ARIA + ASF + Sentinel 1
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NISAR Preparatory Prototype

May 2016

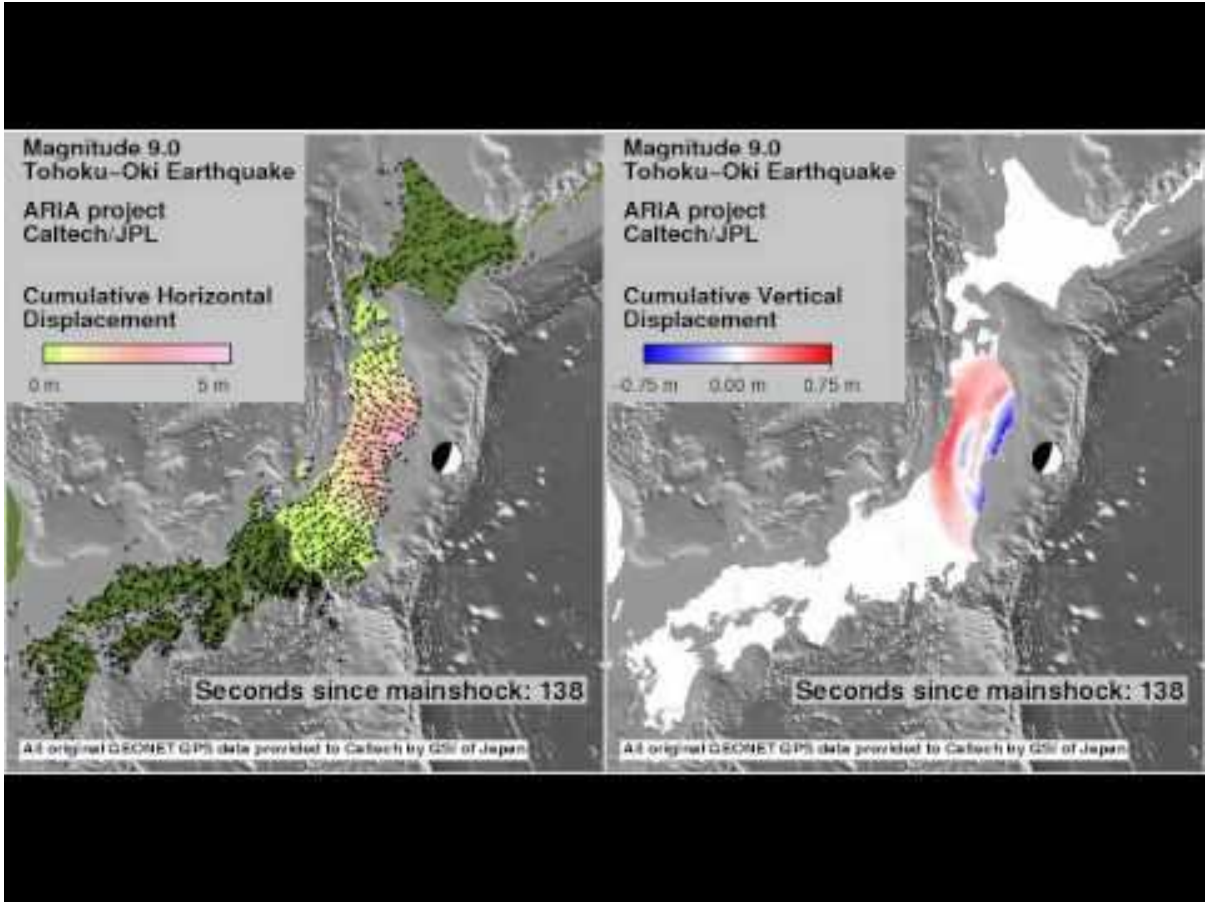
What is ARIA

“Advanced Rapid Imaging and Analysis (ARIA) is a collaboration between JPL and Caltech to exploit radar and optical remote sensing, GPS, and seismic observations for hazard science and response.”

