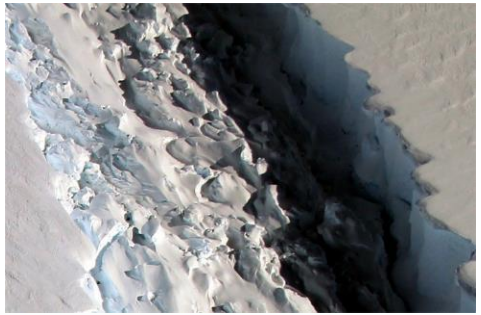
National Aeronautics and Space Administration

SCIENCE






SERVIR SPoRT

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SERVIR connects space to village by helping developing countries use satellite data to address critical challenges in food security, water resources, weather and climate, land use, and natural disasters. A partnership of NASA, USAID, and leading technical organizations, SERVIR develops innovative solutions to improve livelihoods and foster self-reliance in Asia, Africa, and the Americas.

Agriculture & Food Security

Water & Water-Related Disasters

Land Cover & Ecosystems

Weather & Climate

SERVIR

USAID FROM THE AMERICAN PEOPLE

NASA

adpc

ICIMOD

CILSS

RCMRD

What and Who is SERVIR?

"Connecting space to village"

A joint initiative of USAID and NASA that partners with regional technical institutions around the world to get Earth observation information into the hands of decision-makers to improve development outcomes.

- Societal benefit from space
- 20+ satellites, data free and open
- Major research portfolio
- Limited internationally

- Poverty reduction and resilience
- Working on data-dependent issues in data-scarce places
- International field presence

Regional hubs

adpc · RCMRD · ICIMOD · CILSS

Hub partners

Spatial Informatics Group · SEI Stockholm Environment Institute · Deltares Enabling Delta Life · CERSGIS · CSE 30 ans Centre de Suivi Ecologique · ICRISAT · ACMAD · RECTAS

Private sector partners: Google · esri · DigitalGlobe · aws

Research collaborators:
19 universities and research centers located in 14 states (in the U.S.)

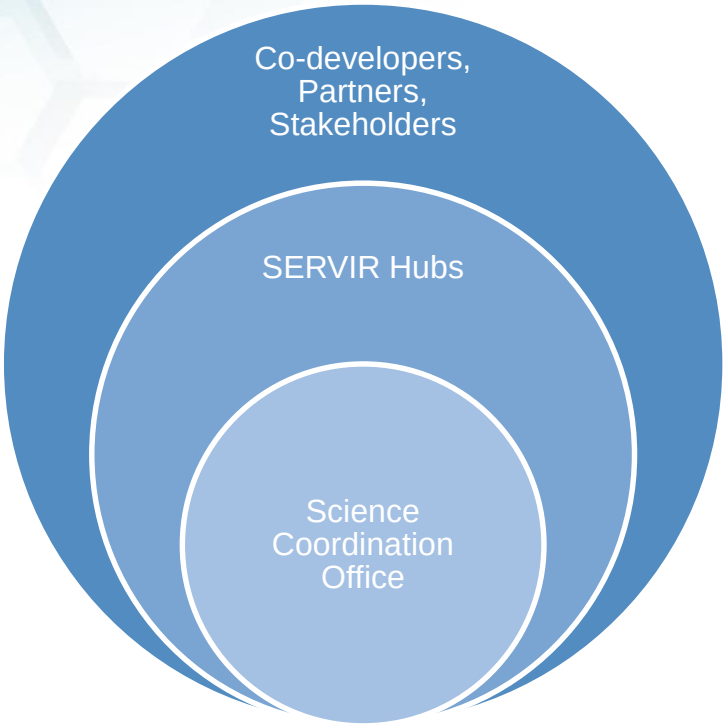
Building SAR Capacity through the SERVIR Network

Where are we now?

- ✓ Internal needs and initial baseline capacity assessed
- ✓ Priority applications identified
- ✓ Involvement with NISAR applications user group
- ✓ Awareness and involvement with CEOS trainings and pilots

Where do we want to be?

