



NOAA's Emergency Response Imagery

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National Geodetic Survey (NGS)

Webinar: NOAA Hurricane Awareness Series: Assessing Post-Storm Damage: NOAA Emergency Response

Date: Tuesday 21 May 2019

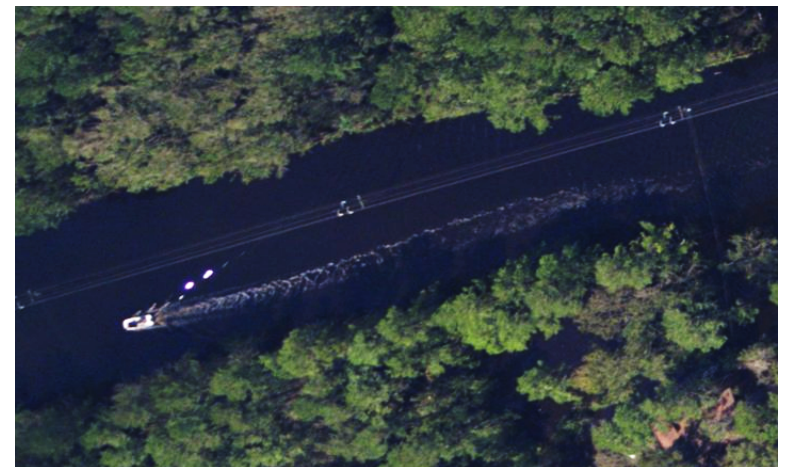
Time: 11:00-12:00 AM ET

Outline

- ER History
- Coordination and Workflow
- Pre-event Imagery
- Emergency Response Website
- Stats
- Use Case Examples



Before Image: Google Earth



After Image: NOAA

Historical Responses



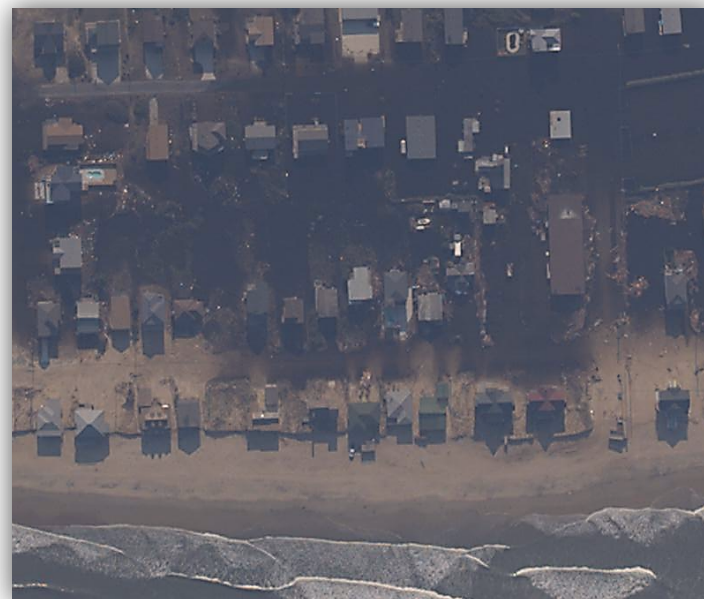
March 1964: Alaska earthquake



August 1969 Hurricane Camille



February 1978 Nor'easter



September 2003 Hurricane Isabel

Emergency Response Imagery

- Support NOAA's requirements and NRF Emergency Support Functions:

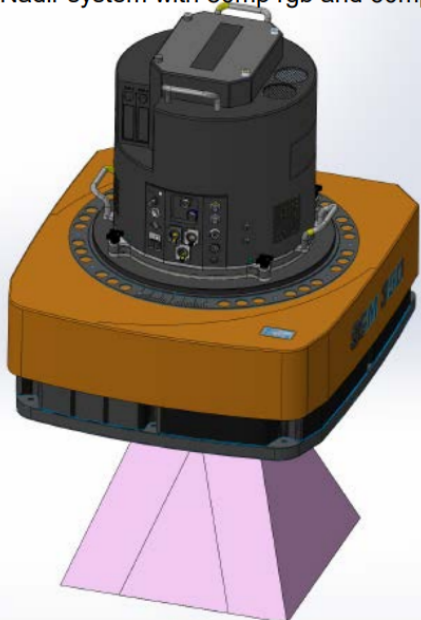
ESF 1	Transportation
ESF 11	Agriculture and Natural Resources
ESF 3	Public Works and Engineering
ESF 9	Search and Rescue
ESF 10	Oil and Hazardous Material Response
ESF 13	Public Safety and Security
ESF 14	Long-term Community Recovery and Mitigation

- Pre-Scripted Mission Assignments (PSMA) With FEMA

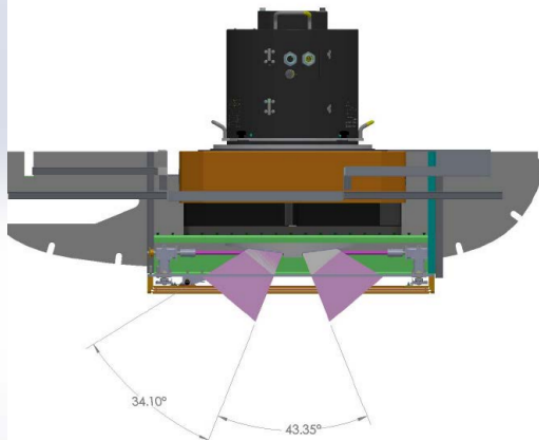
Aircraft and Sensors



Nadir system with 80mp rgb and 60mp nir



Oblique system with two 39mp rgb



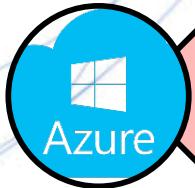
Response Workflow



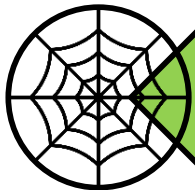
Imagery uploaded to cloud after landing



Ortho-rectification, mosaic processing & web-map tiling in cloud



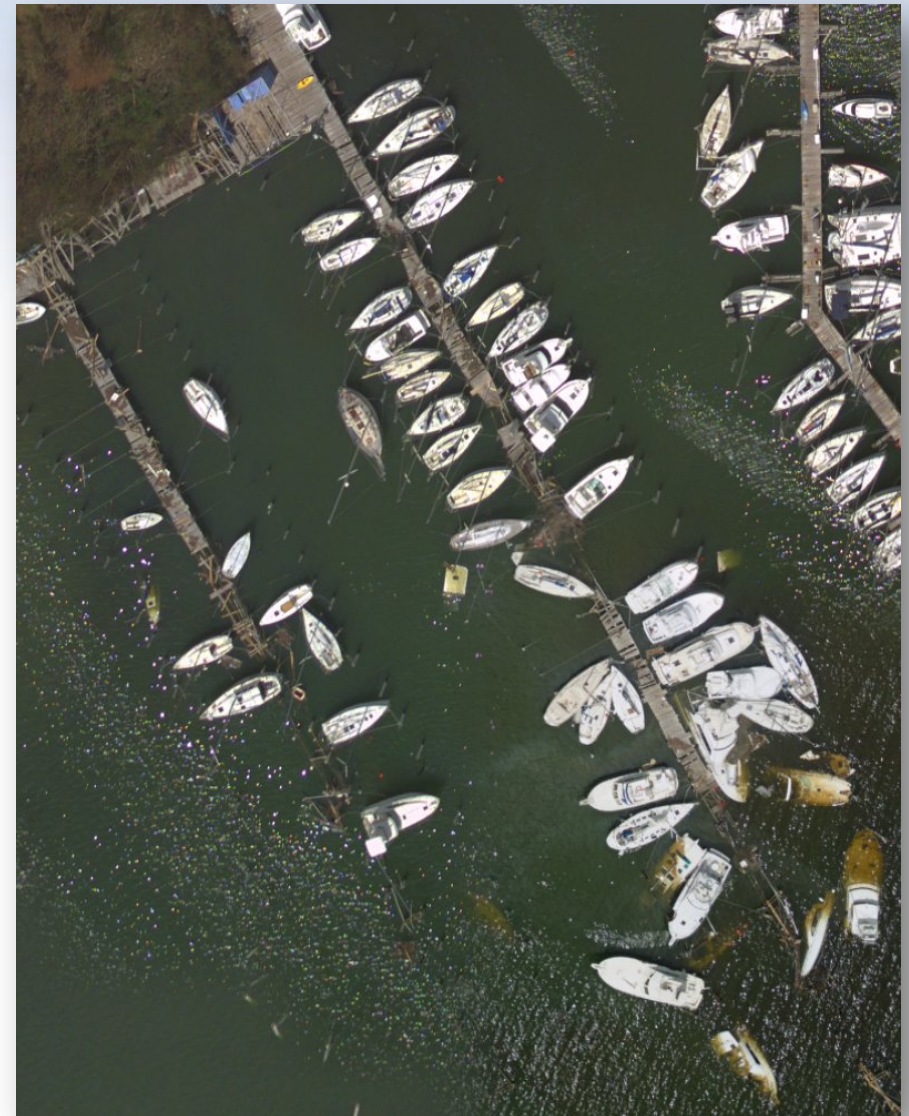
Mosaicked tiles are warehoused in Azure storage

