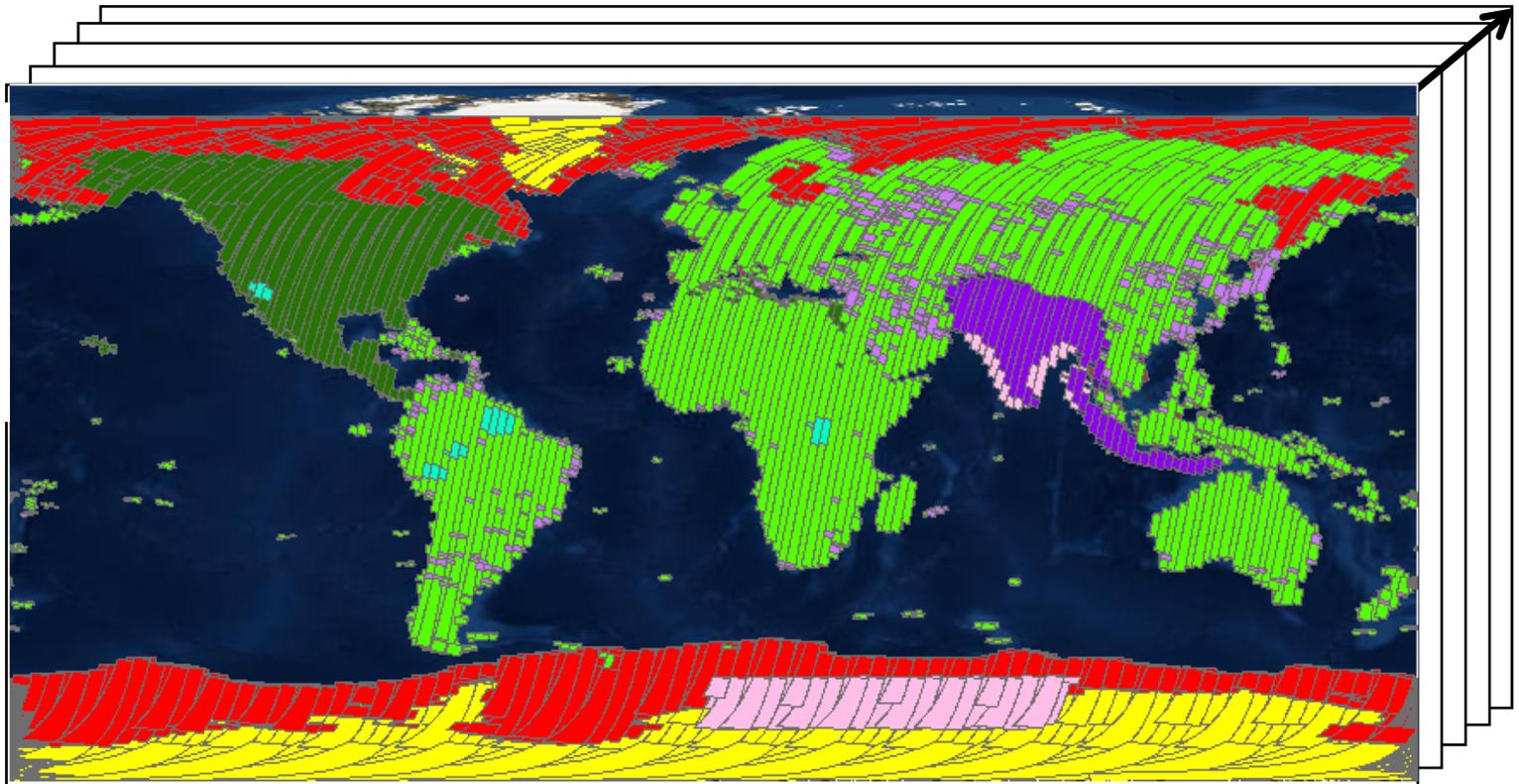
- Med res, 6 per season
- Leaf-on (Quad)
  - Leaf-off (Quad)
  - Veg-wet (Dual)
  - Veg-dry (Quad)
  - Agriculture (Dual)
  - Wetlands/Floods (Dual)

# NISAR Observation Plan for Ecosystems after trade study and requirements analysis

Persistent updated measurements of Earth

No target conflicts:  
overlapping  
targets uses  
union of all  
modes  
specified

Colors indicate  
different radar  
modes



- Continuous engagement between Science and Mission Planning Teams
- Six month planning cycle during development and operations
- Regular dual-pol observations instead of patchy quad-pol observations

J. Doubleday  
P. Sharma,  
JPL

- As shown in previous presentation, NISAR cannot fulfill the needs as specified
  - Spatial resolution is often too coarse
  - Temporal sampling is often too coarse
  - Full-polarization is not often available
  - Low latency is a demonstration capability, not an operational requirement.
- 
- But will NISAR data be useful nonetheless to satisfy or partially satisfy any of the needs?
- 
- Discussion...