ARSET
Applied Remote Sensing Training
http://arset.gsfc.nasa.gov
@NASAARSET

NASA Remote Sensing Applications for Flood Monitoring and Management

April 18-20, 2017

Training Team

Organizer: ARSET

Amita Mehta and Erika Podest (Instructors)

Brock Blevins

Elizabeth Hook

Jessica Fayne

Host: Dewberry

Mathini Sreetharan

Seth Lawler

Course Objectives

By the end of the training, you will be able to:

- Analyze remote sensing data and use flood mapping web tools for flood management, including:
  - flood monitoring, warning, and planning relief activities
- In support of flood management strategies, access data on
  - past and current flood extent and intensity
  - rainfall and soil moisture data, Synthetic Aperture Data (SAR) data
  - terrain data
  - socioeconomic data

NASA Analyzes Deadly Louisiana Flooding

Record-setting rainfall and flooding in southern Louisiana have been calculated at NASA with data from satellites.

An extremely severe rainfall event hit the states of Louisiana and southern Mississippi when a very slow moving low pressure system continuously pulled tropical moisture from the Gulf of Mexico.
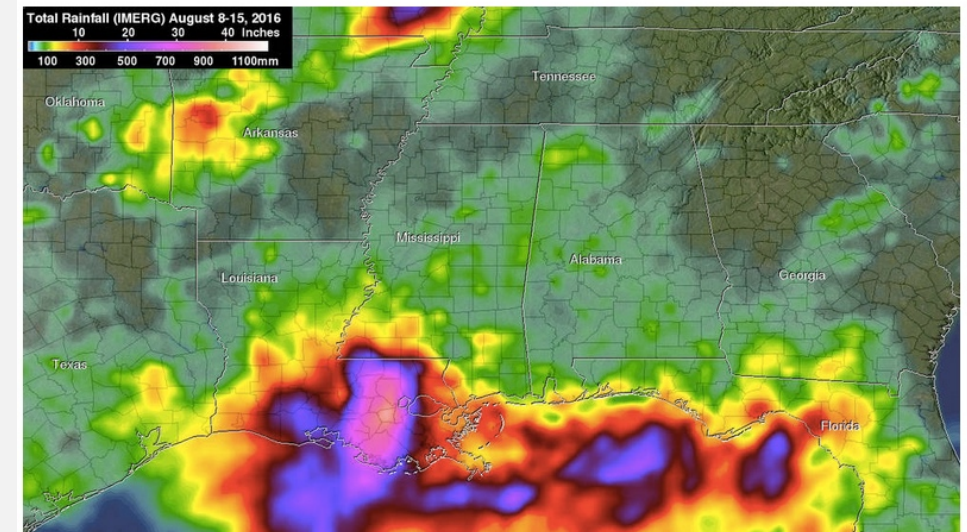
NASA's IMERG data from Aug. 8 to Aug. 15, 2016 showed over 20 inches (508 mm) of rainfall was estimated in large areas of southeastern Louisiana and extreme southern Mississippi. Even greater rainfall totals of 30 inches (762 mm) were indicated in a small area of Louisiana west of Lake Pontchartrain.
Credits: NASA/JAXA, Hal Pierce

Presentation Outline

- About ARSET

- Training Overview

- Training Agenda

Applied Remote Sensing Training (ARSET)
http://arset.gsfc.nasa.gov

NASA's Applied Remote Sensing Training Program (ARSET)

http://arset.gsfc.nasa.gov/

- Empowering the global community through remote sensing training

- Part of NASA's Applied Sciences Capacity Building Program

- Goal: increase the use of Earth Science in decision-making through training for:
  - policy makers
  - environmental managers
  - other professionals in the public and private sector

- Trainings offered focusing on applications in:

Disasters   Ecosystems   Health & Air Quality   Water Resources

ARSET Team

GSFC: 9; ARC: 3; JPL: 2; MSFC: 1; Consultant: 1

Program Support

Ana Prados, Program Manager (GSFC)

Brock Blevins, Training Coordinator (GSFC)

David Barbado, Spanish Translator (GSFC)

Annelise Carleton-Hug, Program Evaluator (Consultant)

Bryan Duncan, Program Support (GSFC)

Elizabeth Hook, Technical Writer/Editor (GSFC)

Marines Martins, Project Support (GSFC)

Acknowledgement:
We wish to thank Nancy Searby for her continued support

Disasters & Water Resources

Tim Stough, Lead (JPL)

Amita Mehta, (GSFC)

Erika Podest, Instructor (JPL)

Land & Wildfires

Cynthia Schmidt, Lead (ARC)

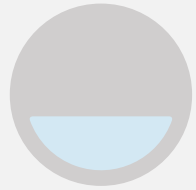Amber Jean McCullum, Instructor (ARC)

