



National Aeronautics and
Space Administration



ARSET

Applied Remote Sensing Training

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

 @NASAARSET

Advanced Webinar on using NASA Remote Sensing for Flood Monitoring and Management

Instructors:

- Amita Mehta (ARSET)
- Kyle Peterson (ARSET)

Week-2

www.nasa.gov

Acknowledgements

- **Training Set-up, Coordination, and Website Help**

Brock Blevins
Elizabeth Hook

- **QGIS Exercise**

Kyle Peterson

- **Spanish Translation**

David Barbato

- **ARSET Manager**

Ana Prados

Course Material

<http://arset.gsfc.nasa.gov/disasters/webinars/advfloodwebinar>

Webinar presentations, exercises, homework assignments, and recordings

The screenshot shows the ARSET website interface. At the top, it lists 'Earth Sciences Division', 'Applied Sciences', and 'ASP Water Resources'. The main navigation bar includes 'DISASTERS', 'ECO FORECASTING', 'HEALTH & AIR QUALITY', and 'WATER RESOURCES'. The 'Disasters' section is active, showing 'Disasters Webinars' and 'Disasters Workshops'. The main content area features a sidebar with 'Fundamentals of Remote Sensing' (On-Demand Training) and 'Upcoming Training' (Ecoforecasting Advanced Webinar). The central focus is the 'Advanced Webinar on Using NASA Remote Sensing for Flood Monitoring and Management' scheduled for 03/16/2016 to 04/06/2016. It includes a video thumbnail showing satellite imagery of a river basin in 2006 and 2011, and a description of the webinar's content.

Links will be available here

Course Materials

Date	Title	Materials
March 15, 2016	View Week 1, Week 2, and Week 3 of NASA Remote Sensing Observations for Flood Management	Homework - due March 15
March 16, 2016	Demonstration of Flood Mapping Web Tools Based on NASA Remote Sensing Observations of Rainfall	Recording Slides Homework
March 23, 2016	Demonstration of Flood Mapping Web Tools Based on NASA Remote Sensing Observations of Land Cover	Recording Slides Homework
March 30, 2016	Overview and Access to Ancillary NASA Data for Flood Management	Recording Slides Homework
April 6, 2016	Flooding Case Studies Using NASA Web Tools and GIS	Recording Slides Homework

Homework and Certificate

- **Homework**

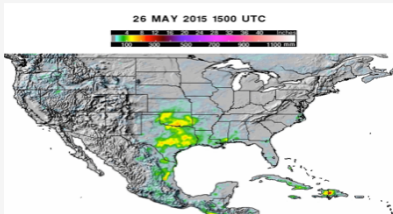
- Hands-on exercises
- Answers to homework questions via Google form
- Available at <http://arset.gsfc.nasa.gov/disasters/webinars/advfloodwebinar>

- **Certificate of Completion**

- Attend all 4 webinar sessions
- Complete all 4 homework assignments
- Certificates will be emailed approx. 2 months after the course finishes by Marines Martins (marines.martins@ssaihq.com)

Course Outline

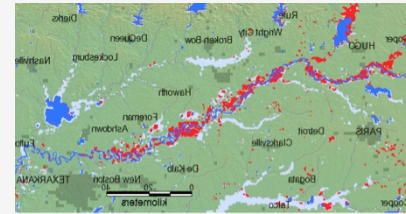
Week 1: Demonstration of Flood Mapping Web Tools Based on NASA Remote Sensing Observations of Rainfall



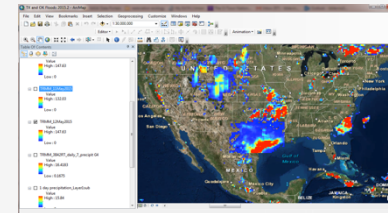
Week 3: Overview & Access to Ancillary NASA Data for Flood Management



Week 2: Demonstration of Flood Mapping Web Tools Based on NASA Remote Sensing Observations of Land Cover



Week 4: Flooding Case Studies Using NASA Web Tools and GIS



Agenda: Week 2

- Demonstration and hands-on exercises of flood mapping using remote sensing of land cover from Terra and Aqua – Moderate Resolution Imaging Spectroradiometer (MODIS)
 - Overview and Demonstration of The Dartmouth Flood Observatory
 - Overview and Hands-on Exercise of using MODIS Near Real-Time Global Flood Mapping
 - Exercise of MODIS Flood Mapping using QGIS

