

NATIONAL GEODETIC SURVEY

NOAA's National Geodetic Survey Utilization of Aerial Sensors for Emergency Response Efforts

JACIE Civil Commercial Imagery Evaluation Workshop 2006

Stephen White



National Oceanic and Atmospheric Administration

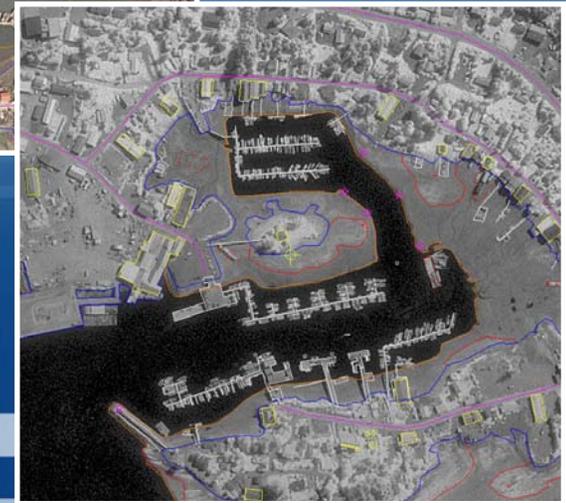
Our Focus

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



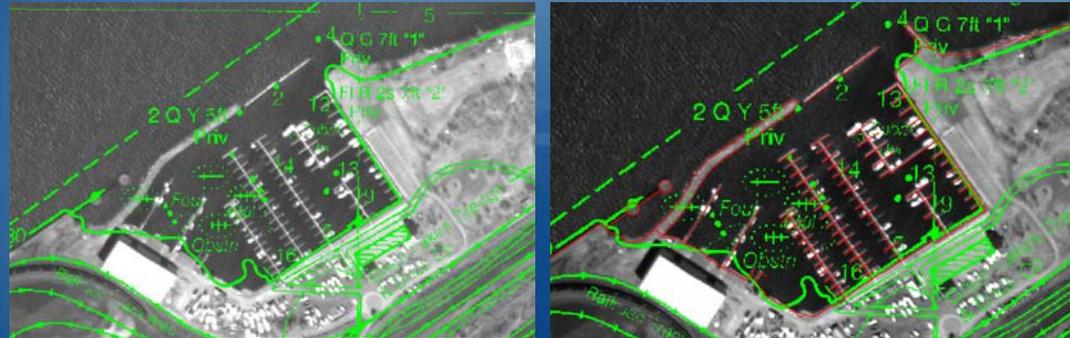
CSCAP: The Coast and Shoreline Change Analysis Program

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Satellite Imagery



Georeference to meet accuracy needs



Updated as needed



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Evaluation of Digital Cameras through Contracting

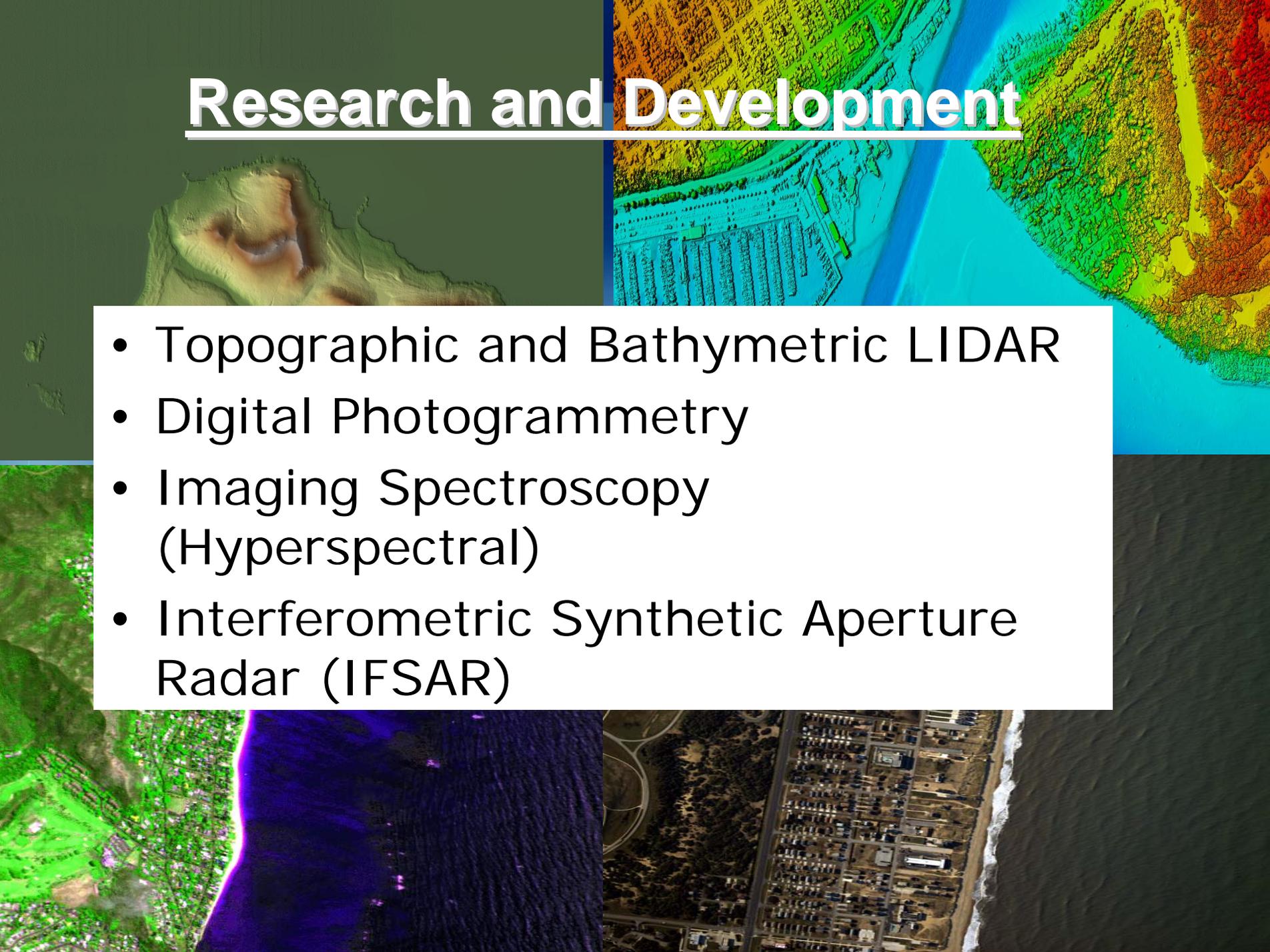
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- DMC
- ADS40
- Vexcel UltraCam



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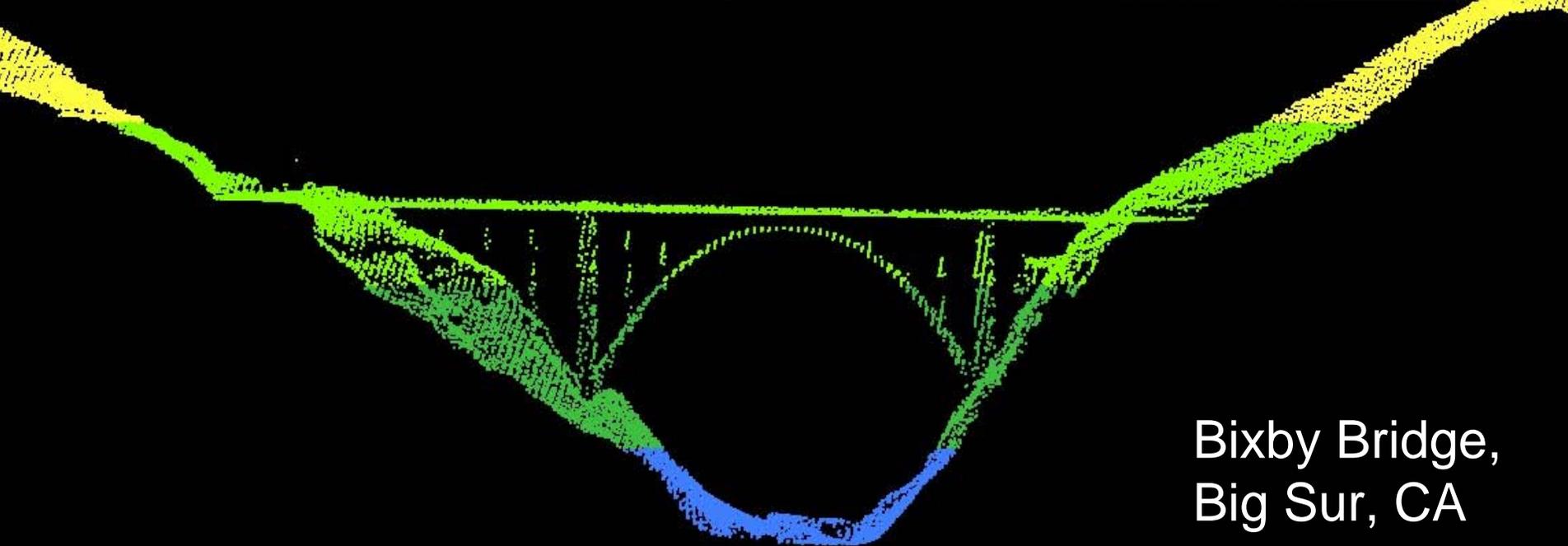
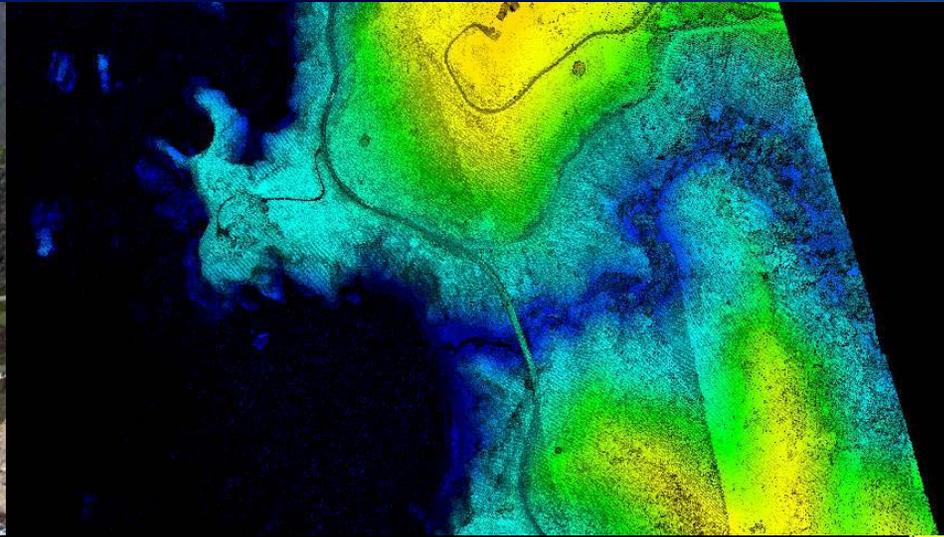
Research and Development

