

NATIONAL GEODETIC SURVEY

NOAA's National Geodetic Survey Emergency Response Efforts

2006 Ocean and Coastal Program Managers' Meeting

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Acting Chief
Remote Sensing Division
NOAA's National Geodetic Survey



National Oceanic and Atmospheric Administration

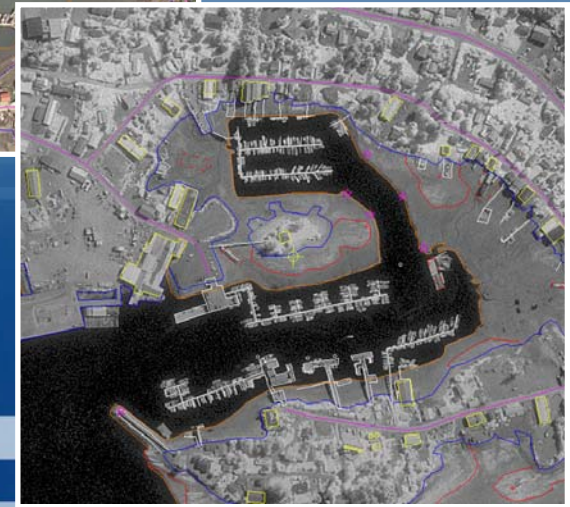
Our Focus

NATIONAL GEODETIC SURVEY

- NOAA
 - National Ocean Service
 - National Geodetic Survey
 - Remote Sensing Division
- Primary programs
 - Coastal Mapping Program
 - Aeronautical Survey Program



Digital Photogrammetric Workstation used for aerotriangulation and feature extraction



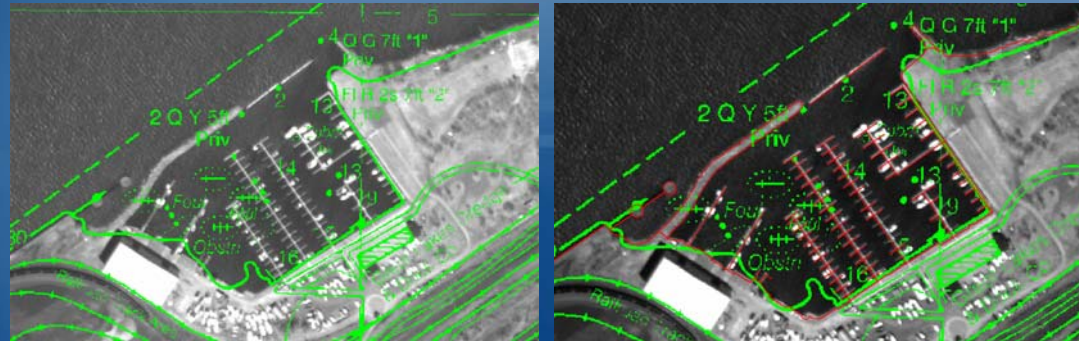
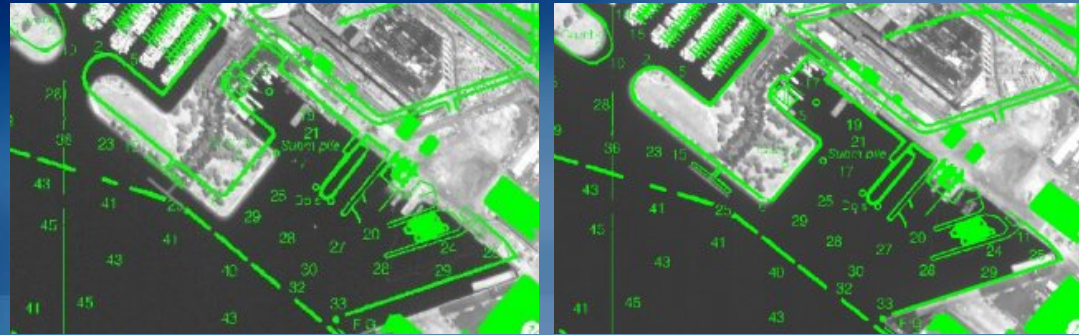
CSCAP: The Coast and Shoreline Change Analysis Program

NATIONAL GEODETIC SURVEY

Satellite Imagery



Georeferenced to meet accuracy needs



Updated as needed



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Emergency Response

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Background

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- Remotely sensed data is acquired to support NOAA's homeland security and emergency response requirements (ESF #10, #11, and #13 of the National Response Plan).
- RSD maintains the capability to provide tools, technology, and expertise in a timely and efficient manner.
- The remotely sensed data collected is disseminated to federal, state, and local government agencies as well as the general public to facilitate support efforts.



Historical Accounts

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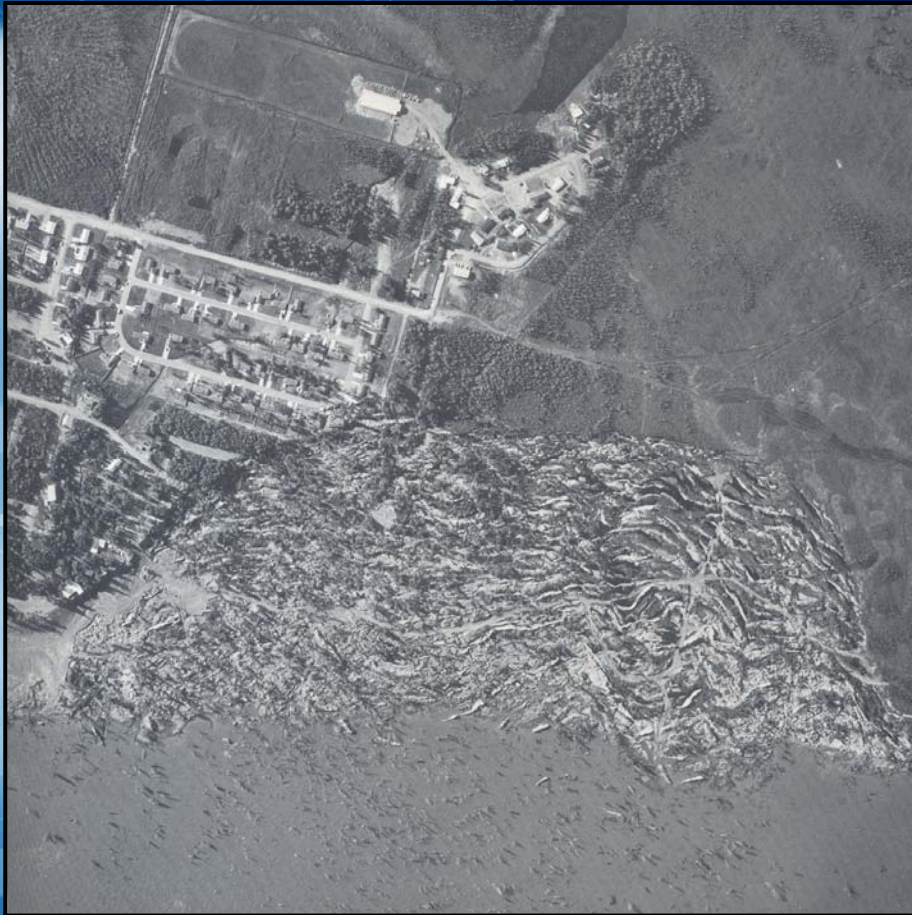
- **Over the last several decades, NOAA has assisted with recovery from a variety of natural and human induced disasters, including:**
 - March 27, 1964: On Good Friday, Alaska was struck by an earthquake and tsunami.
 - Hurricanes: Camille (1969), Ceila (1970), and Frederick (1979).
 - February 1978: Nor'easter damage along the New England coastline.
 - Oil Spills: breaking up and sinking of the Texaco Oklahoma (1971) and the Campeche Bay oil spill (1979).



