Coastal Vulnerability Analysis Using AMBUR-HVA

Final Products and Progress

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Applied Coastal Research Lab
Georgia Southern University
The HVA Team

**LEAD PI**
Clark Alexander – Skidaway Institute of Oceanography

**STATE AGENCY LEADS**
Ken Richardson – NC Dept. of Environment and Natural Resources
Jessica Boynton – SC Department of Health & Environmental Control
Jennifer Kline – GA Dept. of Natural Resources
Julie Dennis – FL Dept. of Environmental Protection

**TECHNICAL LEADS**
J.P. Walsh – East Carolina University
Scott Howard – SC Geological Survey
Clark Alexander – Skidaway Institute of Oceanography
John M. Jaeger – University of Florida

**AMBUR-HVA DEVELOPER**
Chester (CJ) Jackson – Georgia Southern University
# HVA Team/Partner Roles and Responsibilities

<table>
<thead>
<tr>
<th>Institution / Leads</th>
<th>Roles and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skidaway Institute of Oceanography (Alexander)</td>
<td>Project coordination, reporting and fiscal management</td>
</tr>
<tr>
<td>Georgia Southern University (Jackson)</td>
<td>AMBUR Hazard Vulnerability Assessment tool formulation, programming and enhancement; Beta testing for Camden County, Georgia and elsewhere as needed</td>
</tr>
<tr>
<td>East Carolina University (Walsh), SC Geological Survey (Howard), Skidaway Institute of Oceanography (Alexander), University of Florida (Jaeger)</td>
<td>Technical leads for physical, biological and socioeconomic GIS data development and synthesis for Hazard Vulnerability Assessments. Run analyses on pilot study areas.</td>
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<tr>
<td>NC-DNER (Richardson), SC-DHEC(Burger), GA-DNR (Kline), FL Dept. Economic Opportunity (Dennis)</td>
<td>Management leads for coordination on site selection, utility of tools and outcomes, dissemination of results and deliverables to stakeholders</td>
</tr>
<tr>
<td>GSAA RIMS - SECOORA (Hernandez)</td>
<td>Coordination between RIMS and HVA project; hosting AMBUR-HVA tools, manuals and HVA output for all Alliance states (data directly compatible)</td>
</tr>
<tr>
<td>DRC IATT (Salters, Team Lead, SC DHEC; Kline, GA DNR; Miller, NC DENR; Dennis, FL DEO)</td>
<td>Identification of currently available DRC data sets, prioritization of new dataset collection and/or creation, guidance regarding use of AMBUR HVA for DRC IATT work activities.</td>
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<tr>
<td>HE IATT (Landsberg, Team Lead, FL Fish and Wildlife Conservation Commission; Van Dolah, SC DNR; Deaton, NC DENR; Geer, GA DNR)</td>
<td>Identification and dissemination of HE-relevant datasets being developed during HVA analysis, prioritization of new dataset collection and/or creation, guidance regarding use of AMBUR HVA for HE IATT work activities.</td>
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</tbody>
</table>

Notable new partnerships: Emergency Management Agencies
Dissemination of AMBUR-HVA Tool

Welcome to the AMBUR project on R-Forge!
This page includes resources for assessing boundary changes (shoreline change) and coastal vulnerability.

These packages for R provide a collection of functions to quantify historical shoreline change or other boundary movements, and coastal hazards vulnerability.

Download/Install:
To download and install directly in R with dependent packages type:

```
install.packages("ambur", repos=c("http://cran.r-project.org","http://R-Forge.R-project.org"))
install.packages("amburhva", repos=c("http://cran.r-project.org","http://R-Forge.R-project.org"))
```

(It can also be downloaded within R by selecting both CRAN and R-Forge repositories under the "Packages" menu and then choosing Install package(s) under the same menu in the R console)

Developed versions of 'ambur' and 'amburhva' for download:
R-Forge repository: (Users must also download dependent packages using the CRAN repository)

Dependent and recommended packages:
ambur, akima, locfit, shapefiles, sp, spatial, spatstat, googleVis, rgdal, rgeos, stringr
(the dependent packages should automatically install when downloading and installing from within R)

User guide(s) and sample data:
ambur documentation/data (to be revised soon; please email author for changes)
amburhva documentation/data (to be added soon)
AMBUR-HVA GUI Interface

Enter or select your shapefiles and enter your breakpoint values (from high risk to low risk):