- SAR-capable scientists, technicians, *and practitioners throughout the broad SERVIR network.* Aligns with SERVIR Strategic Goals (2015-2020) and Results Framework



Service areas of focus, prioritized:

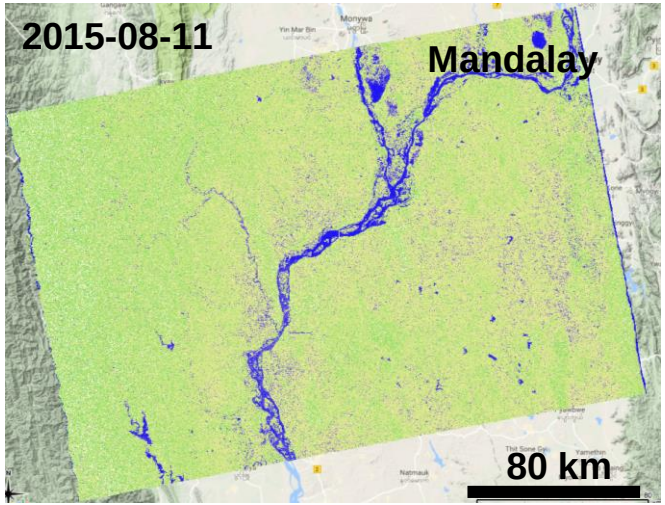
1. Land cover, land use, ecosystems
1. Food security and agriculture
1. Water and disasters
2. Weather and climate

Applications/phenomena of focus

- Surface water and floods
- Forest biomass
- Land cover, LCC, vegetation phenology
- Agriculture, especially rice
- Water height / altimetry
- Soil moisture
- Landslides / surface deformation
- Urban planning / urbanization
- Fire hazards
- Coastal veg, hazards, processes

State of applying SAR in SERVIR services

- Supporting Near-Real-Time Flood Monitoring in Myanmar (Sentinel-1)
  - Related professional workshop in the Lower Mekong region
- Internal training in Hindu Kush-Himalaya
  - ALOS-2 PI at ICIMOD
- Interest in Harmonized LULC mapping in West Africa
- Interest in Biomass estimation in Eastern & Southern Africa
  - Co-training and participation in CEOS SAR workshops
- Series of workshops and creation of a *SAR Handbook* in all SERVIR regions



Contains modified Copernicus Sentinel-1A data (2015), processed by ESA.

SERVIR-SilvaCarbon

SERVIR and SilvaCarbon Strengthen Global Capacity on Synthetic Aperture Radar (SAR) Applications for Forest Management

- Needs assessment: Land Cover Land Use Change (LCLUC) community in Africa and Asia – SERVIR international network
- Goal: Strengthen the capacity of SERVIR international network in the use of SAR for forest mapping/monitoring and biomass estimation
- Focus: create capacity for operational use of SAR data for LCLUC applications

Global Round of SAR Capacity Building workshops for international partners in Africa an Asia (Spring-summer 2018)

Subject Matter Expert (SME)	Training/Book Chapter	Location
Franz Meyer (Univ. of Alaska Fairbanks) Josef Kellndorfer (Earth BigData)	SAR Basics and Forest Degradation and Deforestation	(1)Niamey (2)Kathmandu
Paul Siqueira (Univ. of Massachusetts)	Forest height	Bangkok
Marc Simard (JPL) Hans Andersen (USFS)	Mangrove and Sampling design	Nairobi
Sassan Saatchi (JPL)	Forest structure and biomass	Kathmandu

- Total of 5 trainings:
  - Training tutorials and scripts
  - Open source

SAR Capacity Building Feedback

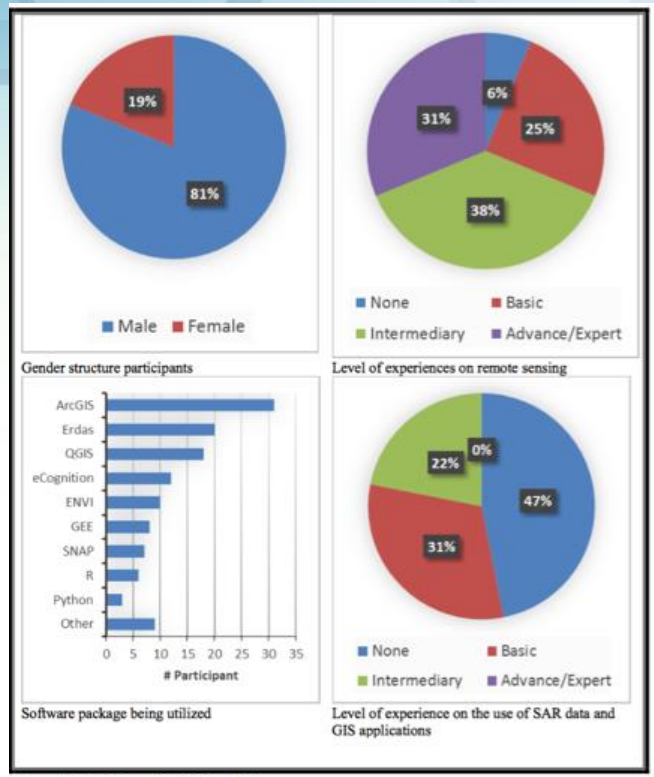


Figure 1. Participants' technical skills

Source: ICIMOD SAR training in Nepal, Feb 2018.