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Historical Accounts

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March 27, 1964: Alaska struck by an earthquake and tsunami.



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Historical Accounts

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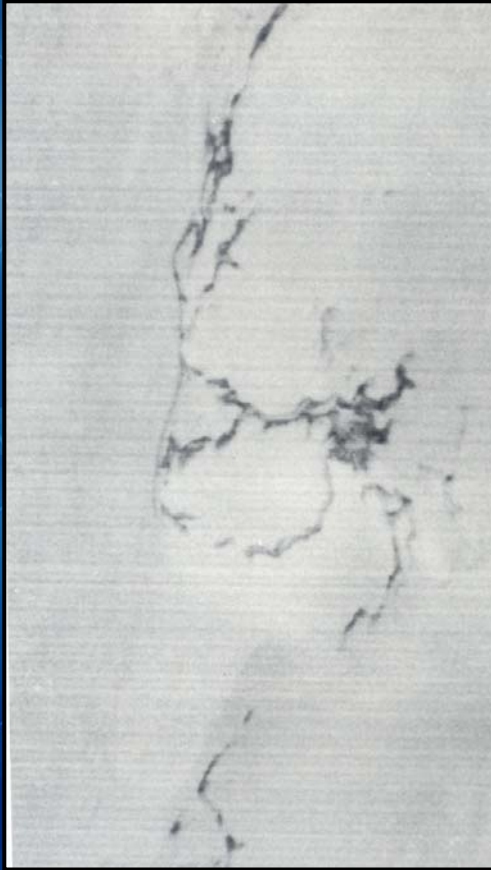
Nor'easter (February 1978)



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Historical Accounts

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Oil Slick from the breaking up and sinking of the tanker Texaco Oklahoma (1971)



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Recent Projects

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- Provided support in the recovery and clean up efforts at the World Trade Center and Pentagon following the September 11 terrorist attacks.
- Acquiring LIDAR to assist with homeland security requirements.
- **Hurricanes:** Isabel (2003), Ivan (2004), Jeanne (2004), Dennis (2005), Katrina (2005), Ophelia (2005), Rita (2005), and Wilma (2005).



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Hurricane Isabel

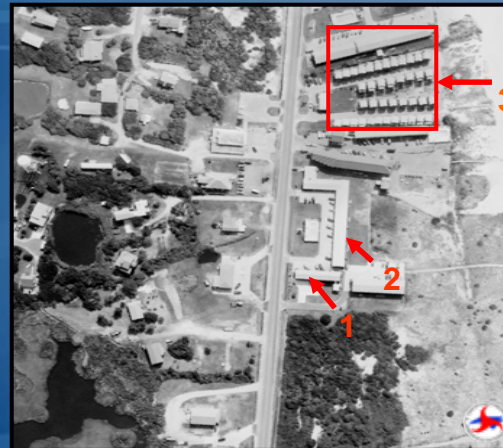
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Image: courtesy of NASA

- On September 18, 2003 Hurricane Isabel made landfall along the North Carolina Outer Banks as a category 2 storm.
- Utilizing the DSS, several flights were made between September 19th and 21st to capture the altered coastline.
- Over one thousand high resolution images were acquired and made available for viewing.

