USACE National Coastal Mapping Program: Advanced Lidar Products to Support Storm Damage Risk Reduction

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Charleston, SC  
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*Trusted Partners Delivering Value, Today and Tomorrow*
Agenda

- JALBTCX and the USACE National Coastal Mapping Program (NCMP)
- 2016 NCMP and Post-Matthew operations overview
- Rapid response lidar products
- Data products for emergency response
- 2017 NCMP planning and coordination
Joint Airborne Lidar Bathymetry Technical Center of Expertise

Director: Jennifer Wozencraft

Annual Technical Workshop, June or July 2017
Southeast U.S.
National Coastal Mapping Program Goals

- Develop regional, repetitive, high-resolution, high-accuracy elevation and imagery data
- Build an understanding of how the coastal zone is changing
- Facilitate management of sediment and projects at a regional, or watershed scale
National Coastal Mapping Progress
Basic NCMP Data Products

- Standard product suite
- Born in 2004 and have evolved since
- Workflows promote ease of use and re-use
- Widely disseminated and publically-available
NCMP Data Access

https://coast.noaa.gov/dataviewer/

- USACE District Office
- USACE Geospatial Repository and Data Management System (GRiD)
- NOAA OCM (Digital Coast) and NCEI (Boulder)
- USGS St. Petersburg, FL and Sioux Falls, SD
- By request to jalbtcx@usace.army.mil

https://griduc.rsgis.erdc.dren.mil/griduc/corpsmap/
Advanced Lidar Products

- Extraction of metrics for beach characterization and development of regional coastal engineering indices

Leveraging ERDC R&D Expertise

- Dune height
- Shoreline change
- Beach width
- Volume change
Fusion Data Products

- Fusion of lidar-derived metrics with spectral information for habitat characterization and monitoring, and critical species detection and modeling

**Leveraging ERDC R&D Expertise**

- Dune vegetation
- SAV
- Land cover
- Water quality indicators
2016 NCMP Operations

**Texas**
- 941 flight lines
- 7 Sept – 17 October
- 40 days
- 67 flights
- Dual Aircraft Operations

**Panhandle**
- 329 flight lines
- 21 July – 6 Sept
- 47 days
- 39 flights

**Florida**
- 588 flight lines
- 17 May – 20 July
- 64 days
- 52 flights

**Puerto Rico**
- 521 flight lines
- 22 Jan – 10 Feb
- 11 May – 16 May
- 24 days
- 27 flights
Key Biscayne, FL to VA/MD Border

- Dual aircraft operations
- 991 flight lines
- 27 Oct – 2 Dec
- 36 days
- 76 flights

- 4 ground-truth teams (USGS)
- 24-hr field office
- Rapid-response data product deliveries
- Advanced lidar products for emergency response
Post-Matthew Operations and Production Center – St. Augustine, FL

Mob: 27 Oct
De-mob: 17 Dec

12 workstations
24 monitors
2 field support boxes
Networking equipment
4 GPS base stations
Ground-truth equipment
Workflow for Rapid Response Lidar Products

- In-field processing from raw lidar waveform to edited and classified (ground/non-ground) point clouds, grid products and contour.

- QT Modeler Grid Generation
  - GeoClassified MGRS box LAS files
  - QT Modeler Grid Generation
  - ArcGIS ascii2raster

- In-field processing:
  - Export ASCII Z Grid
  - Coverage Polygon
  - Coverage .shp
  - RGB Image
  - KML
  - "0" Contour
  - QC & clean
  - 1m Grid
  - 5m Grid
  - 1m Bare Earth Grid
  - NAVD88 Zero Contour
Advanced Lidar Products for Emergency Response

- **Operations**: provide streamlined method to generate volume/shoreline change datasets on a regional scale
- **Planning**: generate map products that can be used to communicate between agency partners to identify priority areas that would benefit from beneficially using sediment
- **R&D**: provide input for SBAS (Sediment Budget Analysis System)
- **Post-Storm**: Hurricane Matthew emergency response – volume change analysis for FL, GA, SC, NC, & VA