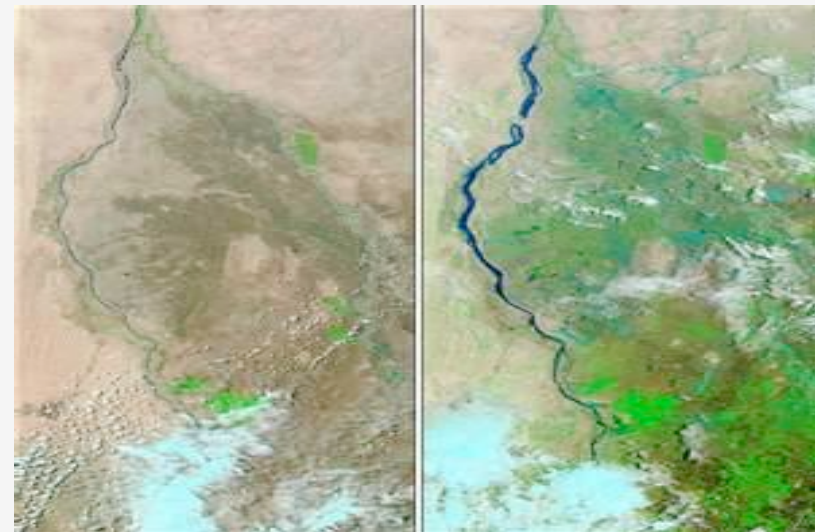
Inundation Mapping

Using Terra/Aqua MODerate Resolution Imaging Spectroradiometer (MODIS)

- MODIS provides observations of land-surface. MODIS reflectance from these bands 1, 2, and 7 [620-670 nm, 841-876 nm, and 2105-2155 nm respectively] indicate the presence of water on land surface previously not covered by water
- A global reference database of water bodies is formed at at 250 m resolution – inundation is mapped with respect to this reference water
- MODIS can not see the surface in the presence of clouds

Flooding along the White Nile, Sudan

earthobservatory.nasa.gov



MODIS-Aqua
6/19/2003

MODIS- Terra
8/11/2003



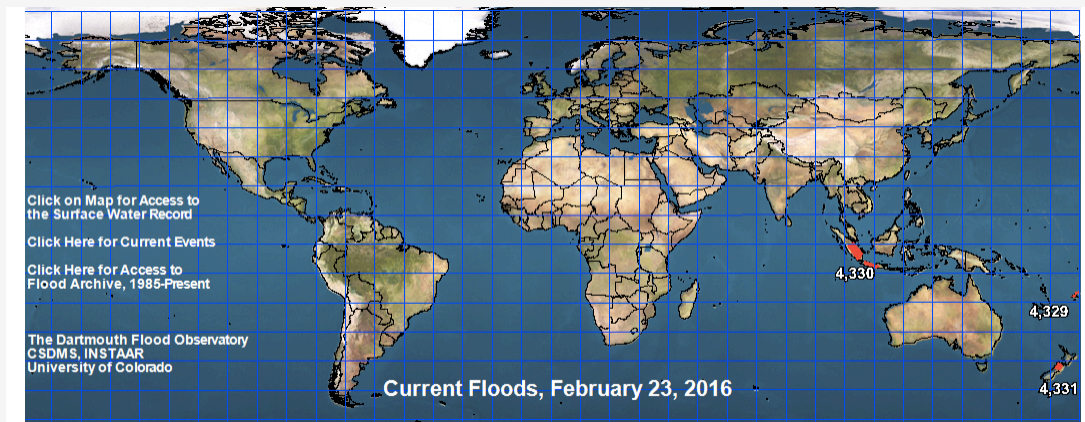
The Dartmouth Flood Observatory (DFO) Overview and Demonstration