Hatteras Village, North Carolina



1998



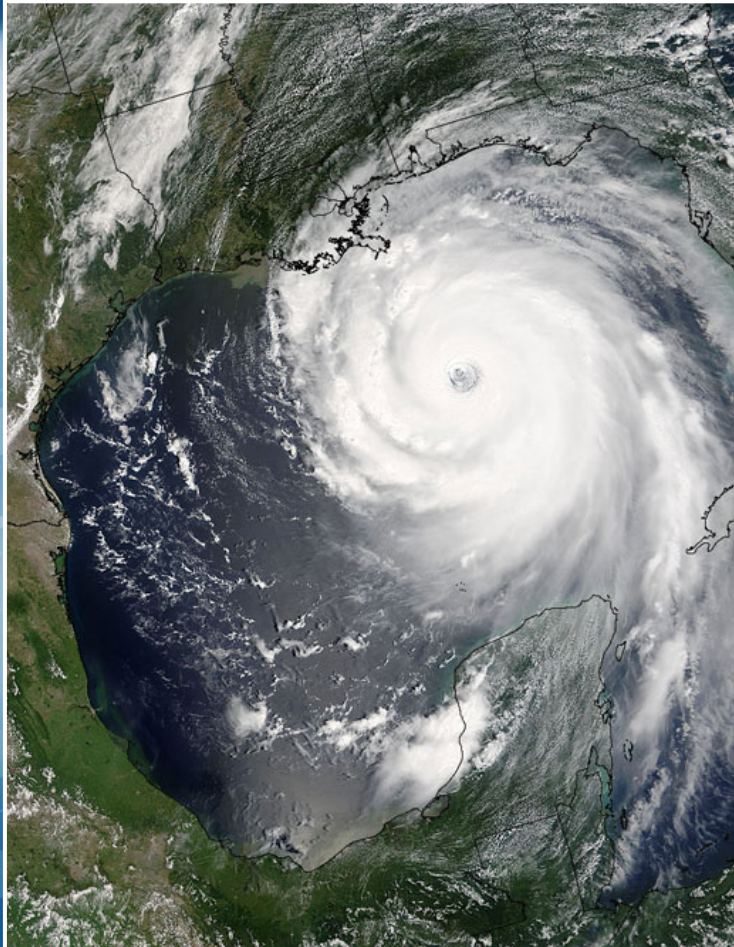
September 19, 2003



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Hurricane Katrina

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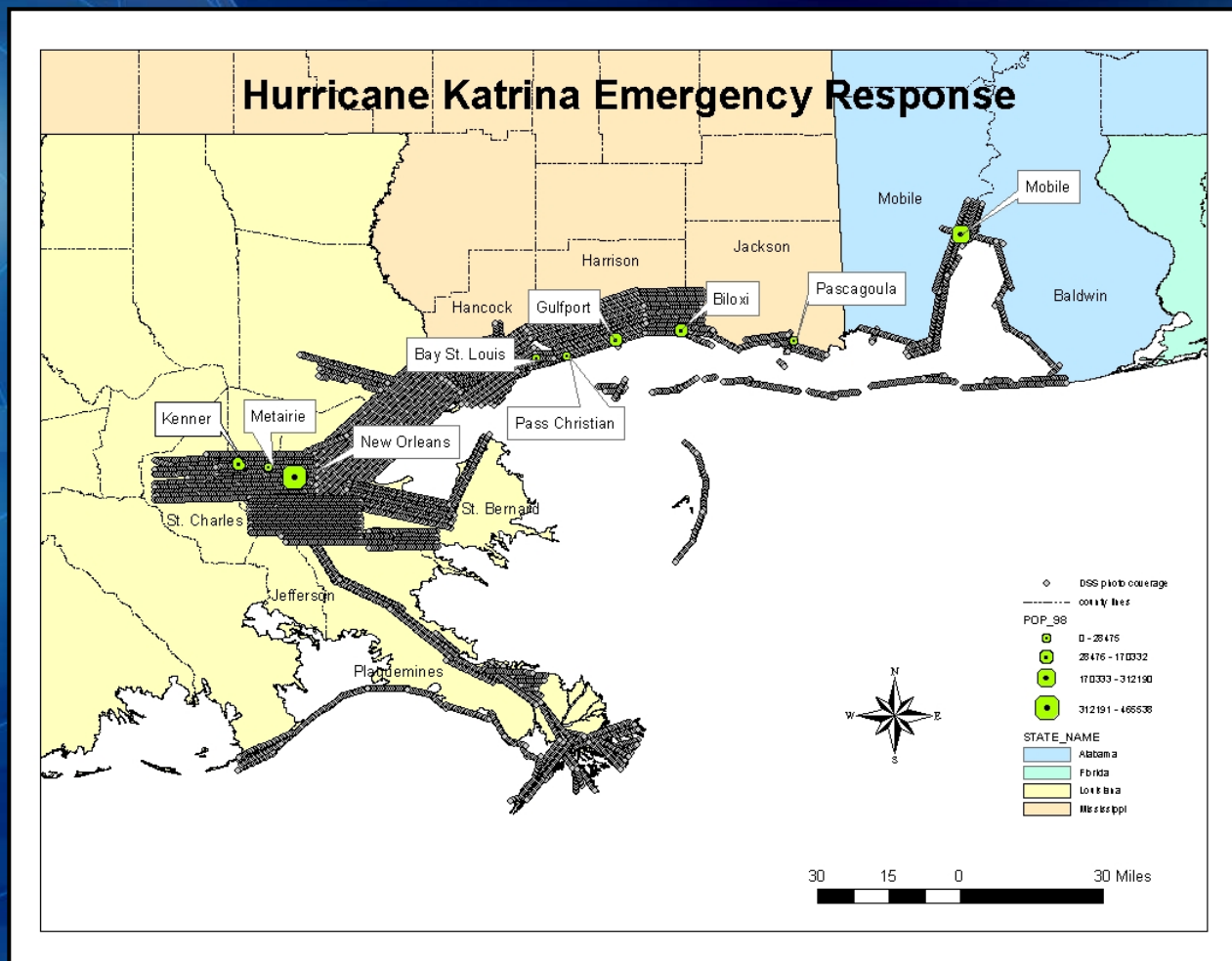
- Hurricane Katrina made landfall near Plaquemines Parish Louisiana with winds of 140 mph and then again near the Louisiana/ Mississippi border with 125 mph winds.
- Utilizing the DSS, several flights were made between August 30th and September 8th to capture the altered coastal areas.
- Over eight thousand high resolution images were acquired and made available for viewing.
- The NGS website has experienced over 73 million hits.



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Hurricane Katrina

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Hurricane Katrina

Grand Isle, LA

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Hurricane Katrina

Chandeleur Islands, LA

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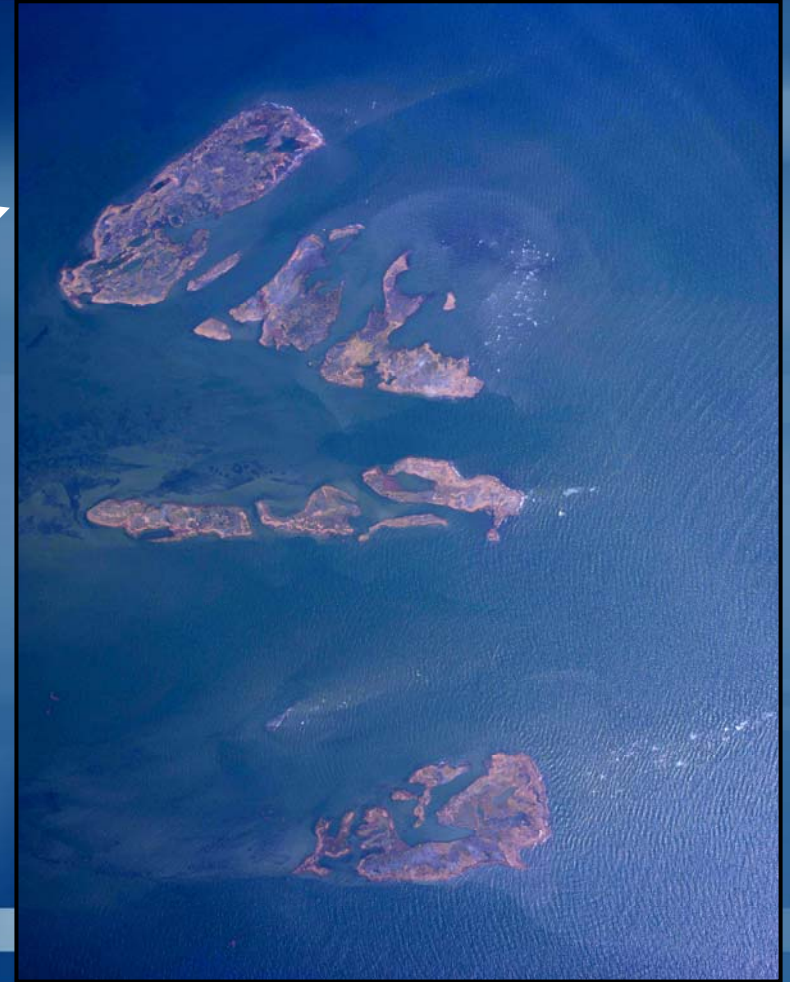