~132 participants in total/ 4 workshops

CB gaps:
-Time series data creation method
-cloud processing for bulk data analysis
-more tutorials and coding to access and process voluminous data
-procedures for data fusion of optical and radar

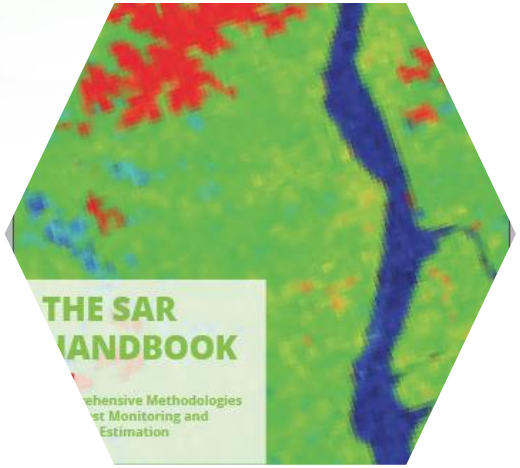
Applications:
-Automated system for forest degradation identification
-Forest health monitoring
-Deforestation early warning system
-Charcoal monitoring (West Africa)
-Illegal mining

Challenges:
Lack of consistent programing knowledge

100%

Capacity increased because of the training

SAR-Handbook: *Comprehensive Methodologies for Forest Monitoring and Biomass Estimation*



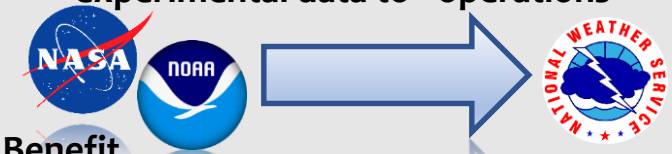
- Explaining how to use and from where to obtain SAR data for forest applications
- Oriented to scientific LCLUC community used to optical remote sensing data
- NASA- E-Book
- Will include training tutorials
- Additional materials:
  - 3 technical videos w/ animations (2 min or less)
    - Goal: animate key concepts that need further explanation
  - Video interviews: Introduction of SAR Handbook chapters and to the people who created it
  - One Pagers: describing key pre-processing and analyses –data recipes

Short-term Prediction Research and Transition (SPoRT) Center

SPoRT is focused on transitioning <u>unique</u> NASA and NOAA observations and research capabilities to the operational weather community to improve short-term weather forecasts on a regional and local scale.

- close collaboration with numerous WFOs and National Centers across the country
- SPoRT activities began in 2002, first products to AWIPS in 2003
- co-funded by NOAA since 2009 through satellite "proving ground" activities

Proven paradigm for transition of research and experimental data to "operations"

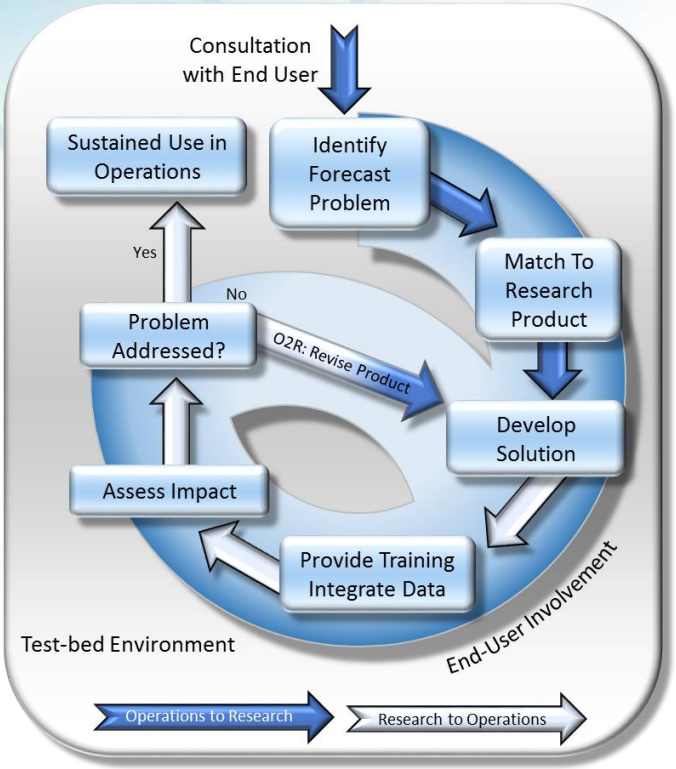


<u>Benefit</u>

- demonstrate capability of NASA and NOAA experimental products to weather applications and societal benefit
- prepares forecasters for use of data from next generation of operational satellites (JPSS, GOES-R)