Sherry Palacios, Instructor (ARC)

Health & Air Quality

Pawan Gupta, Air Quality Lead (GSFC)

Melanie Cook, Instructor (GSFC)

Sue Estes, Health Lead (MSFC)

ARSET Training Levels

Fundamentals

Level 0

Basic Trainings

Level 1

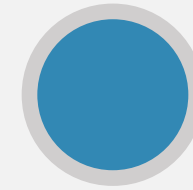**Advanced Trainings**

Level 2

- Online only
- Assumes no prior knowledge of remote sensing
- Examples:
  - *Fundamentals of Remote Sensing*
  - *Satellites, Sensors, Data, and Tools for Land Management & Wildfire Applications*

- Online and in-person
- Requires level 0 training or equivalent knowledge
- Specific applications
- Example:
  - *Remote Sensing of Forest Cover & Change Assessment for Carbon Monitoring*

- Online and in-person
- Requires level 1 training or equivalent knowledge
- More in-depth or focused topics
- Example:
  - *Advanced Webinar: Land Cover Classification with Satellite Data*

ARSET Training Formats

Online

- Available live & recorded
- Typically 1 hr session, 1 per week, over 4-6 weeks
- Available at all training levels:
  – Fundamentals of Remote Sensing
  – Introductory
  – Advanced

In-Person

- 2-7 days in length
- Held in a computer lab
- Mixture of lectures and exercises
- Locally relevant case studies
- Available levels:
  – Introductory
  – Advanced

Train the Trainers

- Trainings and materials
- Offered online & in-person
- For organizers seeking to develop their own applied remote sensing training programs

ARSET Trainings

8,000+
participants

160+
countries

2,600+
organizations

38 online trainings   45 in-person trainings

Disasters
7 trainings

Ecosystems
10 trainings
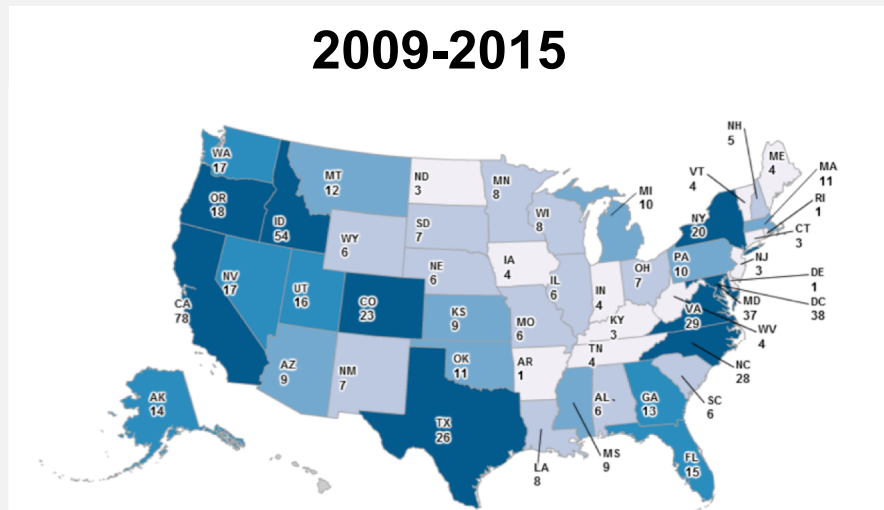
Health & Air Quality
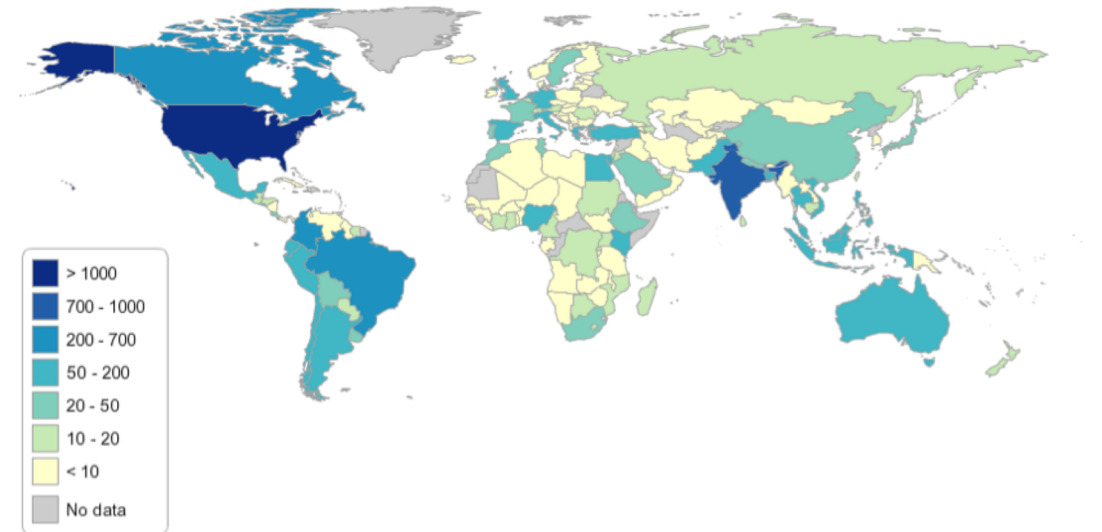48 trainings