October 15, 2004

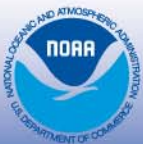
Imagery Courtesy of NASA



September 16, 2005



DSS Imagery

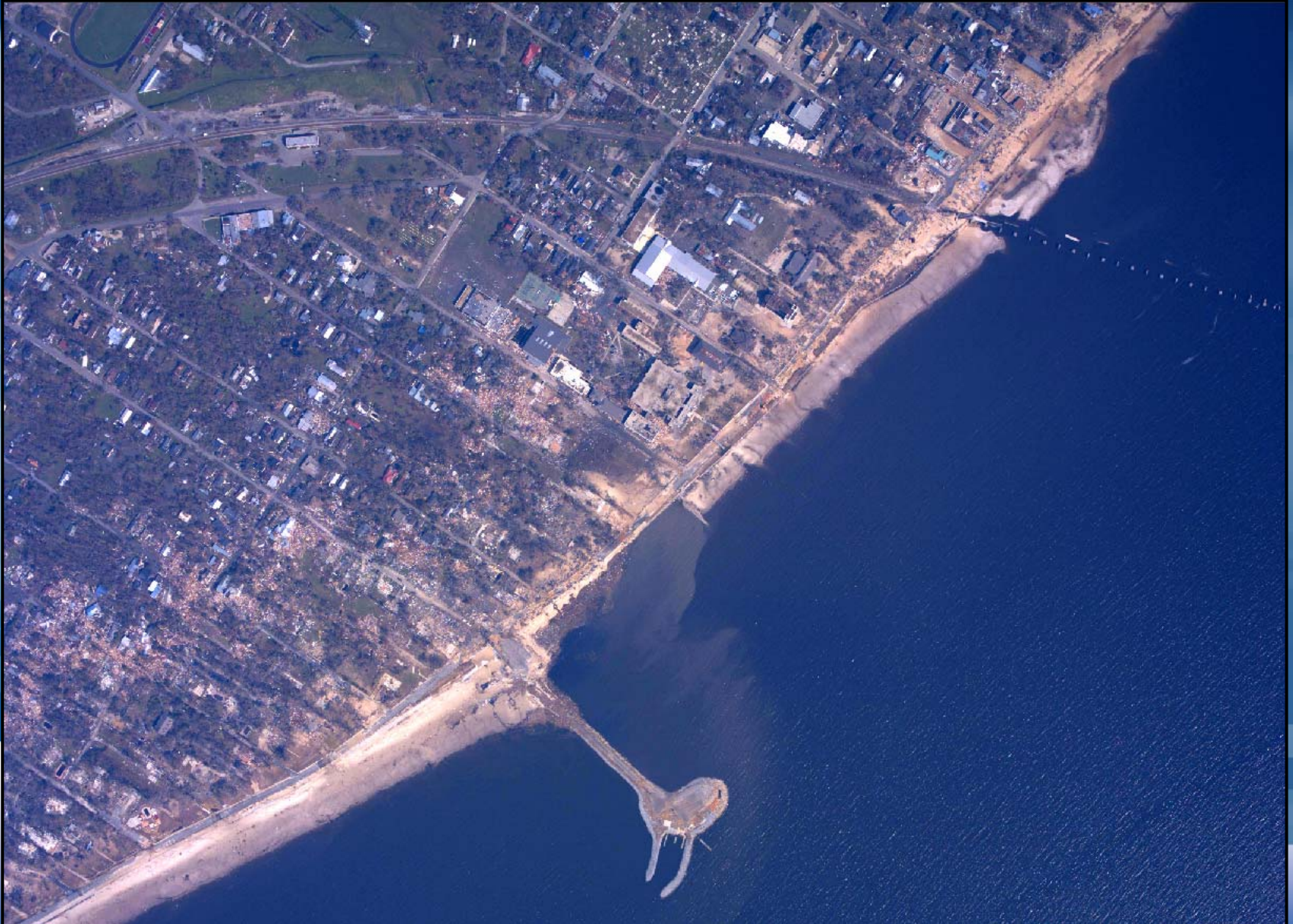


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Hurricane Katrina

Bay St. Louis, MS

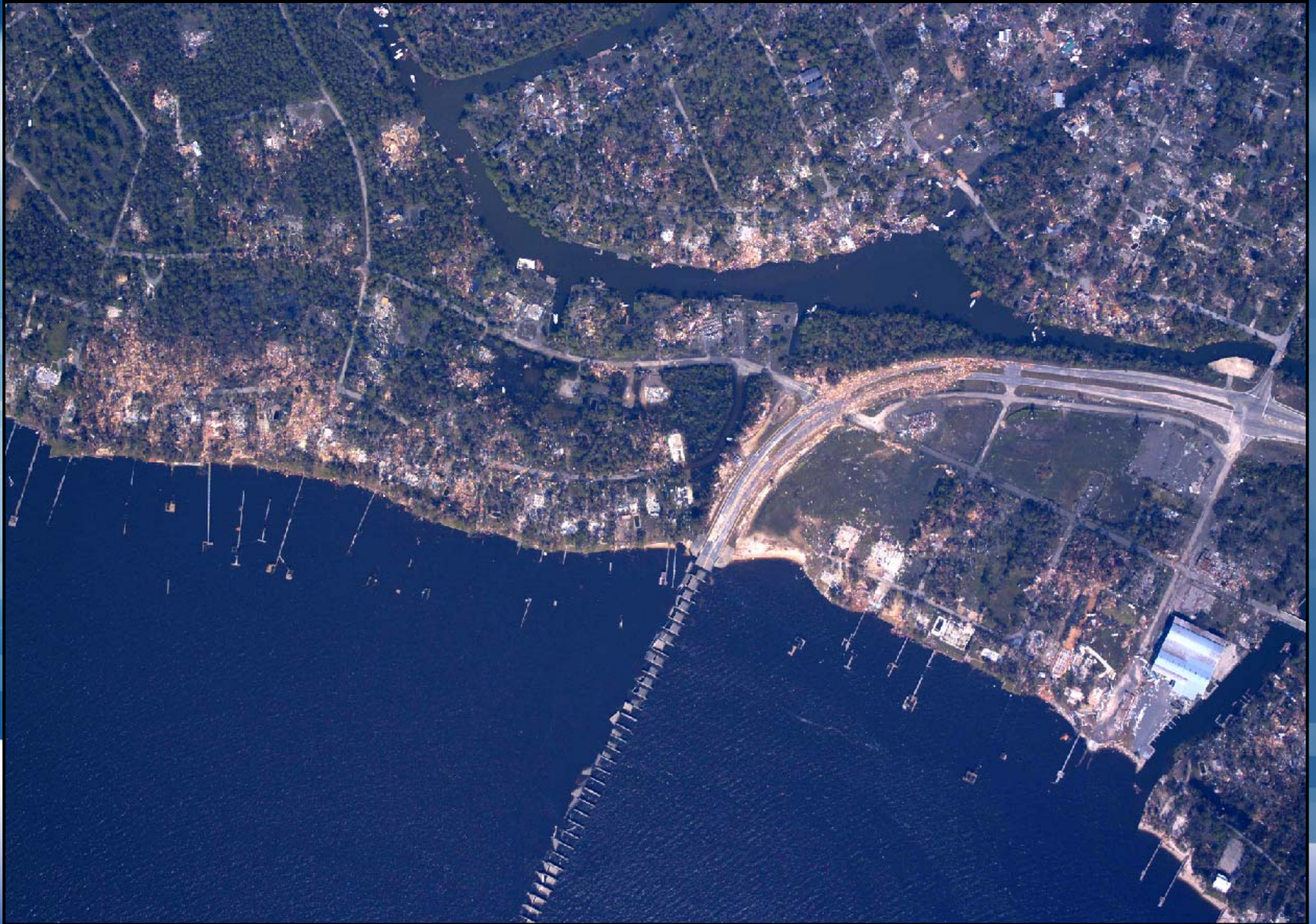
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Hurricane Katrina

