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

JACIE Civil Commercial Imagery Evaluation Workshop 2006

Stephen White
Our Focus

- 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

Satellite Imagery

Image Source: Digital Globe

Georeference to meet accuracy needs

Updated as needed
Evaluation of Digital Cameras through Contracting

- DMC
- ADS40
- Vexcel UltraCam
Research and Development

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

Bixby Bridge, Big Sur, CA
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.
Integrated Bathy/Topo Digital Elevation Model

NOAA Bathymetry

Geoid Model

Tidal Model

Ellipsoid Model

Integrated Bathy/Topo Digital Elevation Model

NOAA-USGS shoreline inconsistencies

GIS users in the Coastal Community

Marine Boundaries & Legal Issues

National Bathymetric Database

VDatum (Vertical Datum Transform Tool)

RTK-GPS vertical referencing Hydrographic Surveys

Shoreline from LIDAR in the intertidal zone

NOAA-USGS shoreline inconsistencies

Private owned

State owned

National Oceanic and Atmospheric Administration
North Carolina Sea Level Rise Project – A VDatum application

Create a DEM
To assess
Sea Level Rise

- Integrated Topo/Bathy DEM
- Areas inundated with a 1.0 m SLR
- Land Elevations
- NOAA Bathymetry

National Oceanic and Atmospheric Administration
Lidar Shoreline Extraction

NATIONAL GEODETIC SURVEY

Edit Lidar Point Cloud

Contour Shoreline from DEM

QA/QC and perform error analysis

VDatum
Research Projects

- A multiple sensor approach to shoreline mapping
Lidar derived shoreline

Hyperspectral Classified image

Feature attributed lidar-derived shoreline superimposed on an orthorectified image
Research Projects

• Investigating Thermal Imagery for Shoreline Delineation
• 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.
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.
- 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).
March 27, 1964: Alaska struck by an earthquake and tsunami.
Historical Accounts

Nor’easter (February 1978)
Oil Slick from the breaking up and sinking of the tanker Texaco Oklahoma (1971)
Recent Projects

- 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.

Hurricane Isabel

- 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
Hurricane Katrina

- 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.
Hurricane Katrina
Chandeleur Islands, LA

Imagery Courtesy of NASA

Imagery Courtesy of NASA

DSS Imagery

National Oceanic and Atmospheric Administration
Hurricane Katrina
Bay St. Louis, MS
Hurricane Katrina
Gulfport, MS
Hurricane Katrina
New Orleans, LA
Hurricane Katrina
New Orleans, LA

Google Earth incorporates NGS imagery.
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.
Thermal Collection to assist with Levee Inspection

17th Street Canal

Industrial Canal
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.