The background of the slide is a collage of various remote sensing images. In the top left, there is a grayscale topographic map of a mountainous region. To its right is a false-color aerial photograph of a coastal area with a river and buildings. The top right corner shows a false-color bathymetric map of a river or lake. The bottom left features a false-color image of a forested area. The bottom center and right show a false-color aerial photograph of a coastal town and beach area.

- Topographic and Bathymetric LIDAR
- Digital Photogrammetry
- Imaging Spectroscopy (Hyperspectral)
- Interferometric Synthetic Aperture Radar (IFSAR)

Coastal Mapping with Lidar

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Bixby Bridge,
Big Sur, CA

VDatum

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The screenshot shows the 'Vertical Datum Transformation V-Datum 1.07' window. It features several input fields and dropdown menus for configuring datum conversions. The 'Horizontal Datum' is set to 'NAD 83, WGS, ITRF'. The 'Vertical Datum' is set to 'NAVD 88'. The 'New Vertical Datum' is also set to 'NAVD 88'. Under 'Vertical Datum Unit', the 'Meter' radio button is selected. Under 'Height or Sounding', the 'Height' radio button is selected. The 'Geoid' is set to 'Geoid 2003'. On the right side, there are input fields for 'Latitude', 'Longitude', and 'Height', all set to '0.000'. Below these are 'Reset' and 'Convert' buttons. The 'Input File(s)' field contains 'tbn_vdatumfile.txt' and the 'Output File' field contains 'VD_tbn_vdatumfile.txt'. The 'Input File Format' section has two radio buttons: '(Key), Lat, Long, Height' (unselected) and '(Key), Long, Lat, Height' (selected). A 'Convert' button is located below these options. The window title bar shows 'Vertical Datum Transformation V-Datum 1.07' and the status bar at the bottom shows 'V-Datum 1.07' and '100%'.

VDatum converts elevation data (heights and soundings) among the 28 different vertical datums

For shoreline extraction using VDatum is critical.

Currently available for:

Tampa Bay, New York Bight, Delaware Bay, Central California, Puget Sound, Strait of Juan De Fuca, Lake Charles and Port Fourchon, LA and northern North Carolina



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The Datum Transformation Roadmap

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WGS 84 (G873)

WGS 84 (G730)

WGS 84 (orig.)

ITRF97

ITRF96

ITRF94

ITRF93

ITRF92

ITRF91

ITRF90

ITRF89

ITRF88

SIO/MIT 92

NEOS 90

PNEOS 90

NAD 83 (86)

NGVD 29

NAVD 88

LMSL

MHHW

MHW

MTL

DTL

MLW

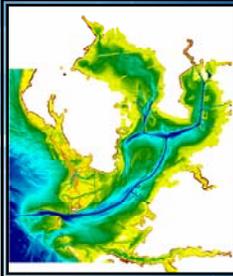
MLLW



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USGS
Topography

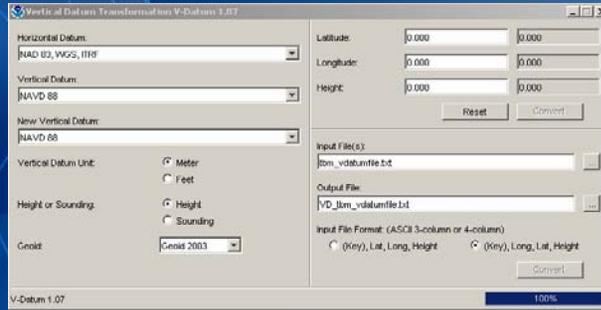


NOAA
Bathymetry

Geoid
Model

Tidal
Model

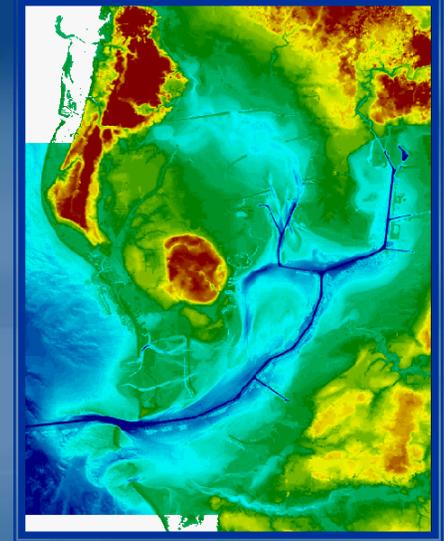
Ellipsoid
Model



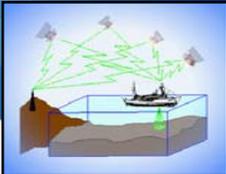
VDatum

(Vertical Datum Transform Tool)

Integrated Bathy/Topo
Digital Elevation Model



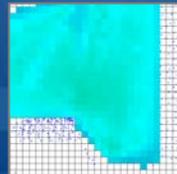
RTK-GPS vertical referencing
Hydrographic Surveys



Shoreline from LIDAR
in the intertidal zone



GIS users in the
Coastal Community

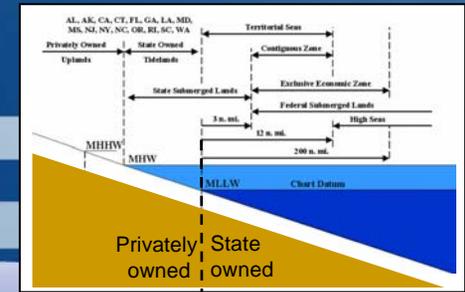


NOAA-USGS shoreline
inconsistencies



National
Bathymetric
Database

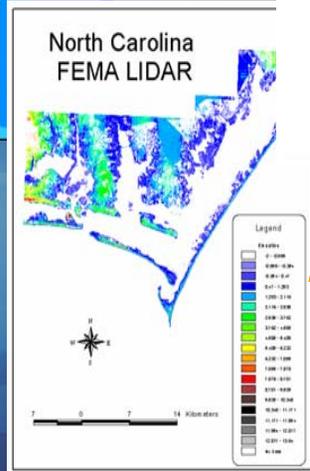
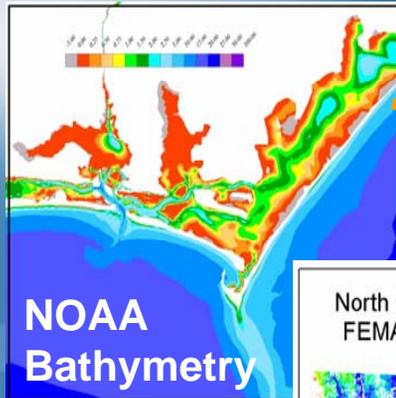
Marine Boundaries & Legal
Issues



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North Carolina Sea Level Rise Project – A VDatum application