Pass Christian, MS

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Hurricane Katrina

Gulfport, MS

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Hurricane Katrina

Gulfport, MS

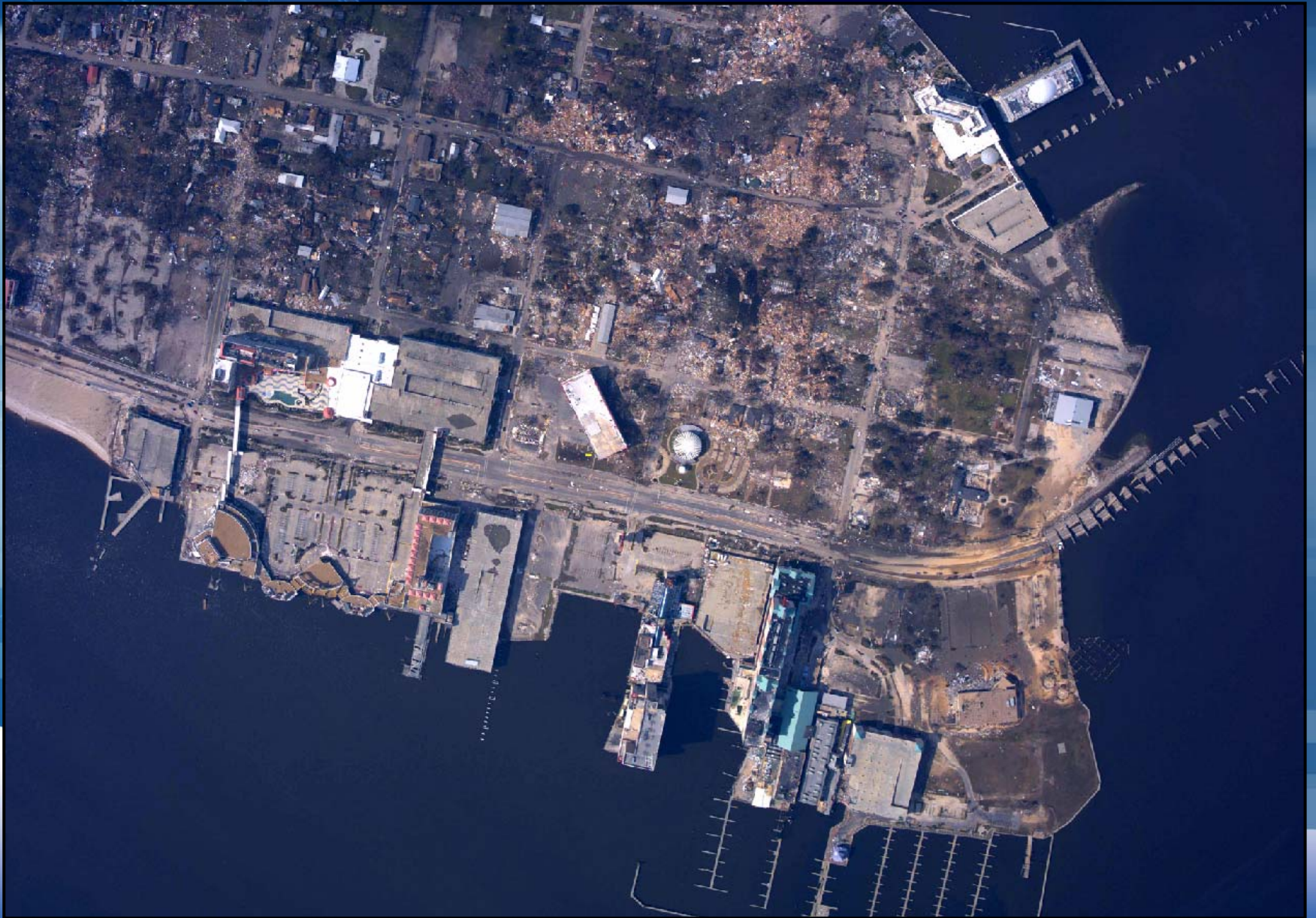
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Hurricane Katrina

Biloxi, MS

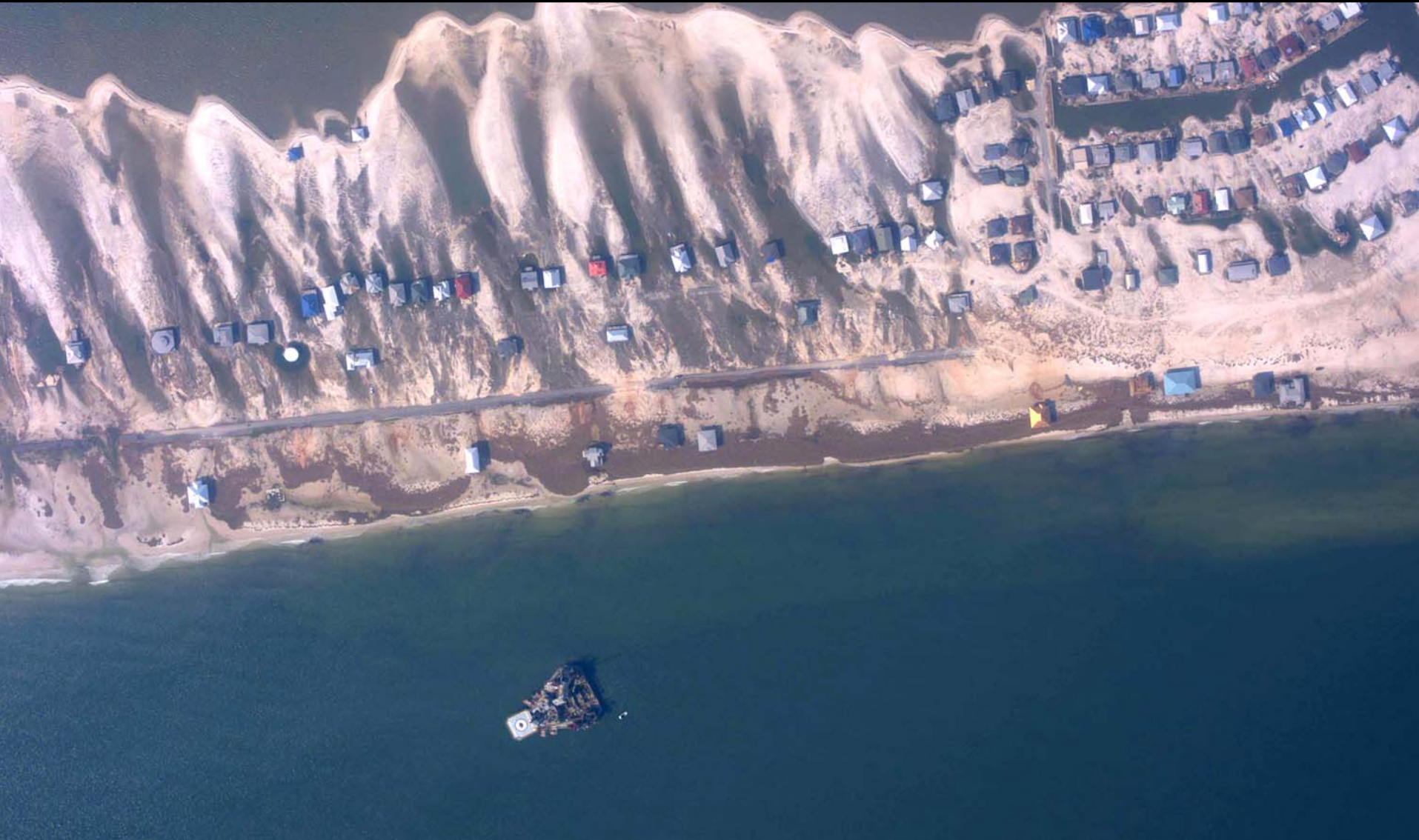
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Hurricane Katrina