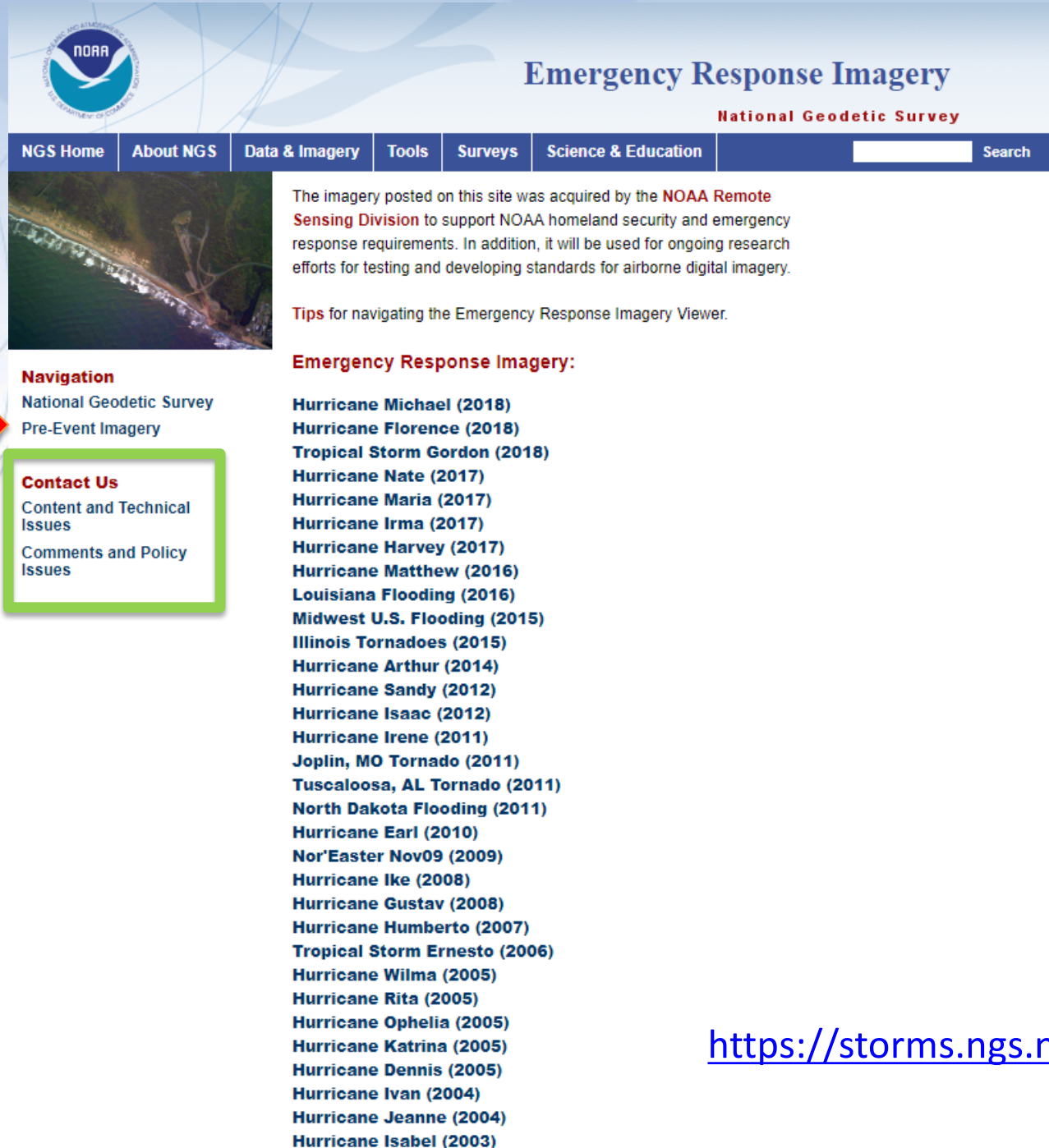



TileServer & MapBox are used to make the data web accessible



Public website is created








Emergency Response Imagery

National Geodetic Survey

[NGS Home](#) [About NGS](#) [Data & Imagery](#) [Tools](#) [Surveys](#) [Science & Education](#) [Search](#)



The imagery posted on this site was acquired by the **NOAA Remote Sensing Division** to support NOAA homeland security and emergency response requirements. In addition, it will be used for ongoing research efforts for testing and developing standards for airborne digital imagery.

Tips for navigating the Emergency Response Imagery Viewer.

Emergency Response Imagery:

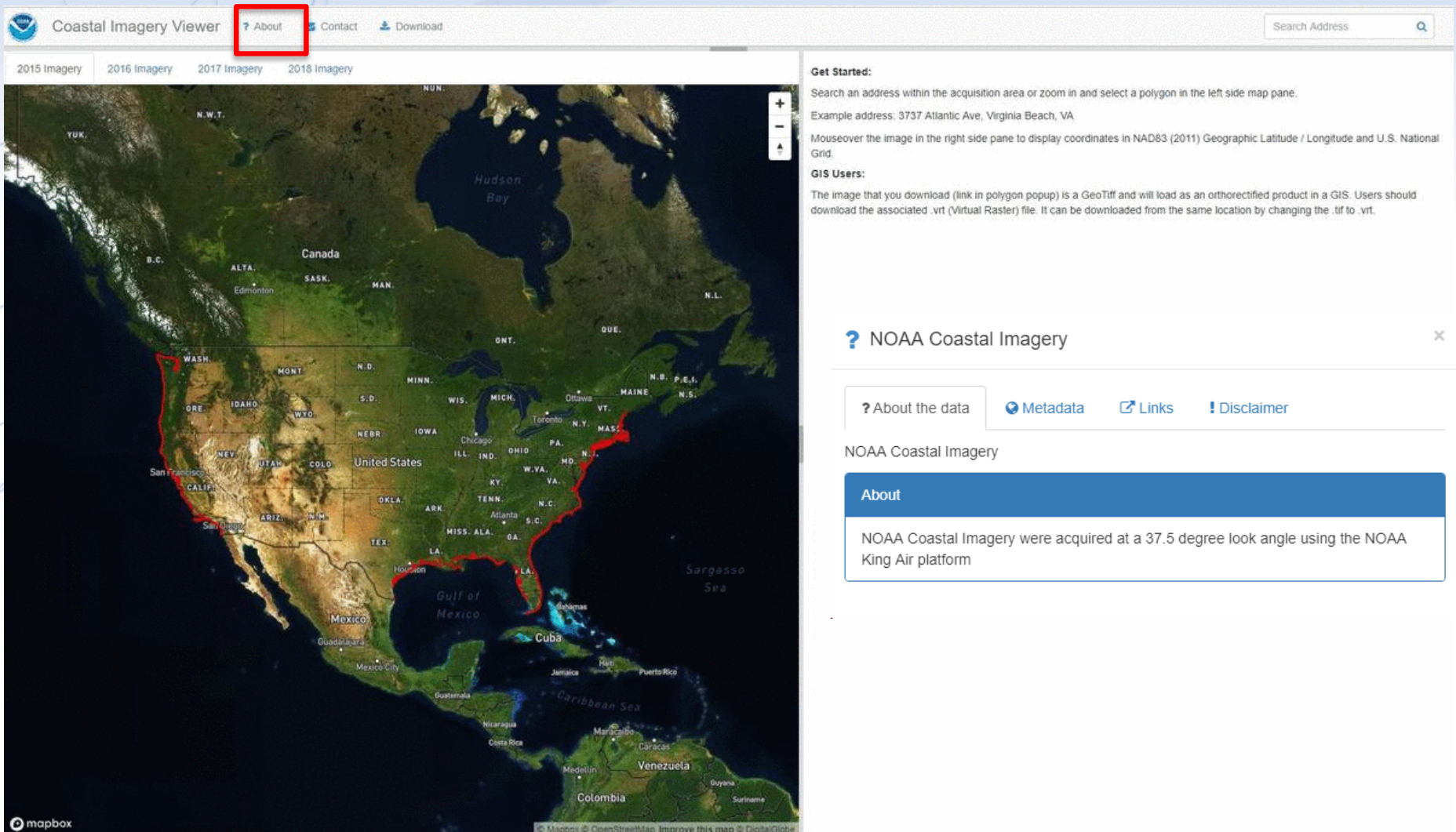
Hurricane Michael (2018)
Hurricane Florence (2018)
Tropical Storm Gordon (2018)
Hurricane Nate (2017)
Hurricane Maria (2017)
Hurricane Irma (2017)
Hurricane Harvey (2017)
Hurricane Matthew (2016)
Louisiana Flooding (2016)
Midwest U.S. Flooding (2015)
Illinois Tornadoes (2015)
Hurricane Arthur (2014)
Hurricane Sandy (2012)
Hurricane Isaac (2012)
Hurricane Irene (2011)
Joplin, MO Tornado (2011)
Tuscaloosa, AL Tornado (2011)
North Dakota Flooding (2011)
Hurricane Earl (2010)
Nor'Easter Nov09 (2009)
Hurricane Ike (2008)
Hurricane Gustav (2008)
Hurricane Humberto (2007)
Tropical Storm Ernesto (2006)
Hurricane Wilma (2005)
Hurricane Rita (2005)
Hurricane Ophelia (2005)
Hurricane Katrina (2005)
Hurricane Dennis (2005)
Hurricane Ivan (2004)
Hurricane Jeanne (2004)
Hurricane Isabel (2003)

Navigation
National Geodetic Survey
Pre-Event Imagery

Contact Us
Content and Technical Issues
Comments and Policy Issues

<https://storms.ngs.noaa.gov/>

Pre-Event Imagery



The image shows the NOAA Coastal Imagery Viewer web application. The top navigation bar includes links for 'About', 'Contact', and 'Download', with 'About' highlighted by a red box. Below the navigation bar, there are tabs for '2015 Imagery', '2016 Imagery', '2017 Imagery', and '2018 Imagery'. The main map area displays a satellite view of the United States and surrounding regions, with a red outline indicating the coastal imagery acquisition area. The right sidebar contains a 'Get Started' section with instructions on how to search for an address and download the imagery. Below this, there is a 'NOAA Coastal Imagery' section with links for 'About the data', 'Metadata', 'Links', and 'Disclaimer'. The 'About' link is highlighted in blue.

