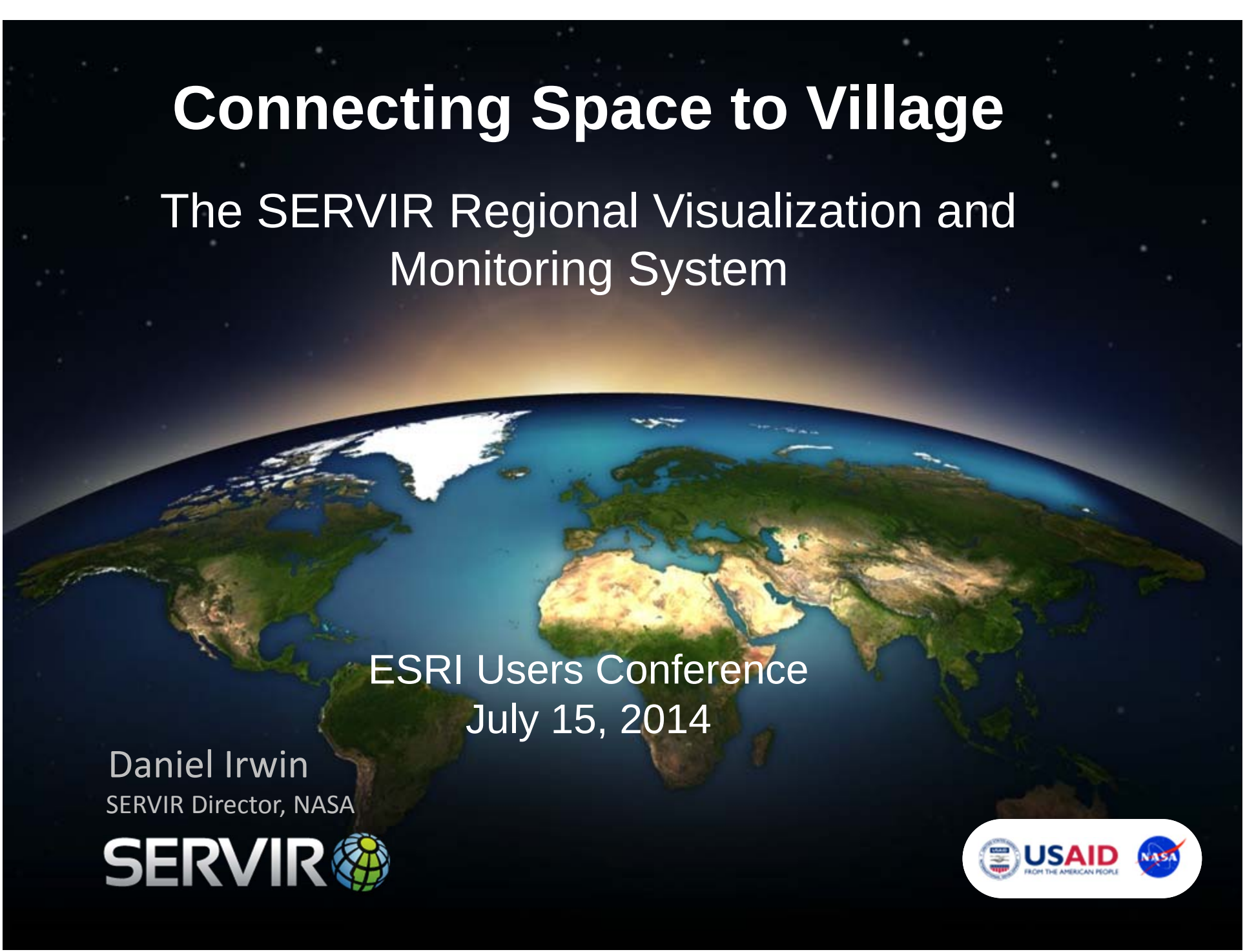
Connecting Space to Village

The SERVIR Regional Visualization and Monitoring System



ESRI Users Conference
July 15, 2014

Daniel Irwin
SERVIR Director, NASA

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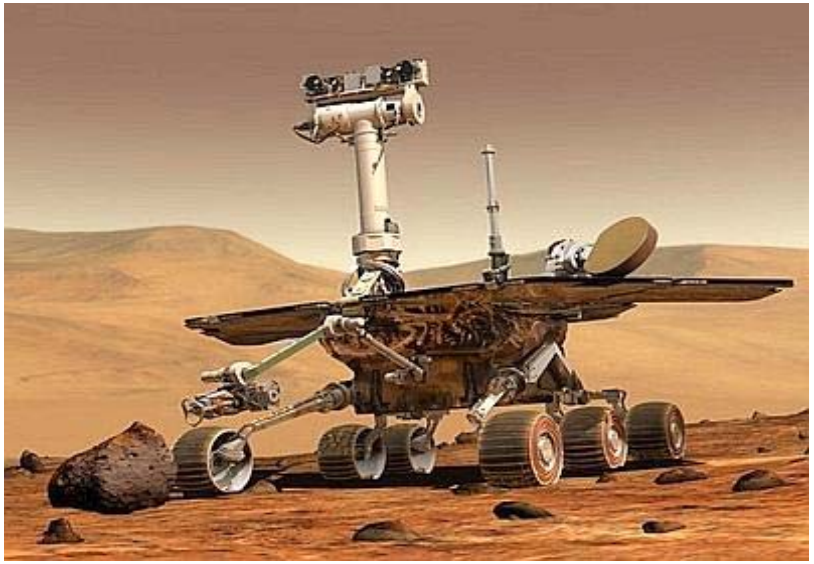
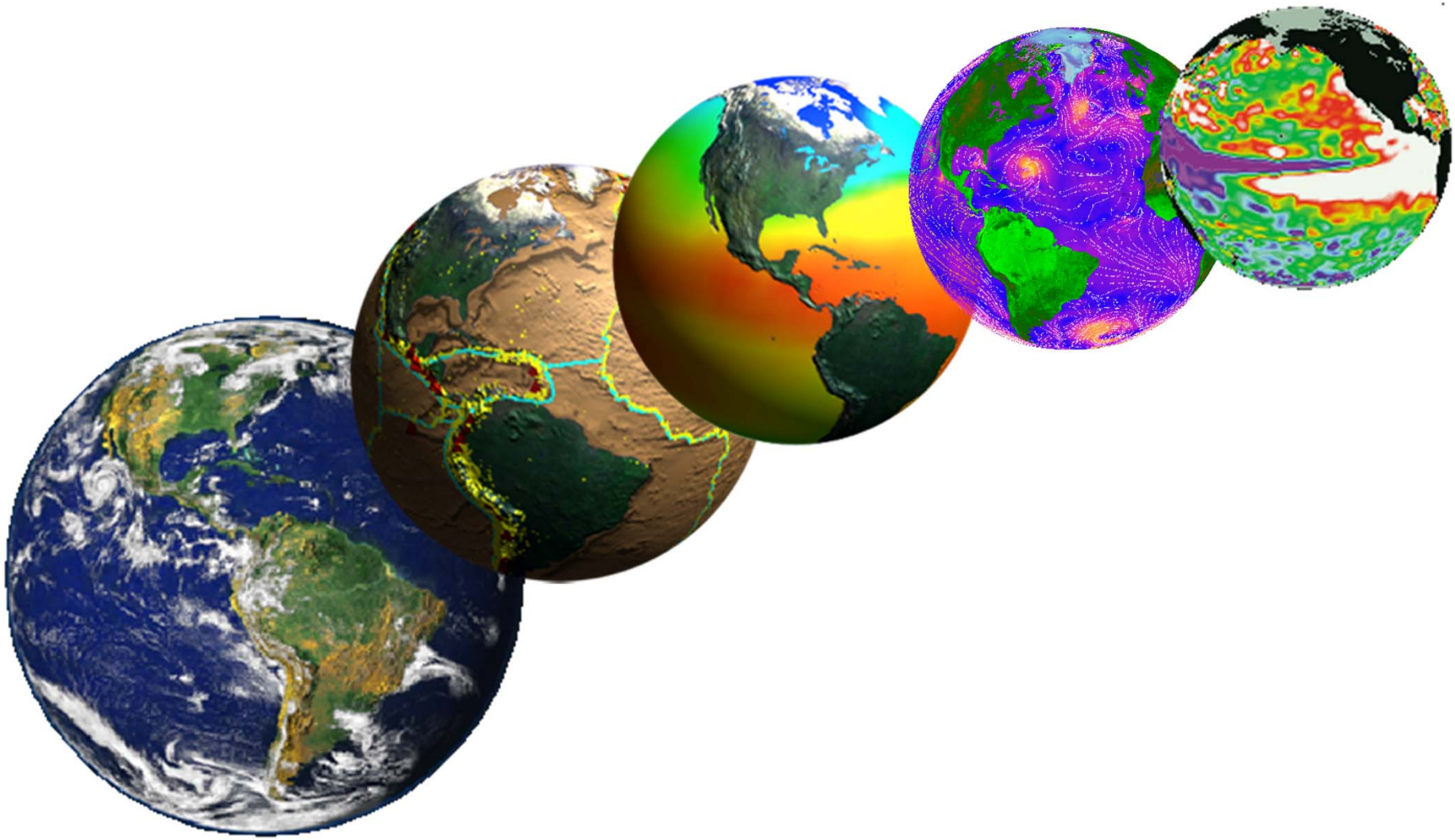
Why NASA?