Dauphin Island, AL

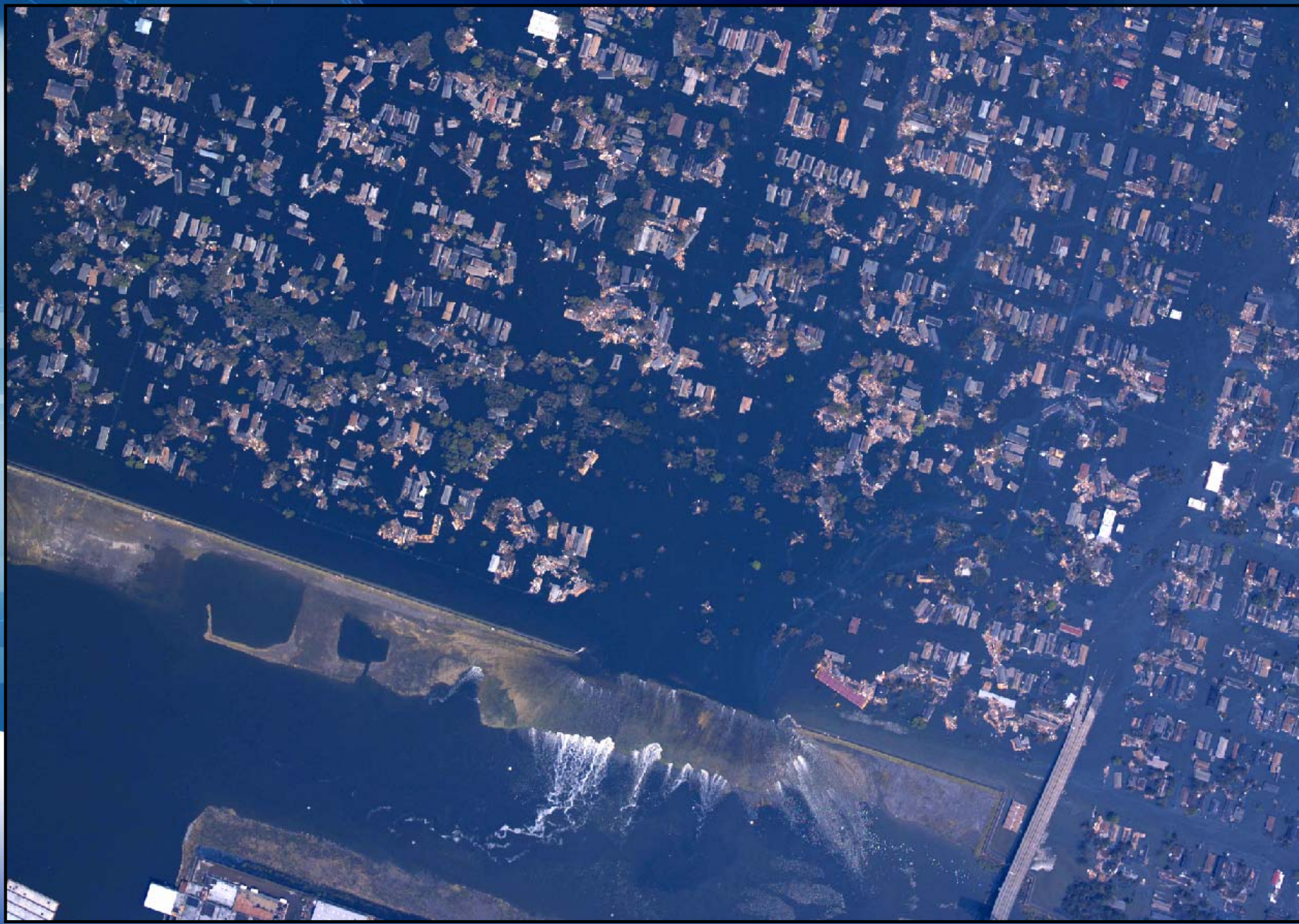
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Hurricane Katrina

New Orleans, LA

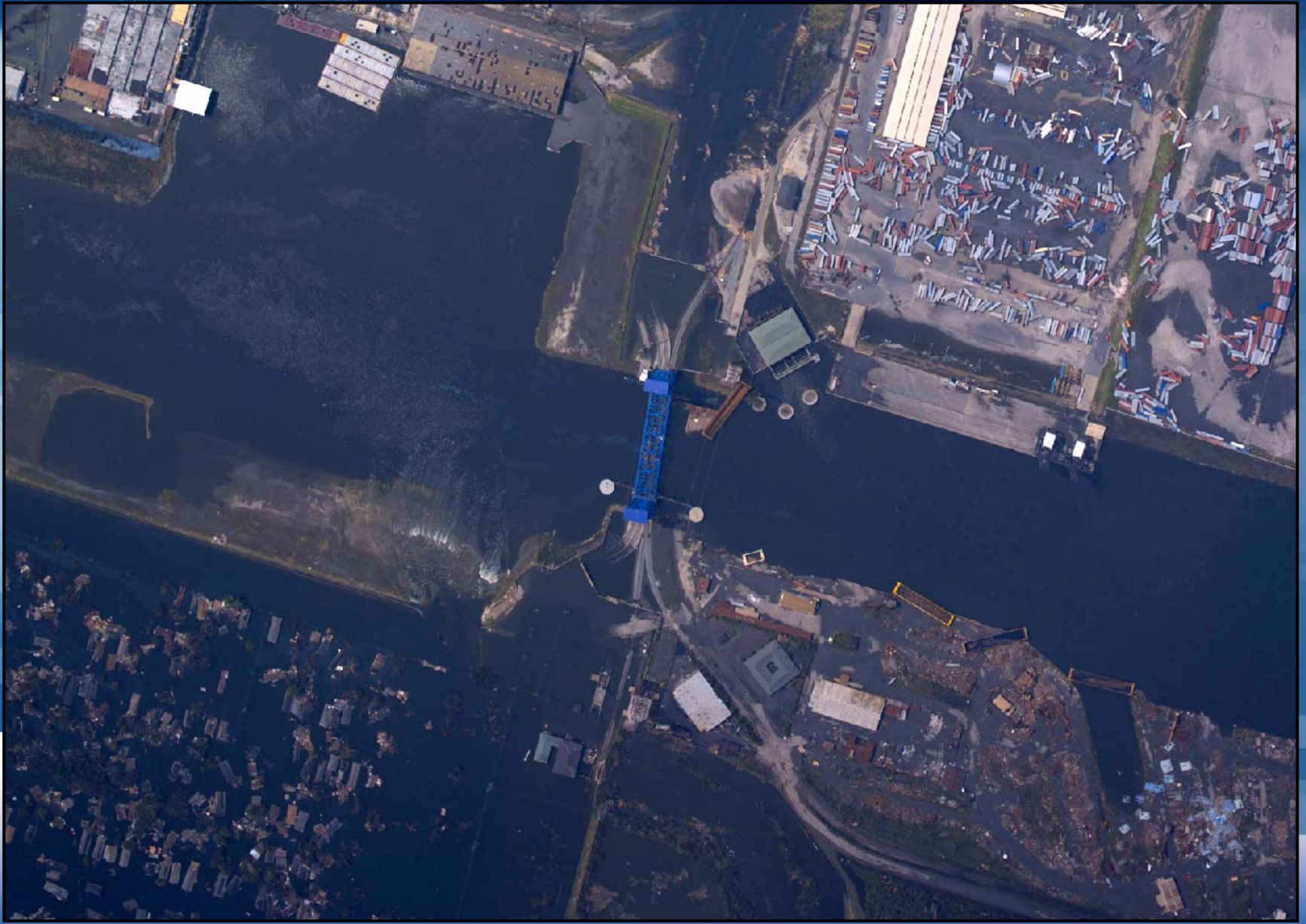
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Hurricane Katrina