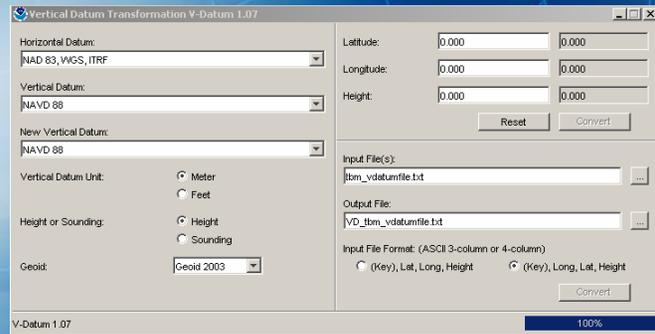
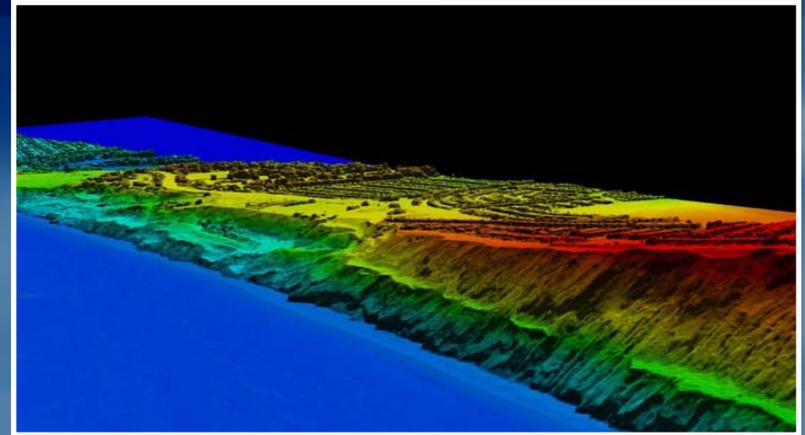
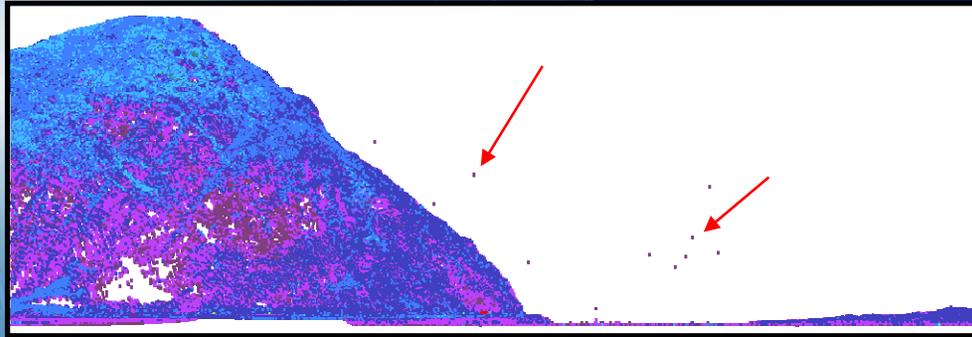
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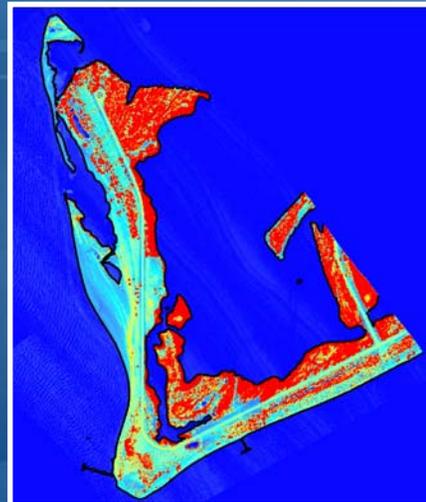
Lidar Shoreline Extraction

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Edit Lidar Point Cloud



VDatum



Contour Shoreline from DEM



QA/QC and perform error analysis

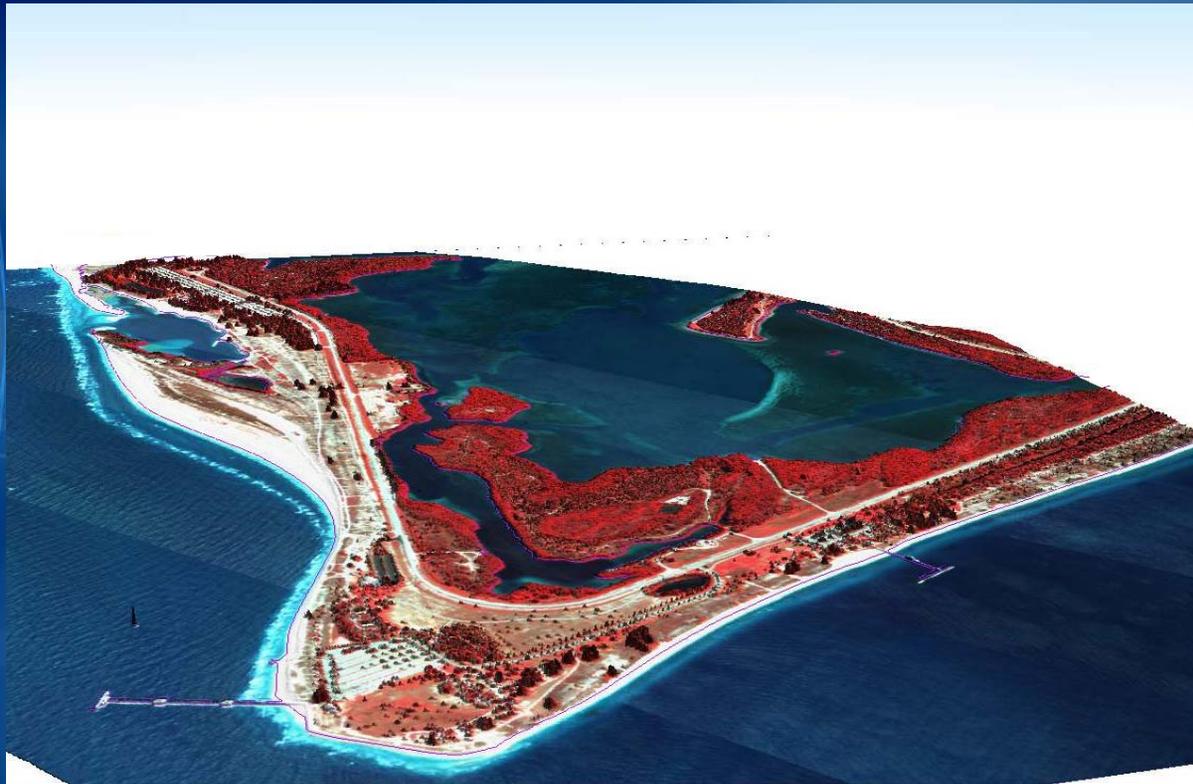


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Research Projects

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- A multiple sensor approach to shoreline mapping



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Research Projects

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Lidar derived
shoreline

Hyperspectral
Classified
image

Feature attributed lidar-derived shoreline
superimposed on an orthorectified image

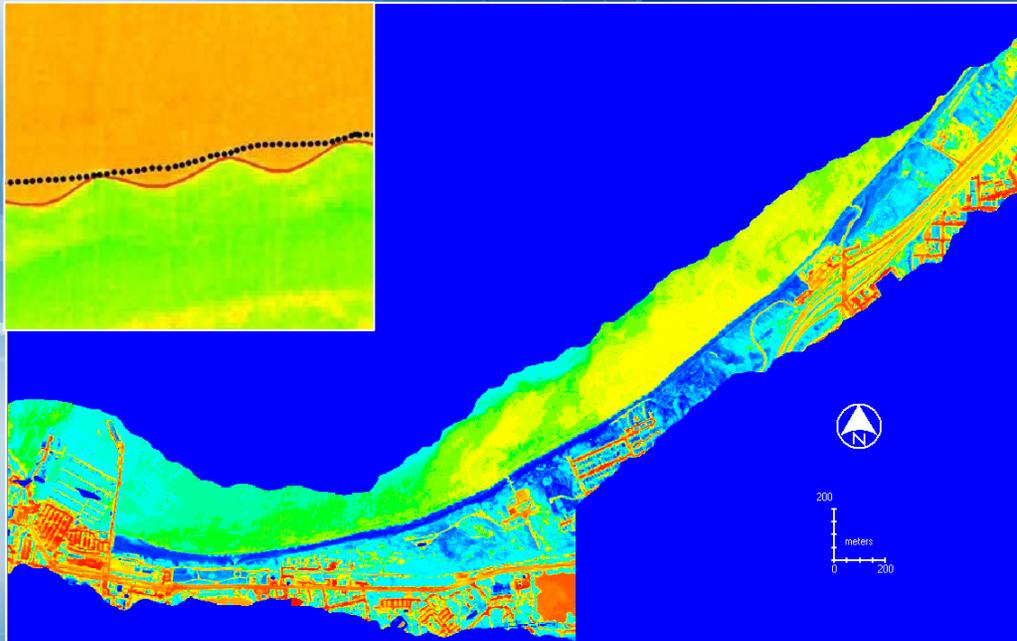


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Research Projects

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- Investigating Thermal Imagery for Shoreline Delineation



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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

NATIONAL GEODETIC SURVEY

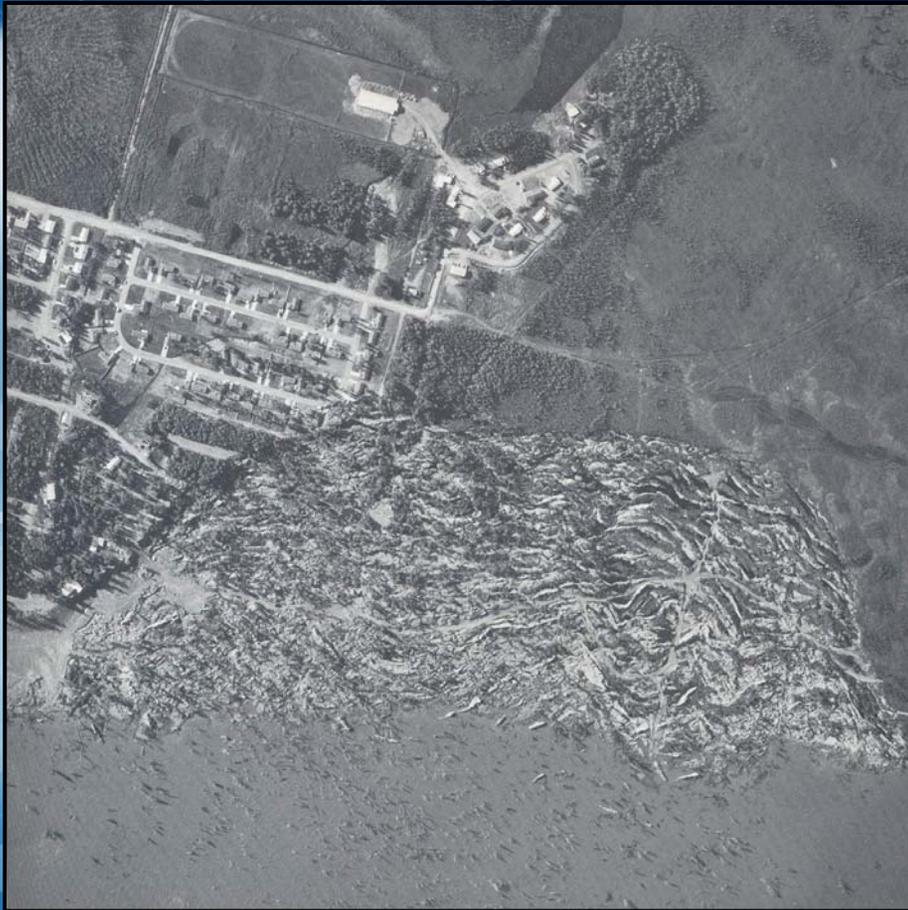
- **Over the last several decades, NOAA has assisted with recovery from a variety of natural and human induced disasters, including:**
 - March 27, 1964: On Good Friday, Alaska was struck by an earthquake and tsunami.
 - Hurricanes: Camille (1969), Ceila (1970), and Frederick (1979).
 - February 1978: 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