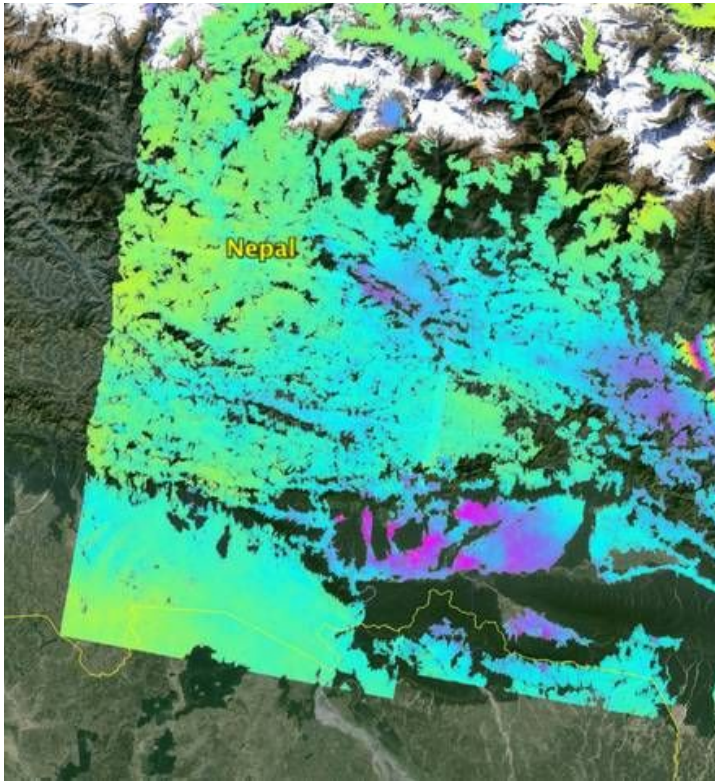
http://aria.jpl.nasa.gov/

Published on Aug 9, 2012

Over 1200 permanent, geodetic GPS stations in the Japanese GEONET network recorded the motion of the Tohoku-Oki earthquake with 1-second resolution. This movie shows the displacements measured at each station.