Water Resources
14 trainings

Train the Trainers
1 training

ARSET's Global Footprint

- 83 trainings
- 8,000+ participants
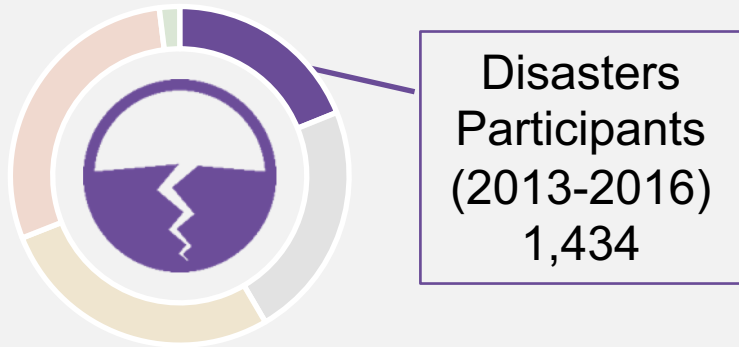- 2,600+ organizations
- 160+ countries
- All 50 U.S. States

2009-2015

ARSET Participants by Country
2009 – 2016

ARSET Disaster Training Impact (2013-2016)

All ARSET Participants (2009-2016): 8,348

Disasters Participants (2013-2016) 1,434
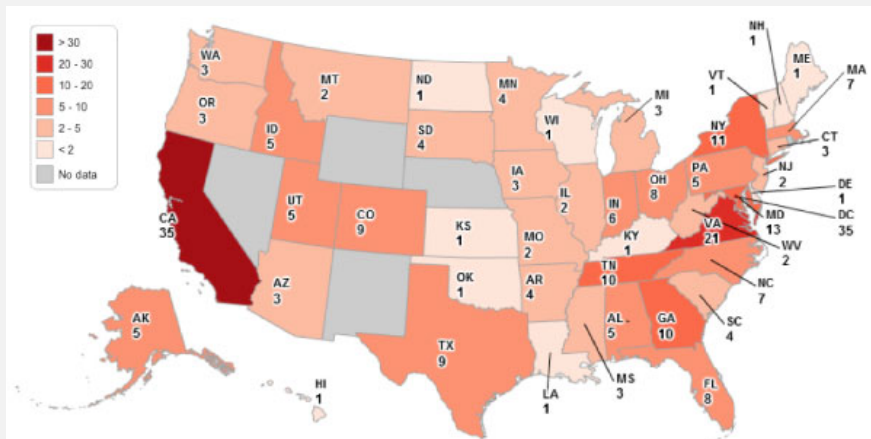
5 online trainings

2 in-person trainings

772 organizations
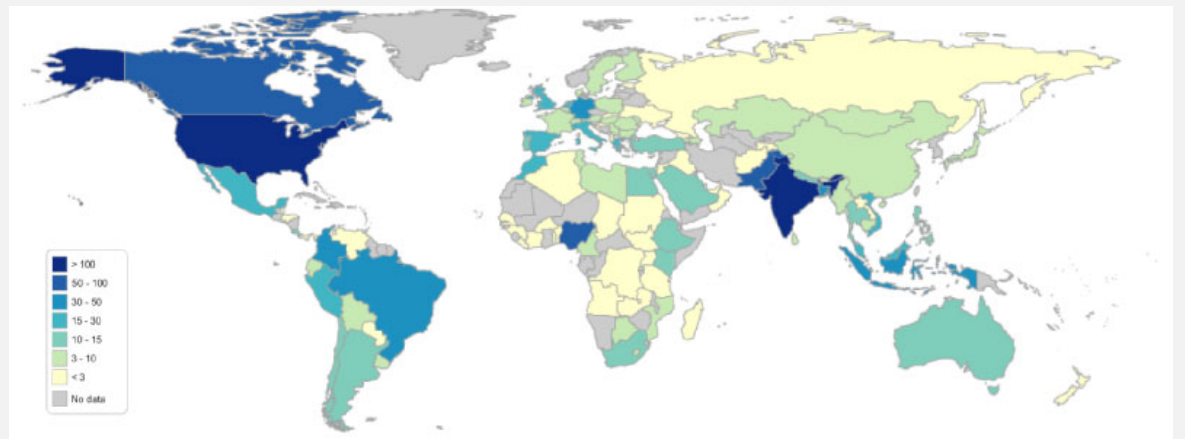
119 countries

Disasters Participants by U.S. State (2013-2016)