Goal 3A: Study Earth from space to advance scientific understanding and meet societal needs



NASA Earth Science Missions
Current & Planned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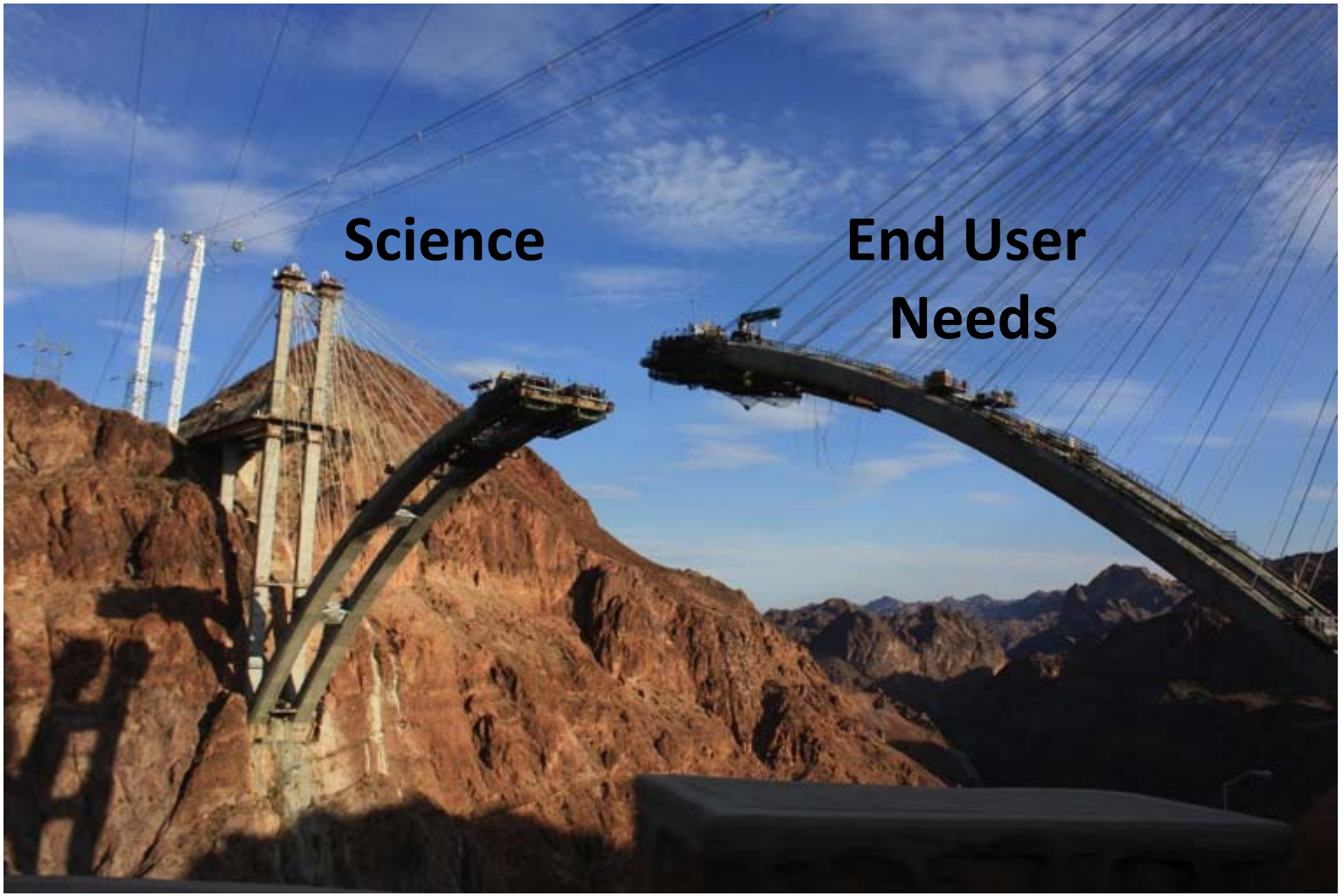
Bridging Science with End User Needs Through Applied Sciences



Courtesy: alifayre

Background – About SERVIR

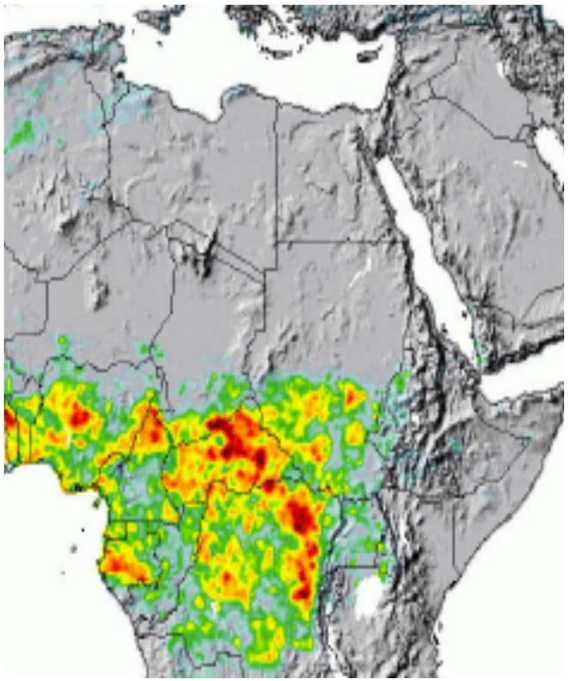
Goal: Improve environmental management and resilience to climate change

Objective: Strengthen capacity of government decision-makers and other key stakeholders to **integrate earth observation information and geospatial technologies into development decision-making**

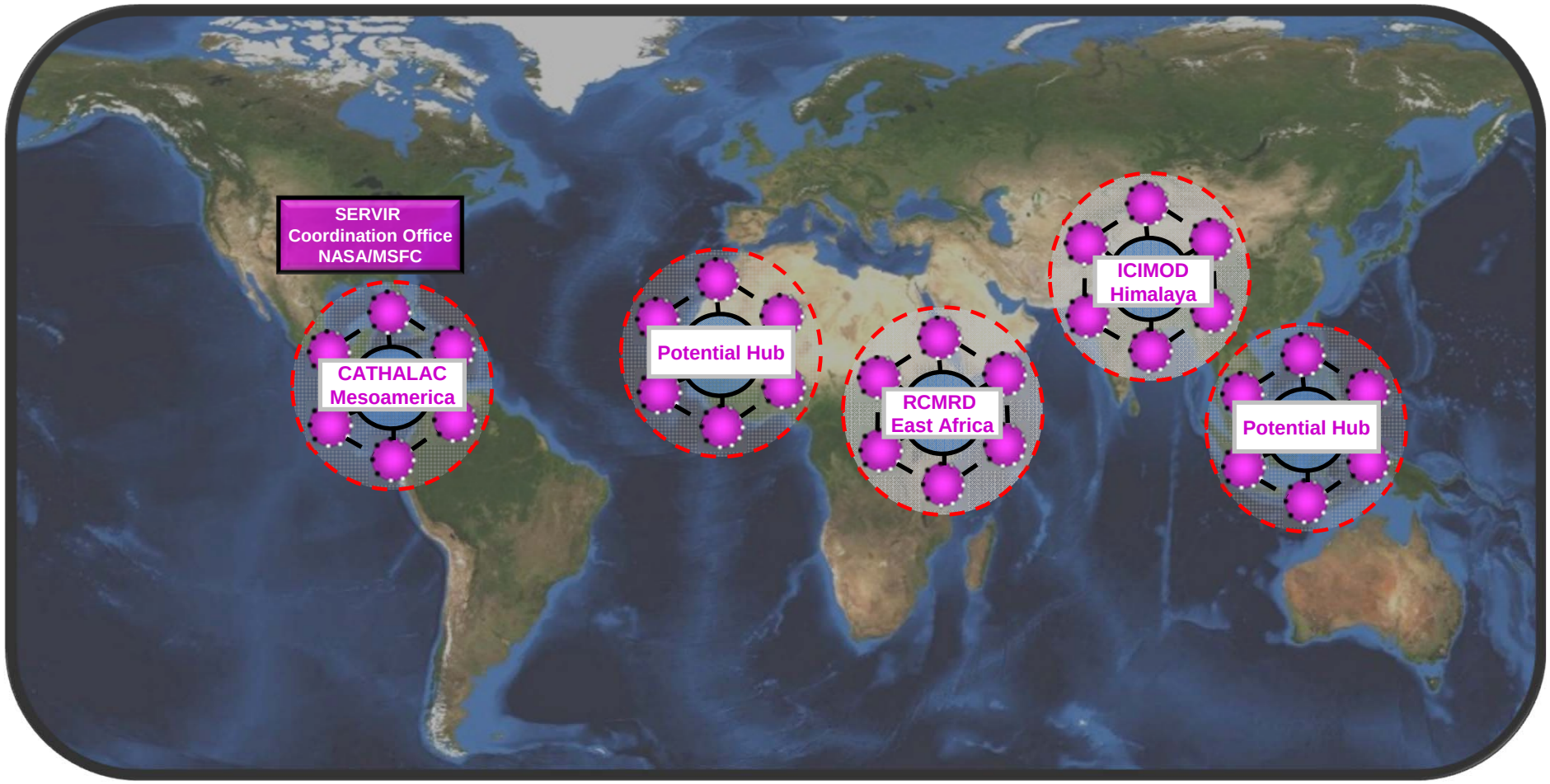
Approach: Leverage agency strengths for impact