Get Started:

Search an address within the acquisition area or zoom in and select a polygon in the left side map pane.

Example address: 3737 Atlantic Ave, Virginia Beach, VA

Mouseover the image in the right side pane to display coordinates in NAD83 (2011) Geographic Latitude / Longitude and U.S. National Grid.

GIS Users:

The image that you download (link in polygon popup) is a GeoTiff and will load as an orthorectified product in a GIS. Users should download the associated .vrt (Virtual Raster) file. It can be downloaded from the same location by changing the .tif to .vrt.

NOAA Coastal Imagery

[? About the data](#) [Metadata](#) [Links](#) [! Disclaimer](#)

NOAA Coastal Imagery

About

NOAA Coastal Imagery were acquired at a 37.5 degree look angle using the NOAA King Air platform

2017 Pre-Event Imagery



Coastal Imagery Viewer

[? About](#)

[Contact](#)

[Download](#)

Search Address



2015 Imagery

2016 Imagery

2017 Imagery

2018 Imagery

2 Image Footprints Selected

Acquired: Apr 15 2017

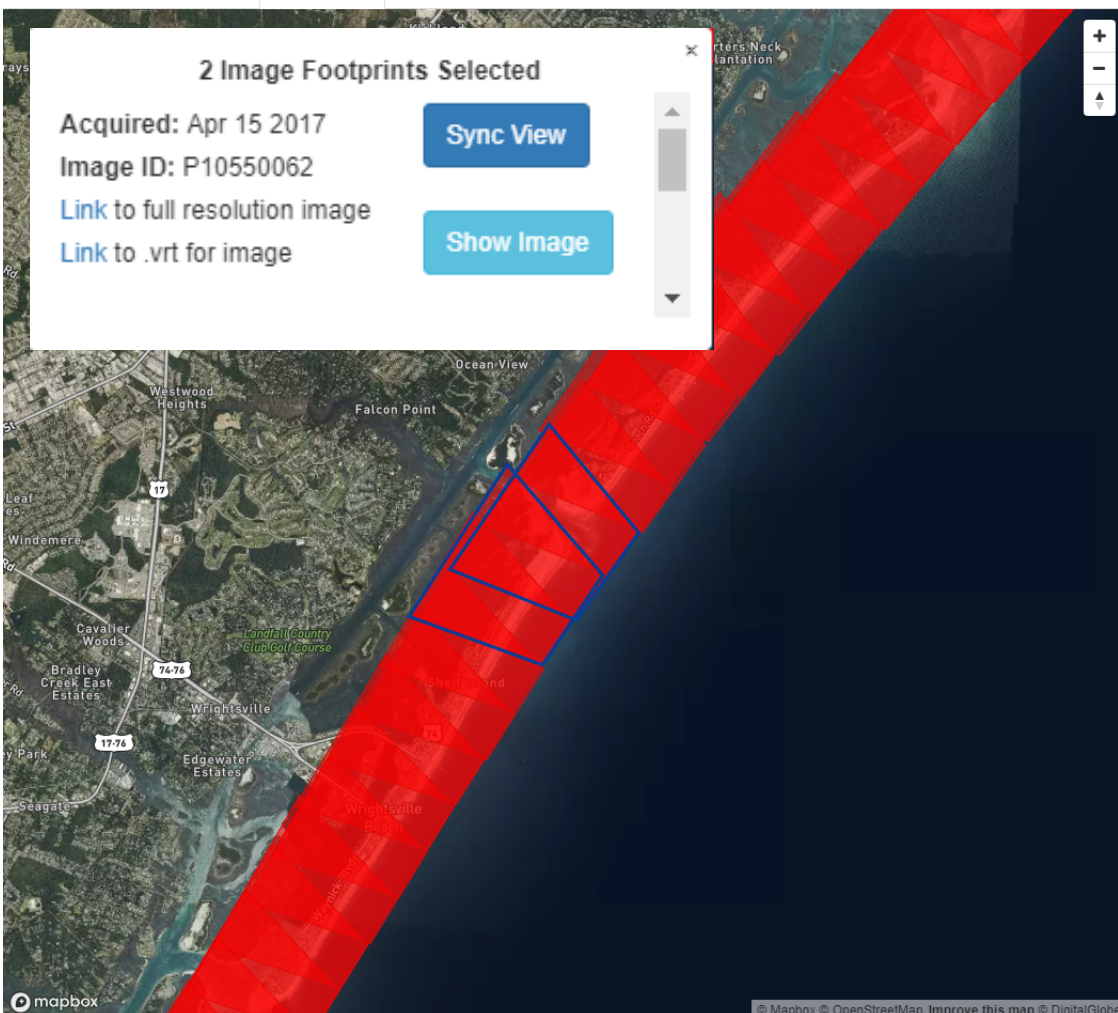
Image ID: P10550062

[Link to full resolution image](#)

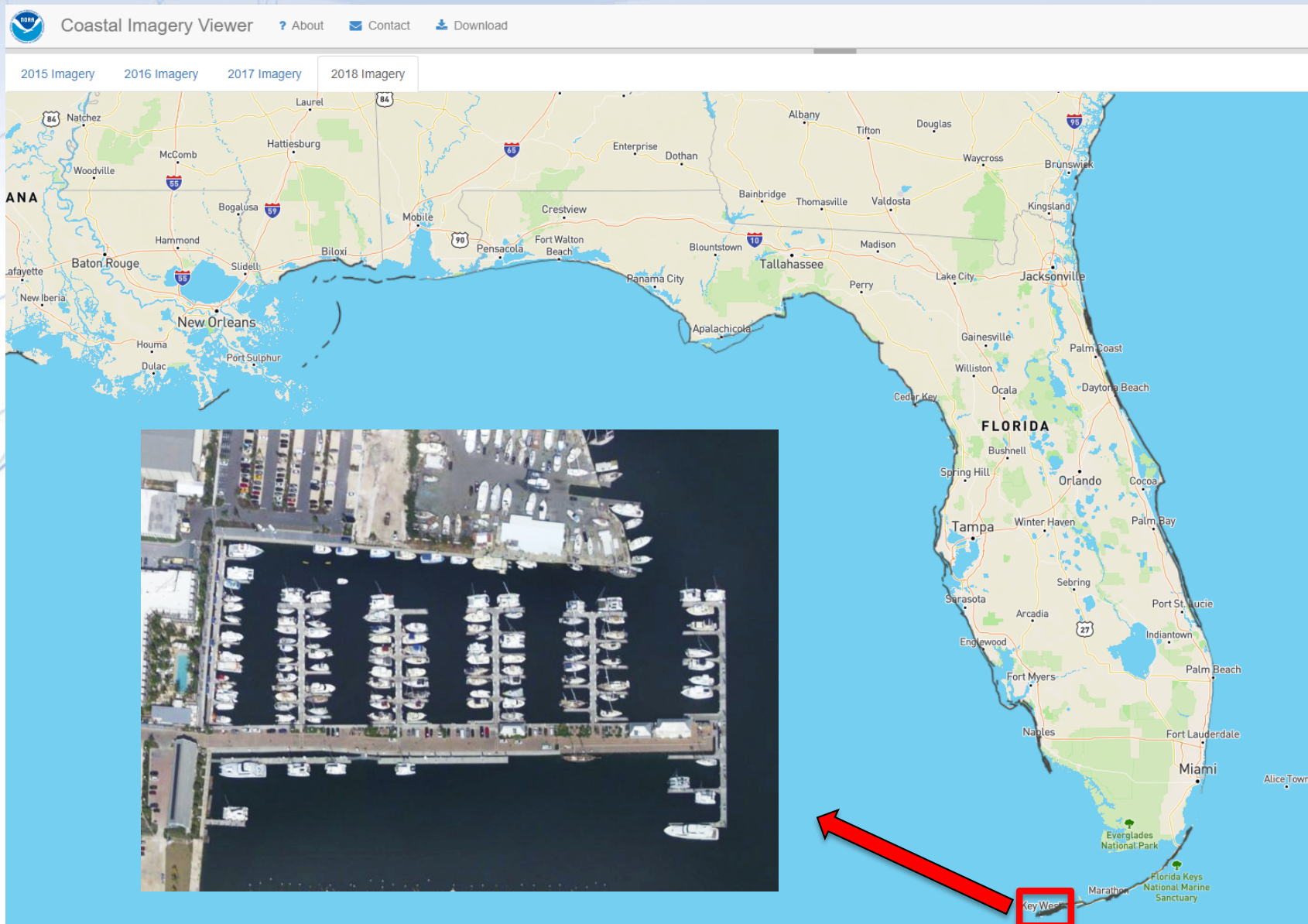
[Link to .vrt for image](#)