NATIONAL GEODETIC SURVEY



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



National Oceanic and Atmospheric Administration

Historical Accounts

NATIONAL GEODETIC SURVEY



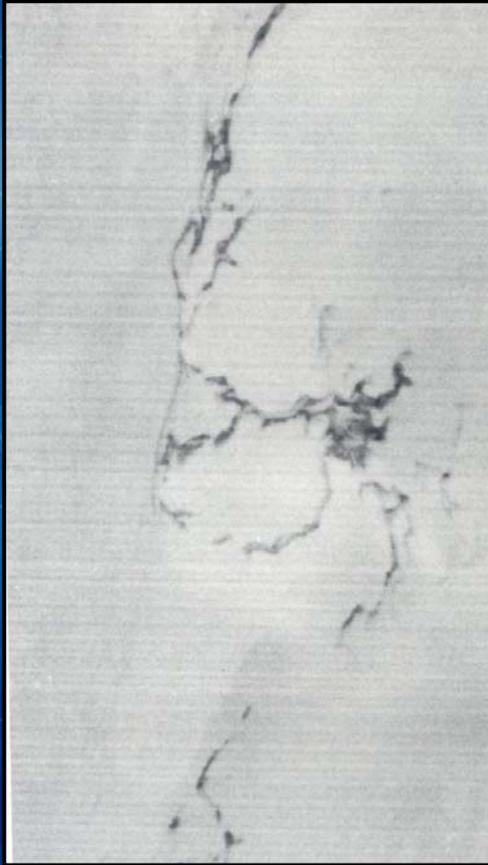
Nor'easter (February 1978)



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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 in port areas.
- **Hurricanes:** Isabel (2003), Ivan (2004), Jeanne (2004), Dennis (2005), Katrina (2005), Ophelia (2005), Rita (2005), and Wilma (2005).



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Hurricane Isabel

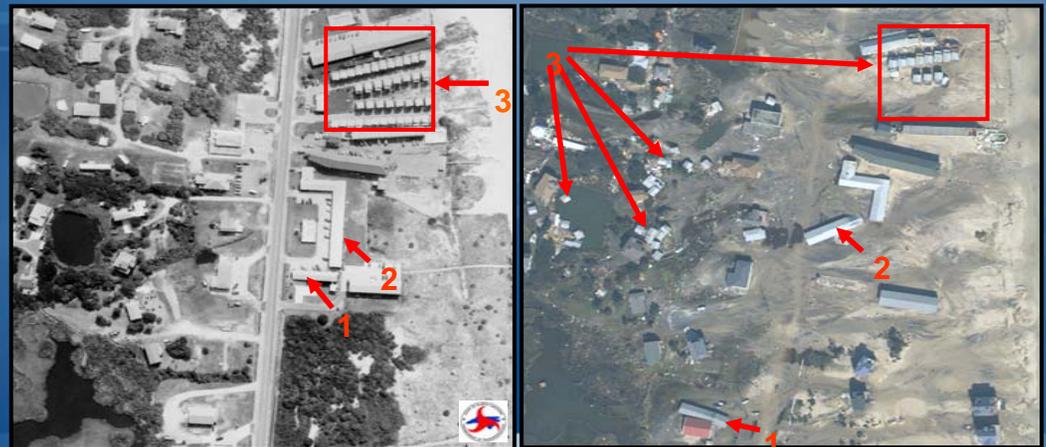
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Image: courtesy of NASA

- 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



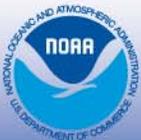
National Oceanic and Atmospheric Administration

Hurricane Katrina

NATIONAL GEODETIC SURVEY



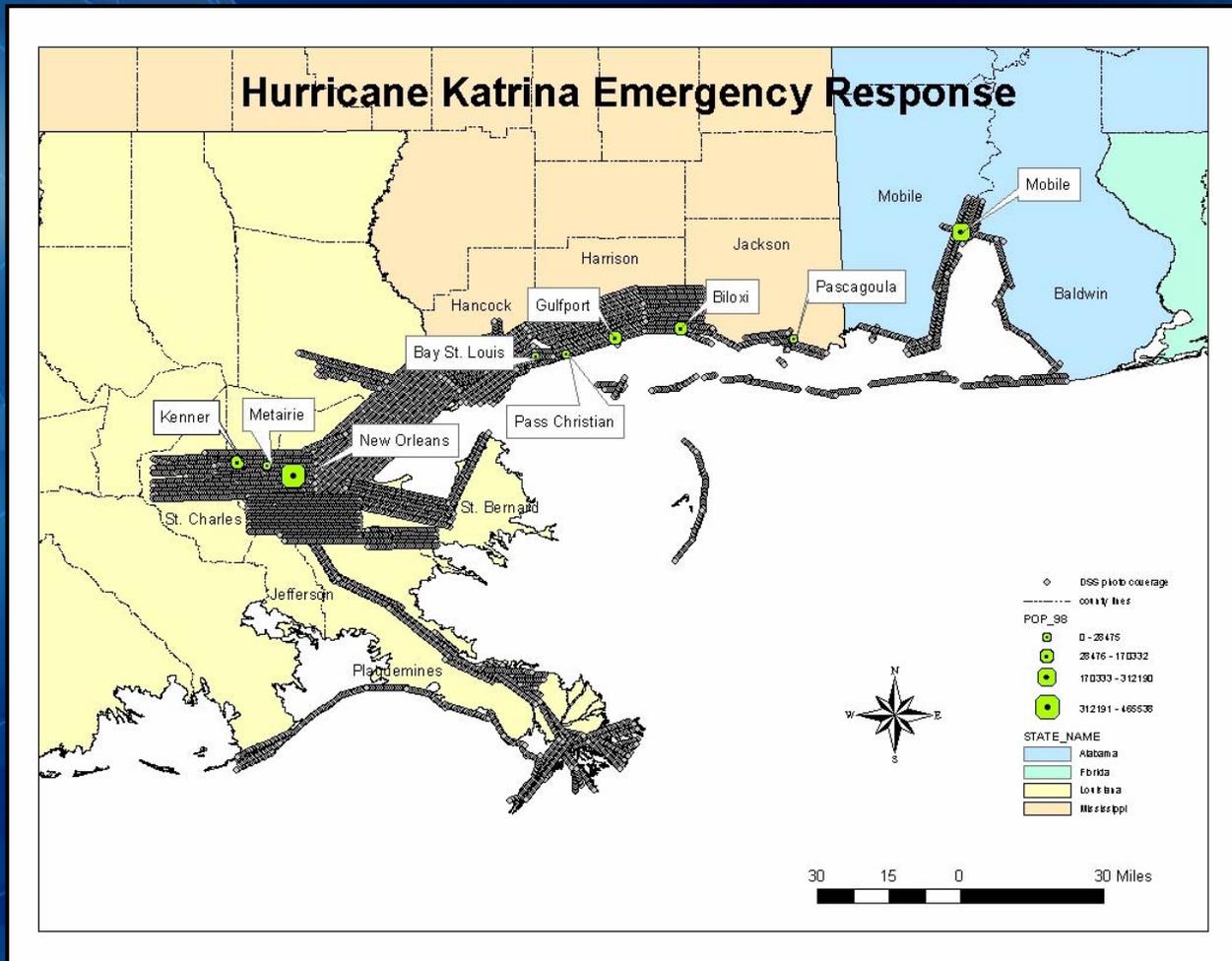
- Hurricane Katrina made landfall near Plaquemines Parish Louisiana with winds of 140 mph and then again near the Louisiana/ Mississippi border with 125 mph winds.
- Utilizing the DSS, several flights were made between August 30th and September 8th to capture the altered coastal areas.
- Over eight thousand 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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National Oceanic and Atmospheric Administration

Hurricane Katrina

Venice, LA

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National Oceanic and Atmospheric Administration