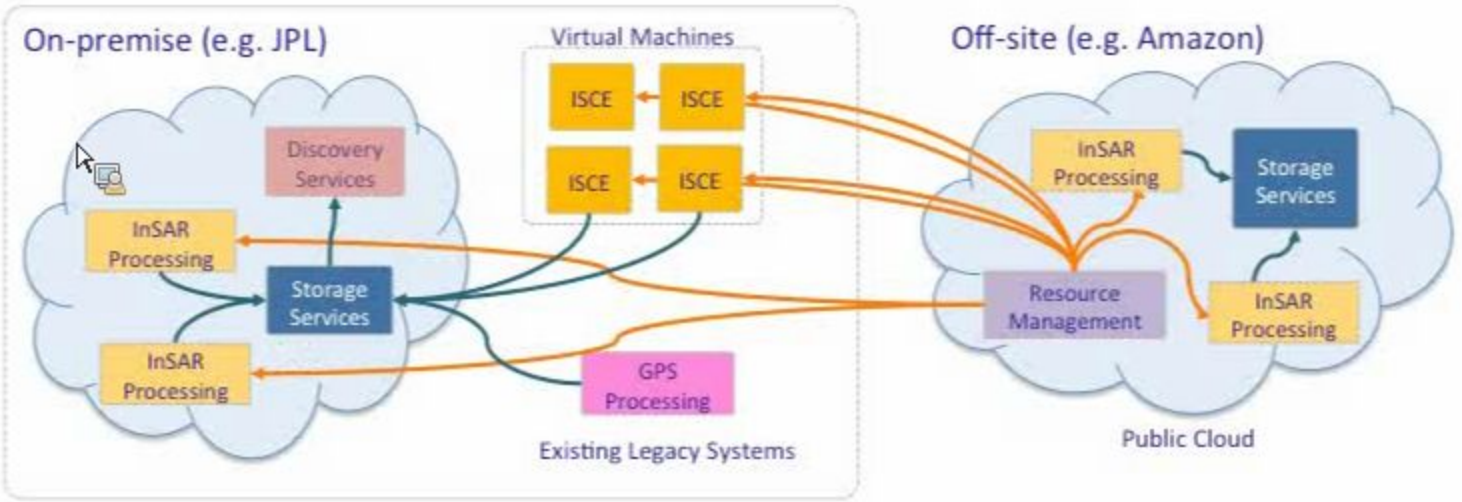


Sample ARIA Products



Sample Products
Continuous GPS and InSAR analysis
Coseismic Surface Displacement
Ground Displacement Monitoring Maps
Earthquake Source Model
Damage Proxy Map
Ground Shaking Maps
Change in Vertical Datum Maps
Critical Infrastructure Assessment Map

Existing ARIA Architecture



HySDS (Hybrid Cloud Computing Science Data System)

HySDS Highlights

HySDS is the generic science data system behind ARIA

Utilizes both **on-premise** and **public** infrastructure

- Leverage existing infrastructure investment
- PB-scale processing and storage purely in public cloud currently too expensive

Hybrid Cloud data system architecture

- **Burst out** to public cloud when demand exceeds on-premise resources
- Deploy AWS-compatible Eucalyptus cloud stack **on-premise**

Public cloud benefits

- Processing at **low-cost (up to 10X cheaper)** using **high-resiliency data system** that can run in competitive AWS **spot market**
- Leverage **Amazon GovCloud US** to address export control and firewall security issues
- **Auto-scaling** of science data system

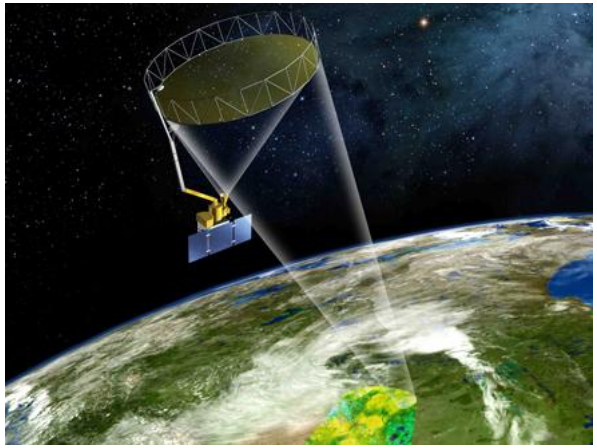
Alaska Satellite Facility (ASF) DAAC

2015 Archive Size: 769 TB, 3.43M granules

Sentinel 1A/B SAR Data Distribution

The Sentinel-1A data available from ASF comprise a complete historical archive of Sentinel-1A synthetic aperture radar (SAR) data processed by the European Space Agency (ESA).

ASF DAAC



2015 Archive Size: 769 TB, 3.43M granules

NISAR Assigned DAAC

NISAR Launch Date: 2020

NISAR Potential* Data Volumes: 95.4 TB/day (yes, per day), 34.8 PB/year

Current EOSDIS Volume (all DAACs): 15 PB

* assuming no data is virtualized

NISAR
NASA - ISRO SAR Mission

NISAR L-Band Data Volume Breakdown

Product	# of Product Types	Volume (TB/Day)
Level 0	2	6.5
Level 1	2	30.9
Level 2	10	58.1

That is a lot of data and we are not prepared.

Yet.

ARIA + ASF + Sentinel 1

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NISAR Preparatory Prototype

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“To accommodate the increased data volume while still maintaining a high level of service the ASF DAAC will need to embrace new technologies and integrate closely with the SDS.”

