Lessons Learned from Successful Earth Science Research-to-Applications Efforts

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- two examples
- lessons learned
- conclusions

SPoRT

- Short-term Prediction Research and Transition (SPoRT) Center is a NASA project to transition unique observations and research capabilities to the operational weather community to improve short-term forecasts on a regional scale.
- Works hand-in-hand with NOAA National Weather Service
- http://weather.msfc.nasa.gov/sport/
- Dr. Brad Zavodsky - Head of SPoRT

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SPoRT Community Partnerships

Over 30 NWS WFOs and All Regional Headquarters

National Centers for Environmental Prediction

- Environmental Modeling Center
- National Hurricane Center
- Weather Prediction Center
- Ocean Prediction Center
- Aviation Weather Center
- Storm Prediction Center

Legend

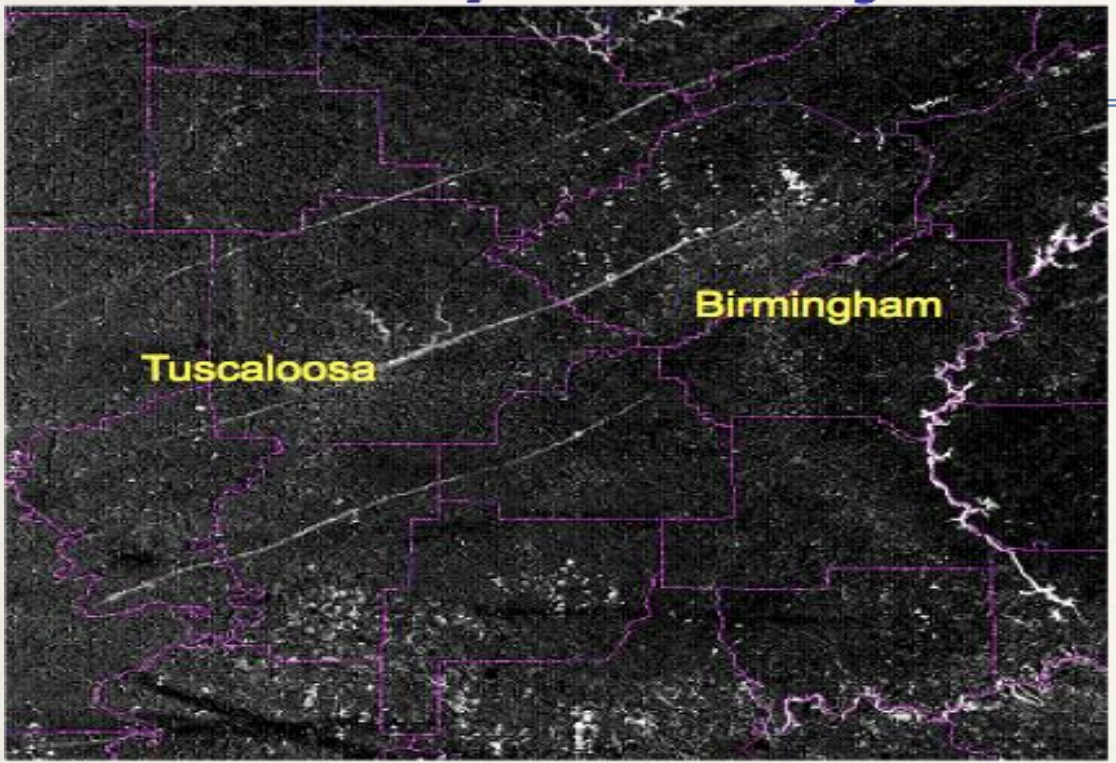
- Product Development Partner
- National Center Evaluation Partner
- NWS Regional Headquarters
- WFO Collaborative Partner
- Center Weather Service Unit
- RFC Collaborative Partner

NOAA Cooperative Institutes as Data Delivery and Product Development Partners

SPoRT collaborates with university partners to develop and distribute products to more than 30 partnering NWS WFOs and 5 National Centers, providing unique observation and modeling capabilities to support their daily forecasting operations.

MODIS Difference: Tornado Tracks

17 April - 4 May 2011



All damage tracks from EF3 and stronger tornados for the southeastern US outbreak are identifiable in the MODIS difference images.

The MSFC SPoRT project applied advanced processing techniques to "before" and "after" images to enhance visibility of tornado damage tracks.

250m visible channel data from MODIS passes on April 17 (Aqua) and May 4 (Terra) were differenced and processed to produce image on left (corresponding to coverage of RGB image in previous slide).

