



# NGS Emergency Response Imagery

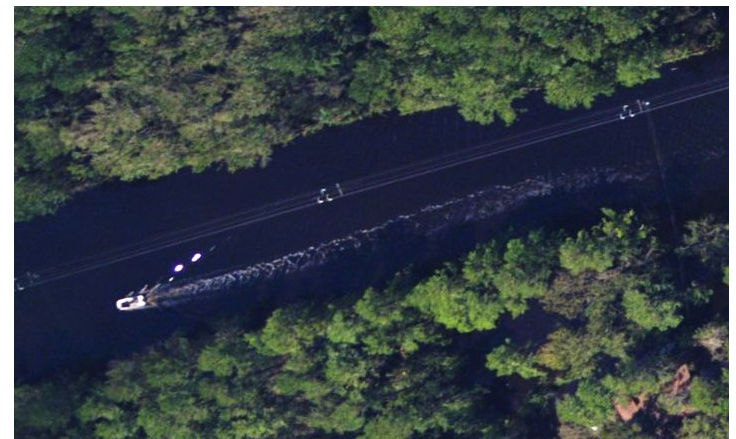
Maryellen Sault  
NOAA/NGS/RSD  
April 2022

# Outline

- NGS & ER History
- Coordination and Workflow
- New Digital Camera
- Pre-event Imagery
- Post-event Imagery Access
- Frequently Asked Questions
- Use Case Examples
- Webstats



Before Image: Google Earth



After Image: NOAA

# National Geodetic Survey

**Mission:** Define, maintain and provide access to the National Spatial Reference System.

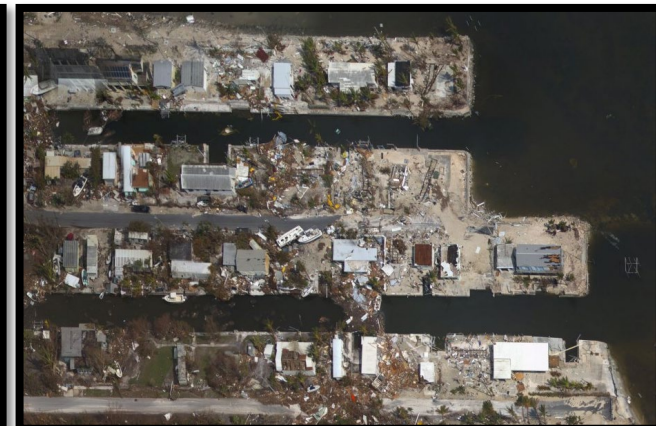
## RSD Primary Programs:



Aeronautical Survey  
Program

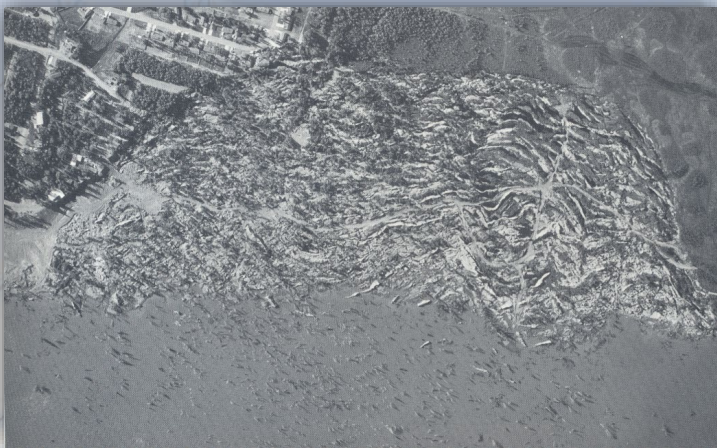


Coastal Mapping  
Program



Emergency Response

# Historical Responses



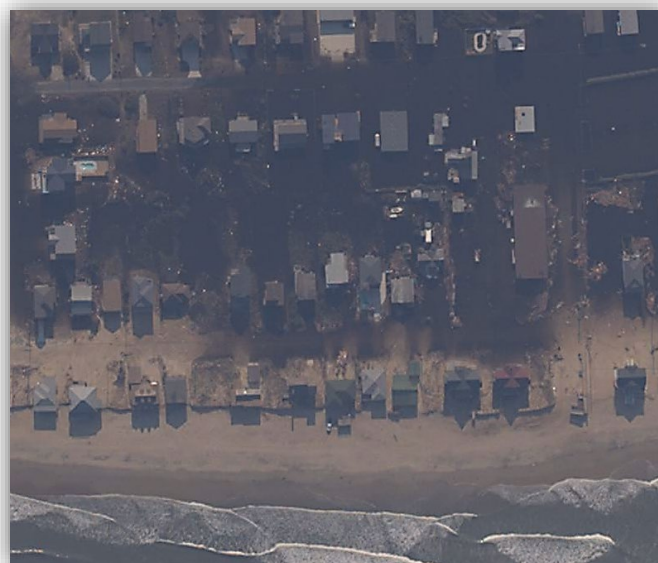
March 1964: Alaska earthquake



August 1969 Hurricane Camille



February 1978 Nor'easter



September 2003 Hurricane Isabel

~4-6 hr Tiled Ortho-mosaic

~3 Days

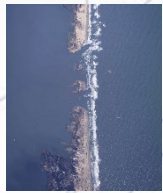
~24 hr

~8-12 hr

Un-rectified Image

Ortho Image

Tiled Ortho-mosaic



2003

2006

2012

16 MP

22 MP

39 MP

“Wheels down to web up”