Hurricane Katrina

Chandeleur Islands, LA

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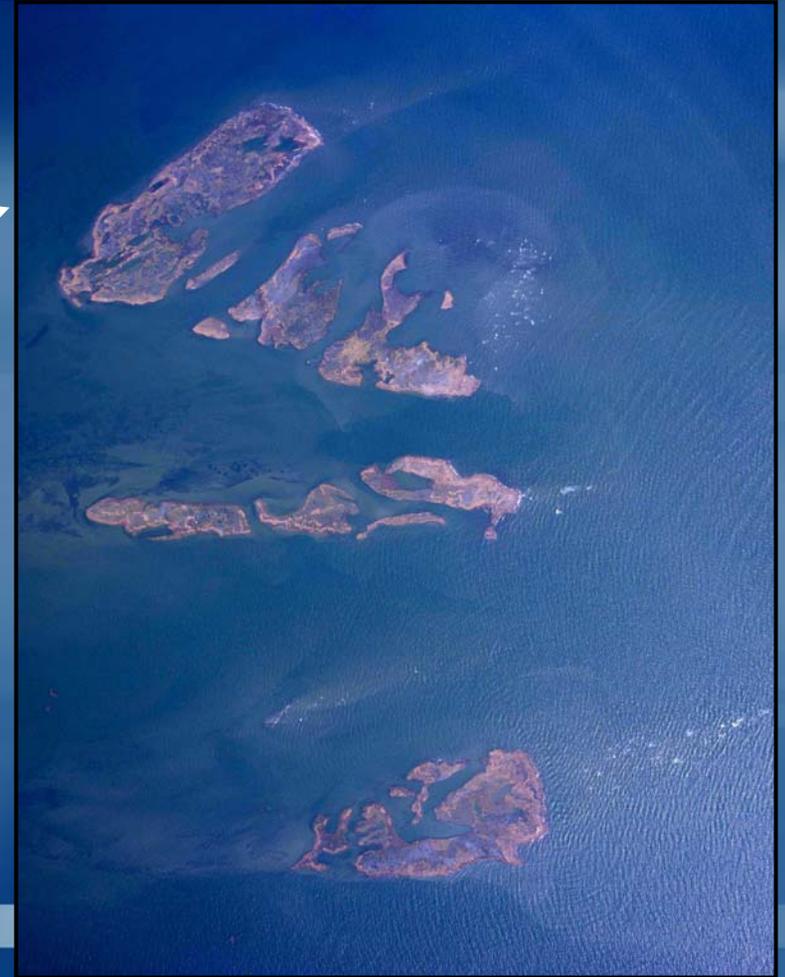


October 15, 2004

Imagery Courtesy of NASA



September 16, 2005



DSS Imagery

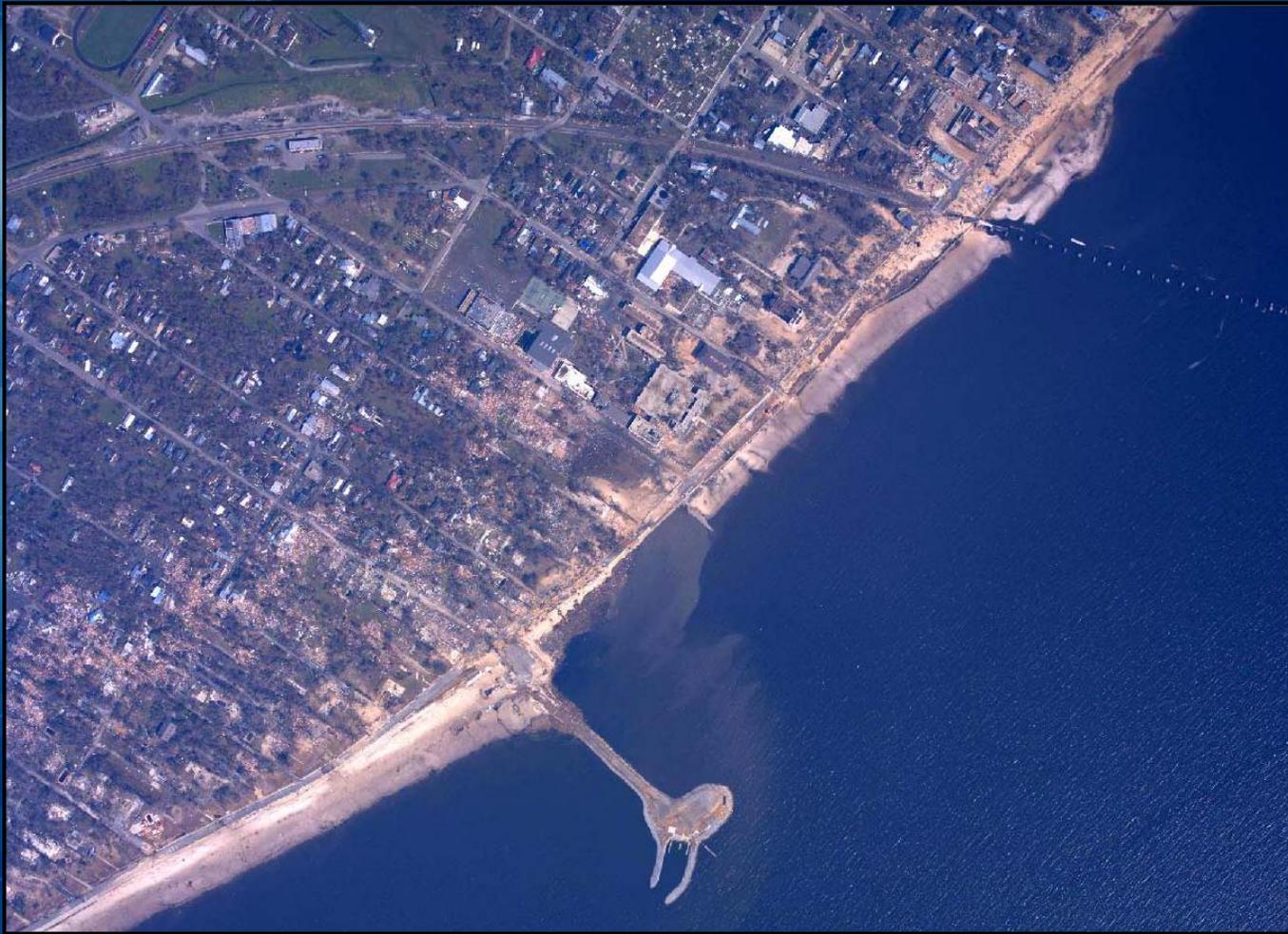


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Hurricane Katrina

Bay St. Louis, MS

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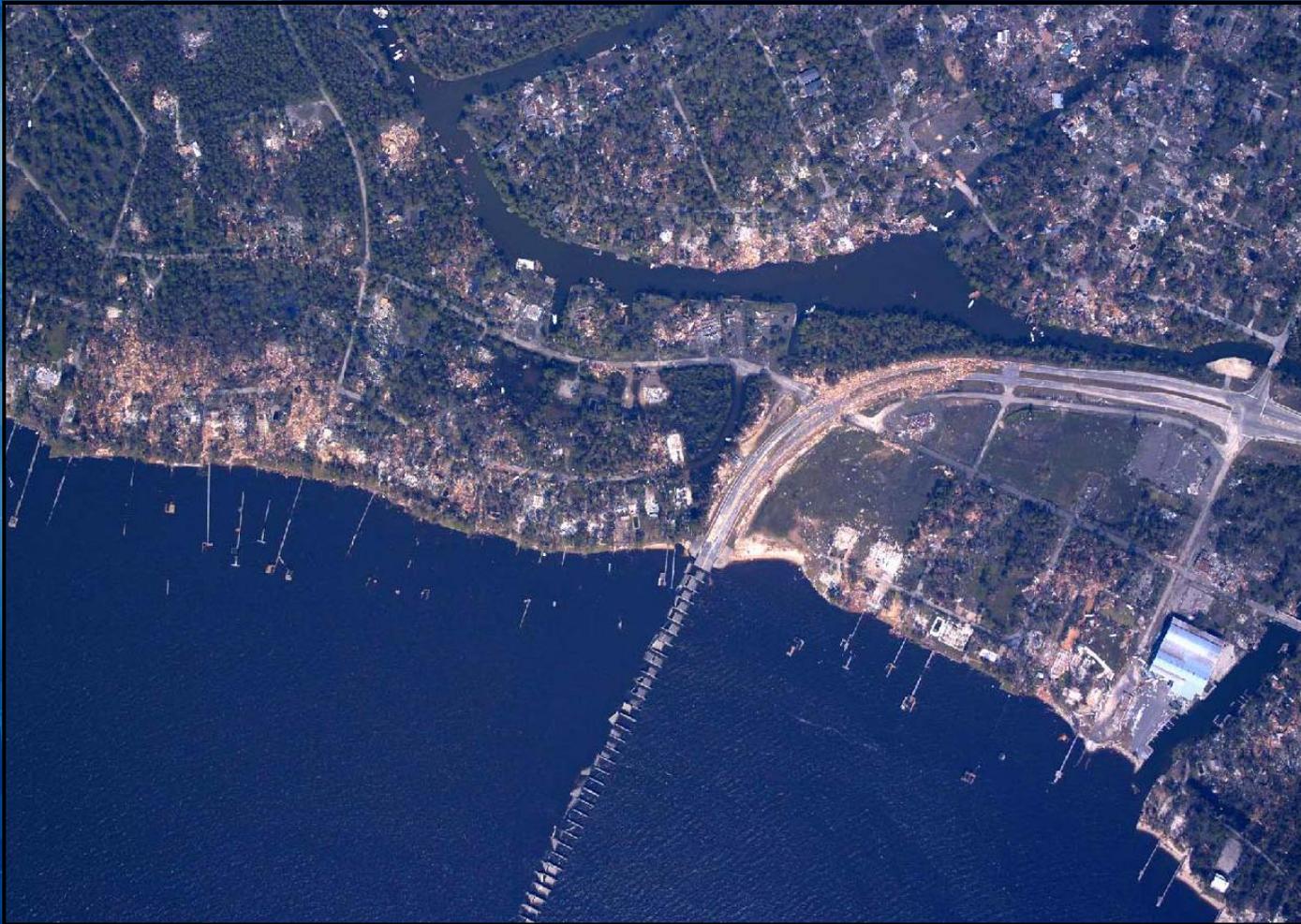