Disasters Participants by Country (2014-2016)

ARSET Website

http://arset.gsfc.nasa.gov/

- Keep updated by signing up for the ARSET listserv: https://lists.nasa.gov/mailman/listinfo/arset
- Get information about ongoing and upcoming trainings
- View training material, watch webinar recordings

Training Overview and Agenda

Training Overview

The ultimate aim of this training is to present two different types of flood detection and mapping tools, and relevant remote sensing data useful for flood management.

Flood Tools:

1. **Based on rainfall information**
   – Statistical models for flood detection use past rainfall information
   – Physical models (hydrology and routing) use rainfall, land cover, soil moisture, terrain, and weather information

2. **Based on land surface observations**
   – Surface characteristics (reflectance and emissivity) change when previously dry surface is inundated

Training Outline

Day	Topic	Application
Day 1 April 18, 2017	Precipitation	• Flood warning and monitoring by tracking precipitation systems • For hydrology model input
	Digital Elevation	• Identification of low-lying areas • Hydrological routing of flood water
Day 2 April 19, 2017	Soil Moisture	• Flood modeling
	Synthetic Aperture Radar Data Information	• Flood monitoring and mapping • identification of post-flood water logged areas

Day 3 April 20, 2017	Flood Tools and Socioeconomic Data	• Flood Management Activities
		  • Monitoring streamflow and Surface inundation
		  • Assessing population and infrastructure under flooding

Training Agenda

Day	Topic	Data Access and Flooding Tools
Day 1 April 18, 2017	Precipitation	• PPS STORM • Giovanni • Mirador
	Digital Elevation	• GDEx • QGIS and Python
Day 2 April 19, 2017	Soil Moisture	• NSIDC
	Synthetic Aperture Radar Data Information	• ASF
Day 3 April 20, 2017	Flood Tools and Socioeconomic Data	• GFMS • MODIS-NRT • ERDS • GDACS • SEDAC

Training Outline: Flooding Tools

GFMS	Global Flood Monitoring System
MODIS-NRT	Moderate Resolution Imaging Spectroradiometer Near Real-Time Inundation Mapping
GDACS-GFDS	Global Disasters Alert and Coordination System-Global Flood Detection System
DFO	Dartmouth Flood Observatory
ERDS	Extreme Rainfall Detection System

Training Agenda: Data Access Tools

PPS	Precipitation processing System
Giovanni	Geospatial Interactive Online Visualization ANd aNalysis Infrastructure
GDEx	Global Data Explorer
QGIS	Quantum Geographic Information System
NSIDC	National Snow and Ice Data Center
ASF	Alaska SAR (Synthetic Aperture Radar) Facility
SEDAC	Socio-Economic Data and Applications Center

Training Agenda: Flood Case Studies

- This training will focus primarily on two case studies:

  1. Flooding in California, January 2017 (Pineapple Express!)

  2. Flooding in North Carolina, October 2016 (Hurricane Matthew)

- There will be an opportunity to analyze a flood case of your choice on Day 3

Training Agenda for 18 April 2017 : Session 1A

Time	Title and Topics	Type	Person
8:30-9:00	Introduction	Presentation	Mike Walsh
9:00-9:30	Applied Sciences Program on Disaster Management	Presentation	John Murray
9:30-9:45	About ARSET, Training Outline	Presentation	Amita Mehta
9:45-10:30	Overview of TRMM and GPM Precipitation Data	Presentation	Amita Mehta
10:30-10:45	Break		
10:45-12:30	Install and test QGIS; Precipitation data access & analysis in QGIS	Exercise	Amita Mehta, Erika Podest, & Jessica Fayne
12:30-1:30	Lunch Break		

Training Agenda for 18 April 2017 : Session 1B

Time	Title and Topics	Type	Person
1:30-2:00	Overview of DEM from the Shuttle Radar Topography Mission and ASTER	Presentation	Amita Mehta
2:00-2:15	Data Access Tools: GDEX CGIAR	Demonstration	Amita Mehta
2:15-3:00	Install & Test Python, Extract Precipitation Data Using Python Script	Exercise	Jessica Fayne, Amita Mehta, & Erika Podest
3:00-3:15	Break	Break	
3:15-3:45			
3:45-5:00	Terrain and Slope Data; Analysis of precipitation and DEM data	Exercise	Amita Mehta, Jessica Fayne, & Erika Podest

Next: Remote Sensing of Precipitation