\* Image sizes are to scale

\*\* 39+39+80 MP

2016 ~158 MP \*\*

# 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

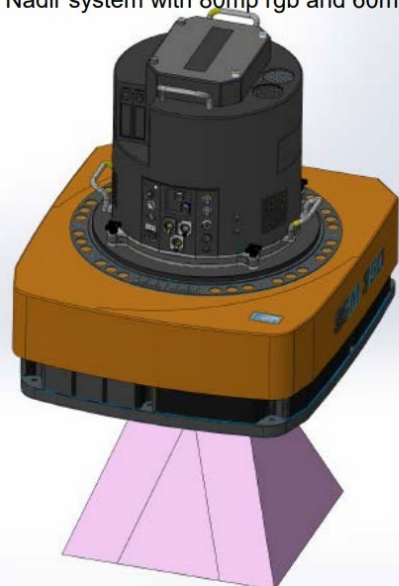
# Pre-event Planning



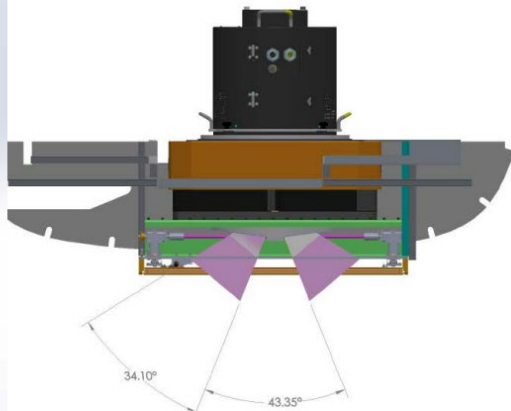
# Aircraft and Sensors



Nadir system with 80mp rgb and 60mp nir

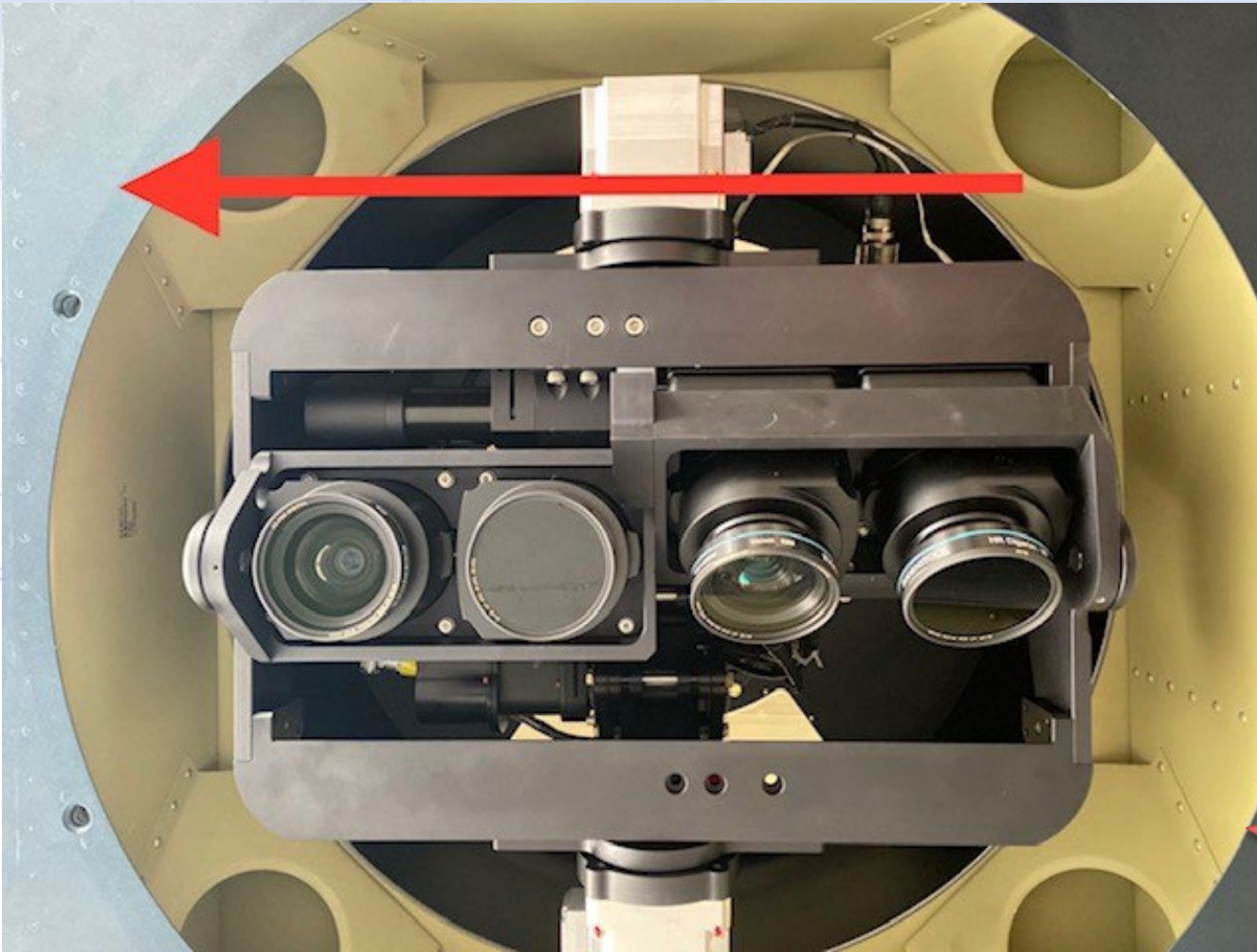


Oblique system with two 39mp rgb





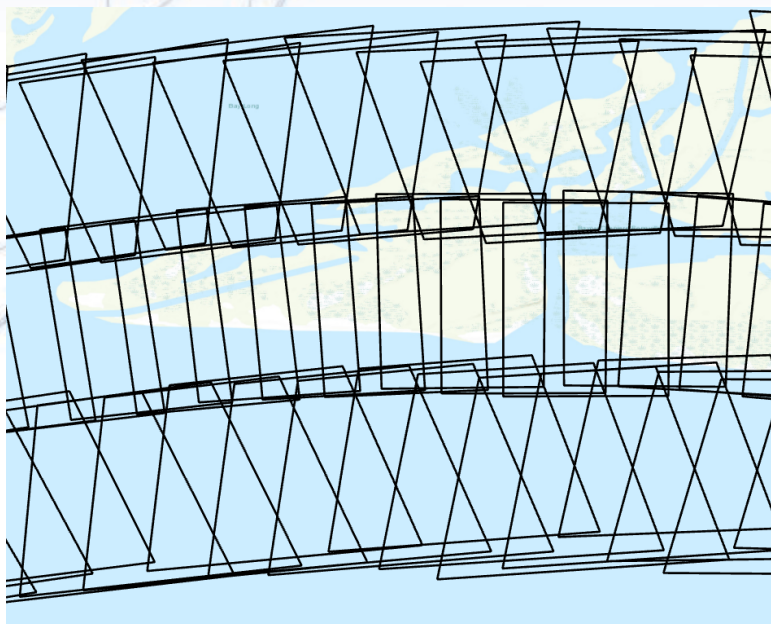
# Applanix / LeadAir DSS (Version 6)



**NEW**

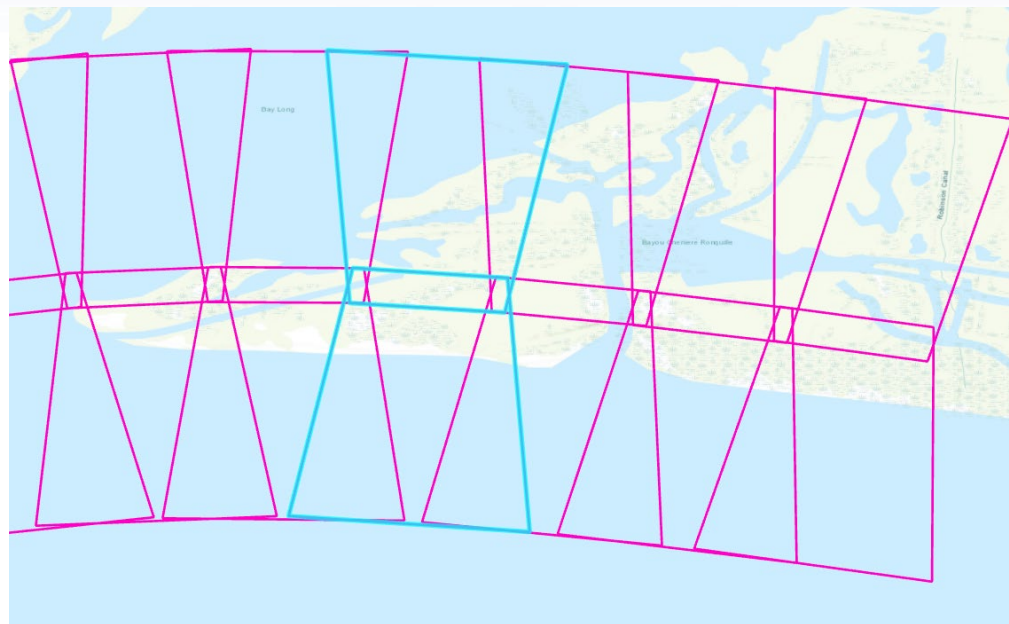
# Footprint Comparison

2020 Hurricane Zeta



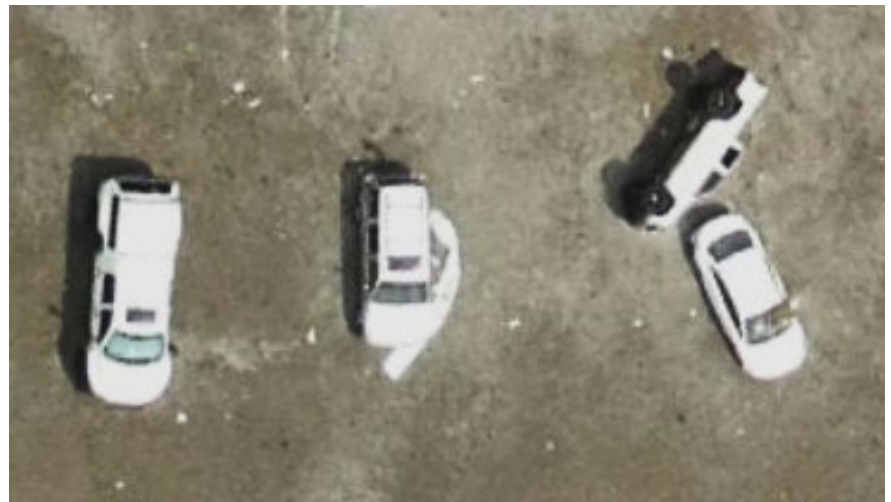
Applanix DSS

2021 Hurricane Ida



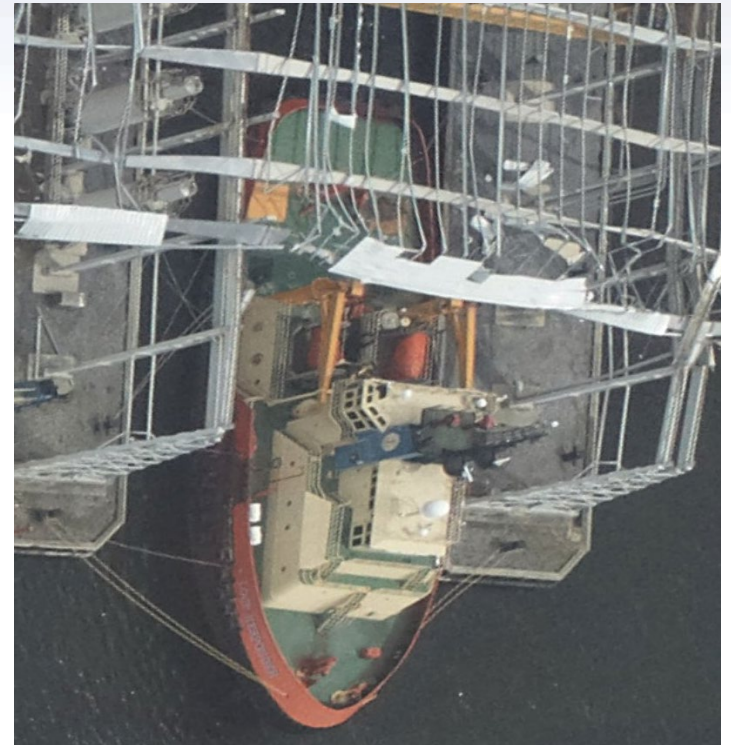
Applanix/ LeadAir DSS (Version 6)