New Orleans, LA

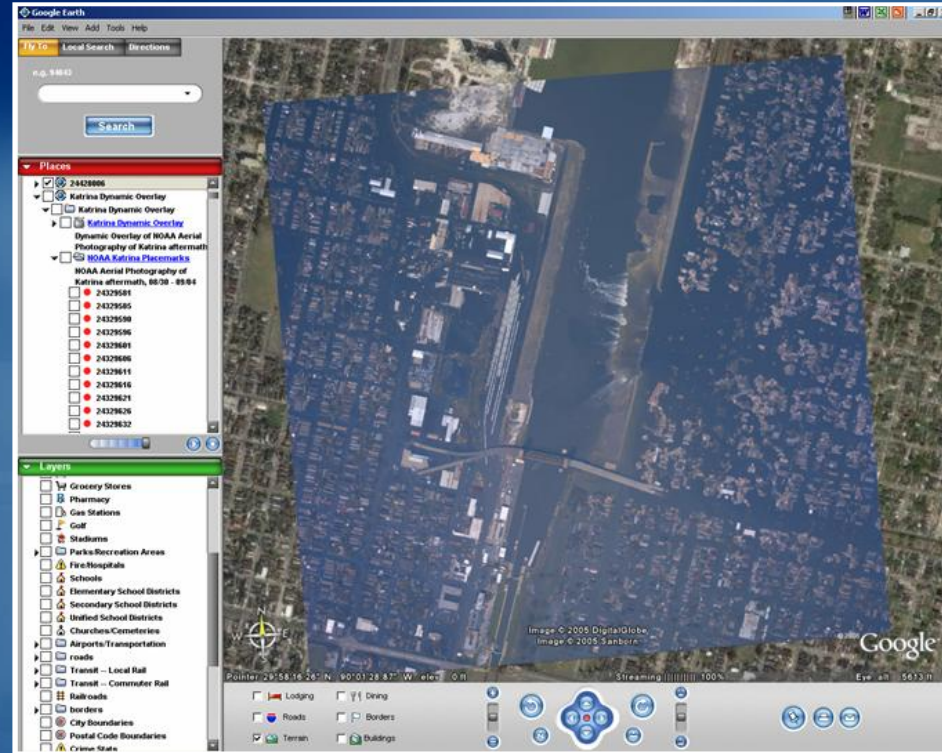
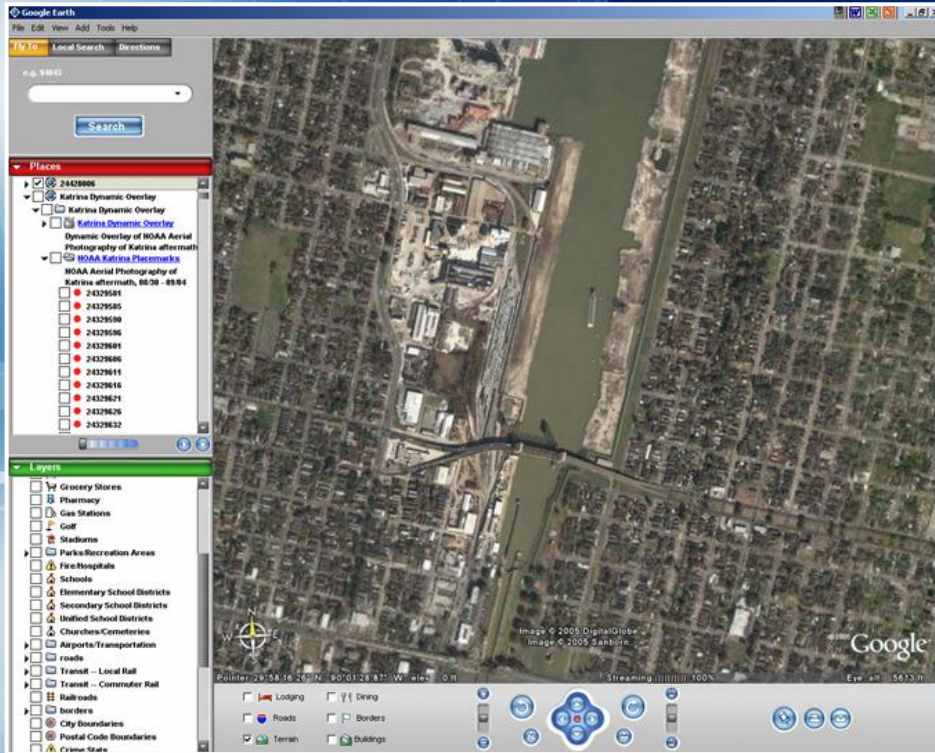
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Hurricane Katrina

New Orleans, LA

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Google Earth incorporates NOAA imagery.



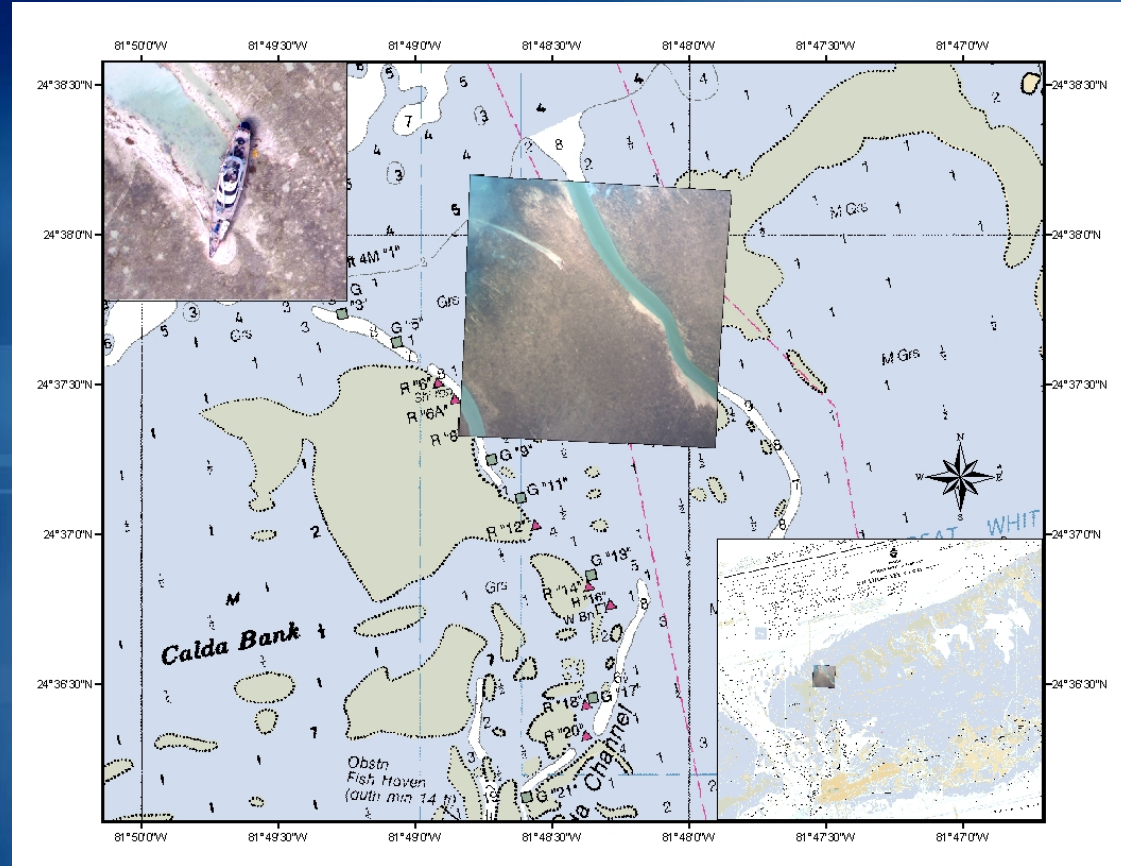
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Hurricane Wilma

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- Hurricane Wilma made landfall on October 24th with winds near 120 mph (category 3 intensity) in southwestern Florida near Cape Romano.
- Approximately 1,600 high resolution images were acquired and made available for viewing.