Background – What We Do

- Strengthens the technical capacity of regional institutions, stakeholders, and youth
- Improves access to data, models, online maps, visualizations
- Creates user-tailored decision support tools and services
- Raises awareness of the value of user-tailored earth obs. information
- Builds partnerships



The SERVIR Network



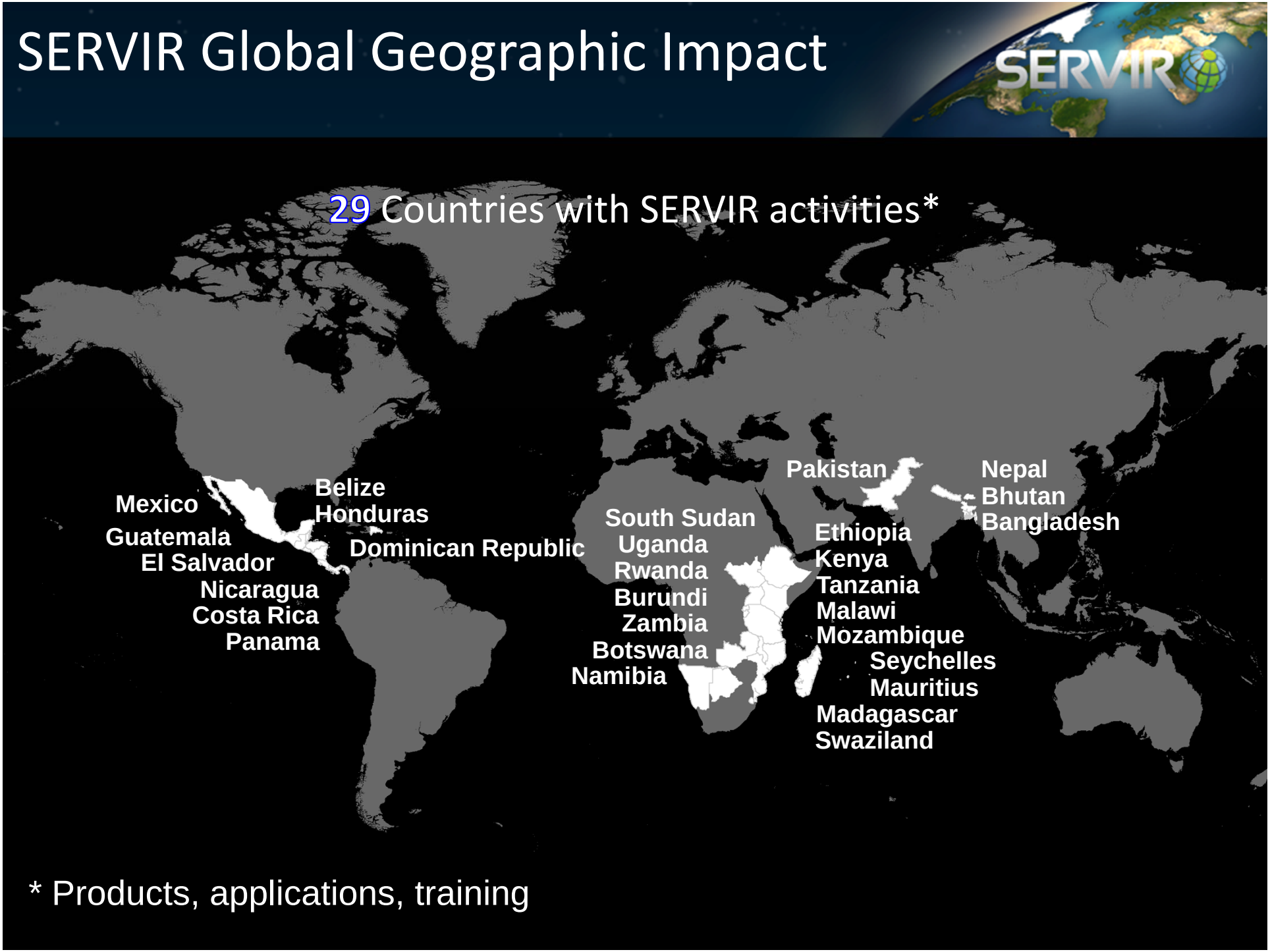
Background-SERVIR Components

- NASA
  - NASA Headquarters Program Management
  - SERVIR Coordination Office
  - SERVIR Applied Sciences Team
- USAID
  - USAID Washington Team
  - Mission AORs
  - Demand Team
- SERVIR Hubs
  - Mesoamerica
  - Africa
  - Hindu Kush Himalaya

SERVIR Applied Sciences Team

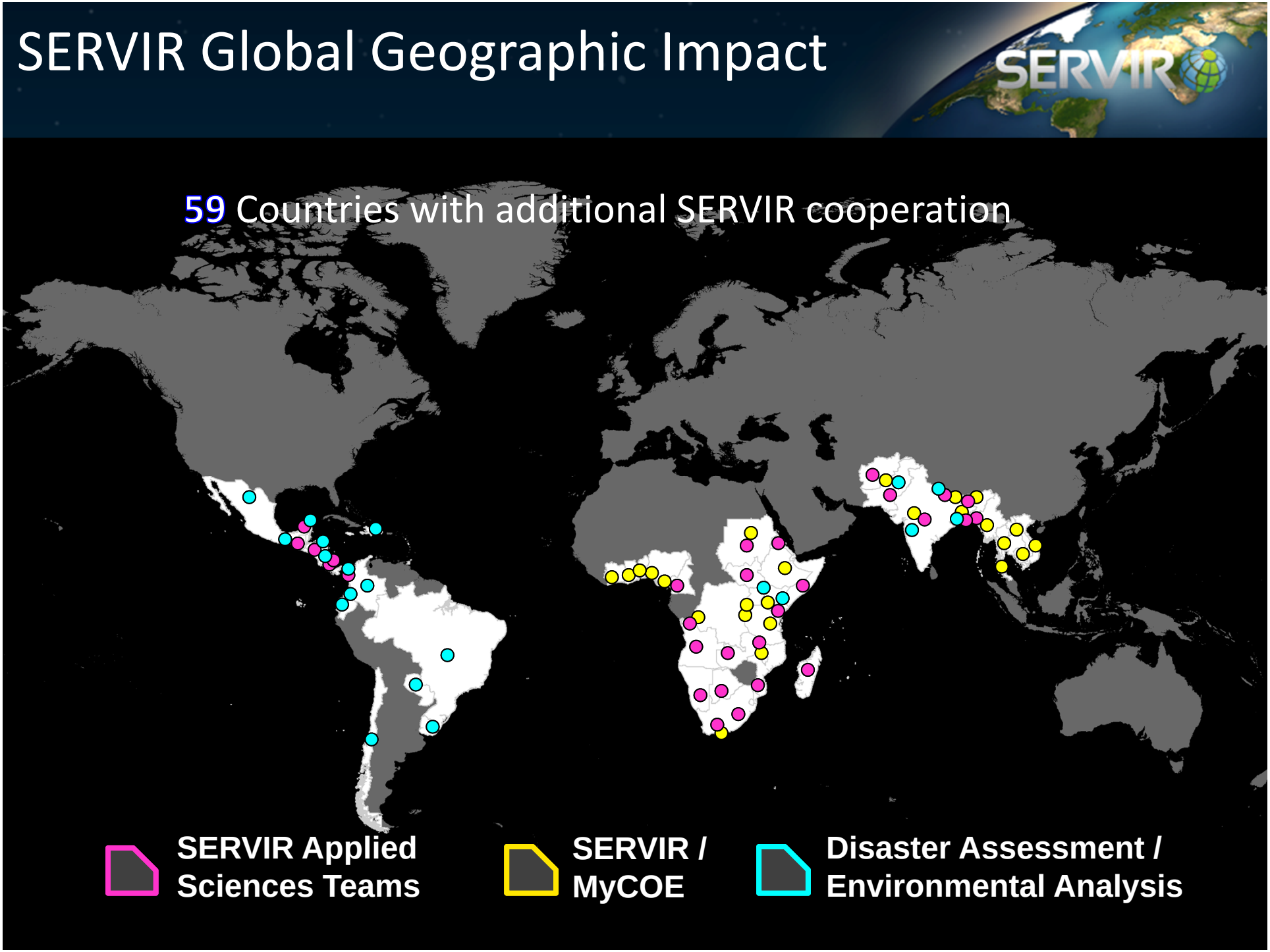
SERVIR team members from Hubs, USAID, NASA