# Increased Resolution



# Value of Oblique Imagery

2021 Hurricane Ida Imagery



# Response Workflow



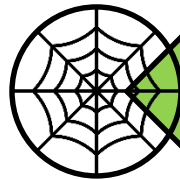
Imagery uploaded to cloud after landing



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



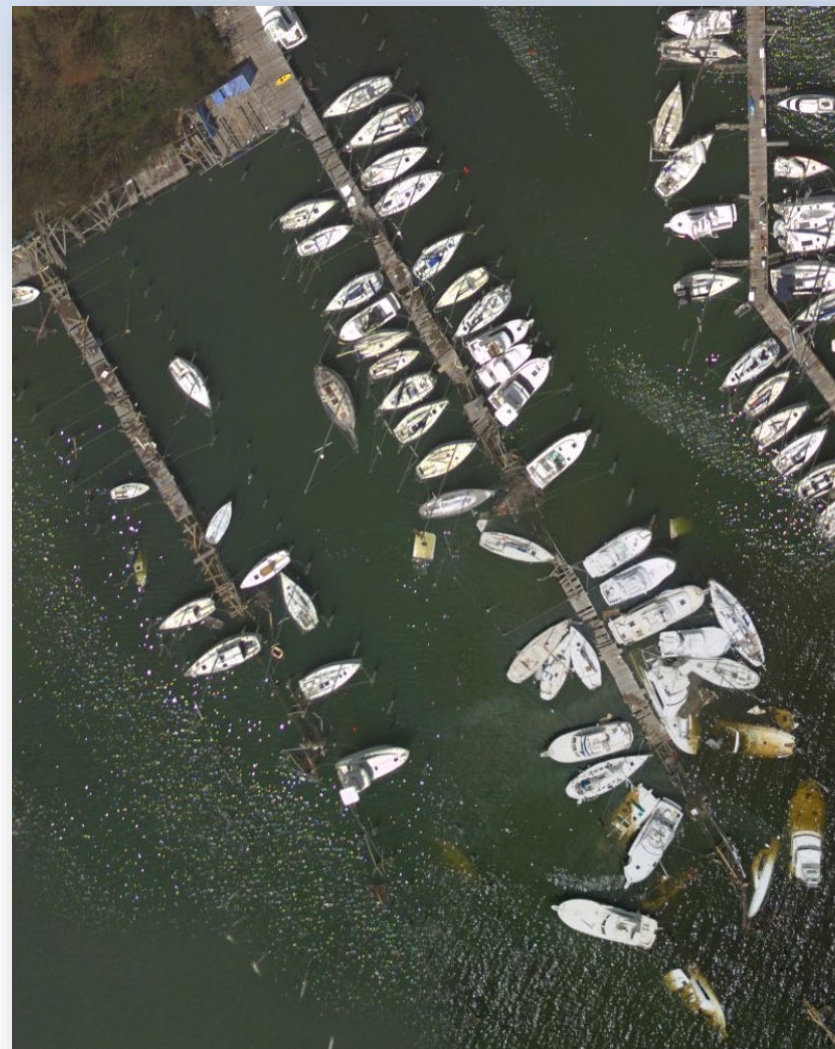
Mosaicked tiles are warehoused in **AWS** storage



TileServer & MapBox are used to make the data web accessible



Public website is created





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 Geodesic Survey  
Pre-Event Imagery

Contact Us

Content and Technical Issues  
Comments and Policy Issues

Emergency Response Imagery:

- Hurricane Ida (2021)
- Hurricane Henri (2021)
- Hurricane Zeta (2020)
- Hurricane Delta (2020)
- Hurricane Sally (2020)
- Hurricane Laura (2020)
- Hurricane Isaias (2020)
- Nashville Tornadoes (2020)
- Hurricane Dorian (2019)
- Hurricane Barry (2019)
- 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)

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

# Pre-Event Imagery

Coastal Imagery Viewer [About](#) [Contact](#) [Download](#)

2015 Imagery 2016 Imagery 2017 Imagery 2018+ Imagery

- Mapbox Streets
- Mapbox Labels
- 2018 RGB Imagery
- 2019 RGB Imagery
- 2020 RGB Imagery

www.noaa.gov © Mapbox © OpenStreetMap Improve this map 1:38 PM

# 2017 Pre-Event Imagery

Coastal Imagery Viewer [About](#) [Contact](#) [Download](#)

2015 Imagery 2016 Imagery 2017 Imagery 2018 Imagery

**2 Image Footprints Selected**

Acquired: Apr 15 2017


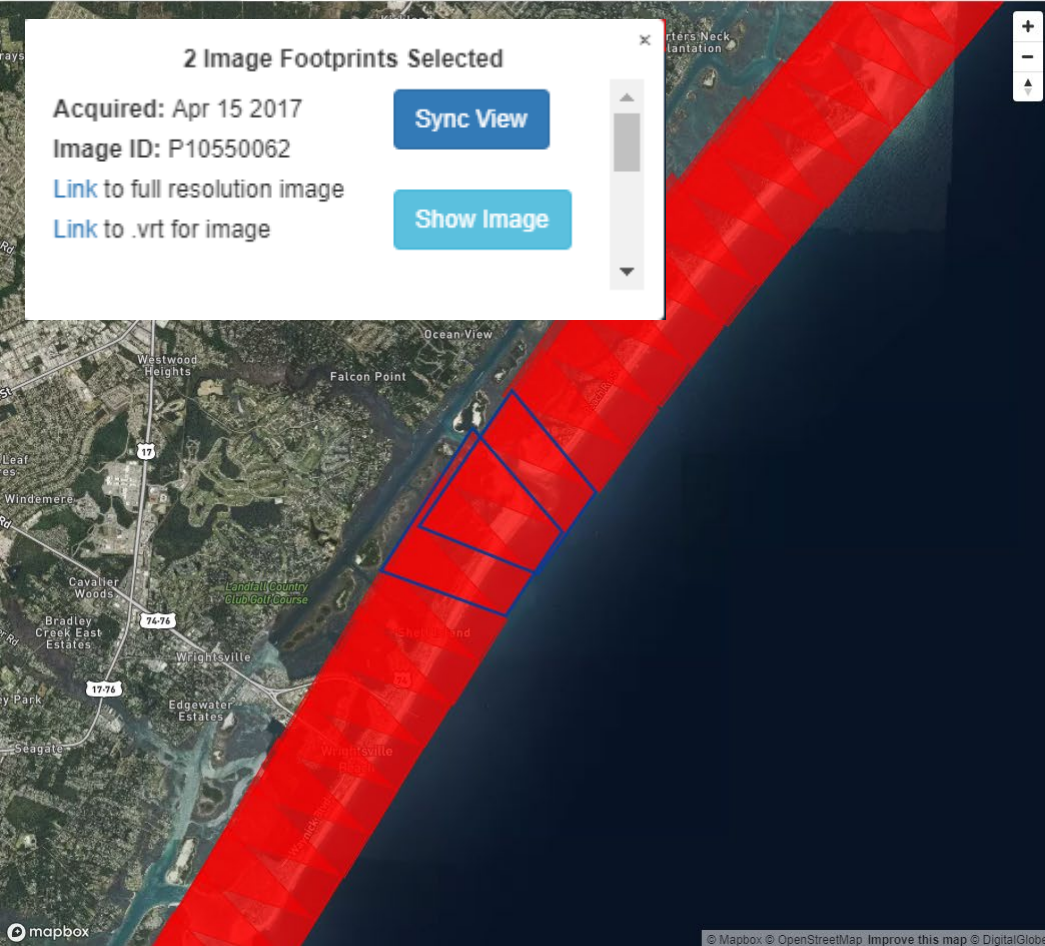
Image ID: P10550062

[Link to full resolution image](#)

[Link to .vrt for image](#)

[Sync View](#)

[Show Image](#)