This imagery is currently being used by the NWS in Google Earth to assist in in damage assessment.

SPoRT

SERVIR is a joint development initiative of NASA and USAID, in partnership with leading regional organizations around the globe, to help developing countries use information provided by

Earth observing satellites and geospatial technologies to address

Food Security, Water and Disasters, Weather and Climate, and Land Use/ Land Cover Change.

SERVIR

- SERVIR—the Regional Visualization and Monitoring System—helps government officials, managers, scientists, researchers, students, and the general public make decisions by providing Earth observations and predictive models based on data from orbiting satellites.

- The SERVIR system helps nations in Mesoamerica, East Africa, the Himalayan and South Pacific regions, and soon Amazonia, cope with eight areas of societal benefit identified by the Group on Earth Observations (GEO): disasters, ecosystems, biodiversity, weather, water, climate, health, and agriculture.

- Dan Irwin - Head of SERVIR

SERVIR

- Decision makers use SERVIR to improve their ability to monitor air quality, extreme weather, biodiversity, and changes in land cover, and the system has been used over 35 times to respond to environmental threats such as wildfires, floods, landslides, and harmful algal blooms. In addition, SERVIR analyzes, provides information about, and offers adaptation strategies for nations affected by climate change. In a very real sense, SERVIR provides basic information for living on planet Earth.

- Works hand-in-hand and jointly funded with the State Department USAID program

- http://www.nasa.gov/mission_pages/servir/index.html

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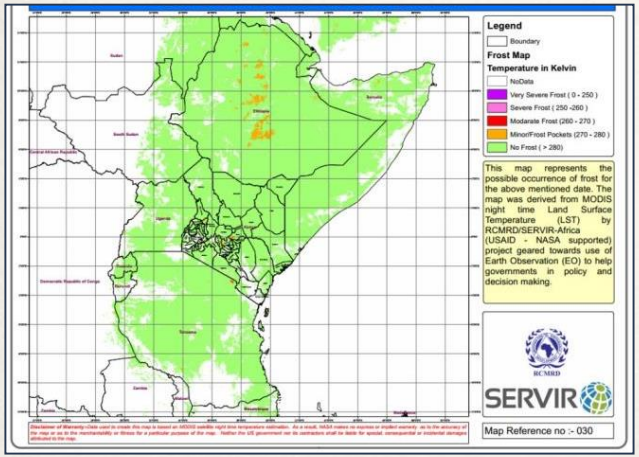
- Insurance companies in Kenya are using SERVIR-Eastern and Southern Africa's satellite-based product to cover frost damages and adjudicate claims. They also plan to disseminate SERVIR's new frost forecast to their policy holders so they can take preventive action, such as harvesting the tea leaves before the frost.

- Preemptive action by the average smallholder tea farmer (i.e., a one acre farm) cuts annual frost damage losses from $200 down to about $120. That $80 in loss prevention represents about 25 days of household food expenditure, or a full year of middle school tuition for one child.



SERVIR frost mapping product showing affected areas in Kenya

SERVIR team meeting with Kenyan tea farmers to understand mitigation options based on options from frost mapping product

Tea leaves affected by frost

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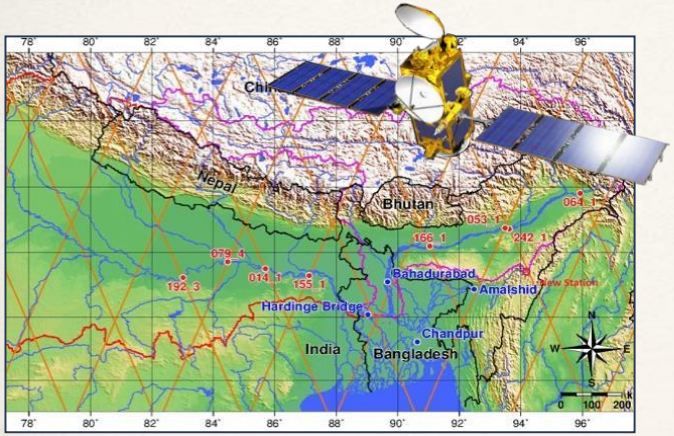
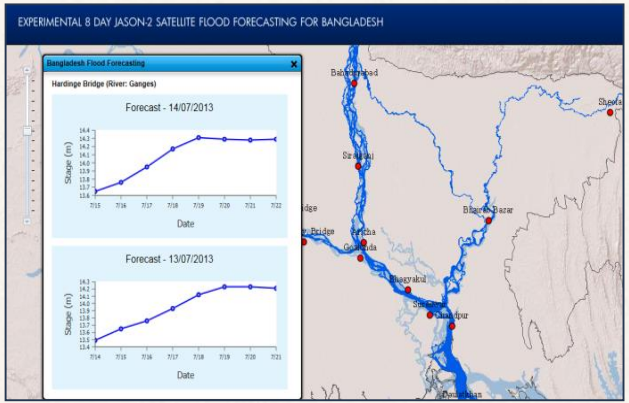
SERVIR developed an innovative satellite radar altimetry application to generate flood forecasts 8 days in advance, providing 160 million citizens with longer lead time to take action as compared to the existing 3-5 day forecast.