SERVIR Global Geographic Impact

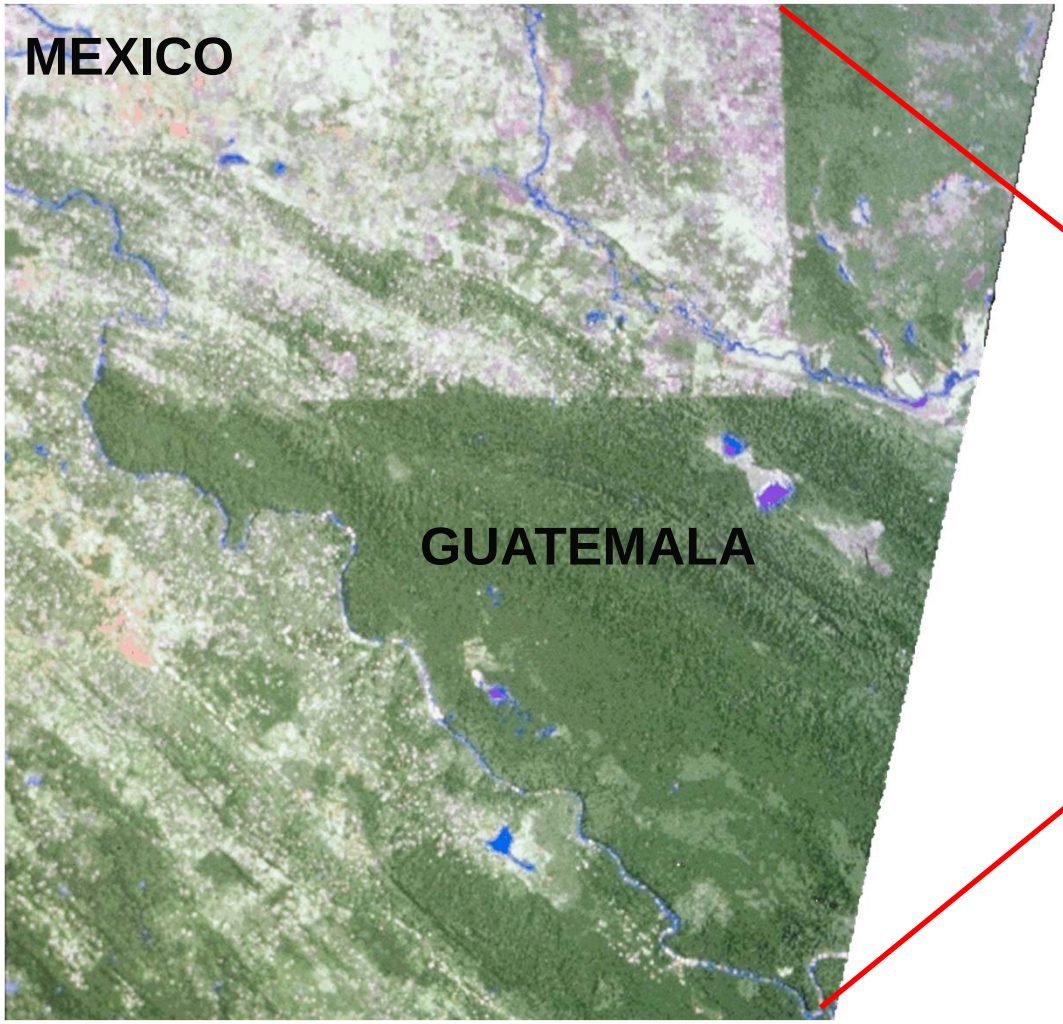


* Products, applications, training

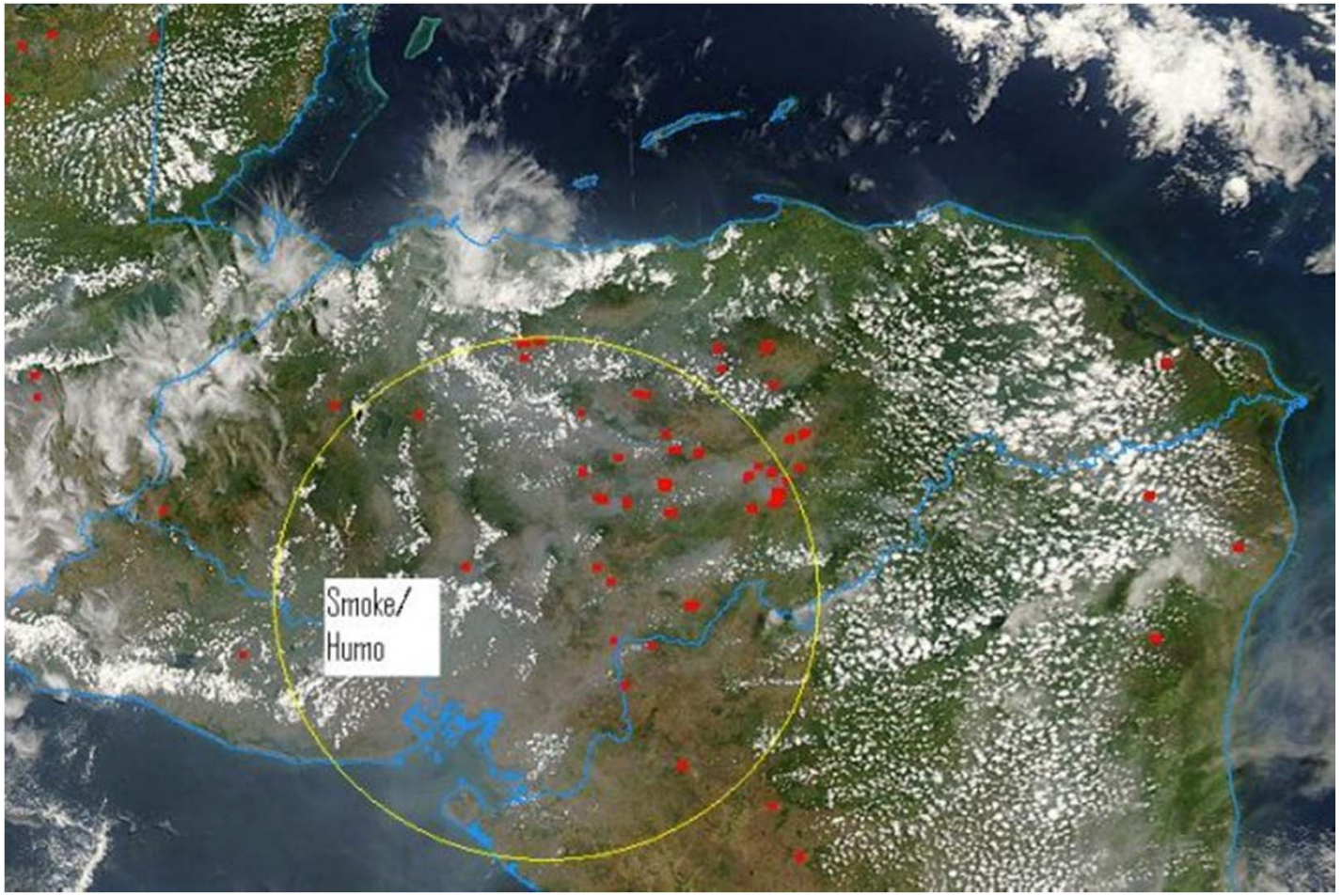
SERVIR Global Geographic Impact



International Boundary from Space: Landsat

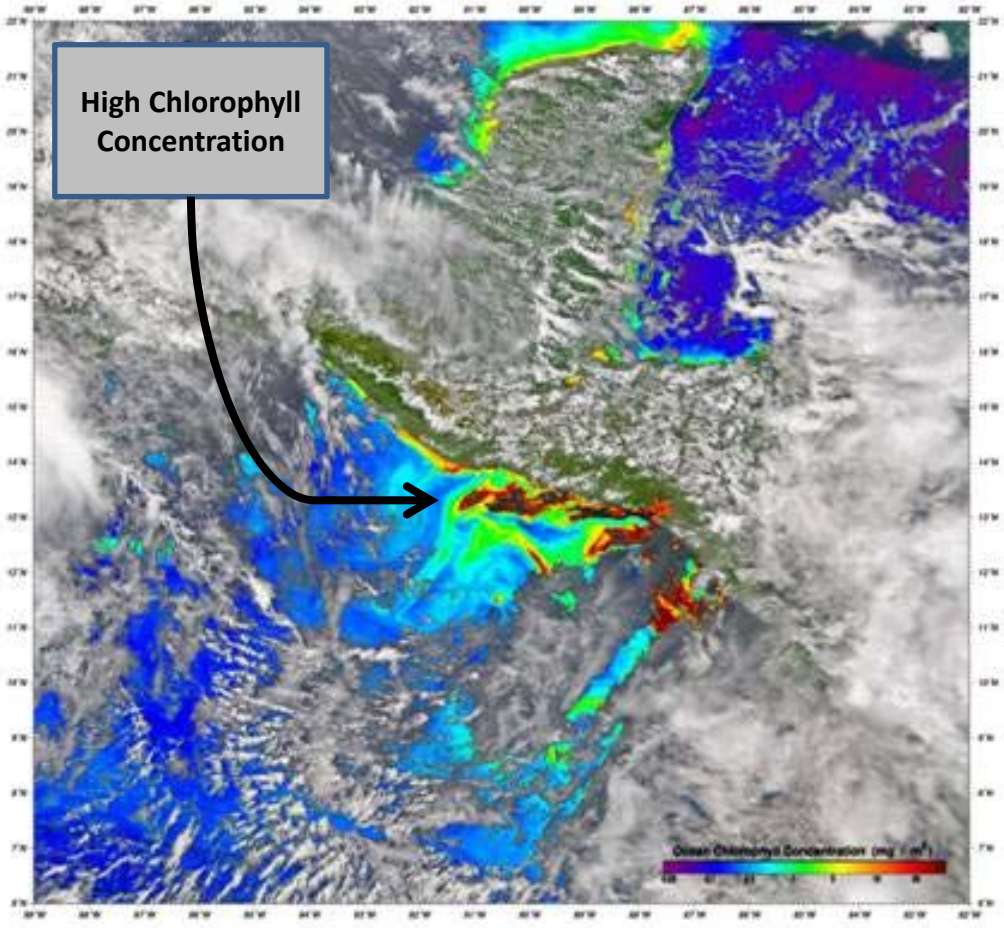


Fire Monitoring



Algal Blooms

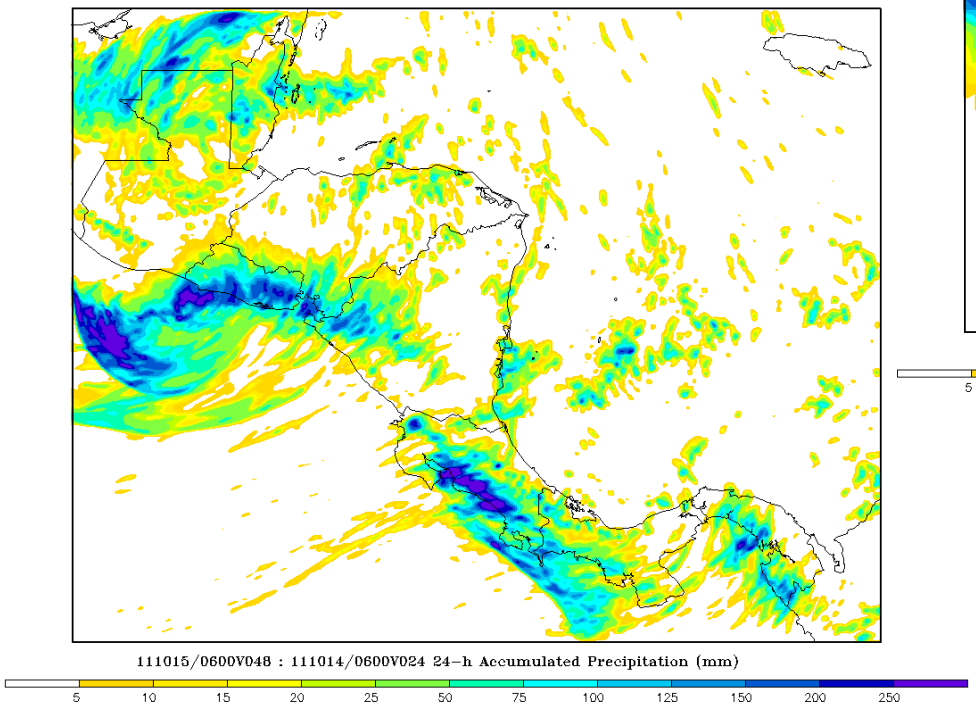