Sync View

Show Image



2018 Pre-Event Imagery



2018 Pre-Event Imagery



Coastal Imagery Viewer

[? About](#)[Contact](#)[Download](#)

Southeast U.S. (Florida Gulf Coast) | 2015

[Download](#)

Southeast U.S. (Florida Gulf Coast) | 2015

[Download](#)

Southeast U.S. (Florida Gulf Coast) | 2015

[Download](#)

South U.S. (Mississippi to Louisiana) | 2015

[Download](#)

South U.S. (Louisiana to Texas) | 2015

[Download](#)

South U.S. (Texas) | 2015

[Download](#)

South U.S. (Texas) | 2015

[Download](#)

Southwest U.S. (California) | 2015

[Download](#)

Northwest U.S. (Oregon to Washington) | 2015

[Download](#)

Northeast U.S. (New York to North Carolina) | 2016

[Download](#)

West Coast U.S. | 2016

[Download](#)

Puerto Rico | 2016

[Download](#)

Alaska | 2016

[Download](#)

Great Lakes Region U.S. | 2016

[Download](#)

South U.S. (Louisiana to Florida Gulf Coast) | 2017

[Download](#)

Southeast U.S. (Virginia to Florida) | 2017

[Download](#)

Northeast U.S. (Maine to North Carolina) | 2018

[Download](#)

Northeast U.S. (Maryland to New York) | 2018

[Download](#)

Southeast U.S. (North Carolina to South Carolina) | 2018

[Download](#)

Southeast U.S. (South Carolina to Florida) | 2018

[Download](#)

Southeast U.S. (Florida to Texas) | 2018

[Download](#)

Southeast U.S. (Texas) | 2018

[Download](#)

Great Lakes Region U.S. | 2018

[Download](#)

West Coast U.S. | 2018

[Download](#)

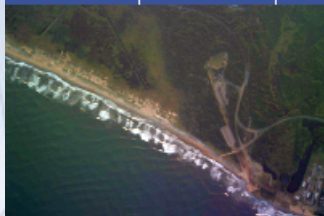
West Coast U.S. | 2018

[Download](#)



Emergency Response Imagery

National Geodetic Survey

[NGS Home](#)[About NGS](#)[Data & Imagery](#)[Tools](#)[Surveys](#)[Science & Education](#) [Search](#)

The imagery posted on this site was acquired by the **NOAA Remote Sensing Division** to support NOAA homeland security and emergency response requirements. In addition, it will be used for ongoing research efforts for testing and developing standards for airborne digital imagery.

Tips for navigating the Emergency Response Imagery Viewer.

Navigation

[National Geodetic Survey](#)
[Pre-Event Imagery](#)

Contact Us

[Content and Technical Issues](#)
[Comments and Policy Issues](#)

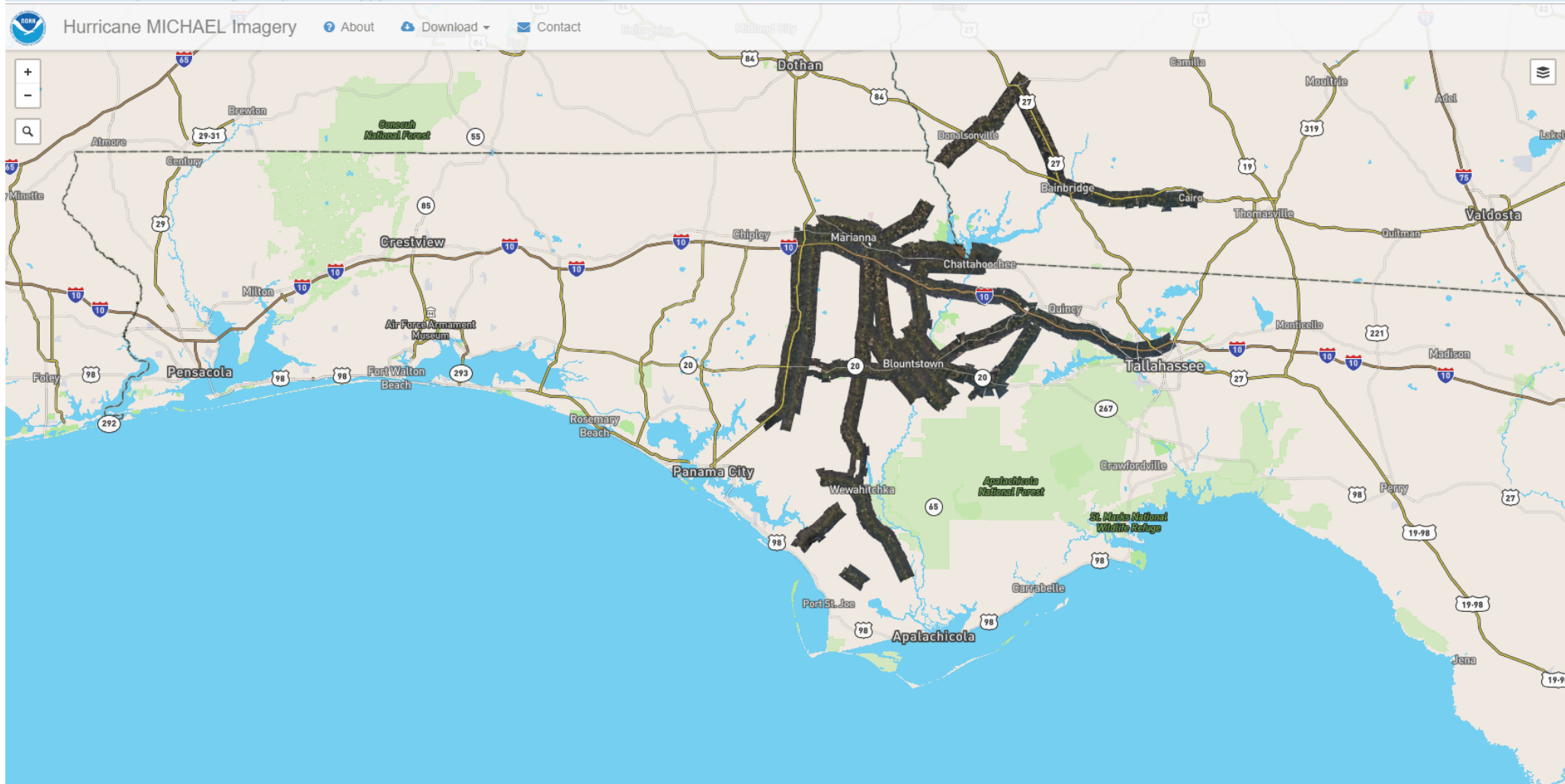
Emergency Response Imagery:

[Hurricane Michael \(2018\)](#)
[Hurricane Florence \(2018\)](#)
[Tropical Storm Gordon \(2018\)](#)
[Hurricane Nate \(2017\)](#)
[Hurricane Maria \(2017\)](#)
[Hurricane Irma \(2017\)](#)
[Hurricane Harvey \(2017\)](#)
[Hurricane Matthew \(2016\)](#)
[Louisiana Flooding \(2016\)](#)
[Midwest U.S. Flooding \(2015\)](#)
[Illinois Tornadoes \(2015\)](#)
[Hurricane Arthur \(2014\)](#)
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[Hurricane Irene \(2011\)](#)
[Joplin, MO Tornado \(2011\)](#)
[Tuscaloosa, AL Tornado \(2011\)](#)
[North Dakota Flooding \(2011\)](#)
[Hurricane Earl \(2010\)](#)
[Nor'Easter Nov09 \(2009\)](#)
[Hurricane Ike \(2008\)](#)
[Hurricane Gustav \(2008\)](#)
[Hurricane Humberto \(2007\)](#)
[Tropical Storm Ernesto \(2006\)](#)
[Hurricane Wilma \(2005\)](#)
[Hurricane Rita \(2005\)](#)
[Hurricane Ophelia \(2005\)](#)
[Hurricane Katrina \(2005\)](#)
[Hurricane Dennis \(2005\)](#)
[Hurricane Ivan \(2004\)](#)
[Hurricane Jeanne \(2004\)](#)
[Hurricane Isabel \(2003\)](#)

This map displays the Florida Panhandle region, highlighting the path of Hurricane Michael. The hurricane's trajectory is marked by a thick black line that begins in the Gulf of Mexico, passes near Panama City, and continues inland. Key locations shown include Panama City, Tallahassee, Dothan, and various highways such as I-10, I-95, and US-90. Natural features like the Apalachicola National Forest and the St. Marks National Wildlife Refuge are also labeled. The map includes a search bar at the top left and a legend at the top right.