<http://floodobservatory.colorado.edu/>

Image Credit: Terra MODIS/Worldview; 17 Jan 2016

DFO

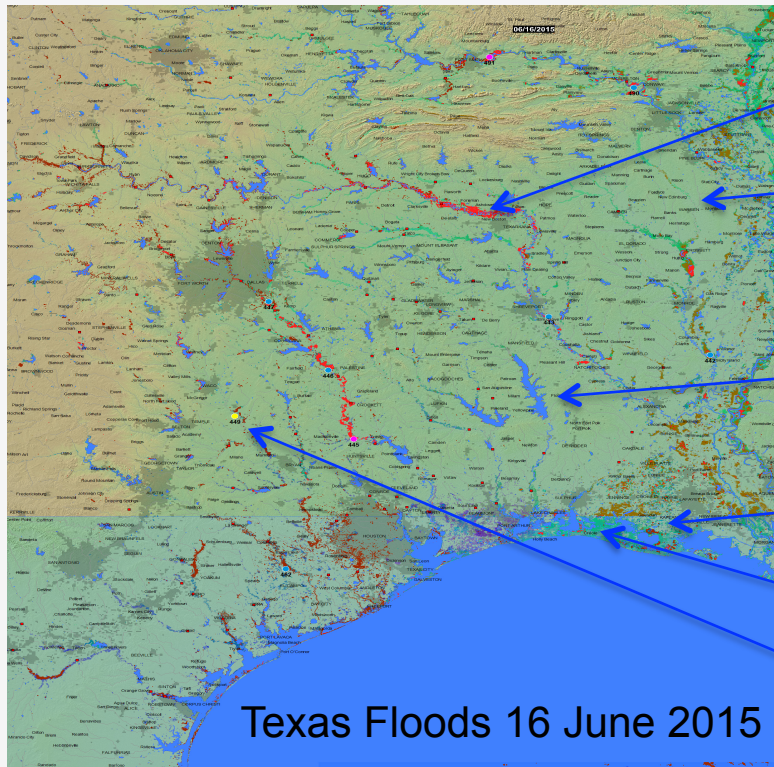
- Uses Flood Mapping based on MODIS reflectance
- Also uses Landsat-8 and EO-1 images, and COSMO-SkyMed and Sentinel-1 synthetic aperture radar (SAR) images when available
- Experimental River Discharge obtained by using Microwave data (AMSR, AMSR-2, TMI, GMI) and a run-off model



Provides near-real time flood mapping and current/past flood event mapping

<http://floodobservatory.colorado.edu/>

DFO Flood Event Mapping



Red: Flooding within the past 14 days
(MODIS automated product)

Light Red: Flooded during this event, from
earlier MODIS coverage or non-automated
MODIS mapping

Dark blue, Permanent water, February,
2000 (Shuttle Water Boundary Data)

Darker Red: Flooded areas from high
resolution SAR or Landsat 8 data

Past Floods

Colored dots show *access River Watch Site*

A satellite image of Louisiana, showing the state's coastline and major cities. A semi-transparent grey box is overlaid on the map, containing the text 'DFO Demonstration' and a URL. The map shows the Gulf of Mexico to the south, with the state of Louisiana extending northwards. Major cities like Houston, New Orleans, and Baton Rouge are visible. The overlay box is centered over the northern part of the state.

DFO Demonstration

<http://floodobservatory.colorado.edu/>

Image Credit: Terra MODIS/Worldview: 17 Jan 2016



Overview and Demonstration of MODIS Near Real-Time Global Flood Mapping

<http://oas.gsfc.nasa.gov/floodmap/>

Image Credit: Terra MODIS/Worldview; 17 Jan 2016

MODIS NRT Global Flood Mapping

- Flood Mapping based on MODIS reflectance at 250 m resolution, composited on 2, 3, and 14 days
- Flood maps available on 10°x10° tile
- Permanent water and surface flood water data available
- Cloud shadows or terrain shadows can be misinterpreted as surface water

NRT Global Flood Mapping

Global Map

Click for ArcGIS Portal map interface

10° Flood Map Tile Production

For more information, please contact floodmap at lists.nasa.gov

NOTE: THIS IS AN EXPERIMENTAL PRODUCT AND SYSTEM

News/Status

11-Nov-2014: ArcGIS Online Map available.
10-Nov-2014: MODIS flood product evaluation report available.