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Hurricane Katrina

Pass Christian, MS

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Hurricane Katrina

Gulfport, MS

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Hurricane Katrina

Gulfport, MS

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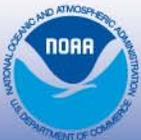
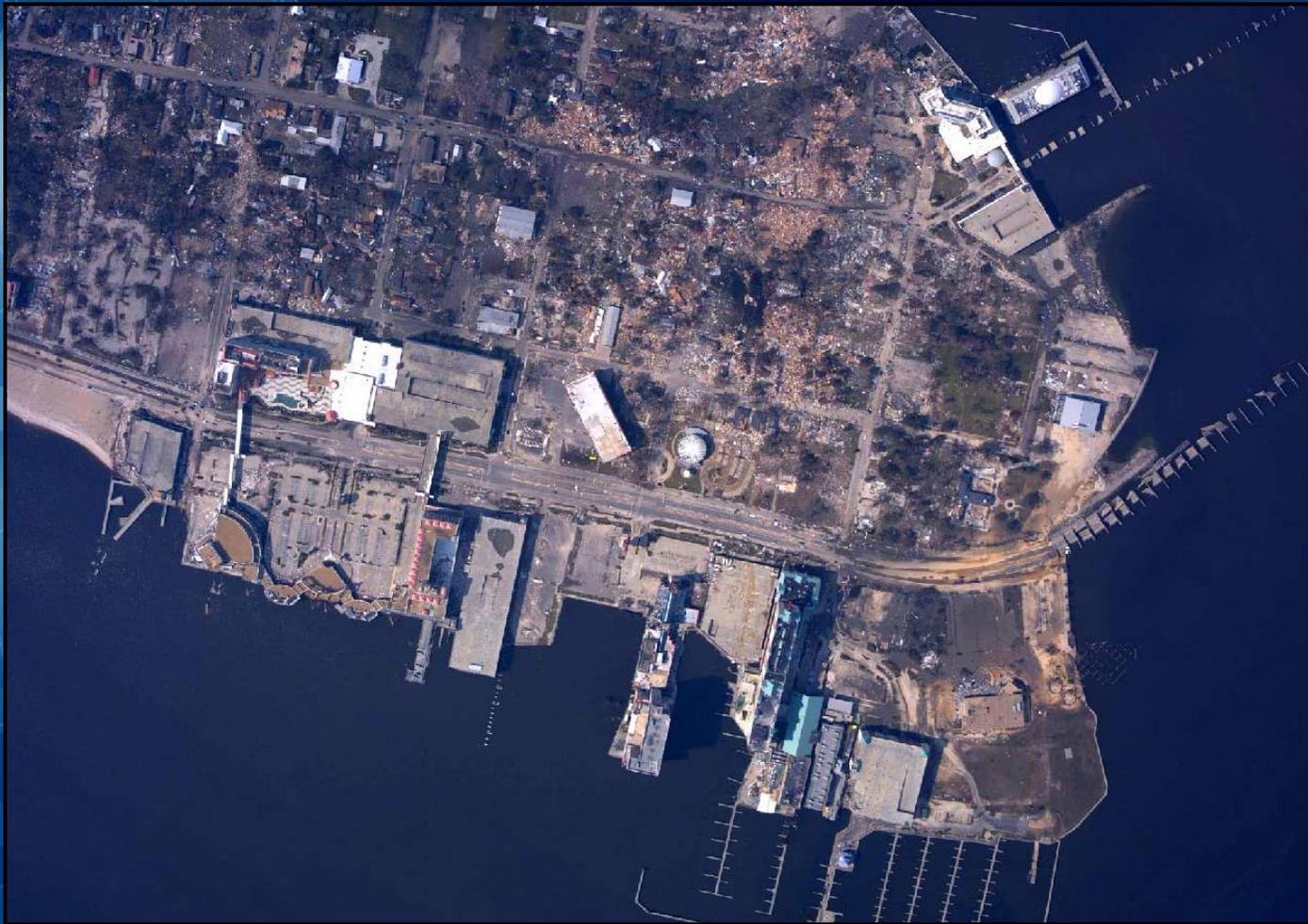


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Hurricane Katrina

Biloxi, MS

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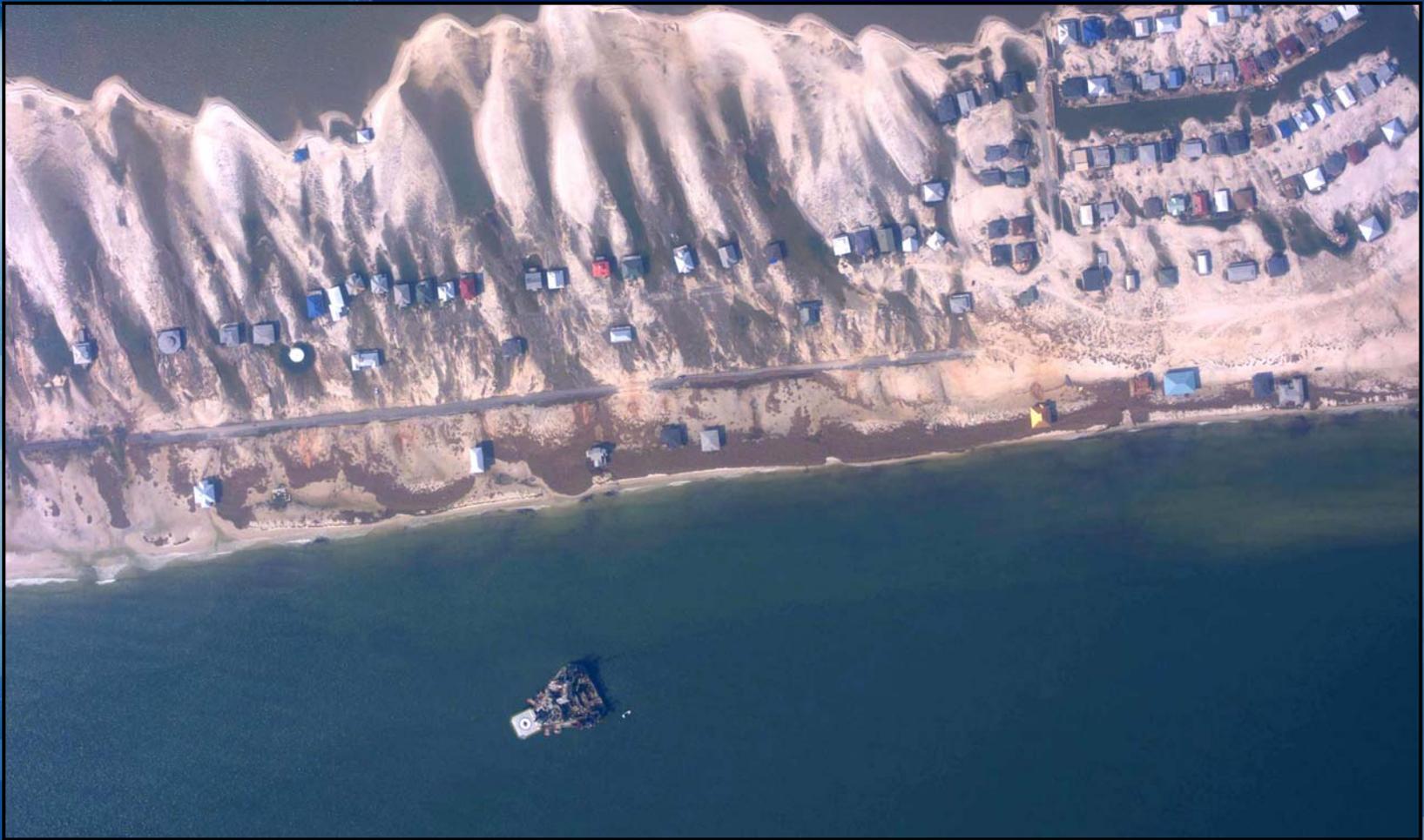