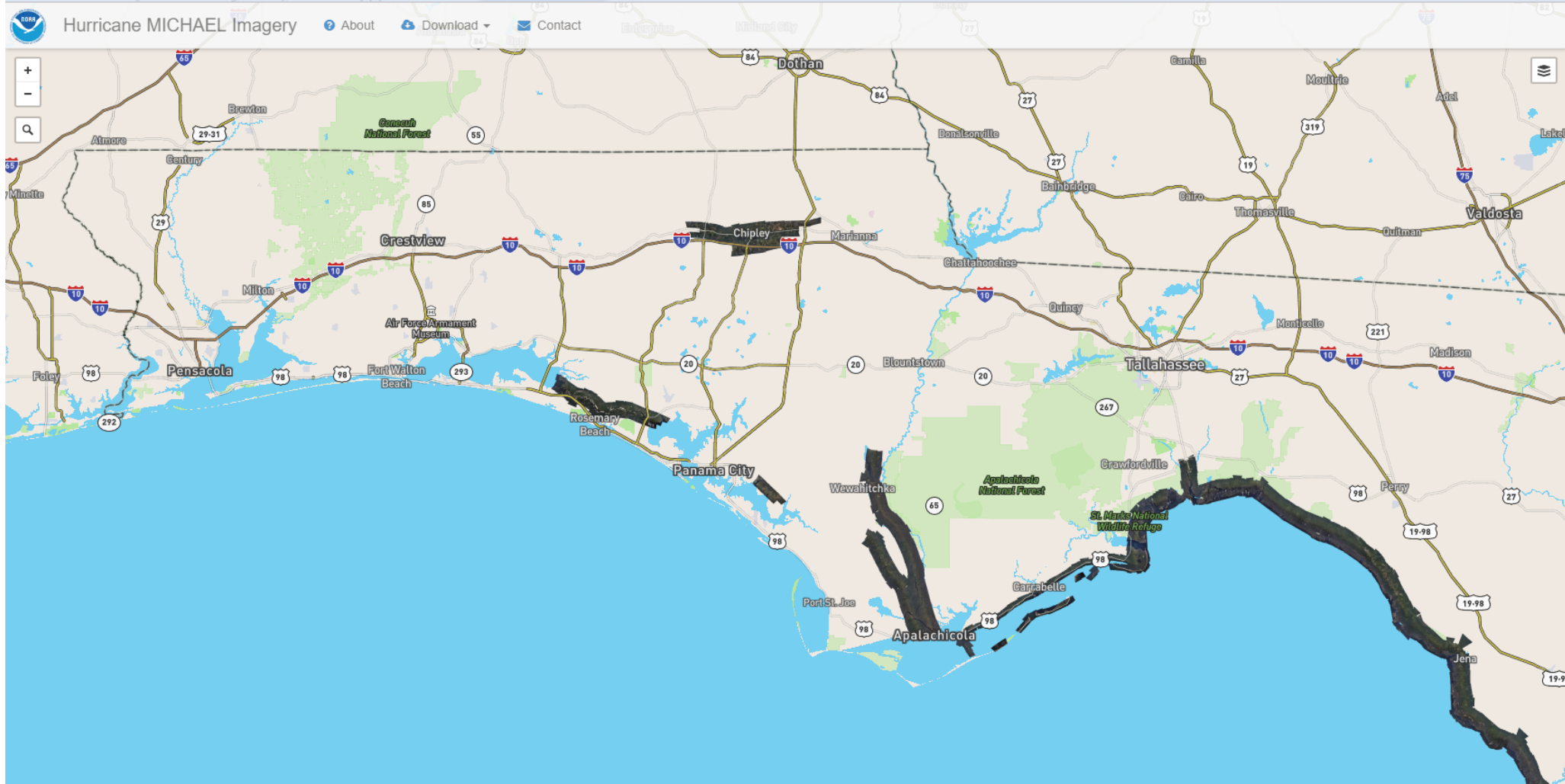
13

Hurricane Michael



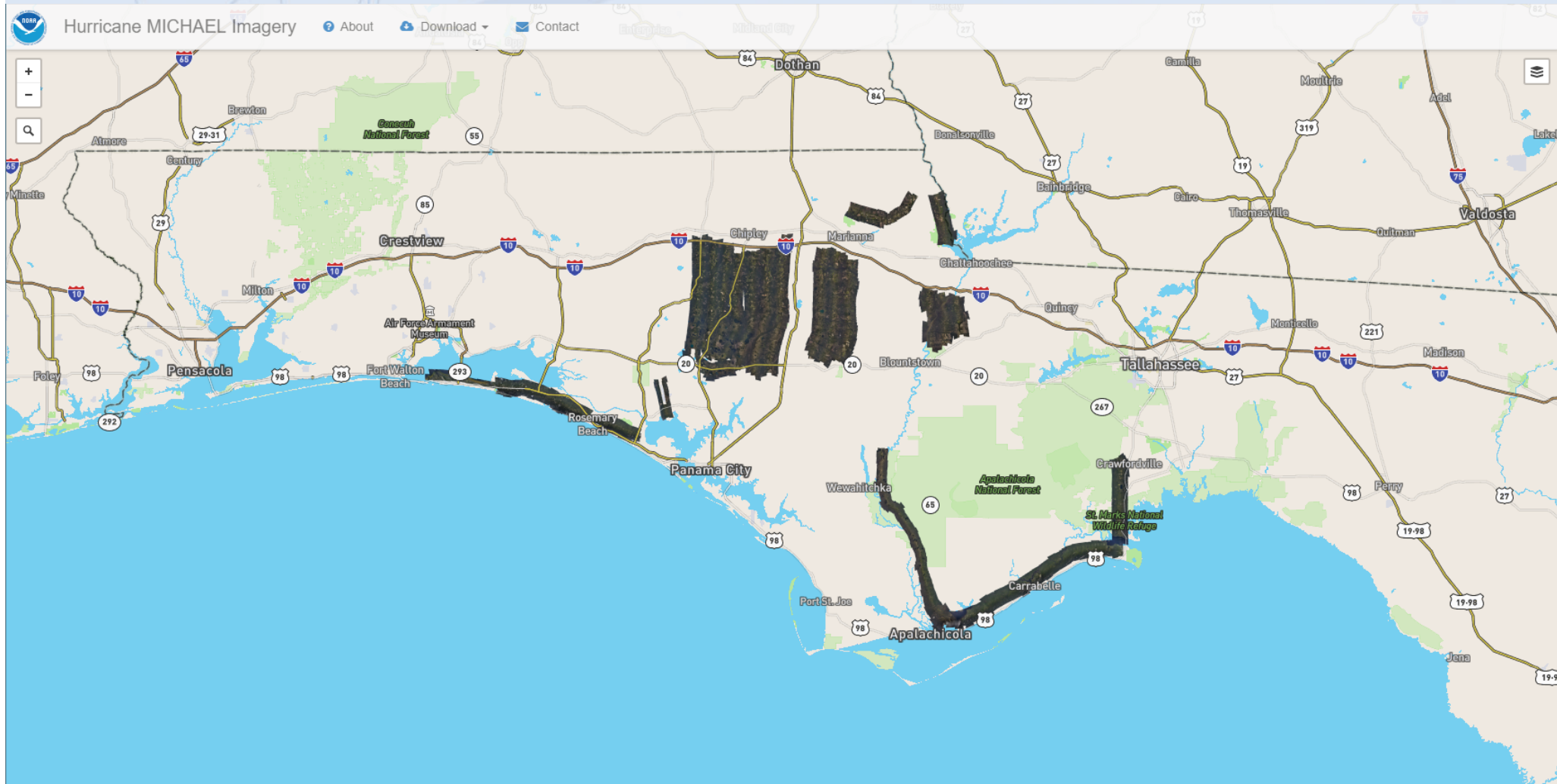
October 12, 2018

Hurricane Michael



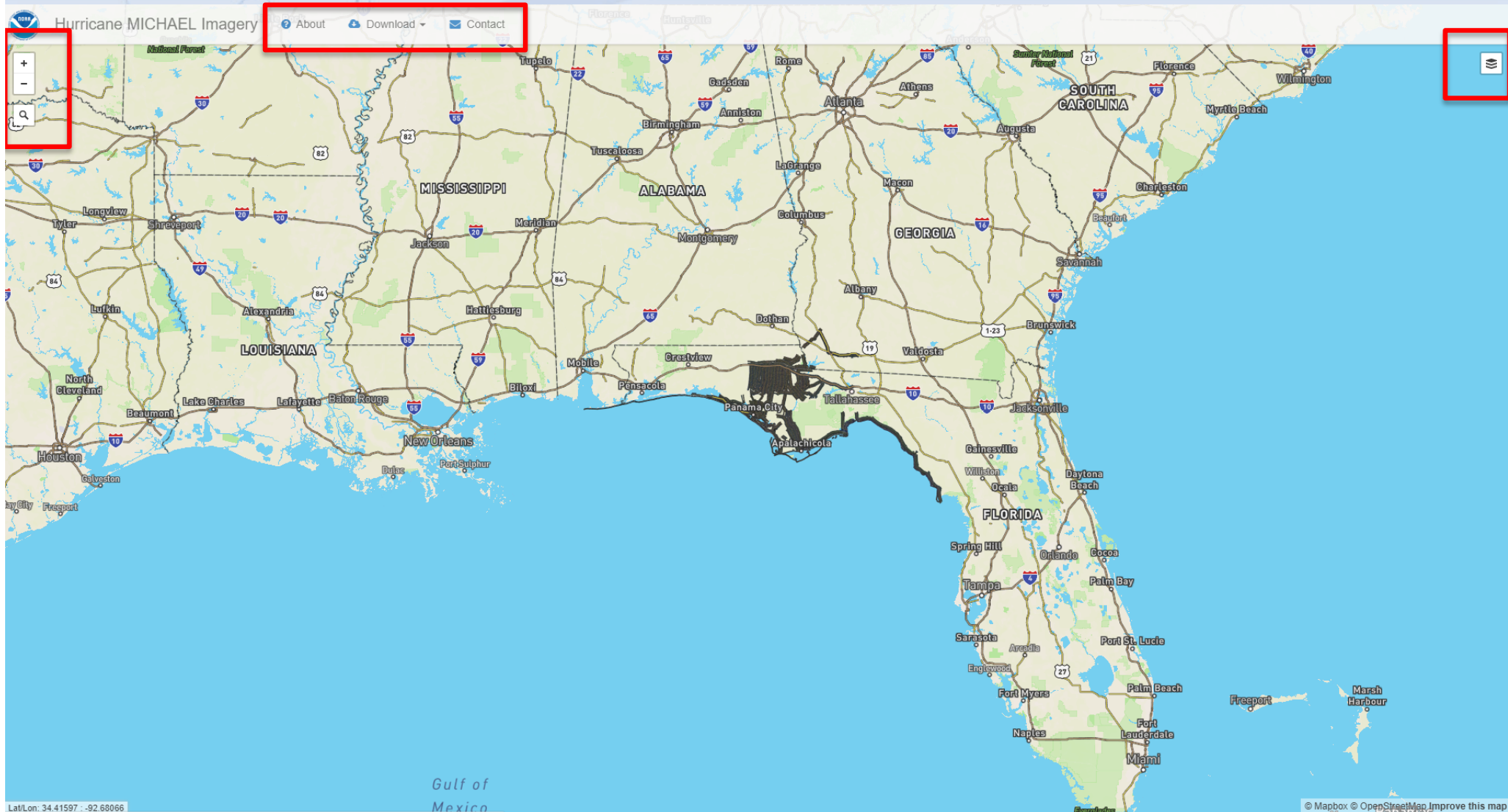
October 13, 2018

Hurricane Michael



October 14, 2018

Hurricane Michael



Hurricane Michael

Hurricane MICHAEL Imagery

[About](#) [Download](#) [Contact](#)

[? About the data](#) [Web Services](#) [! Disclaimer](#) [Metadata](#)

Hurricane MICHAEL Aerial Imagery Response

About

This imagery was acquired by the NOAA Remote Sensing Division to support NOAA homeland security and emergency response requirements. In addition, it will be used for ongoing research efforts for testing and developing standards for airborne digital imagery. Individual images have been combined into a larger mosaic and tiled for distribution. The approximate ground sample distance (GSD) for each pixel is ~25 cm / zoom level 19.

More information about this project and the imagery can be found [here](#)