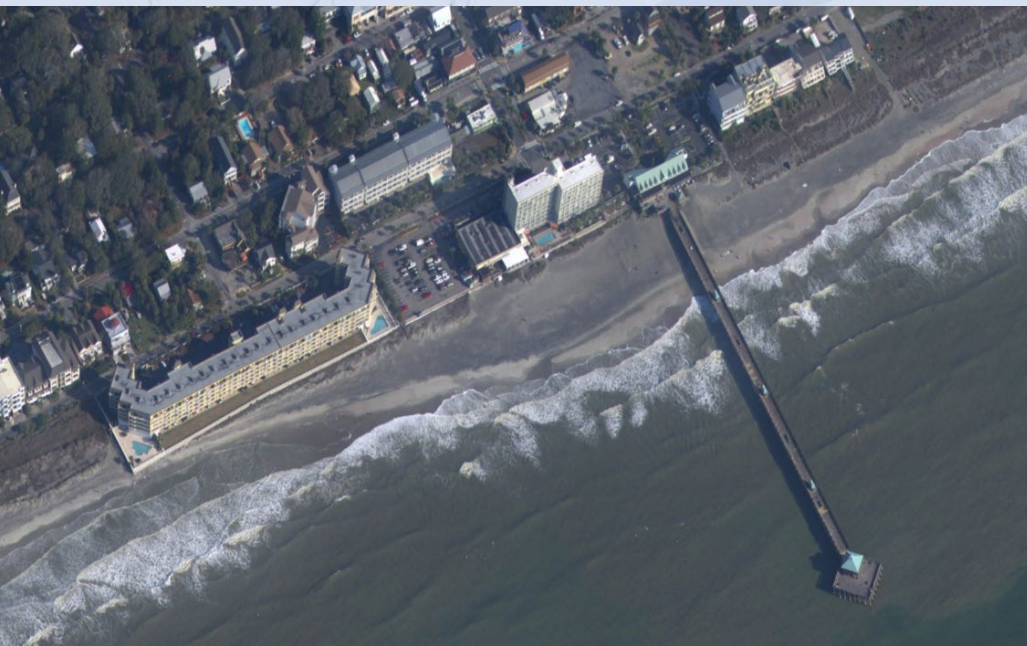


© Mapbox © OpenStreetMap Improve this map © DigitalGlobe

16 Leaflet | NOAA Imagery



# 2020 Pre-Event Imagery



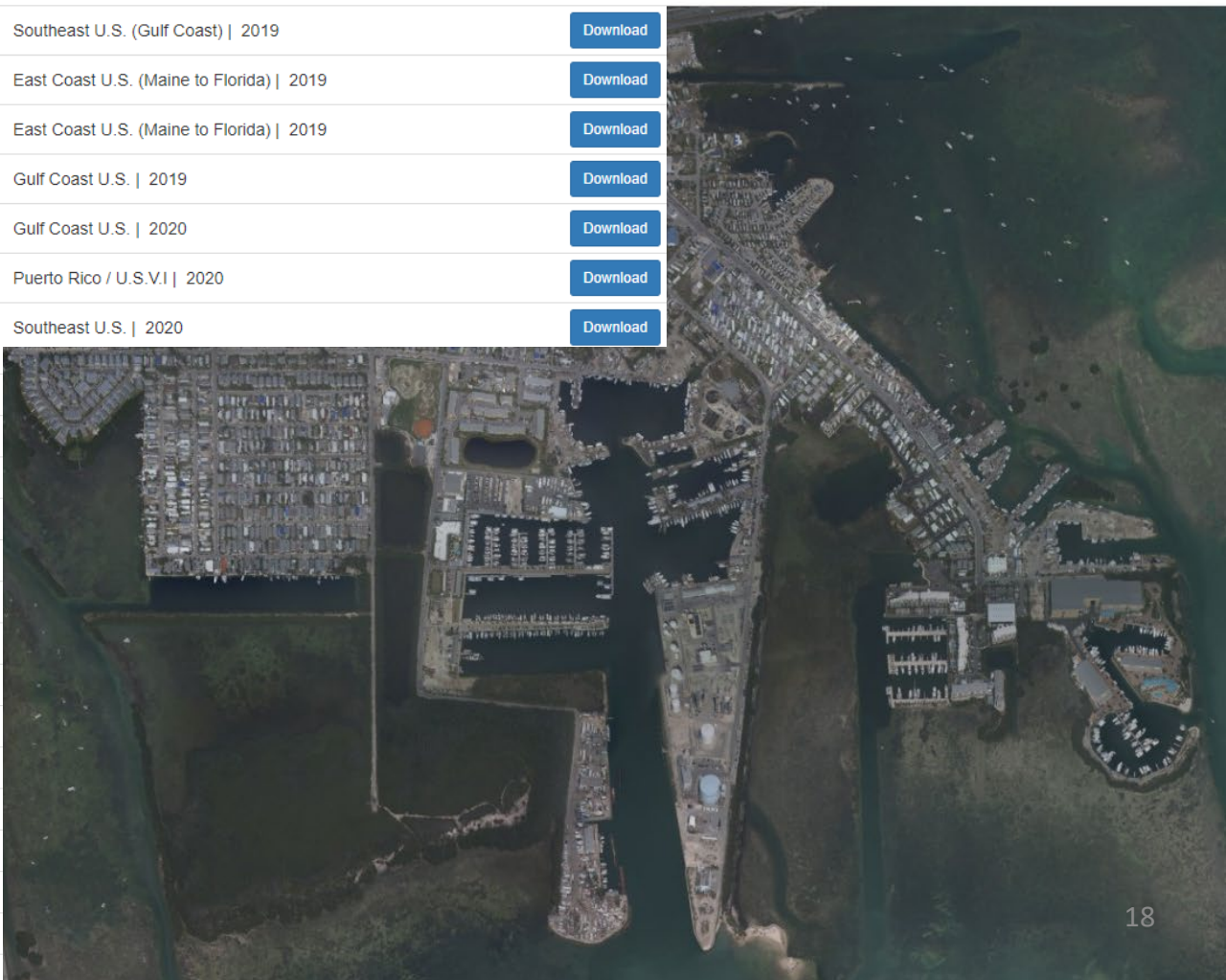
Search Address

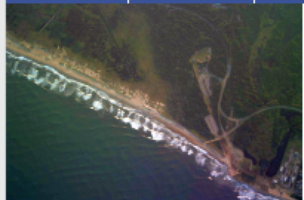
- Mapbox Streets
- Mapbox Labels
- 2018 RGB Imagery
- 2019 RGB Imagery
- 2020 RGB Imagery

A map interface showing a satellite image of the coastal area. The map includes a search bar at the top right and a legend on the right side. The legend has five items: 'Mapbox Streets' (selected), 'Mapbox Labels', '2018 RGB Imagery', '2019 RGB Imagery', and '2020 RGB Imagery' (selected). The map shows a coastline with a long pier extending into the ocean. The 2020 RGB Imagery is overlaid on the map, showing the pier and the surrounding area in a dark, almost black color. The map also shows a network of waterways and landmasses in light blue and green. The mapbox logo is visible in the bottom left corner, and the text '© Mapbox © OpenStreetMap Improve this map' is visible in the bottom right corner.

# Pre-Event Imagery Download

Southeast U.S. (Florida Gulf Coast)   2015	<a href="#">Download</a>	Puerto Rico / U.S.V.I   2018	<a href="#">Download</a>
Southeast U.S. (Florida Gulf Coast)   2015	<a href="#">Download</a>	Southeast U.S. (Gulf Coast)   2019	<a href="#">Download</a>
Southeast U.S. (Florida Gulf Coast)   2015	<a href="#">Download</a>	East Coast U.S. (Maine to Florida)   2019	<a href="#">Download</a>
South U.S. (Mississippi to Louisiana)   2015	<a href="#">Download</a>	East Coast U.S. (Maine to Florida)   2019	<a href="#">Download</a>
South U.S. (Louisiana to Texas)   2015	<a href="#">Download</a>	Gulf Coast U.S.   2019	<a href="#">Download</a>
South U.S. (Texas)   2015	<a href="#">Download</a>	Gulf Coast U.S.   2020	<a href="#">Download</a>
South U.S. (Texas)   2015	<a href="#">Download</a>	Puerto Rico / U.S.V.I   2020	<a href="#">Download</a>
Southwest U.S. (California)   2015	<a href="#">Download</a>	Southeast U.S.   2020	<a href="#">Download</a>
Northwest U.S. (Oregon to Washington)   2015	<a href="#">Download</a>		
Northeast U.S. (New York to to North Carolina)   2016	<a href="#">Download</a>		
West Coast U.S.   2016	<a href="#">Download</a>		
Puerto Rico   2016	<a href="#">Download</a>		
Alaska   2016	<a href="#">Download</a>		
Great Lakes Region U.S.   2016	<a href="#">Download</a>		
South U.S. (Louisiana to Florida Gulf Coast)   2017	<a href="#">Download</a>		
Southeast U.S. (Virginia to Florida)   2017	<a href="#">Download</a>		
Northeast U.S. (Maine to North Carolina)   2018	<a href="#">Download</a>		
Northeast U.S. (Maryland to New York)   2018	<a href="#">Download</a>		
Southeast U.S. (North Carolina to South Carolina)   2018	<a href="#">Download</a>		
Southeast U.S. (South Carolina to Florida)   2018	<a href="#">Download</a>		
Southeast U.S. (Florida to Texas)   2018	<a href="#">Download</a>		
Southeast U.S. (Texas)   2018	<a href="#">Download</a>		
Great Lakes Region U.S.   2018	<a href="#">Download</a>		
West Coast U.S.   2018	<a href="#">Download</a>		
West Coast U.S.   2018	<a href="#">Download</a>		