> Go to News/Status page

NASA Official: Frederick Policelli
Page Last Updated: January 13, 2015

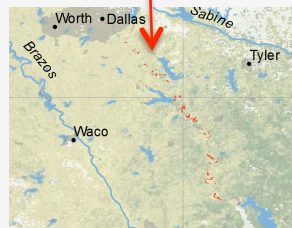
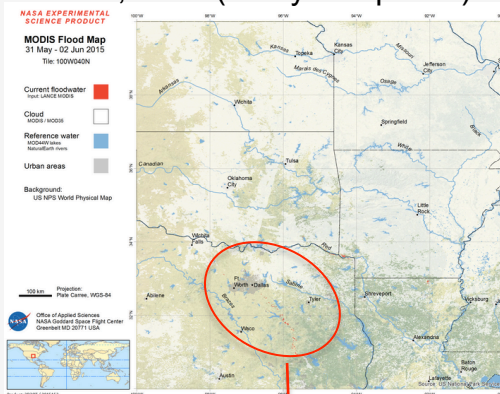
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Contact Us

Provides near-real time and past flood mapping from April 2011

<http://oas.gsfc.nasa.gov/floodmap/>

MODIS Flood Mapping : Texas Floods

Texas Flood Map
June 2, 2015 (3-day composite)



3 Day Composite 2 Day Composite 1 Day Composite 14 Day Composite

« June 2015 »
 S M T W T F S
 1 2 3 4 5 6
 7 8 9 10 11 12 13
 14 15 16 17 18 19 20
 21 22 23 24 25 26 27
 28 29 30

Products		Available Downloads	
MODIS Flood Map	MFM	png	
MODIS Flood Water	MFW	shapefile (.zip)	KMZ
MODIS Surface Water	MSW	shapefile (.zip)	KMZ
MODIS Water Product	MWP	geotiff	
README		pdf	txt

Check slide show for the last 10 days.

Filename Convention:

PRODUCT_DATE_TILE_COMPOSITE_XTRA.EXT

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

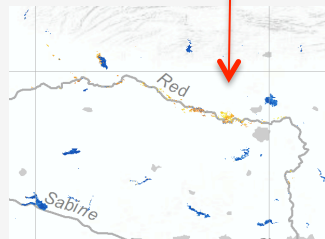
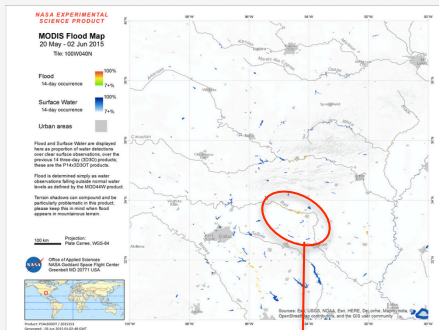
MSW_2012009_020E000S_3D3O_V.shp
 MFM_2012009_020E000S_2D2O.png

(yyyydoy lon-lat 2 or 3 day Observations)

MODIS Flood Mapping : Texas Floods

Composites of the previous 14 days' 3-day product

Texas Flood Map
June 2, 2015 (14-day composite)



14 Day Composite 3 Day Composite 2 Day Composite 1 Day Composite

« June 2015 »

S	M	T	W	T	F	S
1	2	3	4	5	6	
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Products		Available Downloads			
MODIS Flood Map	MFM	png			
MODIS Flood Water	MFW	percent (.tif)	any (.tif)	any (.shp)	any (.kmz)
MODIS Surface Water	MSW	percent (.tif)	any (.tif)	any (.shp)	any (.kmz)
README		pdf	txt		

Similar Filename convention with additional processing information for composite field:

- N: No shadow masking
- T: Terrain shadow masking
- C: Cloud shadow masking
- S: both terrain and cloud Shadow masking

For Example: **2D2OT**: 2 Days imagery, 2 Observations required, Terrain shadow masking applied

Provides the occurrence of water as the percent of clear observations over the last 14 days' products (GeoTIFF and shapefile)
GeoTIFF are 0-1 images; it is 1 if the percent water is > 0



Hands-on Exercise: MODIS Inundation Mapping Using QGIS

Image Credit: Terra MODIS/Worldview: 17 Jan 2016

Coming Up Next Week

Overview & Access to Ancillary NASA Data for Flood Management

- Synthetic Aperture Radar data and application for flood monitoring
- Shuttle Radar Topography Mission terrain data access relevant for flood plain identification
- NASA Socio-economics data access useful for flood preparedness and relief planning

Thank You

The recording of today's session will be available shortly at
<http://arset.gsfc.nasa.gov/disasters/webinars/advfloodwebinar>