- **enter location name (optional)**
- **Select a directory to store results**
- **Select AMBUR Envelope Transects Shapefile**
- **Select FEMA Q3/DFIRM Shapefile**
- **Select NOAA/NWS/USACE SLOSH Shapefile**
- **Select NOAA SoVI Shapefile**
- **remove anthropogenic transects**
- **spatial search radius (map units)**
- **transect buffer (map units)**
- **shoreline change rate (map units/yr) breakpoints**
  - 1
  - 0.2
  - 0.2
  - 1
- **temporal shoreline change (st.dev map units/yr) breakpoints**
  - 0.5
  - 0.2
- **spatial shoreline change (st.dev map units/yr) breakpoints**
  - 0.16
  - 0.074
- **SoVI (score) breakpoints**
  - 6.77
  - 4.06
  - -1.37
  - -4.09

**OK**
What are the products?

**Inputs**
- Four components
  - Storm surge layer (SLOSH)
  - Shoreline Change Rate (+/-) layer
    - Digitized shorelines
    - Historic and current imagery
  - Flood map layer
  - SoVI® layer

**Final HVA Products**
- Composite layer (all four datasets) ranked 1 - 5
- Individual layers (Each ranked 1 – 5)
  - Shoreline Change (3 components)
    - Rate, Temporal, and Spatial variation
  - Inundation (Flood and Storm Surge)
  - Inundation + SoVI®

Boynton, 2014
All pilot areas ~1000 km estuarine shoreline; variety of shoreline types, public and private ownership; tourism important; robust datasets.

- **NC** – Nags Head, Rodanthe, Ocracoke, Cape Hatteras National Seashore, Pea Island NWR.
- **SC** – Charleston Co.; N. Edisto R.; Edisto I.; Wadmalaw I.; multiple quads.
- **GA** – Camden Co.; Kings Bay NSB, Cumberland I. National Seashore.
- **FL** – Guana Mantanzas Tolomato NERR, NASA, Canaveral National seashore, SJWRMD. Marsh and mangrove habitats.
Shoreline Change (“red” indications erosion)
Shoreline Change ("red" indications erosion)
Florida shoreline change and inundation HVAs
Georgia shoreline change and inundation HVAs
South Carolina shoreline change and inundation HVAs
North Carolina shoreline change and inundation HVAs
Most of the area in yellow (HVA 3) was inundated during Irene (2011), and a portion of the red (HVA 5) zone was where an inlet formed.

Walsh, 2014
Applied uses

HVA Component: Shoreline Change Rate

Boynton, 2014
Dissemination of Pilot Study Results

GSAA Regional Information Management System
http://gsaaportal.org

North Carolina Coastal Hazards Decision Portal (NC COHAZ)
http://coastal.geology.ecu.edu/NCCOHAZ/index.html

South Carolina Department of Natural Resources
http://www.dnr.sc.gov/data.html

Georgia Coastal Hazards Portal (GCHP)
http://gchp.skio.usg.edu
Other Outreach Activities

**Florida**
- Florida Department of Environmental Protection: Florida's Coastal Office / Guana Tolomato Matanzas National Estuarine Research Reserve (GTM Research Reserve)
- Florida Department of Environmental Protection: The St. Johns River Water Management District (SJRWMMD)
- John F. Kennedy Space Environmental Management Branch, NASA
- Florida Sea Grant

**North Carolina**
- Stakeholders workshop held on May 6-7, 2013 on Roanoke Island, NC
- NC Coastal Atlas

**Georgia**
- GA NPR Interview (Alexander) April, 2014
- City of St. Marys and Camden County government officials and emergency management personnel
- Chatham County and City of Savannah officials during the Chatham County Disaster Recovery and Redevelopment planning meeting
- Over 20 academic and public talks on coastal hazards that discussed AMBUR-HVA
Outreach Activities: Professional Meetings

Sessions Convened:


Abstracts Presented:


<table>
<thead>
<tr>
<th>Hosting Organization/ Meeting</th>
<th>Affiliation of attendees (Federal, state, local, non-profit, private)</th>
<th>Attendees</th>
<th>Number of participants</th>
<th>Date of presentation</th>
<th>Location</th>
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<tbody>
<tr>
<td>SC DHEC - OCRM</td>
<td>State</td>
<td>OCRM staff, SC Geological Survey staff</td>
<td>20</td>
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<td>SC Department of Natural</td>
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<td>SCDNR, ACE Basin NERR, US Army Corps, Sea Grant, Coastal Carolina Univ.</td>
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<td>ABS Consulting</td>
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<td>NOAA Coastal Services Center</td>
<td>Federal and State</td>
<td>NOAA CSC*, Winyah Bay and ACE NERRs, State Emergency Management Division, SCDHEC, GSAA</td>
<td>50+</td>
<td>4/11/2014</td>
<td>Charleston, SC</td>
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<td>(CSC)</td>
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NOTE: AMBUR-HVA informational Powerpoint is available upon request.
Potential Future Development