Monitoring of Harmful Algal Blooms (HAB) using remotely sensed data products for the coast of El Salvador

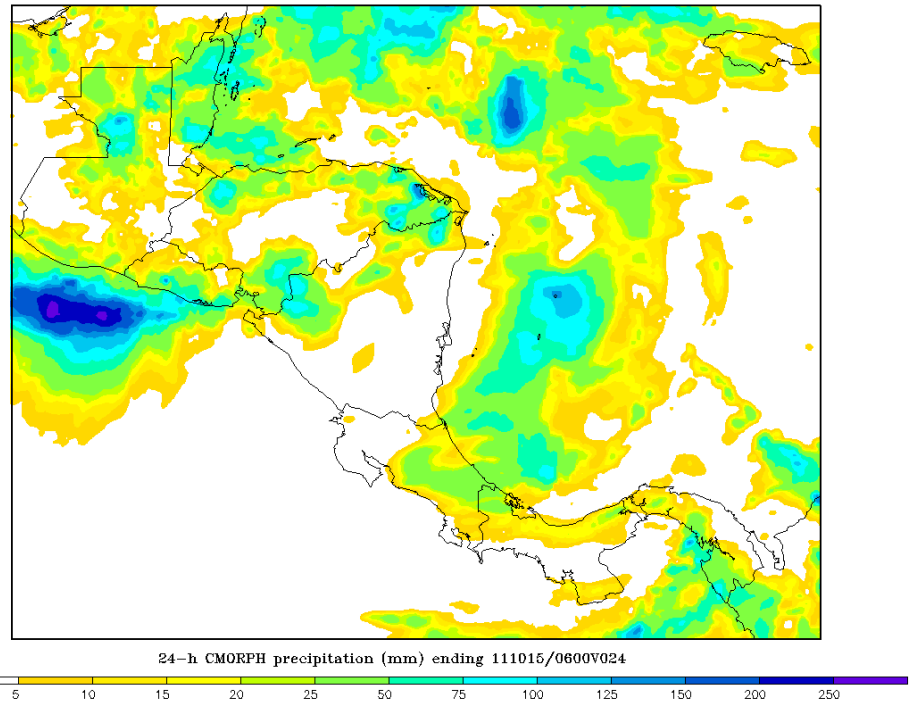


Improved Weather Forecasting for Extreme Events

Heavy Rainfall: 13 Oct 2011 WRF run
24-h accumulated precipitation ending 0600 UTC 15 Oct

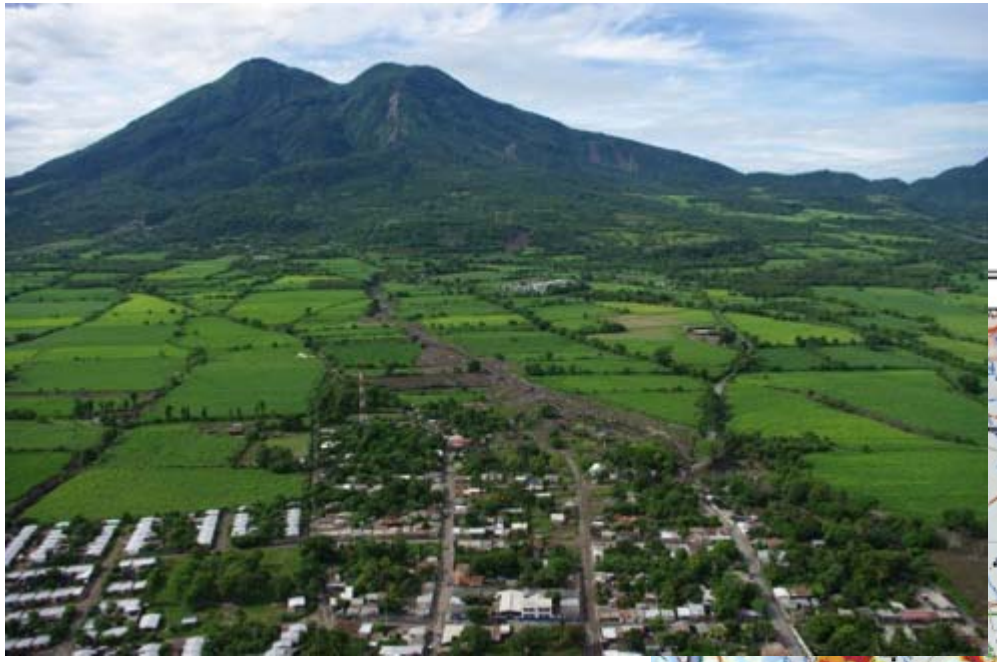
24-48 hour forecast (below)