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:

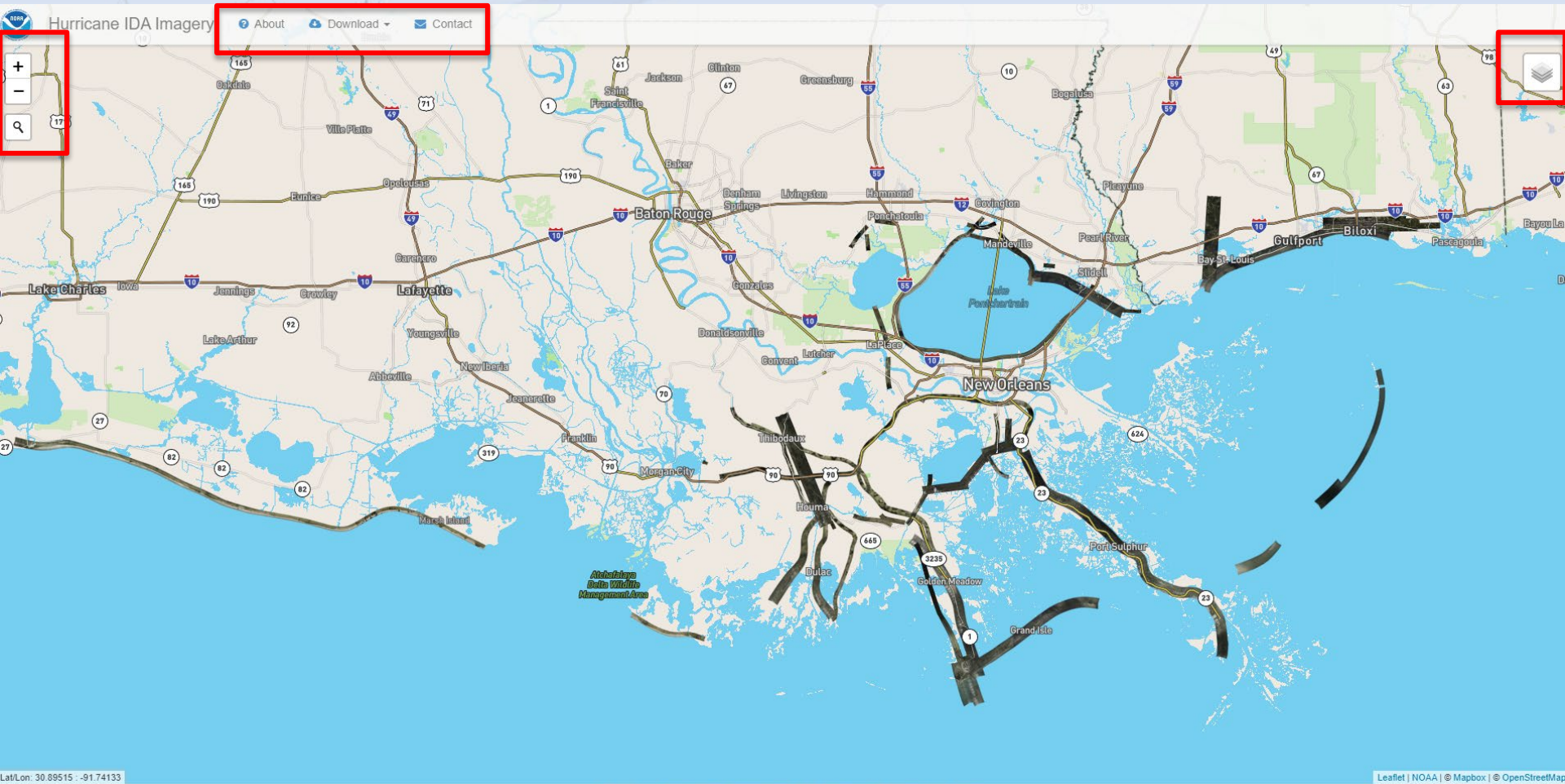
- Hurricane Ida (2021)
- Hurricane Henri (2021)
- Hurricane Zeta (2020)
- Hurricane Delta (2020)
- Hurricane Sally (2020)
- Hurricane Laura (2020)
- Hurricane Isaias (2020)
- Nashville Tornadoes (2020)
- Hurricane Dorian (2019)
- Hurricane Barry (2019)
- Hurricane Michael (2018)
- Hurricane Florence (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)



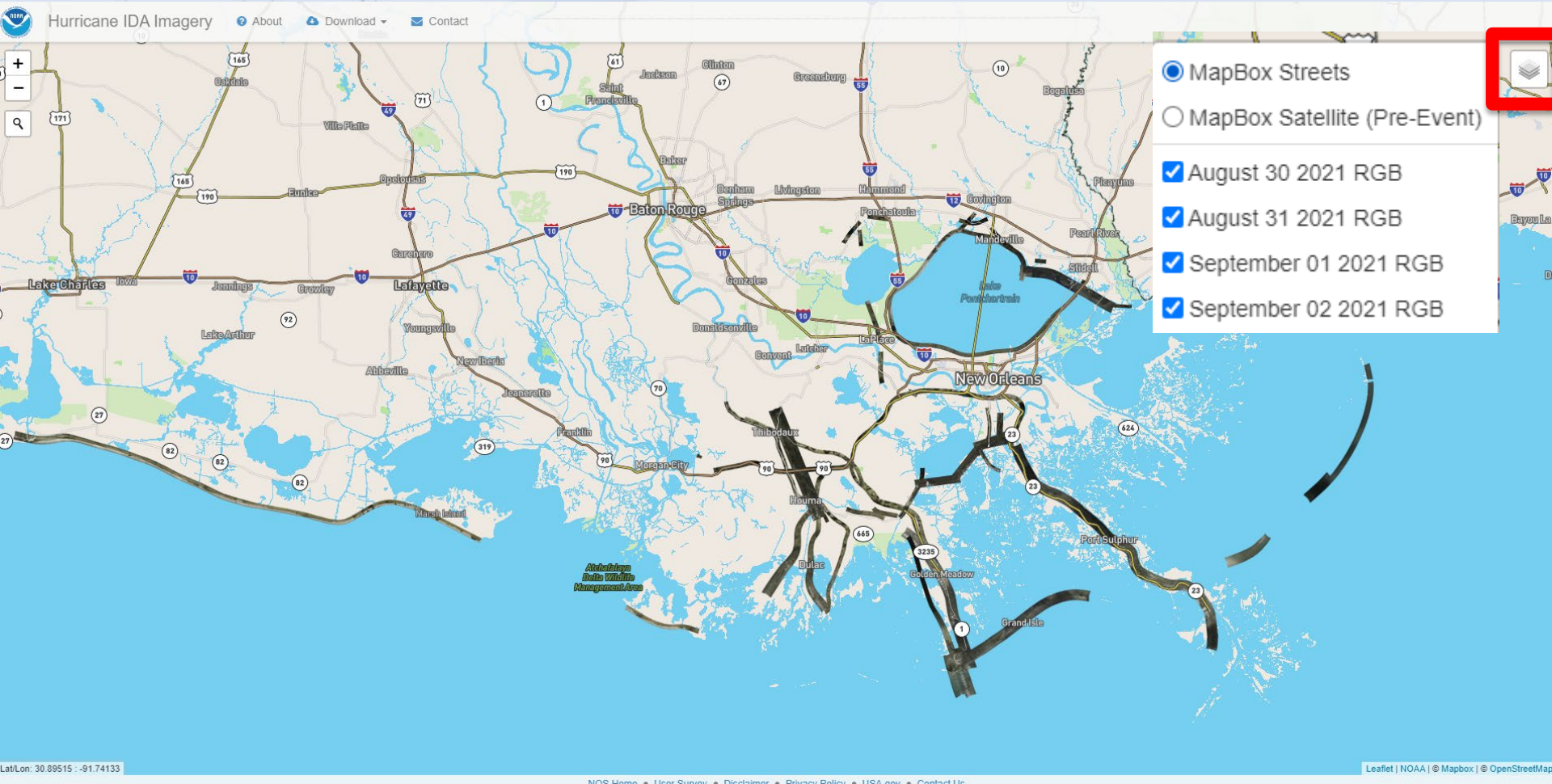
Navigation  
National Geodetic Survey  
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Comments and Policy  
Issues