### East Coast Volume Change (2005 – 2010)

<table>
<thead>
<tr>
<th>State</th>
<th>Start Date</th>
<th>End Date</th>
<th>Baseline Length</th>
<th>Number of Transsects</th>
<th>Average Shoreline Change Rate</th>
<th>Volume Density Rate</th>
<th>MHW Volume Density Rate</th>
<th>Above MHW Volume Density Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME</td>
<td>10/19/2005</td>
<td>6/19/2010</td>
<td>62</td>
<td>633</td>
<td>0.4</td>
<td>13.5</td>
<td>0.7</td>
<td>0.6</td>
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<td>NH</td>
<td>11/01/2005</td>
<td>6/20/2010</td>
<td>15</td>
<td>152</td>
<td>1.0</td>
<td>2.6</td>
<td>(0.5)</td>
<td>(0.5)</td>
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<tr>
<td>MA</td>
<td>11/11/2005</td>
<td>5/26/2010</td>
<td>381</td>
<td>3,834</td>
<td>2.8</td>
<td>(2.8)</td>
<td>(0.9)</td>
<td>(0.8)</td>
</tr>
<tr>
<td>NY</td>
<td>10/26/2005</td>
<td>8/13/2010</td>
<td>192</td>
<td>1,921</td>
<td>6.9</td>
<td>4.5</td>
<td>4.1</td>
<td>4.2</td>
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<tr>
<td>NJ</td>
<td>9/2/2005</td>
<td>8/28/2010</td>
<td>203</td>
<td>2,034</td>
<td>6.6</td>
<td>2.1</td>
<td>2.2</td>
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<td>MD</td>
<td>9/3/2005</td>
<td>8/2/2010</td>
<td>50</td>
<td>500</td>
<td>4.3</td>
<td>2.8</td>
<td>2.7</td>
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<td>VA</td>
<td>9/2/2005</td>
<td>7/28/2010</td>
<td>183</td>
<td>1,835</td>
<td>7.2</td>
<td>3.1</td>
<td>3.4</td>
<td>2.9</td>
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<td>NC_2009</td>
<td>9/28/2005</td>
<td>8/18/2009</td>
<td>272</td>
<td>2,725</td>
<td>3.9</td>
<td>0.6</td>
<td>(1.3)</td>
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<td>NC_2010</td>
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<td>5/4/2010</td>
<td>236</td>
<td>2,269</td>
<td>0.2</td>
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<td>2.5</td>
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<td>SC</td>
<td>1/13/2006</td>
<td>5/4/2010</td>
<td>277</td>
<td>2,778</td>
<td>2.1</td>
<td>2.3</td>
<td>1.3</td>
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<td>GA</td>
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<td>5/4/2010</td>
<td>145</td>
<td>1,452</td>
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<td>3.0</td>
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<td>FL_E</td>
<td>7/1/2004</td>
<td>5/4/2010</td>
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<td>298</td>
<td>2,998</td>
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<td>2.4</td>
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<td>FL_NW</td>
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<td>6/20/2010</td>
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<td>(9.5)</td>
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<td>(0.2)</td>
<td>(0.2)</td>
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<td>Total/Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,289</td>
<td>33,012</td>
<td>0.9</td>
<td>4.6</td>
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</tbody>
</table>
Post-Matthew Data Production Status Map

http://arcg.is/2kqc0h9

- DEM and shoreline deliveries completed for FL, GA, SC and VA
- NC completion mid-February
- Imagery and volume change work on-going
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS.

The information depicted on this map represents elevation changes along the North Carolina Coast comparing the pre-Hurricane Matthew with the post-storm condition.

Volumes included in the table were computed in 300-ft alongshore sections, and are provided in units of cubic yards (cy) and/or cubic meters (m³).

Pre- and post-storm shorelines are indicated on the map as a dashed gray line and solid black line, respectively.

The bar chart includes the Volume Change (light blue) and MWV Volume Change (dark blue). The Shoreline Change Rate is represented by the black line.

 BUILDING STRONG
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2017 NCMP Planning

- May – Oct
- GA through Long Island
- Seeking opportunities for coordination

USACE Planned Lidar
- 2017
- 2018
- 2019
- 2020
- 2021

2017 NCMP Planning
Thank you!

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