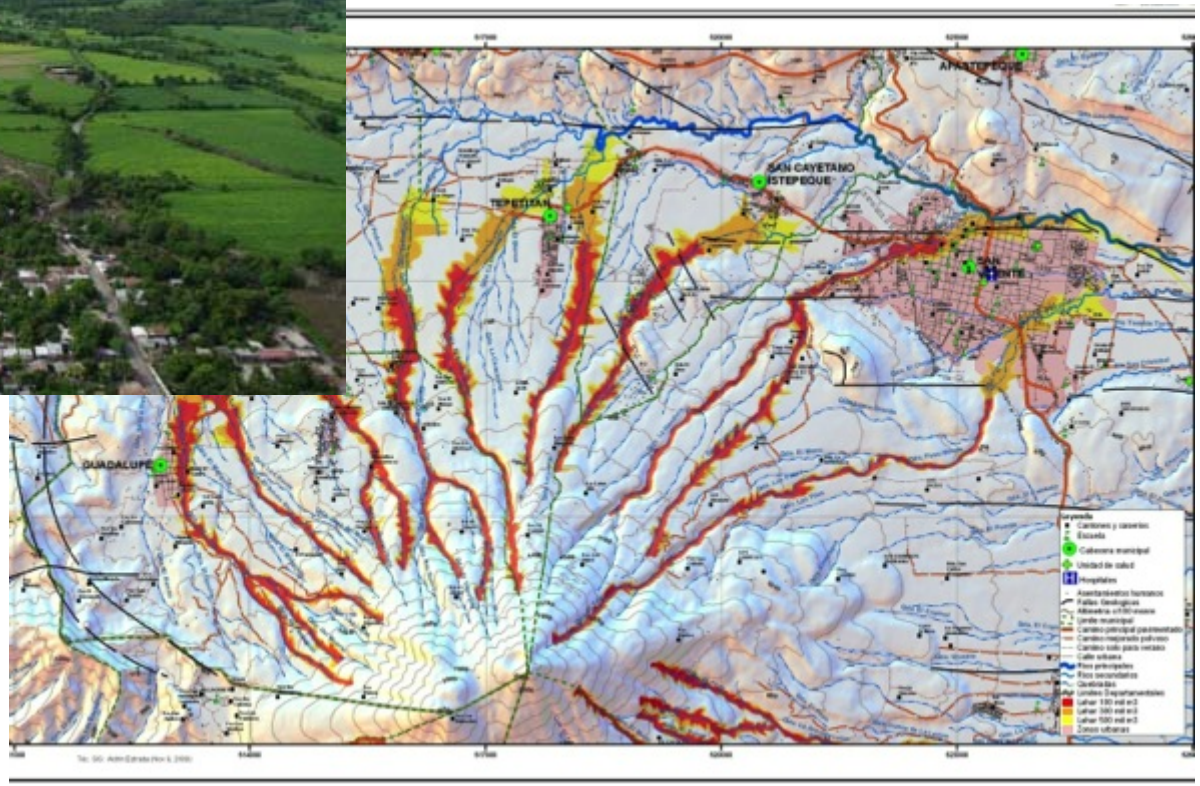




CMORPH satellite precipitation (above)

El Salvador Flooding and Debris Flow





E0-1
ASTER
IKONOS
FORMOSAT

November 2009

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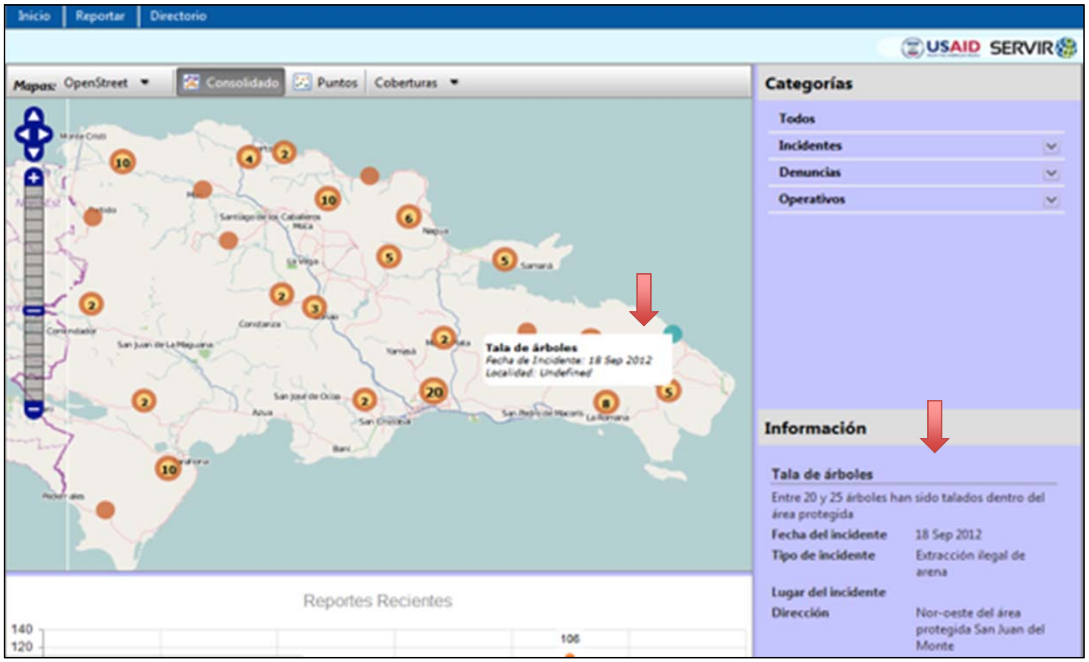
El Salvador Flooding and Debris Flow

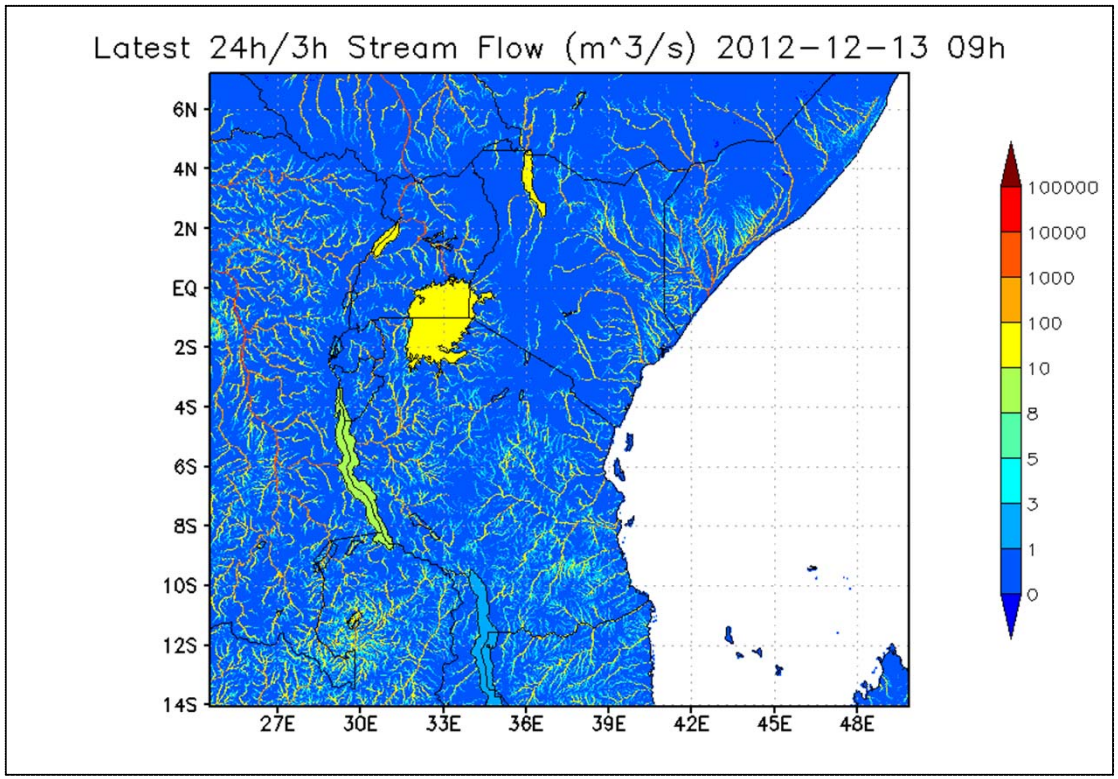
Environmental Complaints System Dominican Republic

Before

After



Hydrologic Modeling and Flood Forecasting



CREST real time stream conditions in East Africa

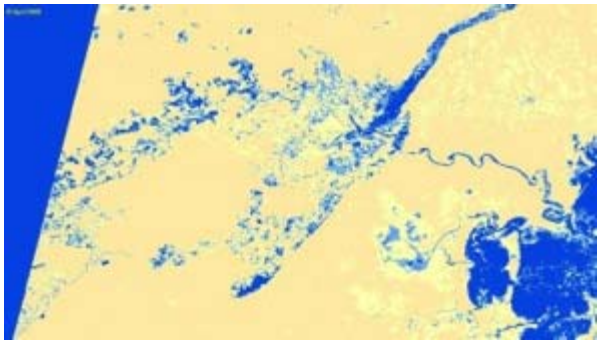
"The biggest problem we have is lack of data. When someone, like SERVIR-Africa comes along to help us out it is very good because we have been missing floods."

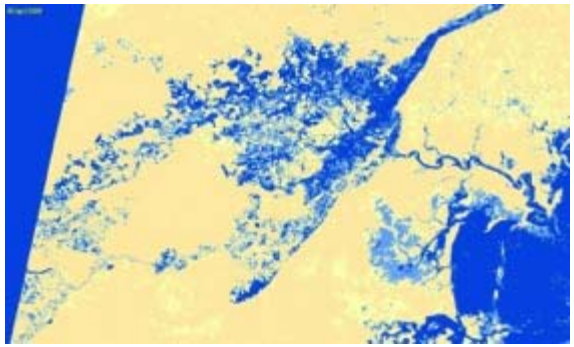
Simintei Kooke
Deputy Director of Water Resources,
Kenya Ministry of Water and Irrigation

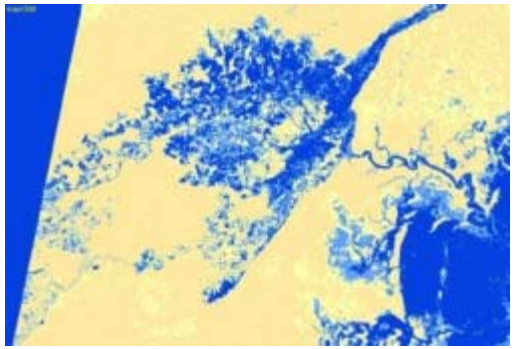
- SERVIR uses NASA's CREST hydrologic model, satellite data, and local information to provide streamflow and flood conditions throughout East Africa.
- Kenyan Government requested CREST monitoring of 850 high-risk locations in the country.
- Other countries in the region are now soliciting CREST training from NASA.