# Hurricane Ida



# Hurricane Ida



# Hurricane Ida

The screenshot shows a web application interface for Hurricane IDA imagery. At the top left, there is a navigation bar with the NOAA logo, the title "Hurricane IDA Imagery", and links for "About", "Download", and "Contact". The "About" link is highlighted with a red box. Below the navigation bar is a map of the Gulf Coast region, showing Lake Charles, Lake Arthur, and the Gulf of Mexico. A popup window titled "Hurricane IDA Imagery" is open, containing a navigation menu with "About the data", "Web Services", "Disclaimer", and "Metadata". The "About" section is selected, displaying the following text:

**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 ~15 cm / zoom level 20.

# Hurricane Ida WMTS

Hurricane IDA Imagery

Download Contact

**About**

## Hurricane IDA Imagery

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

- **WMTS version 1.0.0 GetCapabilities:**  
<https://storms.ngs.noaa.gov/storms/ida/services/WMTSCapabilities.xml>
- **All Services:** <https://storms.ngs.noaa.gov/storms/ida/services/resource-urls.html>

Lat/Lon: 30.89515 ; -91.74133

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Leaflet | NOAA | © Mapbox | © OpenStreetMap

# Hurricane Ida Download

The screenshot shows the 'Hurricane IDA Imagery' web application interface. A red box highlights the 'Download' button in the top navigation bar. A dropdown menu is open, listing eight download options. Each option includes a download icon, a description of the flight (date and flight number), and two file format choices: TIF and RAW JPEG. The background is a map of the Biloxi Marsh area in Mississippi, showing roads, water bodies, and the hurricane's path.

Date	Flight	TIF	RAW JPEG
August 30 2021	RGB Flight 1	(TIF)	(RAW JPEG)
August 30 2021	RGB Flight 2	(TIF)	(RAW JPEG)
August 31 2021	RGB Flight 1	(TIF)	(RAW JPEG)
August 31 2021	RGB Flight 2	(TIF)	(RAW JPEG)
September 01 2021	RGB Flight 1	(TIF)	(RAW JPEG)
September 01 2021	RGB Flight 2	(TIF)	(RAW JPEG)
September 02 2021	RGB Flight 1	(TIF)	(RAW JPEG)
September 02 2021	RGB Flight 2	(TIF)	(RAW JPEG)

Lat/Lon: 30.89515 - -91.74133

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# Digital Coast Data Access Viewer

The screenshot displays the Digital Coast Data Access Viewer interface. At the top, the NOAA logo is followed by the title "DIGITAL COAST: DATA ACCESS VIEWER" and navigation tabs for "IMAGERY", "LAND COVER", and "ELEVATION". On the right side of the header, there are links for "HELP" and "SHARE".

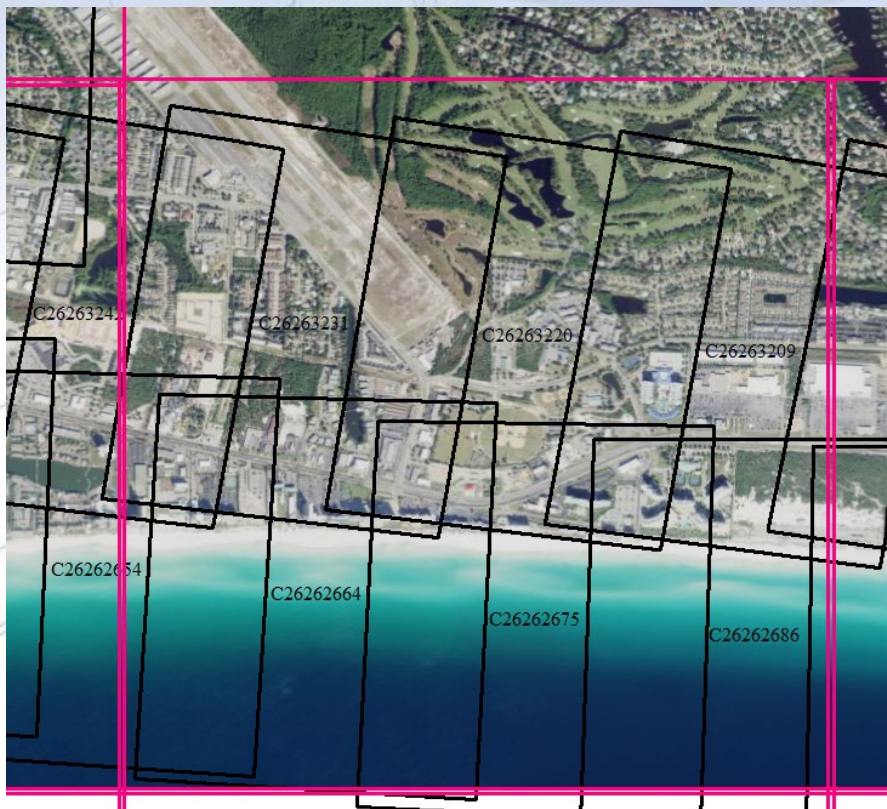
The main map area shows a coastal region with a yellow bounding box highlighting a specific area. Above the map is a search bar with the text "Search By Address, Lat/Lon or Exten" and a "Draw" button. Below the map, there are controls for "Streets" and "Satellite" views, along with a "2000 ft" scale bar.

On the right side, there is a list of data products with the following details:

- NOAA Nation. (dropdown)
- Sort Results (dropdown)
- 2021 NOAA NGS Post Hurricane Ida Emergency Response Imagery: LA, MS  
NOAA NGS  
2.19 GB
- 2020 NOAA NGS Hurricane Zeta Emergency Response Imagery: Louisiana  
NOAA NGS  
1.38 GB · BULK DOWNLOAD
- 2019 NOAA NGS DSS Infrared 8 Bit Imagery: Gulfport, MS  
NOAA NGS  
75.24 MB · BULK DOWNLOAD
- 2019 NOAA NGS DSS Natural Color 8 Bit Imagery: Gulfport, MS  
NOAA NGS  
225.98 MB · BULK DOWNLOAD
- 2018 NOAA NGS DSS Natural Color 8 Bit Imagery: Tropical Storm Gordan  
NOAA NGS  
347.25 MB · BULK DOWNLOAD
- 2017 Hurricane Nate NOAA NGS DSS Natural Color 8 Bit Imagery  
NOAA NGS  
221.01 MB · BULK DOWNLOAD
- 2015 Gulf Port, MS NOAA NGS DSS Natural Color 8 Bit Imagery

At the bottom right, it says "Showing 7 results".

# FAQ - Image Time



C26262664

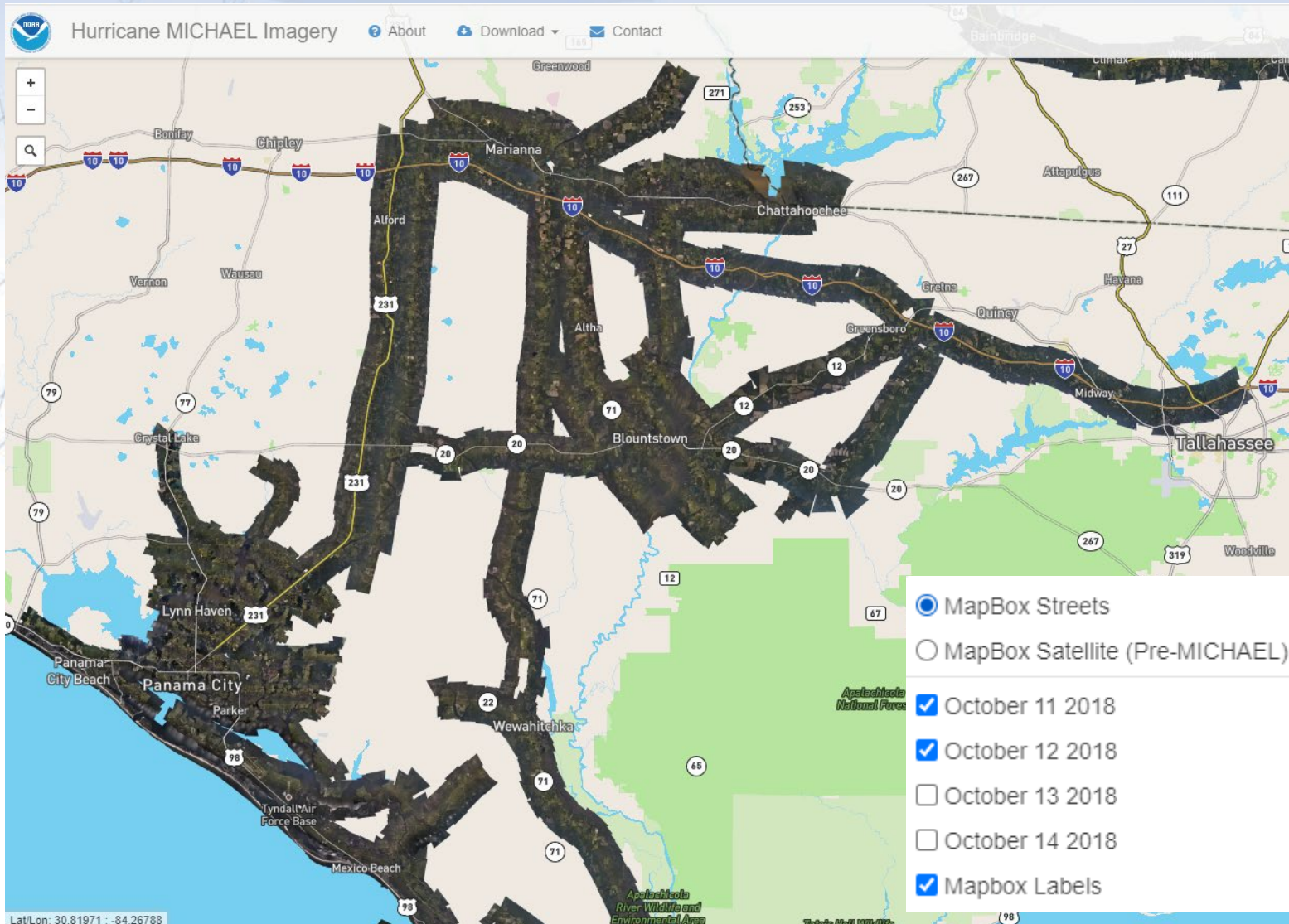
C = Camera identifier  
262 = GPS day of year  
62664 = Approximate seconds  
of GPS day 262