Lat/Lon: 34.41597, -92.68066

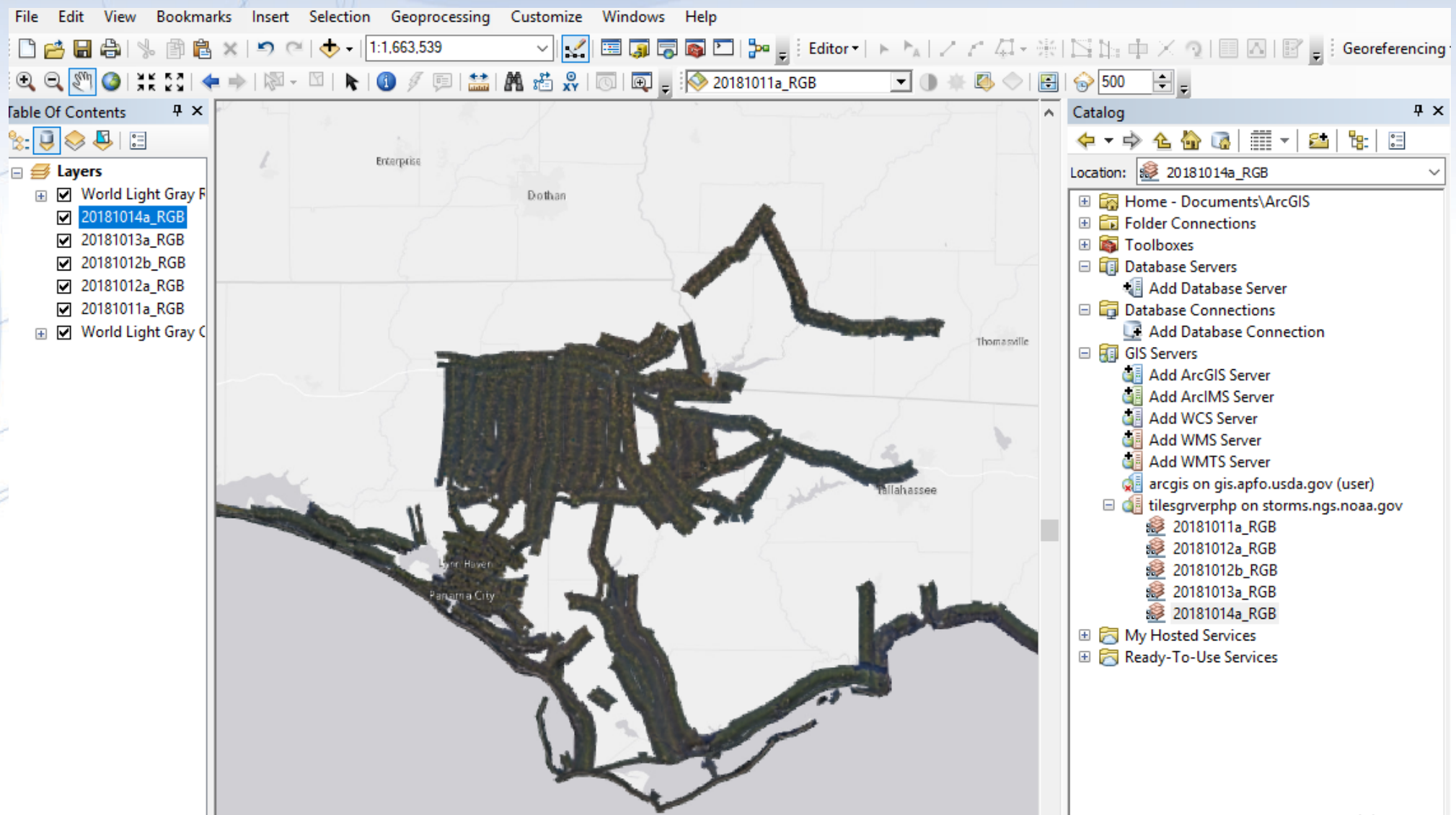
© Mapbox © OpenStreetMap Improve this map

The image is a screenshot of a web browser displaying a map of the Southeastern United States, specifically focusing on the Gulf of Mexico and the states of Alabama, Georgia, South Carolina, and Florida. The map shows major cities, highways, and water bodies. A white overlay box is positioned in the center of the screen, containing the following elements:

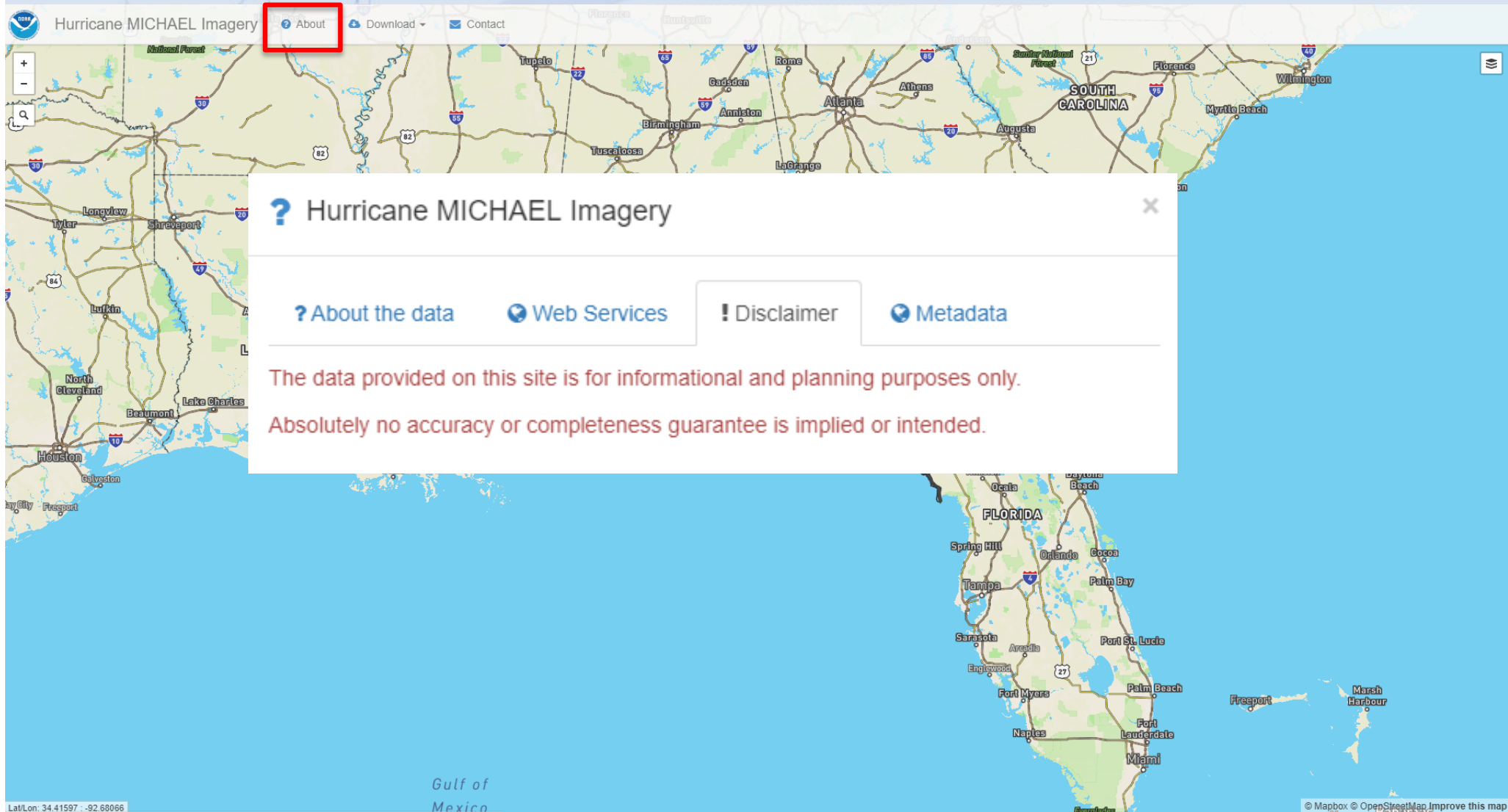
- Top Navigation Bar:** Includes links for "About" (highlighted with a red box), "Download", and "Contact".
- Main Title:** "Hurricane MICHAEL Imagery" with a question mark icon and a close button (X).
- Navigation Links:** Four links are displayed: "About the data", "Web Services", "Disclaimer", and "Metadata".
- WMTS Information:** A section titled "WMTS version 1.0.0 GetCapabilities:" followed by the URL: `https://storms.ngs.noaa.gov/storms/tilesj/services/tileserv.php/wmts`.