Mapping Floods in Africa

Lake Liambezi Area



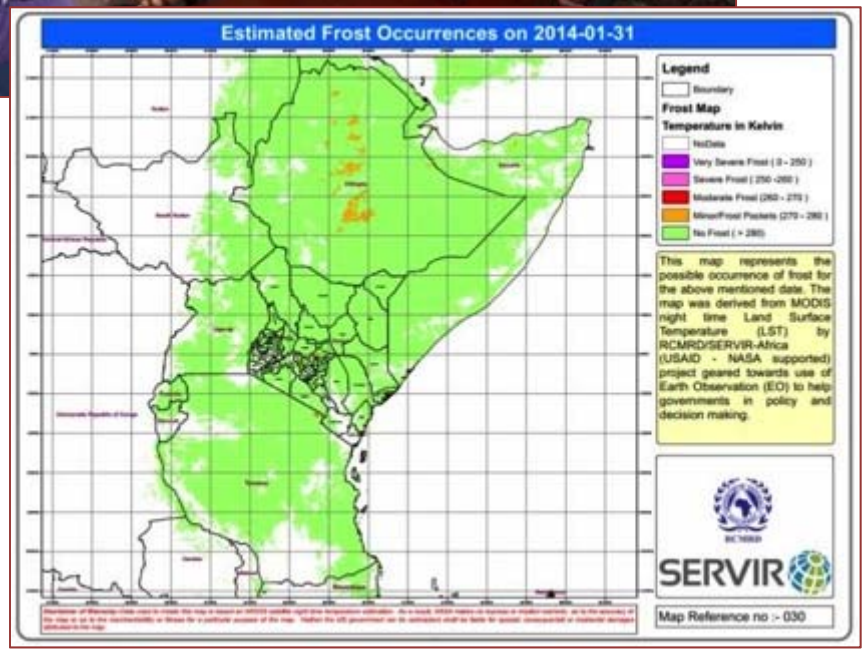




LAKE LIAMBEZI AREA – NASA EO1 BAND 6 SCENES FOR 01, 09 and 14 APRIL 2009

(false colours based on preliminary classification without ground verification)

Highlights: Frost Mapping



Problem: Frost can cause millions of dollars in damage to tea crops, which is a major industry in Kenya and provides a living for about 4 million persons. Farmers need to know where and when frost might occur.

What SERVIR did: SERVIR created an automated, near real-time frost mapping system using satellite and in-situ data. The system emails daily maps identifying areas with high potential for frost to Kenya Meteorological Service, the Tea Research Foundation of Kenya (TRFK), and others.

Results:

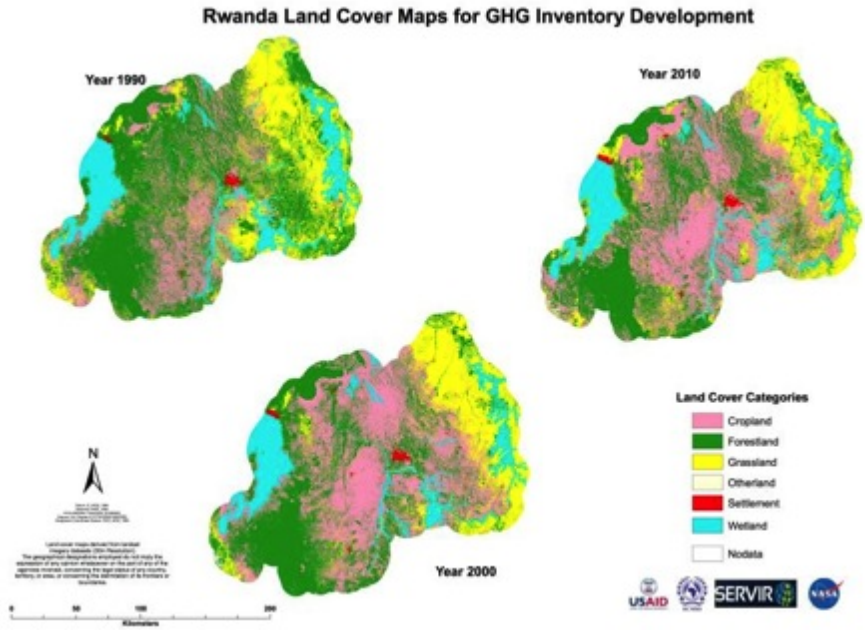
- Reduce crop losses by helping farmers avoid frost-prone times and select best locations for planting.
- With prior warning, farmers can pick tea leaves before frost or take other preventive measures.
- Help TRFK develop best practices. Tea farmers all over Kenya depend on TRFK for research for improvement.

Highlights: Land cover maps completed for all 6 targeted African countries

- **What was the problem?** Landcover change is the biggest contributor of greenhouse emissions in least developed nations. Six countries (Rwanda, Malawi, Zambia, Namibia, Botswana, and Tanzania) did not have harmonized land cover maps and GHG emissions inventory. USEPA is working in collaboration with UNFCCC to convert the land cover change into emissions inventory.

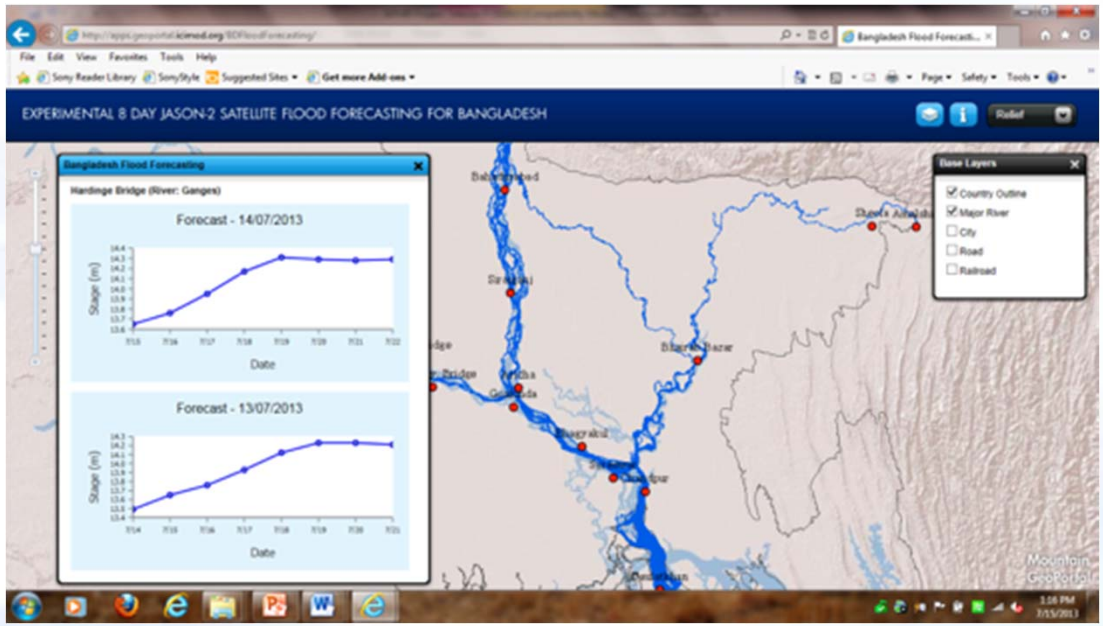
- **What specifically did we do?** SERVIR-Africa, working with the forest departments in those countries and in collaboration with USEPA, produced land cover maps in multiple time epochs to generate land cover change maps for use by the countries in their GHG emissions inventories.

- **What came of it?** Rwanda, Namibia, Zambia, and Botswana are using this data in their emissions inventories (with help from USEPA). They plan to do this exercise again for their next national communication. Zambia is creating the 1990 maps using the methods learned from SERVIR-Africa.



Highlights: Improved Flood Forecasting

- **Problem:** Bangladesh's severe flooding problems affect millions of residents. The Institute of Water Modeling (IWM) in Bangladesh generates flood forecasts just 3 days in advance – insufficient time for families and farmers to prepare.
- **What SERVIR did:** A SERVIR AST effort led by Dr. Faisal Hossain linked JASON-2 altimetry data to flood forecasts. SERVIR-HKH has helped IWM develop capacity to generate flood forecasts 8 days in advance using this near real time satellite data.



- **Results:** IWM generated experimental 8-day forecasts accurately representing river levels for the 2013 monsoon season. The Ministry of Water Resources will soon incorporate the 8-day forecasts in the official Bangladeshi forecasting system, providing160 million citizens with longer lead time for disaster preparedness.