022581-0831212042333-RGB1.jpg

022318 = image id  
083121 = MMDDYY  
2042333 = HHMMSSs (UTC)  
RGB1 = camera id



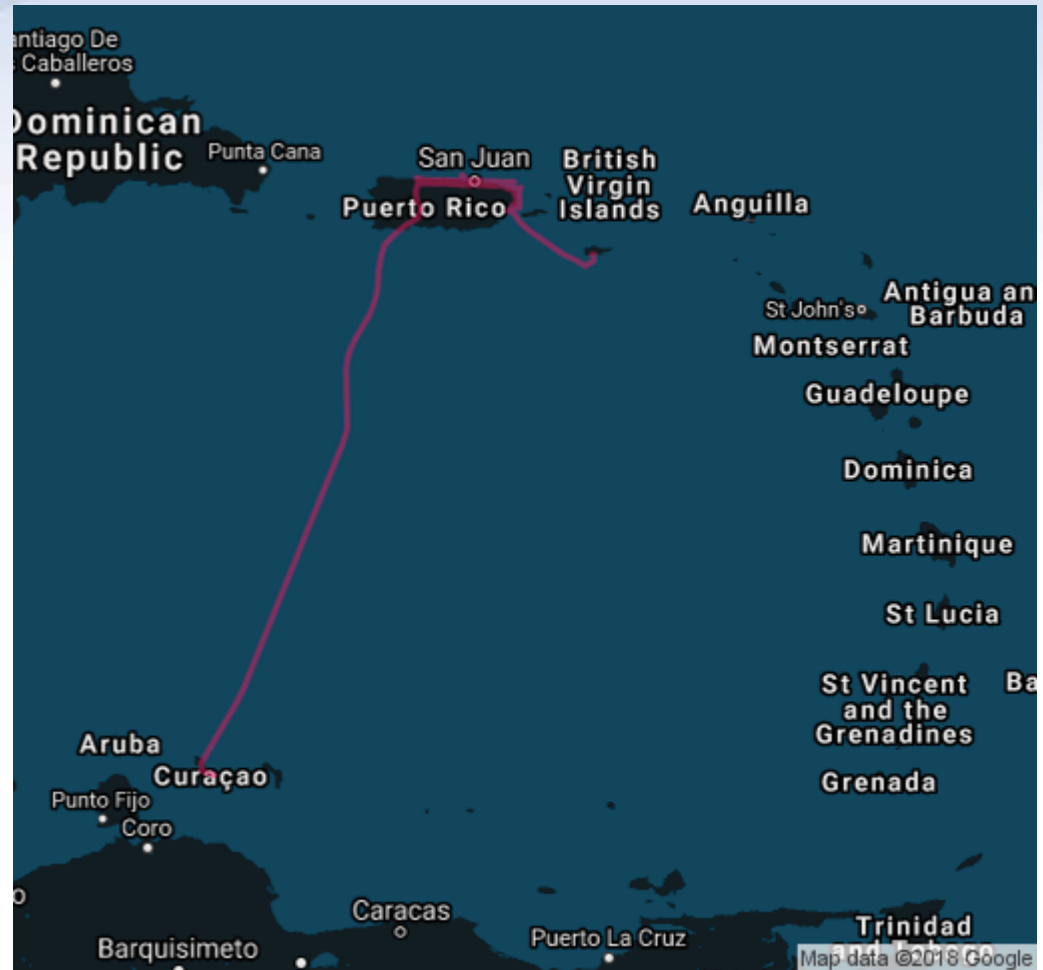
# FAQ – Missing Area



# FAQ – Viewer Updated

## Hurricane Maria

- Remote Operations
- No Electricity
- No Internet
- Closed Airport
- Weather



# FEMA Geospatial Damage Assessment

## Hurricane Michael Modeled Damage Assessments

FEMA

Modeled Damage Assessments County Breakdown: Affected County Breakdown: Destroyed