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Lessons Learned and Future Directions

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- **Operations this year were an overall success:**

- Data was made available to the public within 24 hrs of collection.
- The imagery was deemed valuable for internal and external needs.
 - Internal: NRT's
HAZMAT
Coastal Zone Management
Hurricane Research
 - External: DHS
USACE
State and Local Emergency Managers
General Public



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Lessons Learned and Future Directions

NATIONAL GEODETIC SURVEY

•Improvements to Operations:

- Development of a flight plan database from Texas to Maine, which will include the outer coast and integral infrastructure.
- FTP site dedicated to government users only
- A Standard Operating Procedures (SOP) document will be generated for defining the Remote Sensing Division's emergency response efforts.

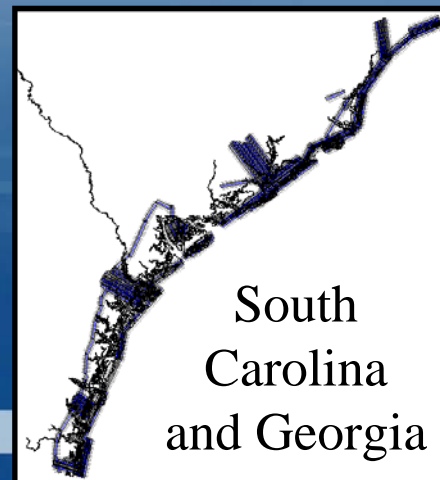
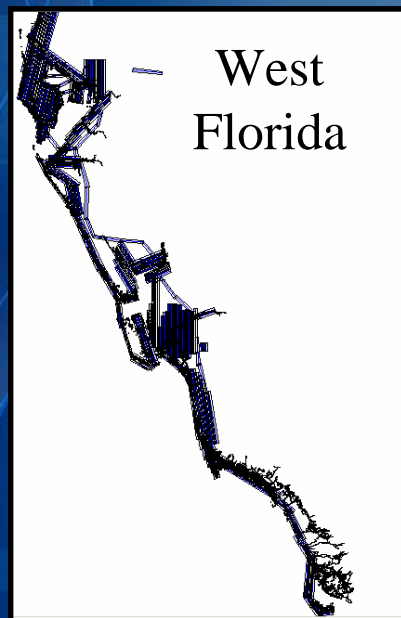
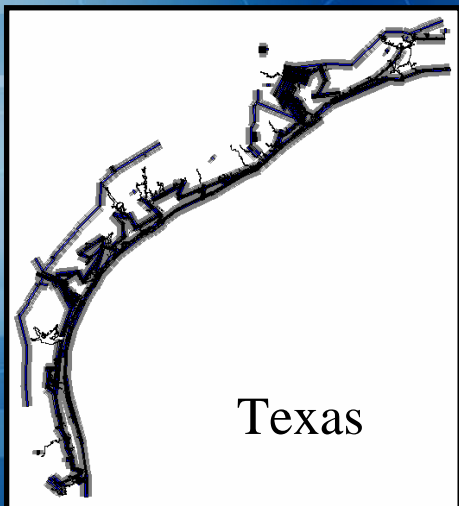
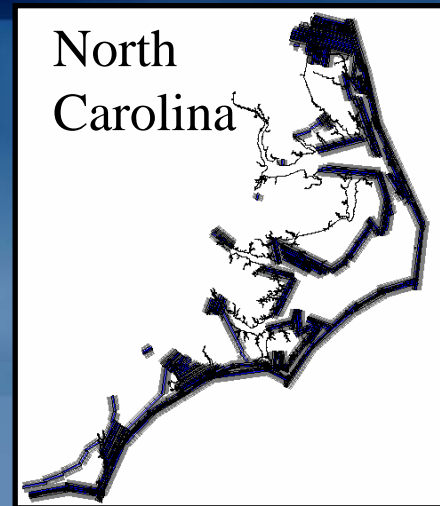
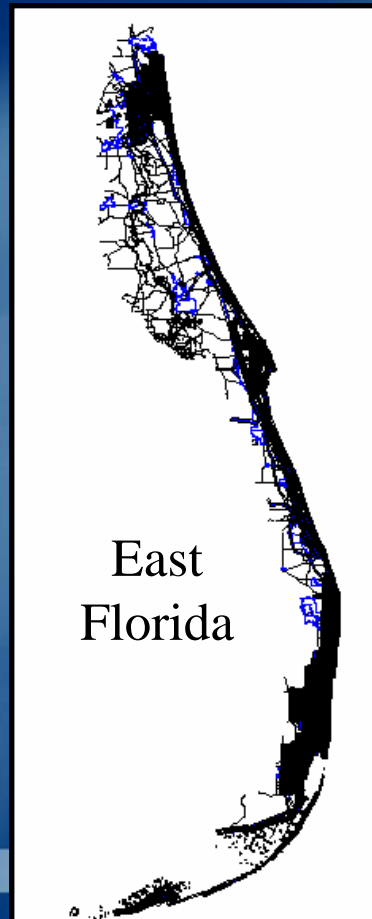
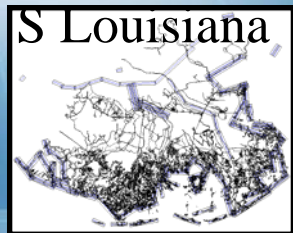


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Lessons Learned and Future Directions

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Flight Plan Database



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Lessons Learned and Future Directions

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- Digital Sensor System Improvements:

- Making NOAA's data more "GIS friendly".

- Short term: Incorporate a geo-referencing step in the processing of raw data after landing. Output will be JPEGs (*.jpg) with world files (*.jgw). The image pixels will be geolocated using the initial GPS/IMU data from the mission and existing DEMs.

- Long term: Incorporate the geo-location of pixels on the fly, so that when the camera hard drives are removed at the end of the flight, the geo-referenced data will be available.



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Lessons Learned and Future Directions

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•Website Improvements:

•Overwhelmed NOAA Web Servers:

•Statistics

- Over 73 million hits for data
- Delivered over 43 Terabytes of data

•**September 1, 2005:** NGS web server experiences problems.

•**September 2-5, 2005:** NOAA upgraded web farm storage array and CPU, and increased bandwidth from ISP.

•**September 3, 2005:** NOAA Internet connection reached its maximum capacity.

•**September 4, 2005:** NOAA off-loads out bound traffic to College Park Max.

•**September 4, 2005:** NOAA Backbone network reconfigured to support traffic to and from the web farm.

•**September 5, 2005:** NOAA Intrusion Detection system reconfigured to accommodate demands, second port opened on College Park Max.

•**September 7, 2005:** NOAA moves 150 Mbs of web pages to Boulder load-balancing site.



Lessons Learned and Future Directions

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•Website Improvements:

- We have started delivering Zip files of imagery and Exterior Orientation (EO) parameters for geo-referencing .
- Starting the process of improving our delivery system, while remembering that our main effort is rapid response.
- Currently working on improved backdrops. (Utilizing satellite imagery)



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Summary

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- **Remote Sensing Division has two mapping programs:**
 - Coastal Mapping
 - Airport Survey
 - Research and Development that support both programs
- **NOAA/NGS/RSD plans to acquire remotely sensed data in the future to support the agency's homeland security and emergency response requirements.**
- **The data will continue to be disseminated and promoted in a manner to facilitate support efforts.**
- **During FY06 RSD will continue to improve on several issues to make the efforts more efficient and useful.**