The map background shows the Gulf of Mexico to the west and south, with major cities like Houston, New Orleans, Atlanta, and Miami visible. The overlay box is semi-transparent, allowing the map to be seen through it.

Hurricane Michael WMTS in ArcGIS



Hurricane Michael



Hurricane Michael Imagery Download

Hurricane MICHAEL Imagery

Download

Contact

October 11 A 2018	(TIF)	(RAW JPEG)
October 12 A 2018	(TIF)	(RAW JPEG)
October 12 B 2018	(TIF)	(RAW JPEG)
October 13 A 2018	(TIF)	(RAW JPEG)
October 14 A 2018	(TIF)	(RAW JPEG)

Lat/Lon: 34.41597, -92.68066

© Mapbox © OpenStreetMap Improve this map

Contact Us

The screenshot shows the NOAA Hurricane Michael Imagery web application. The top navigation bar includes the NOAA logo, the title "Hurricane MICHAEL Imagery", and links for "About", "Download", and "Contact". The "Contact" link is highlighted with a red rectangle. Below the navigation bar is a map of the Gulf of Mexico and the southeastern United States, showing the path of Hurricane Michael. A white modal window titled "Contact" is open in the center of the screen. The modal contains the following text:

Content and technical issues contact: [ngs.hurricane1](mailto:ngs.hurricane1@noaa.gov)
Comments and policy questions contact: [ngs.hurricane2](mailto:ngs.hurricane2@noaa.gov)

The map shows the Gulf of Mexico and the southeastern United States, including Louisiana, Mississippi, Alabama, and Florida. Major cities like New Orleans, Mobile, Panama City, Tallahassee, Jacksonville, Orlando, and Miami are labeled. The hurricane's path is indicated by a dark line with a black cloud icon representing the eye of the storm.

Image Date

Hurricane MICHAEL Imagery

About Download **Contact**

MapBox Streets
MapBox Satellite (Pre-MICHAEL)
October 11 2018
☒ October 12 2018
☒ October 13 2018
☒ October 14 2018
☒ Mapbox Labels

Lat/Lon: 34.41597, -92.68066

© Mapbox © OpenStreetMap Improve this map

Address Search



Website Stats (Sep 15, 2018 – May 15, 2019)



1,200,000
Users

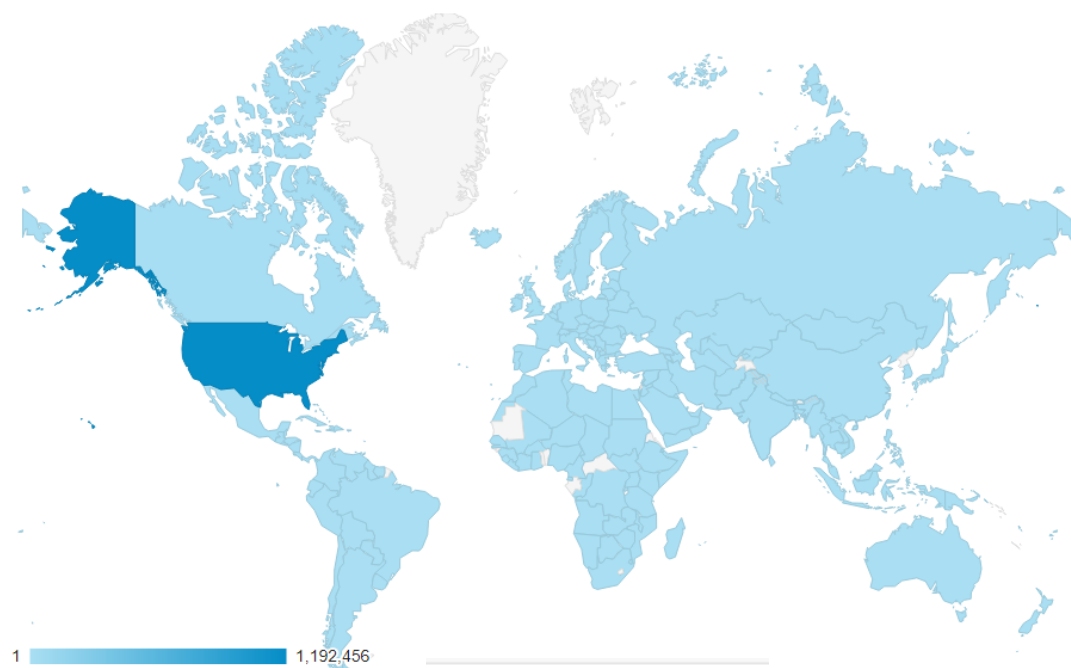


2,746,555
Pageviews



Top Pages Viewed

1. Michael (70%)
2. Florence
3. Harvey
4. Maria
5. Irma
6. Katrina



1. United States
2. Canada
3. India
4. United Kingdom
5. Puerto Rico

FEMA Geospatial Damage Assessment



Hurricane Michael Modeled Damage Assessments

Modeled Damage Assessments County Breakdown: Affected County Breakdown: Destroyed