JASON-2 radar altimetry measures river water height



SERVIR flood forecasting system, currently used at the Bangladesh Flood Forecast and Warning Center


মধ্য আগস্টে আরেকটি বন্যার আশঙ্কা

আগস্টে দক্ষিণ ও পূর্ব এশিয়ার দেশগুলোতে ৫-১০% বেশি বৃষ্টি হবে। ইতিমধ্যে ভারত, নেপাল ও পাকিস্তানে এবার স্বাভাবিকের চেয়ে ১০-২০% বেশি বৃষ্টি হয়েছে

ভারত ও নেপালে এখন যে অতিবৃষ্টি ও বন্যা হচ্ছে, তার প্রভাব বাংলাদেশের ওপর দ্রুত পড়বে। ফলে আগস্টে বাংলাদেশে বড় বন্যার আশঙ্কা আছে

Flood warning and recognition of SERVIR in Bangladesh's largest newspaper "Prothom-alo"

In August 2014 and July 2016, the SERVIR warning system accurately predicted a large flood wave earlier than the government's standard operational system. SERVIR was applauded by the Bangladeshi government on national TV and in the newspaper.

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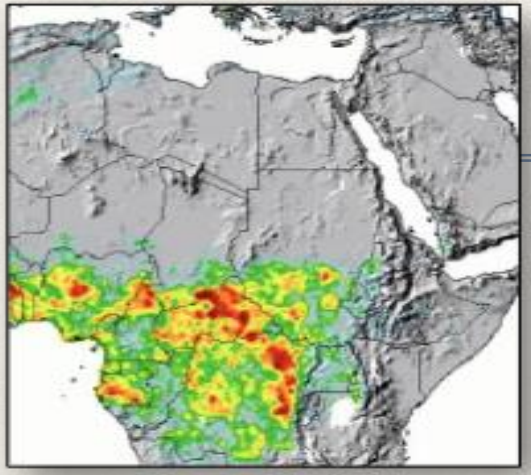
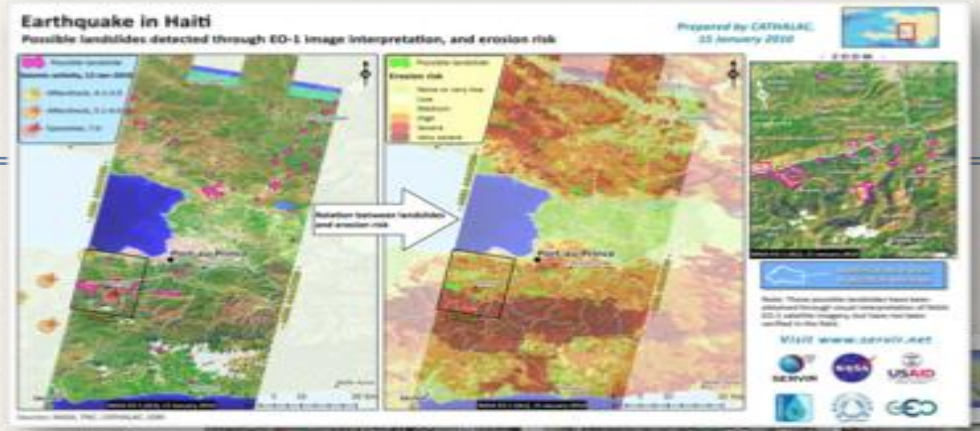


Flood Forecasting in Africa

Mapping Fires in Guatemala Mexico



Earthquake in Haiti

Lessons Learned

- Nothing happens overnight
- There has to be a commitment on both sides:
  - research/ operations
  - science/ applications
  - provider/ user
- Commitment must exist at all levels; from management down to implementer and user
- End-User engagement from the beginning is important