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Hurricane Katrina

Dauphin Island, AL

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Hurricane Katrina

New Orleans, LA

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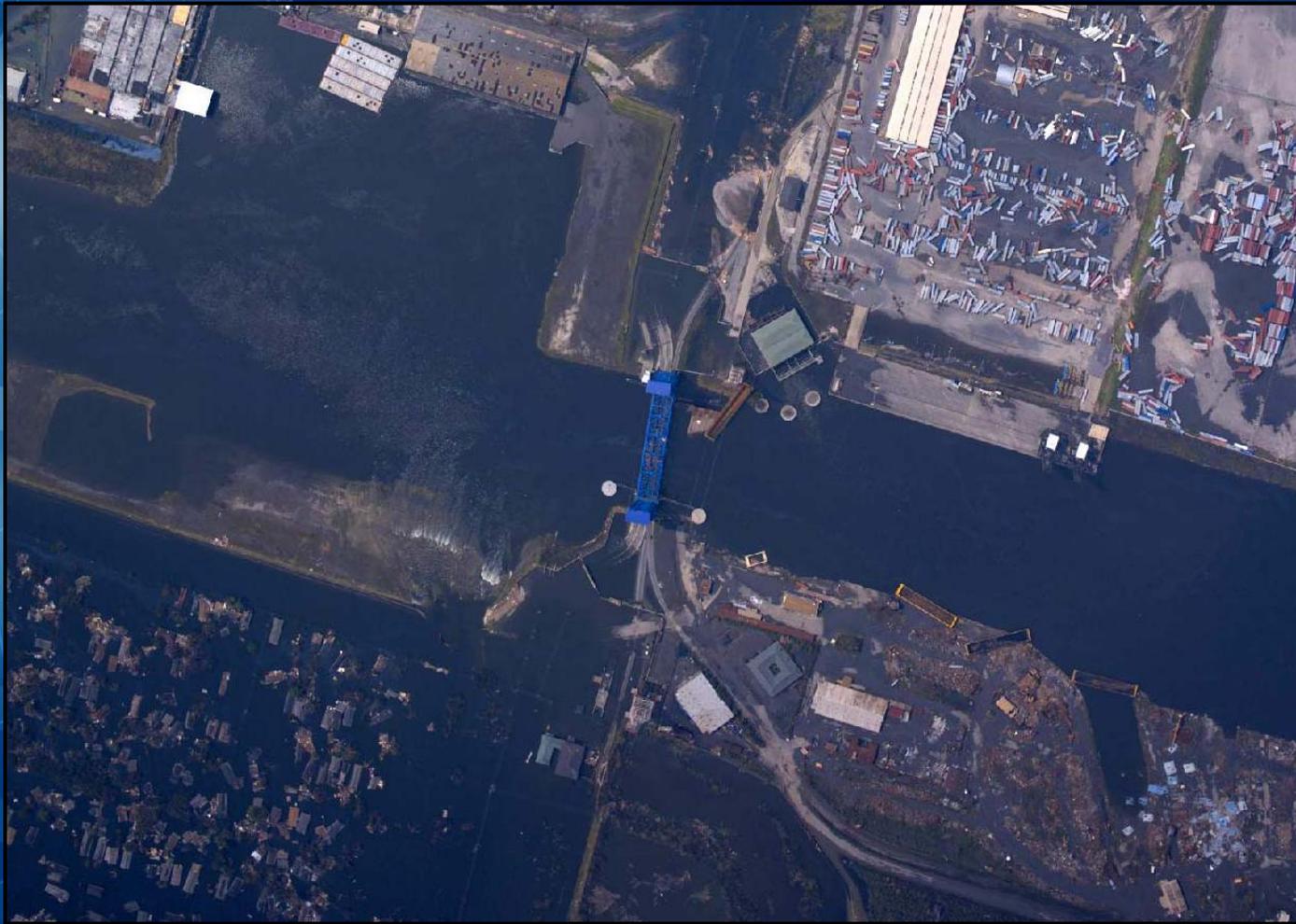


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Hurricane Katrina

New Orleans, LA

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National Oceanic and Atmospheric Administration

Hurricane Katrina

New Orleans, LA

NATIONAL GEODETIC SURVEY

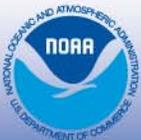
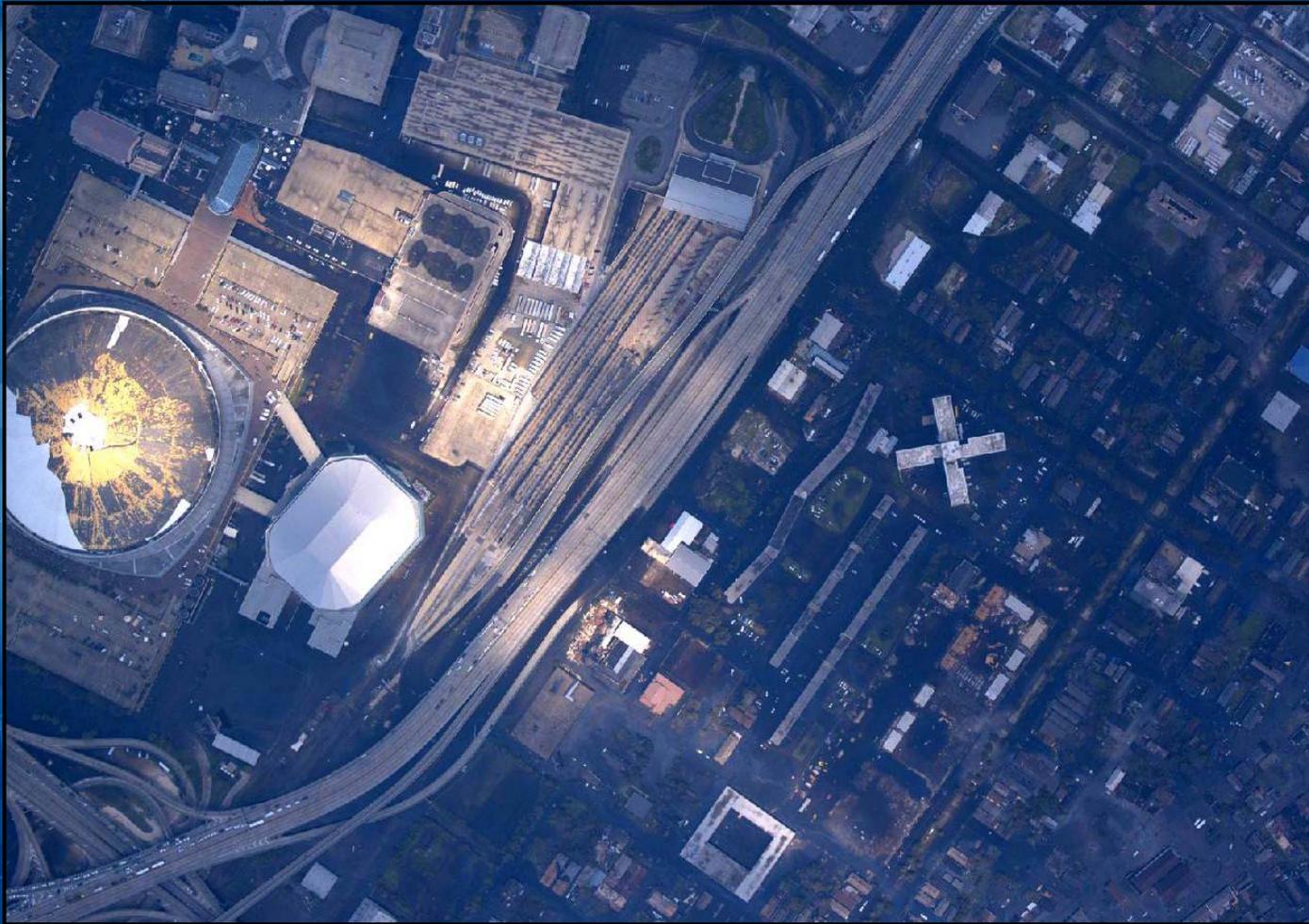


National Oceanic and Atmospheric Administration

Hurricane Katrina

New Orleans, LA

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Hurricane Katrina

New Orleans, LA

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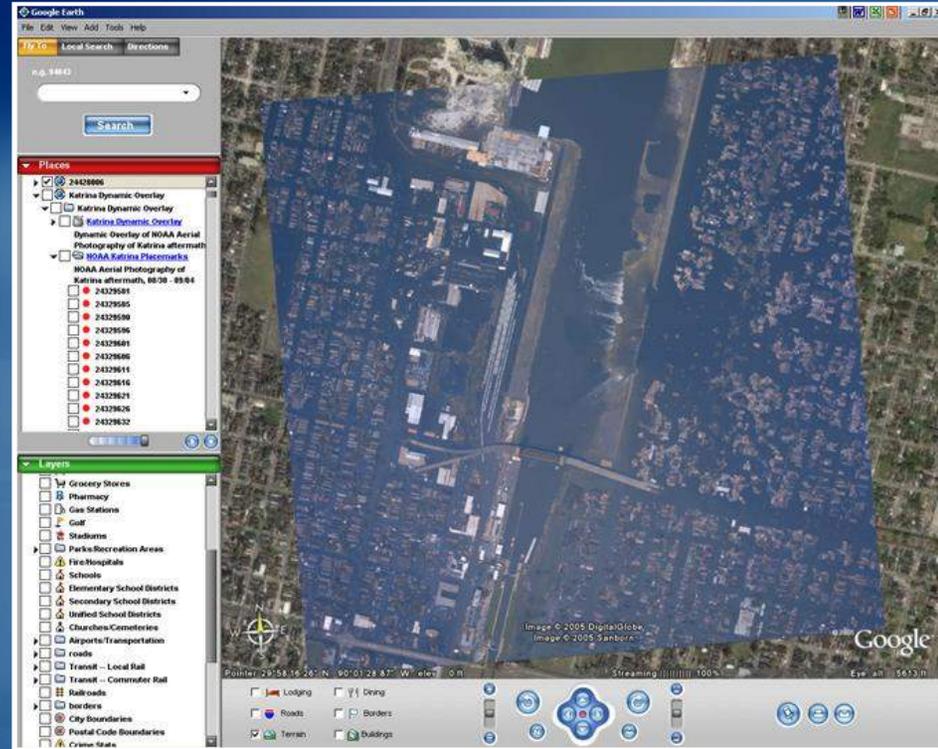
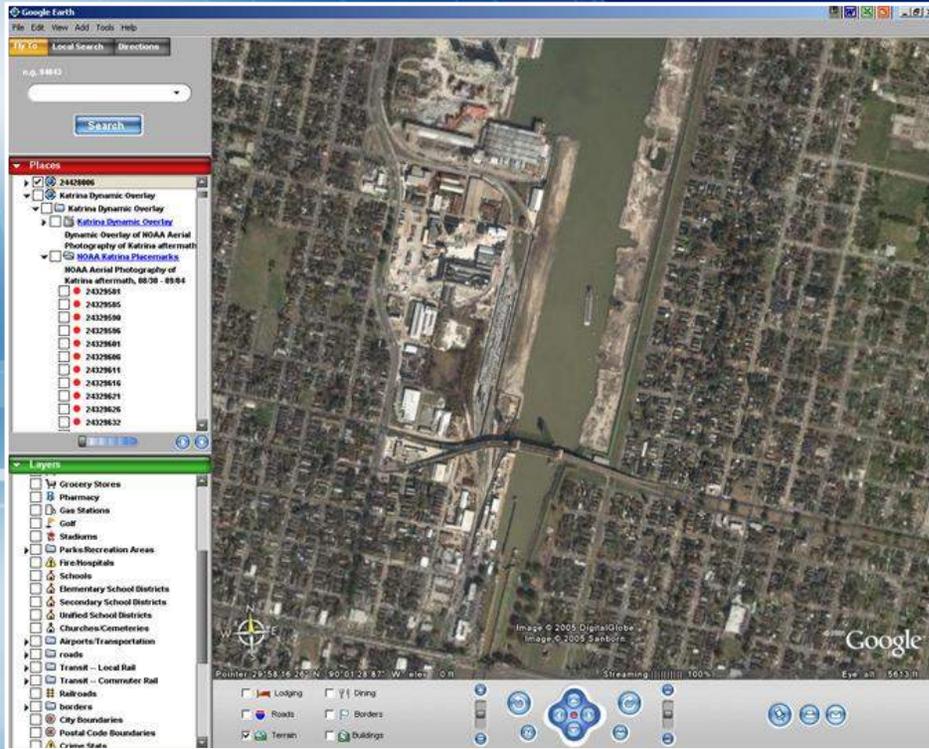