Bangladesh Flash Flood Early Warning System Pilot

- Requested by the Center for Environmental and Geographical Information Systems (CEGIS), Bangladesh, and led by SERVIR-HKH, a Wireless Sensor Network (WSN) based flash flood early warning system was recently installed in Sunamganj, (north-eastern) Bangladesh
- System consists of 4 river level sensors along the length of the Jhalukhali river
- Warnings are sent out to the public via sirens that are part of the WSN system, along with SMS-based alerts sent to emergency managers
- CEGIS is working with the local community to take responsibility for and maintain the network

ISERV: The ISS / SERVIR Environmental Research and Visualization System

- Testbed SERVIR camera on the International Space Station
- Tasked by SERVIR Hubs
- 4m Spatial Resolution
- 14.5km x 10km field of view
- Visible Spectrum
- Operating since February 2013

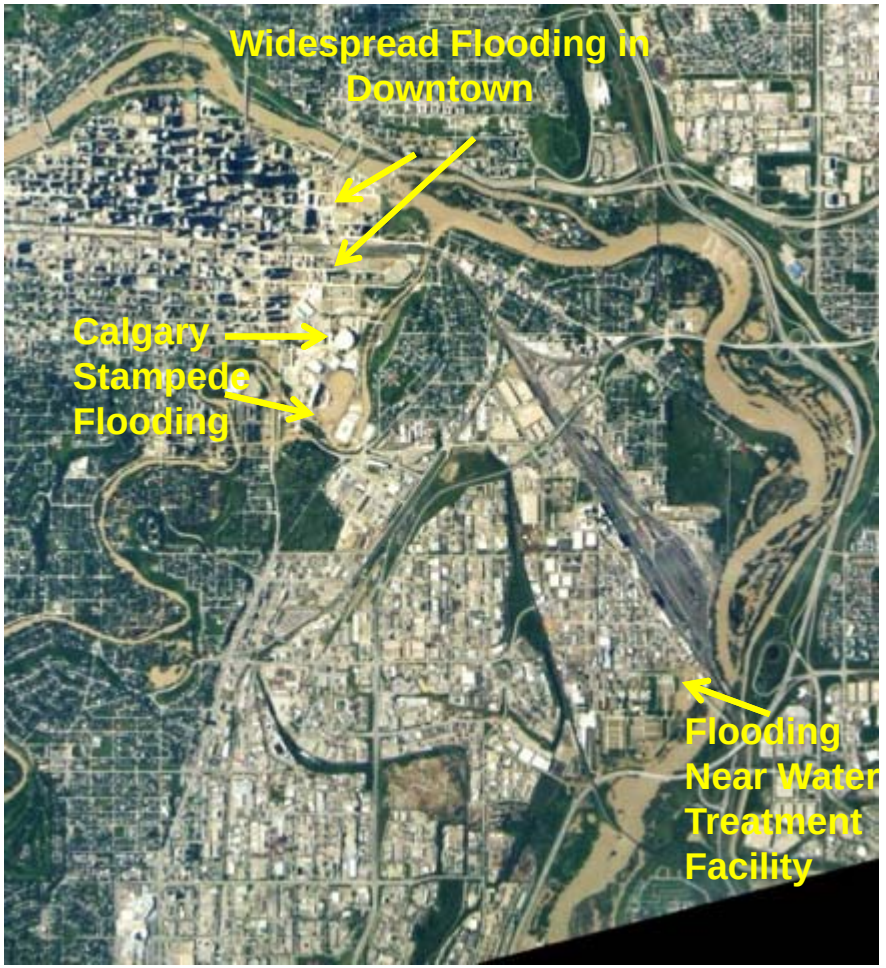
February 18, 2013: The Rio San Pablo in Veraguas, Panama, as it empties into the Golfo de Montijo

ISERV First Light

TELEDYNE BROWN ENGINEERING, INC.
A Teledyne Technologies Company

Calgary Pre-Flood/Post-Flood Comparison

Before flood: Google Earth Image
September 2008



After flood: NASA/ISERV Image
June 22, 2013

This image was taken by ISERV-- a new NASA-developed testbed camera onboard the International Space Station.

ISERV Imagery

Chile

Malawi

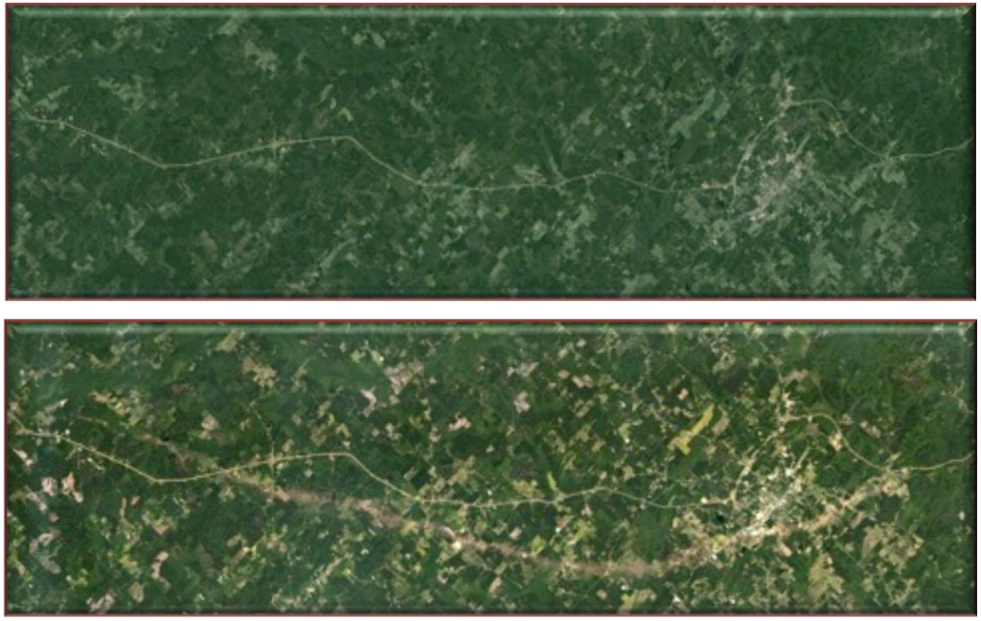
Sudan

San Francisco, USA

Flooding in Khor, Russia, and the Surrounding Area Along the Ussuri River

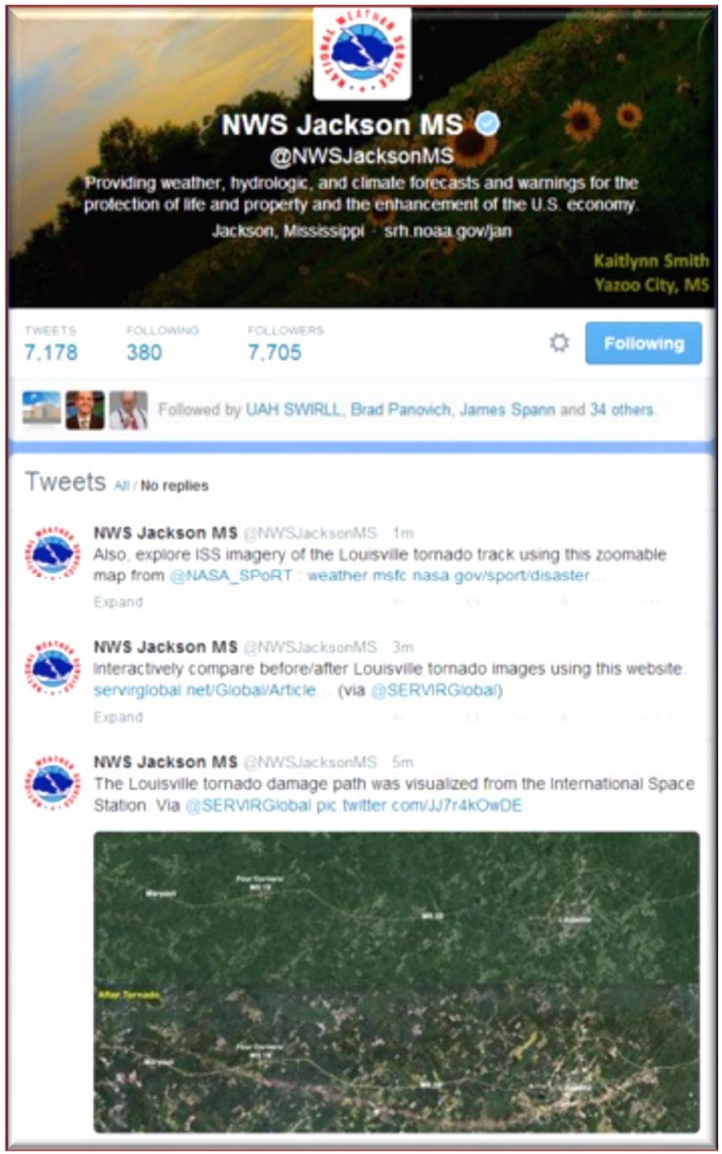
Before: ISERV, 8 Sept 2013
After: GeoEye 25 Aug. 2006

Highlights: ISERV



Above: On 4 May 2014, ISERV Team captured photos of scar left by EF-4 tornado in Louisville, Mississippi, 28 April 2014. The image above shows the region before (Landsat) and after (ISERV) the tornado.

At right: The National Weather Service Jackson MS office publicized the ISERV imagery via twitter.



Training the Next Generation of Leaders

USAID
FROM THE AMERICAN PEOPLE

NASA

Highlights: Young researchers from around the world find MyCOE / SERVIR Capstone event an inspiration

"In all of this, I have again gained firm conviction in my belief that significance is not by salary, sex or status; it is by serving others. It's always a good thing to serve others and it is my conclusion that we need more SERVIR initiatives to serve the world and eventually heal her." Capstone Fellow Wasiu Alimi, Nigeria

MyCOE / SERVIR Capstone Fellows from East Africa, the Hindu Kush-Himalaya region, West Africa, and Southeast Asia with NASA Administrator Charles Bolden