Lessons Learned

- The provider and user exist in very different cultures
  - Provider (researcher)
    - focuses on detail, perfection
    - how things work
    - scientific method
  - User
    - just want it to work
    - doesn’t care about some of the details
- The researcher must live in the user world long enough to understand it - not the other way around

Lessons Learned

- Clearly identify the needs and requirements
- Reassess needs and requirements on a frequent and regular basis
- Identify conditions of satisfaction for the end user
- Involve the user in the entire process
- The user must have some investment in the product in order for them to eventually own it

Lessons Learned

- Need to have this conversation with the end user early in process:
  - How to get data - not the provider choice, must be accessible
  - When do they need it - frequency of update, prediction parameters
  - What format do they use - not the provider choice
  - How is the data used by end user - not how the provider uses it

Lessons Learned

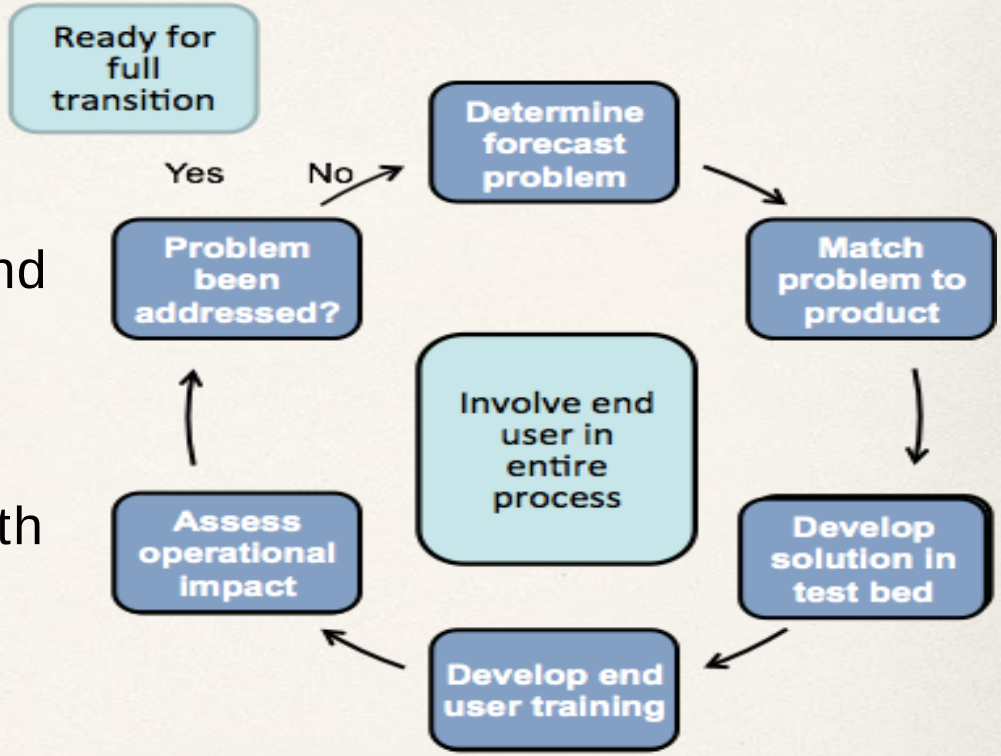
- Just because we (i.e. researchers) have provided a great product, the user will adjust to it - NOT
- User frequently does not have the resources to receive and ingest the product
- In the cases of SERVIR and SPoRT, USAID and NWS provide capacity to the receiver to ingest the product
- Develop a strong advocate in the user world - they will help convince the users to buy into the product

Lessons Learned

- Must develop trusted relationships because the user will not appreciate all that you have to offer
- Recognize and understand the difference between research, building tools, and transition process
- Include training and building capacity in the transition process

SPoRT paradigm

- match forecast challenge to data/ product
- develop solution / demonstrate in ”test bed” environment
- integrate successful products into end user’s decision support tools
- create product training
- perform product assessment
- Maintain interactive partnership with end user throughout process
- Need local end user advocate for product
- Endorsement from all levels of end user organization



Lessons Learned

- Marketing - getting the word out
  - Need some early success stories
  - Demonstrate how the user benefits - economic impact is the key
  - Invest in resources to properly tell the story, demonstrate the value
  - Team up with experts - don’t try to do this yourself

Conclusion

- We have a lot to learn from our Earth Science colleagues
- They have been at this much longer than we have
- But we have a future
- This is an area of growth in the discipline because it brings a new dimension, an applied dimension
- Transitioning must be intentional and be able to stand on its own