***HySDS** has been tentatively identified as the processing system for both NISAR and SWOT missions.*

Bottom Line: ARIA and ASF will utilize Sentinel 1 SAR data as a proxy for developing an End-to-End NISAR processing workflow, and will be assuming an “all-cloud” (AWS) implementation

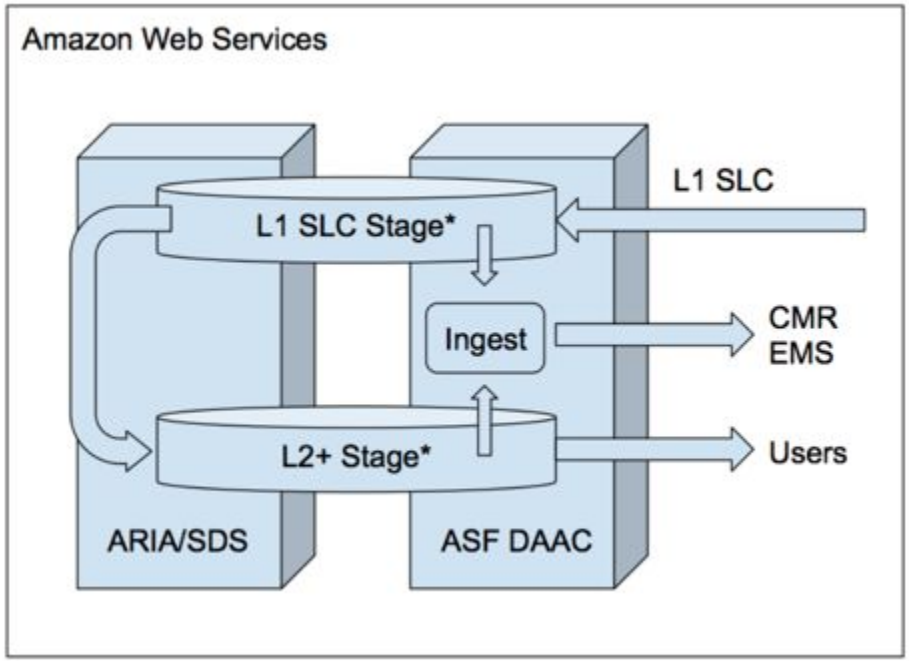
High Level 3 Year Plan for NISAR Preparation

Year 1
Solid Earth Level 2 Prototypes, Storage, On-Demand Processing

Year 2
Bulk reprocessing scenarios, Solid Earth Level 3, Sentinel-1A/B

Year 3
[TBD] Expand on L3 products ecosystems and cryosphere, PGE delivery, End-User processing and Outreach

Diagramming Basic DAAC Functions



* indicates shared storage between DAAC and ARIA to facilitate data transfer

Main EOSDIS Goals for this Effort

- Demonstration of full end-to-end SDS processing to DAAC archive and distribution
- Demonstration of on-demand processing both by SDS and DAAC to test viability of virtualized products, potentially reducing data volumes
- Demonstration of functional DAAC data lifecycle (S3 -> S3IA -> Glacier)
- Demonstration of a smooth, repeatable transition of PGE code to DAAC to allow for on-demand processing beyond life of mission
- Cost modeling and baseline comparisons of operating a DAAC in cloud
- Utilization of Sentinel-1 distribution metrics to develop a catalog of empirically-derived areas of greatest data usage to be used in NISAR storage and costing estimates

Main EOSDIS Goals Continued

- Model performance under nominal on-demand, forward processing, and bulk-reprocessing scenarios
- Development and Testing of potential End User Processing Scenarios
  - User processing on DAAC-provisioned compute resources
  - User processing on DAAC-provided images with user-funded compute resources
  - Leverage CATEES efforts to encourage end-user cloud focused processing
- Development of best practices for migrating DAAC and SDS capabilities into the NASA-compliant General Application Platform (NGAP)
- Develop Lessons learned for other DAACs looking towards combining SDS-DAAC processing pipelines

Other Upcoming Missions will also Benefit ...

Surface Water and Ocean Topography (SWOT)

Launch Date: 2020

Also looking at HySDS and cloud-based ingest, archive and distribution

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