### Modeled Damage Assessments



Modeled damage assessments broken into categories: Affected & Destroyed

TOTAL Affected Destroyed

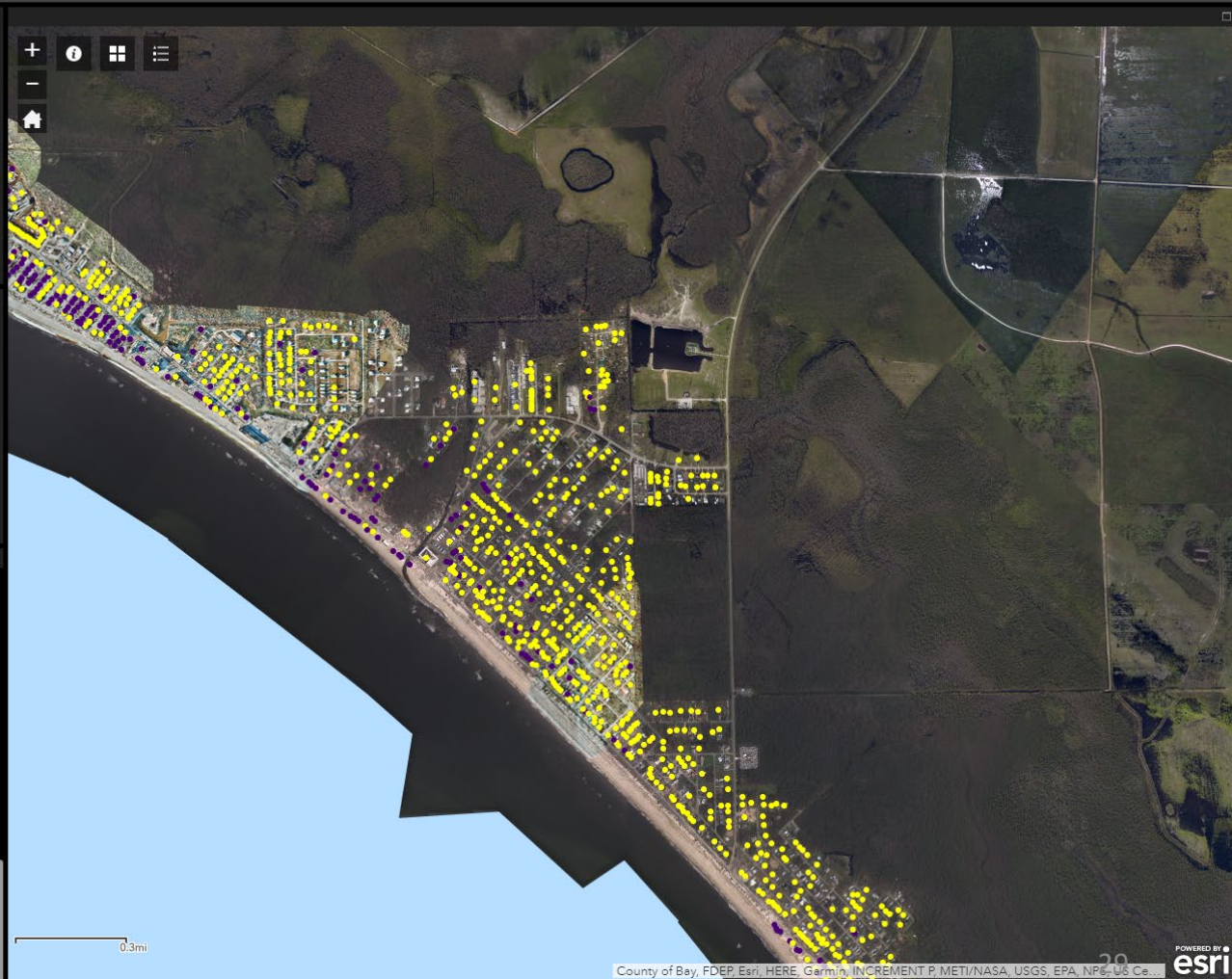
### Total Damage Count

# 22,181

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

### Imagery List

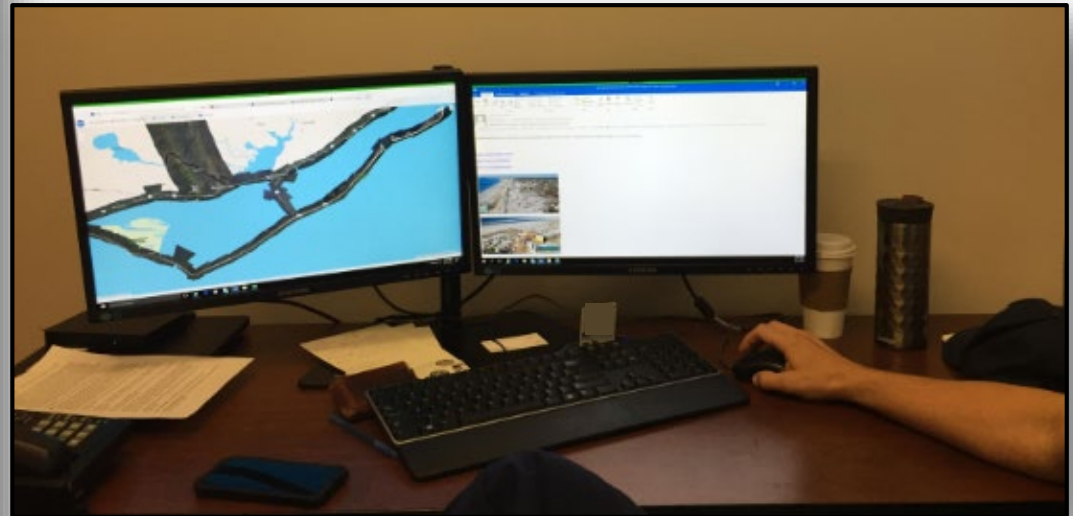
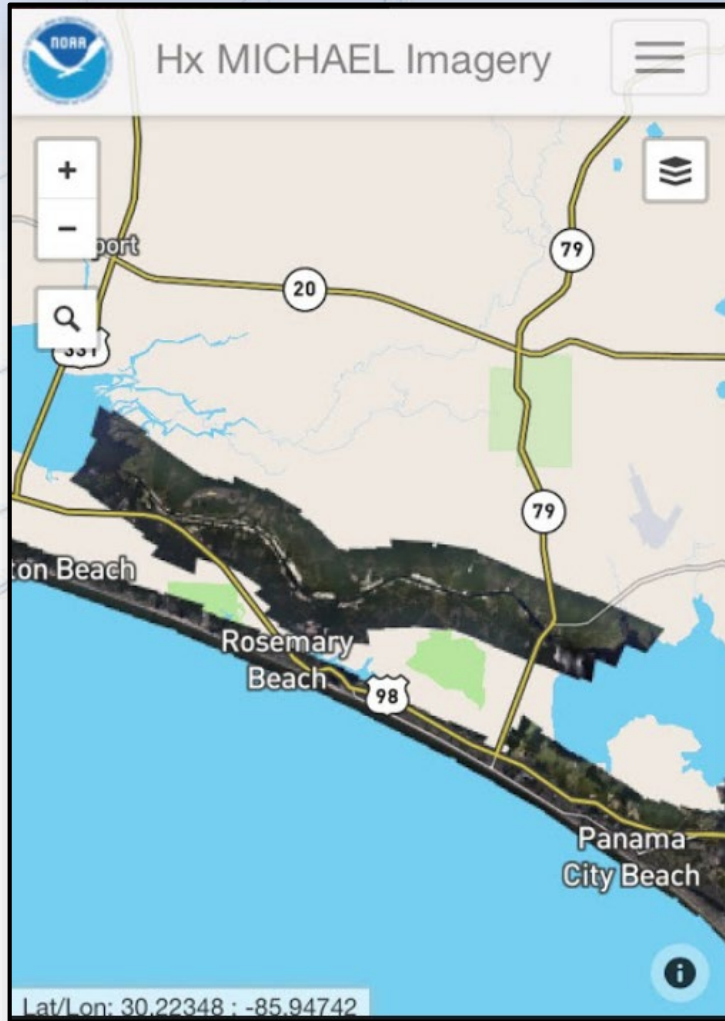
- NICB Imagery: South Pensacola Orthophoto 2\* 10/13/2018 ...
- NICB Imagery: Pensacola to Panama City 9\* 10/12/2018 ...
- NICB Imagery: Apalachicola to Panama Orthophoto 3\* 10/13/2018 ...
- NICB Imagery: Donalsonville to Moultrie Orthophoto 8\* 10/13/2018 ...
- NICB Imagery: Mexico Beach to Port St. 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





BAE SYSTEMS

GXP Geospatial eXploration Products™

# Operation Silver Sun Hurricane Florence

Wallace, NC 28466  
Coordinates: 34°43'28.5"N 77°59'04.9"W  
Image Date: 18-Sept-2018



ATTENTION: This document for Team Rubicon Disaster Response. All requests for use outside of Team Rubicon USA please contact: RFI@Teamrubiconusa.org

34° 43' 28.800"N  
077° 59' 05.100"W  
WGS\_84  
10 m MSL

Butler Rd

Duke St

Wallace Mhp Ln

Old Wilmington Rd

NC-11 S

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.

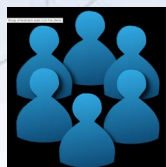
GEOVIS Team Comment: Three neighborhoods butler road, Wallace Mhp Ln, Duke St all under water with substation as well under water.

HF Product #002-0923-2018





# Website Stats (Feb 15, 2018 – April 13, 2022)



1,800,00  
Users

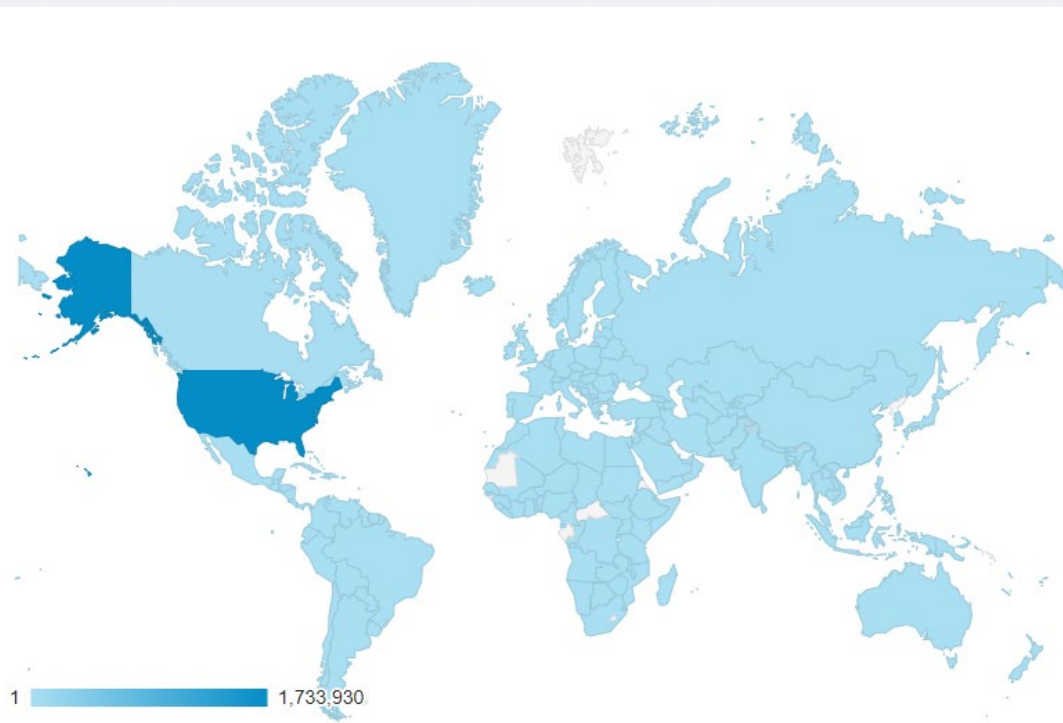


4,126,780  
Pageviews



## Top Pages Viewed

1. Michael
2. Florence
3. Ida
4. Laura
5. Harvey
6. Maria



# 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 is collected, processed, and disseminated in GIS ready formats
- Goal: processed and available 6-8 hours after landing
- Technical Questions: [ngs.hurricane1@noaa.gov](mailto:ngs.hurricane1@noaa.gov)