Modeled Damage Assessments



Affected Destroyed

Modeled damage assessments broken into categories: Affected & Destroyed

TOTAL Affected Destroyed

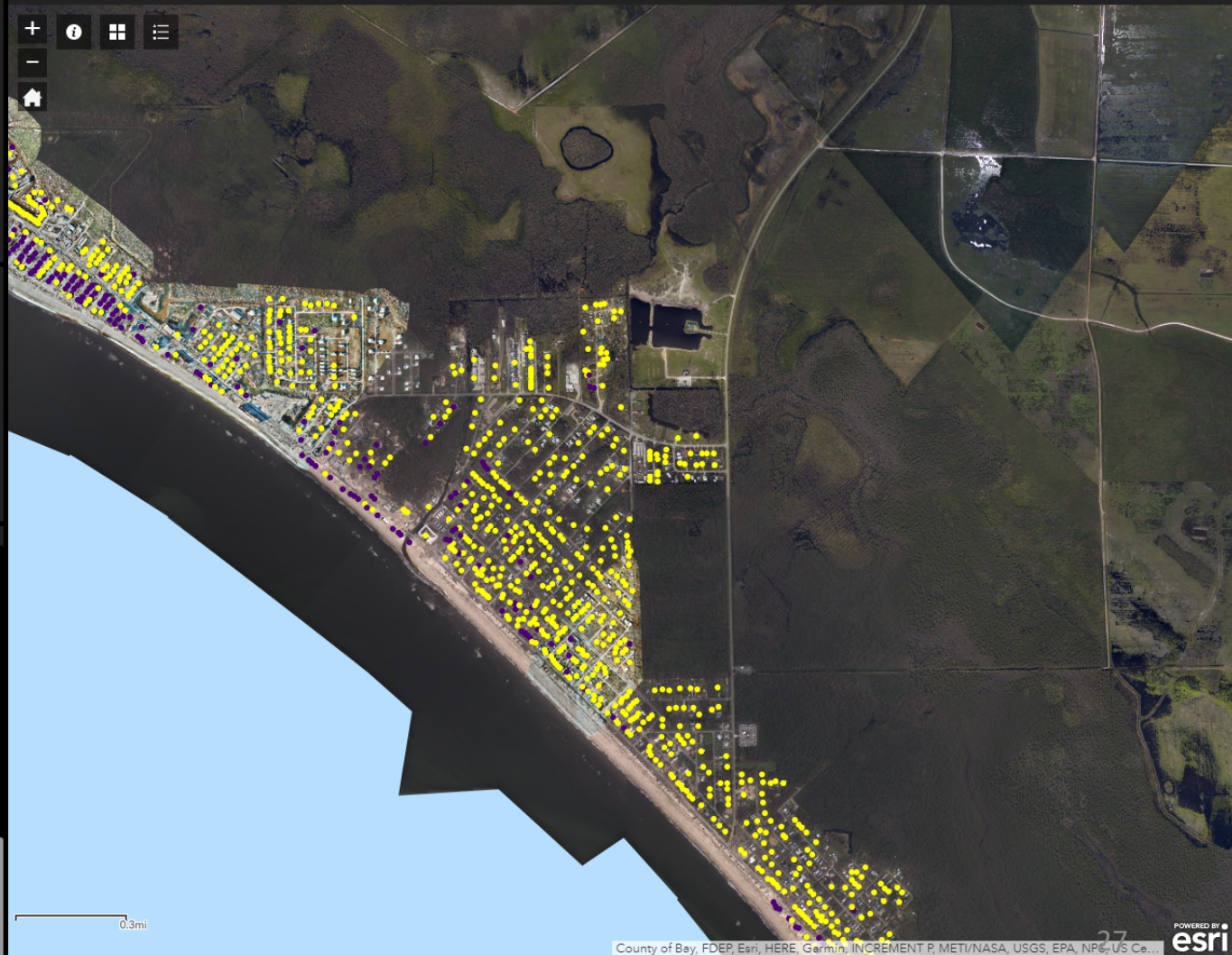
Total Damage Count

22,181

This is the total count of structures that have been assessed via imagery.

Imagery List

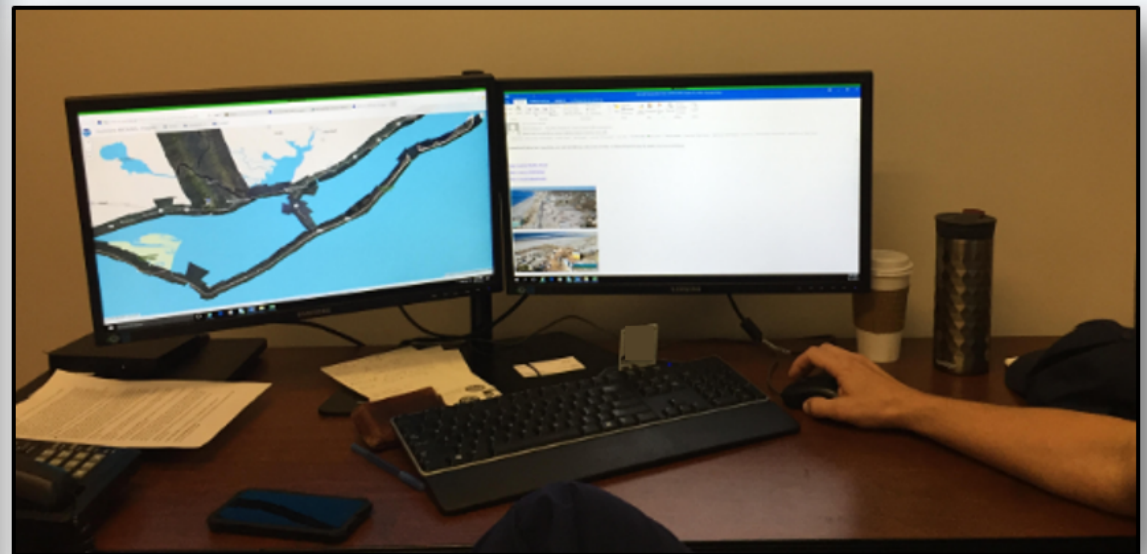
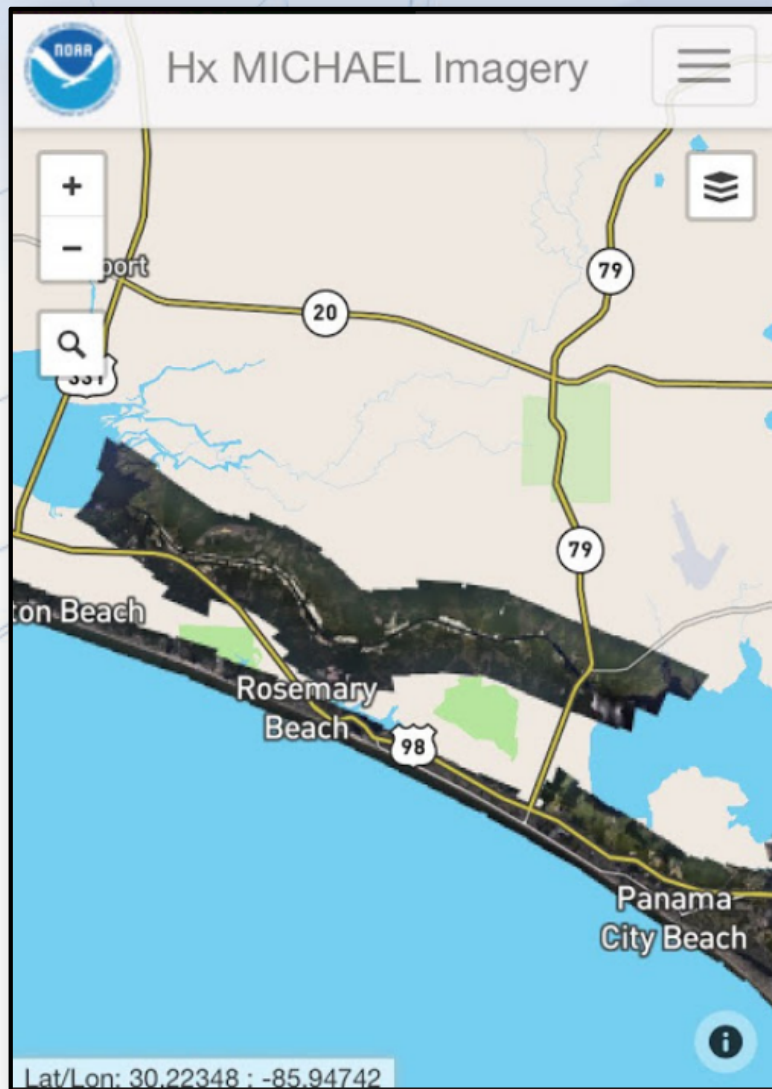
- ☐ NICB Imagery: South Pensacola Orthophoto 2" 10/13/2018
- ☐ NICB Imagery: Pensacola to Panama City 9" 10/12/2018
- ☐ NICB Imagery: Apalachicola to Panama City 3" 10/13/2018
- ☐ NICB Imagery: Donalsonville to Moultrie Orthophoto 8" 10/13/2018
- ☐ NICB Imagery: Mexico Beach to Port St. Joe Orthophoto 3" 10/13/2018
- ☐ NICB Imagery: Chattahoochee to Thomasville Orthophoto 3" 10/13/2018
- ☒ NOAA Imagery: 20181014a_RGB
- ☒ NOAA Imagery: 20181013a_RGB
- ☒ NOAA Imagery: 20181012b_RGB
- ☒ NOAA Imagery: 20181012a_RGB
- ☒ NOAA Imagery: 20181011a_RGB



Hurricane Michael Search and Rescue



Safety of Navigation



Humanitarian Support

The screenshot displays the NOAA National Geodetic Survey Product Gallery interface. The main window shows a satellite image of a coastal area with a table of metadata. The table includes the following information:

Property	Value
Description	Tiff Image
File Size	148 MB
Begin Date	2018-09-18T23:59:59.000Z
Date Collected	2018-09-18T23:59:59.000Z
Derived Sensor	Direct Linear Transform
End Date	2018-09-18T23:59:59.000Z
Filename	20180918aC0775230w343900n.tif
Mean GSD (m)	0.1366655061177887
NBANDS	4
NBPP	8
NCOLS	18681
NROWS	18681
Date Produced	2018-09-18T23:59:59.000Z
Date Cataloged	2018-09-19T13:53:06.003Z
File Path	D:\noaa\20180918a_RGB\20180918aC0775230w343900n.tif
Area Coordinates	POLYGON

The interface also includes a search bar, a map of Jacksonville, Florida, and a sidebar with navigation options. The status bar at the bottom indicates "Showing 482 of 962 total results" and "Sort By: Date Collected".

Team Rubicon is an international non-profit disaster response organization that unites the skills and experiences of military veterans with first responders to rapidly deploy emergency response teams, free of charge, to communities affected by disasters.

Summary

- Data has been acquired to support emergency response efforts due to hurricanes, flooding, earthquakes, and tornadoes since the mid-1960s.
- Data is disseminated to federal, state, and local government agencies, as well as the general public to facilitate support efforts
- Imagery (typically nadir and/or oblique) is collected, processed, and disseminated in GIS ready formats
- Goal: processed and available 6-8 hours after landing
- Technical Questions: ngs.hurricane1@noaa.gov
- POC Mike Aslaksen mike.aslaksen@noaa.gov 301-801-9024