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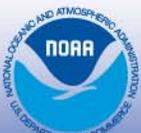
Hurricane Katrina

New Orleans, LA

NATIONAL GEODETIC SURVEY



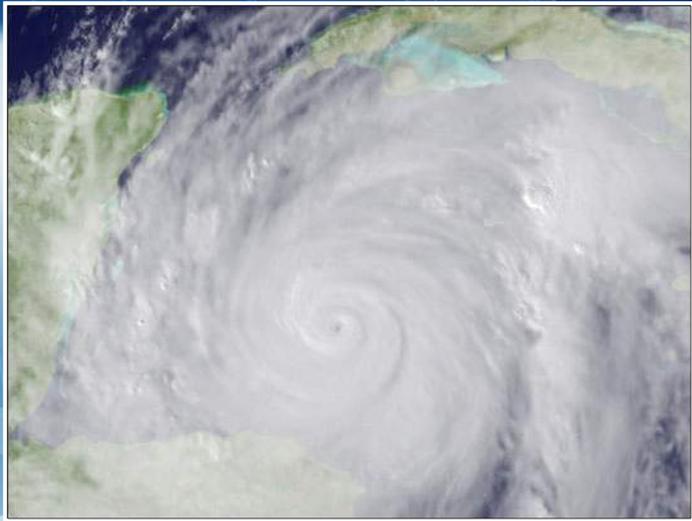
Google Earth incorporates NGS imagery.



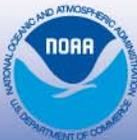
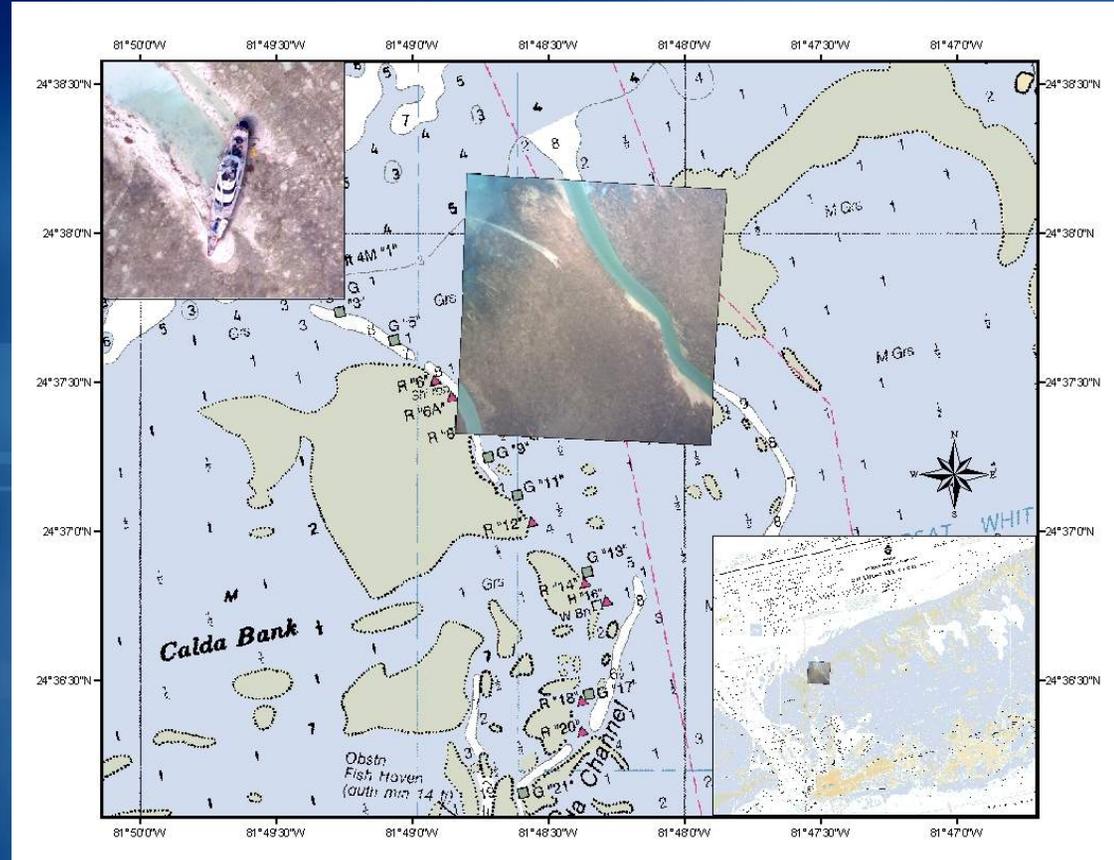
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Hurricane Wilma

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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.

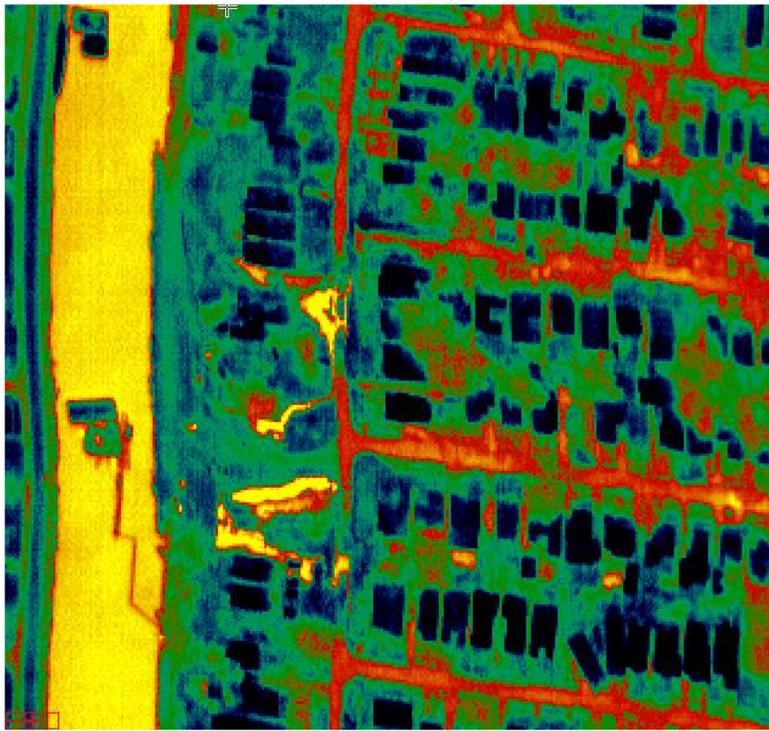


National Oceanic and Atmospheric Administration

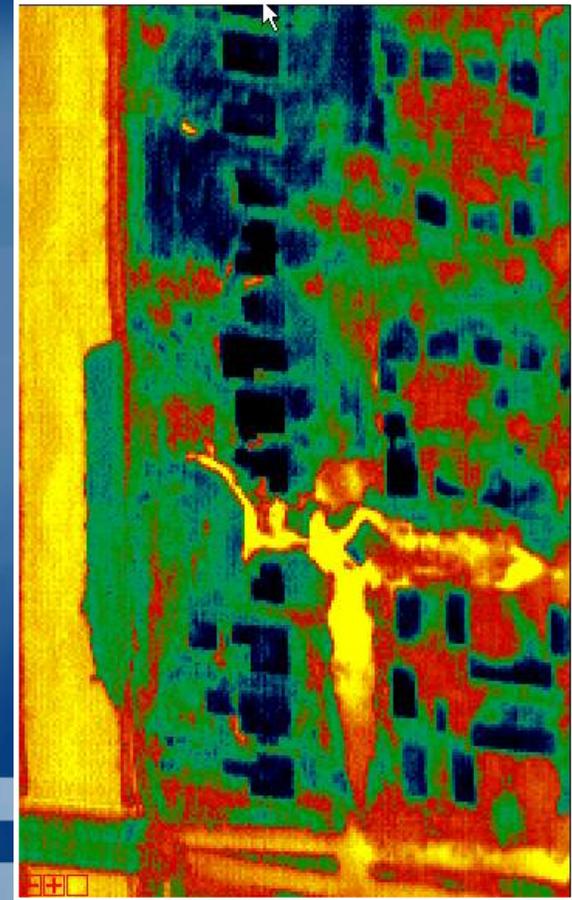
Thermal Collection to assist with Levee Inspection

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17th Street Canal



Industrial Canal



National Oceanic and Atmospheric Administration

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.**
- **This data also assist in supporting the testing and development of guidelines for the acquisition and utilization of remotely sensed data for the integration into NOAA programs.**