SPORT

SPoRT Paradigm for R2O & O2R Success



Keys to success

- Involve end user in entire process
- Develop end-user appropriate training
- Assess impact of solution on operations
- Incorporate feedback as part of the O2R process
- A successful transition occurs when a new capability has a predominately positive impact on the forecast problem and is used "operationally" in the end users decision support system.
- "Operational" use means regular or sustained use of data / products to make decisions

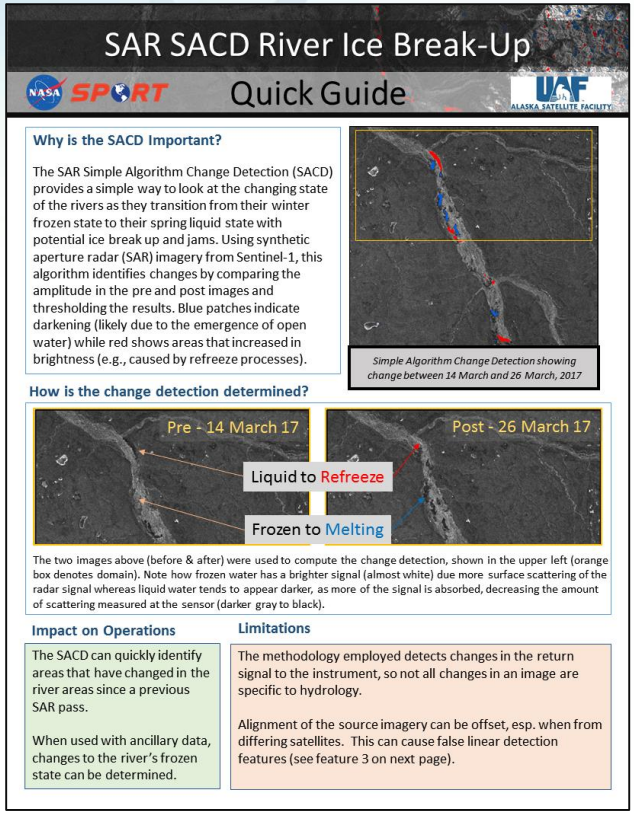
NASA's Earth Science Disasters Program

- NASA's Earth Science: Disasters Program has established a "SAR Tiger Team" of experts affiliated with various Centers, projects, and within academia to help with product development and end-user support
- Activities have included use of ASF-generated and routine SAR products, along with other developments via JPL/ARIA, GSFC, and others, focused on standardization and routine visualizations
- Training through event response, user engagement, ARSET, and others have been crucial for incorporating the use of these products in the "operations" for response entities, similar to MSFC/SPoRT experiences with NOAA's NWS
- Regarding SAR education, end users have a range of interests including:
  - Local efforts to build their own capacity around software tools, product generation, and interpretation – the ability to be self-directed and manage generation of products
  - Collaborative efforts to routinely receive SAR-based products and value-added analysis from partners, but with enough underlying background to have confidence and understanding in their capabilities and limitations

Collaborations with ASF

- MSFC Earth Science Disasters Team and MSFC/SPoRT have been working with ASF (and through them, others) to gain knowledge about synthetic aperture radar and its uses in their program
- Collaborative experiences and knowledge-sharing have facilitated outreach to more end users and a broader community engaged around SAR analysis
- Training sessions led by ASF, similar to those hosted by SERVIR and others, have proven beneficial for engaging a broader community around the use of SAR in decision-making and other applications.
  - Continued collaborations in the SAR community on training workshops around current missions, future missions (NISAR, commercial/international, future Designated Observables missions) presumably would be of continued benefit
- SPoRT sent two team members to Fairbanks for two weeks in March for a 2-week sprint to help develop 3 products that would be beneficial to SPoRT end users
  - These close collaborations between actual/potential end users and developers can be helpful in fine-tuning the needs for products and also help improve communications around training

End User Training – Product Example



- End-user training is an integral part of the transitioning a research product into an operational environment.
- Modification of format, application, and product description help to tailor training to the decision maker's requirements.
- Training modules (Articulate and Slide format) serve to describe the science and application of the produce.
- 1-2 page Quick Guides offer an annotated case example with quick reference reminders of how to use the product along with caveats and limitations.
- These modes of training have proven helpful for end users and could be expanded or replicated to SAR-specific topics:
    - Wavelengths
    - Platforms
    - Polarizations
    - Decompositions
    - Software