Seafloor Geology and the Blue Economy

M. Scott Harris, Ph.D., P.G.
Department of Geology, Director of Archaeology

COLLEGE of CHARLESTON
1770

- 142 students have completed the CofC BEAMS Program as of Spring 2017
- 68 of the 124 students who have graduated (55%) are currently in the marine geospatial workforce in private, government or academic positions
- 32 of these students (47%) are women.

Today's Presentation

- BOEM has given a larger overall picture
- This talk:
  - Big picture for geological studies
  - Current projects
  - Data we have or are working towards
  - What studies are needed?
  - Data needs
  - Challenges and Opportunities

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There is HUGE VALUE in these types of regional and localized studies

Big Picture: what studies?

Physical Nature of the System (ALL BASELINE)

Seafloor habitats (rock, sand, grass)

Sand for beach renourishment

Mineral Resources (not a focus for this talk)

Wind for energy (later talk)

Cultural Heritage Distributions

Historic and Prehistoric

Natural Heritage

-REDUCE IMPACTS ON and USE ALL AREAS-

Current Projects

- BOEM Sand with SC DNR Geology

- BOEM Wind with SC Sea Grant

- Grainsize analysis of offshore cores

- Geoarchaeology and ancient landscapes

- Shorelines: Active beach over flights, historical data analysis

- Flooding: Storm surge mapping, normal tides

Geologial Mapping, workforce training, *etc.*
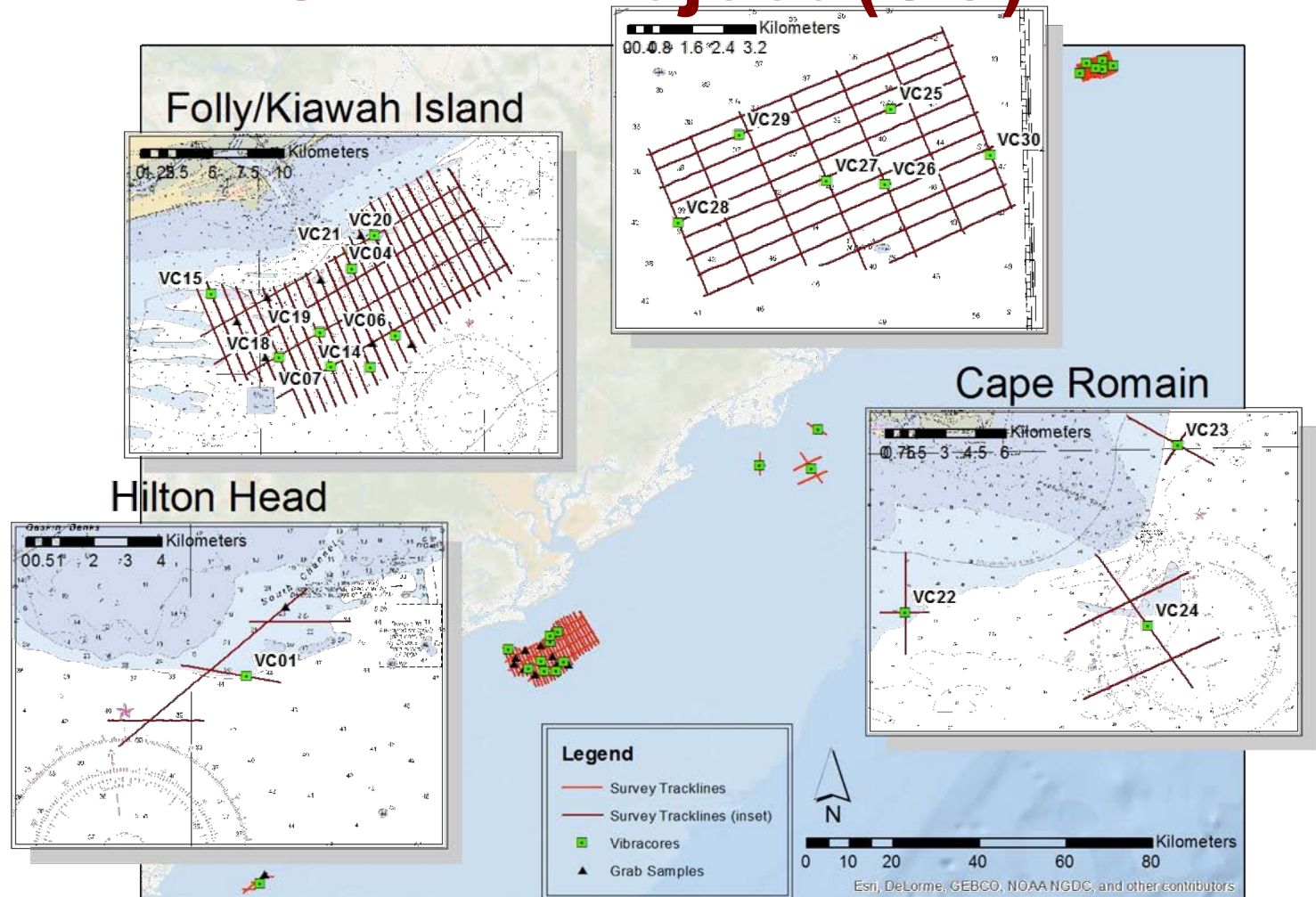
Sand: Beach Renourishment
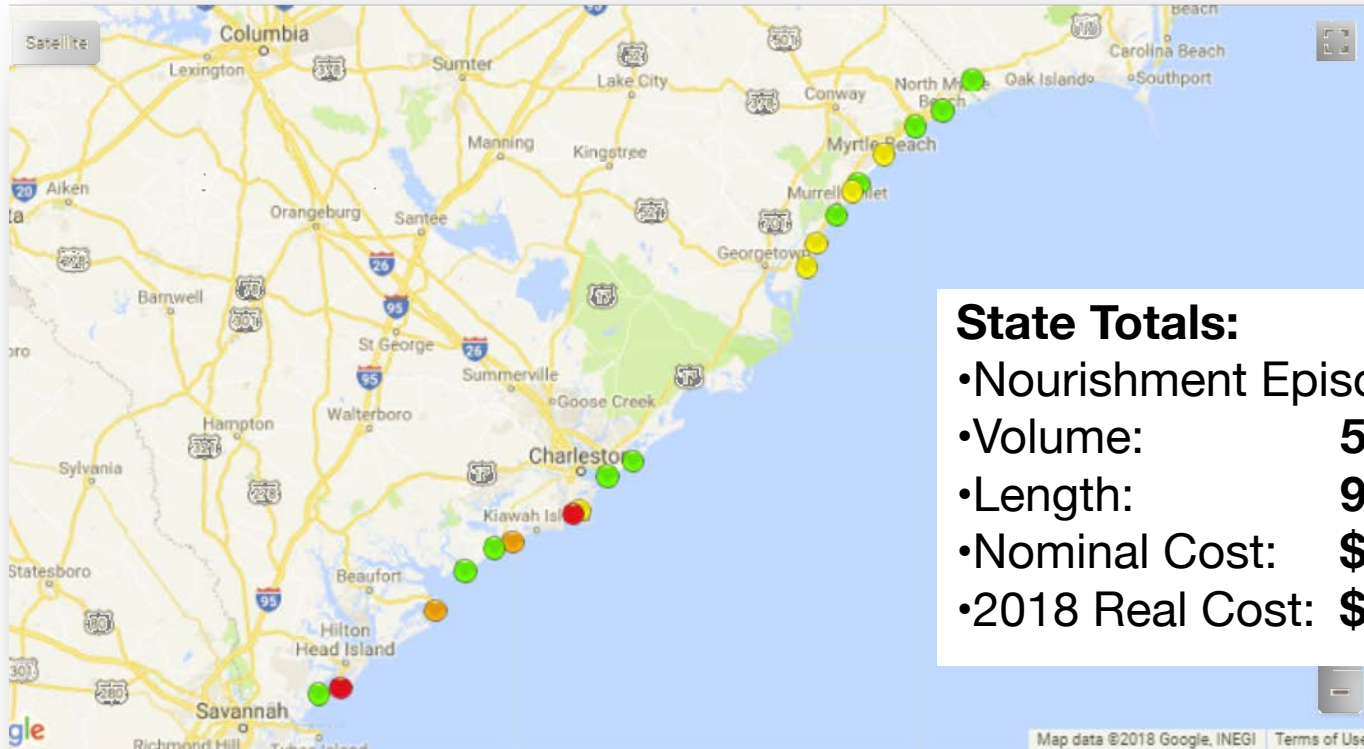
State Totals:
- Nourishment Episodes: 76
- Volume: 54,568,061 yd^3
- Length: 953,367 ft / 180mi
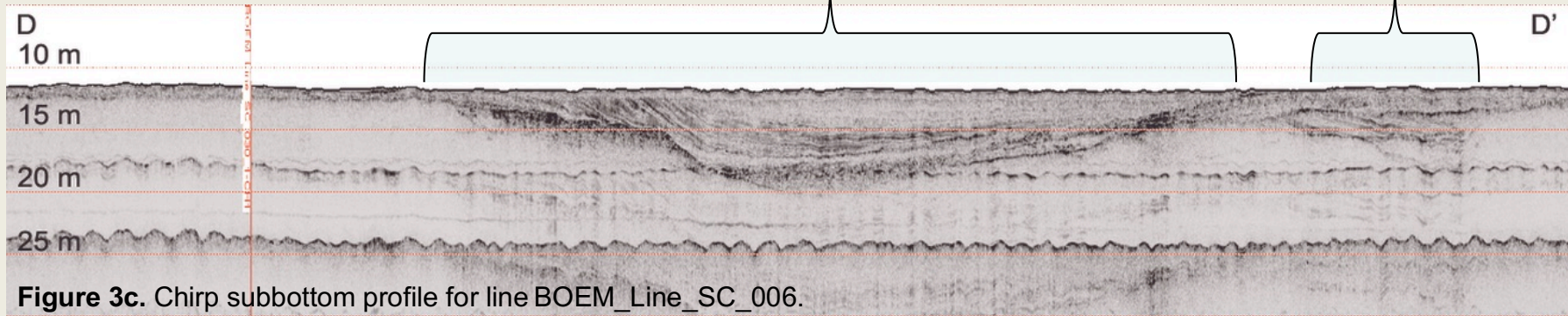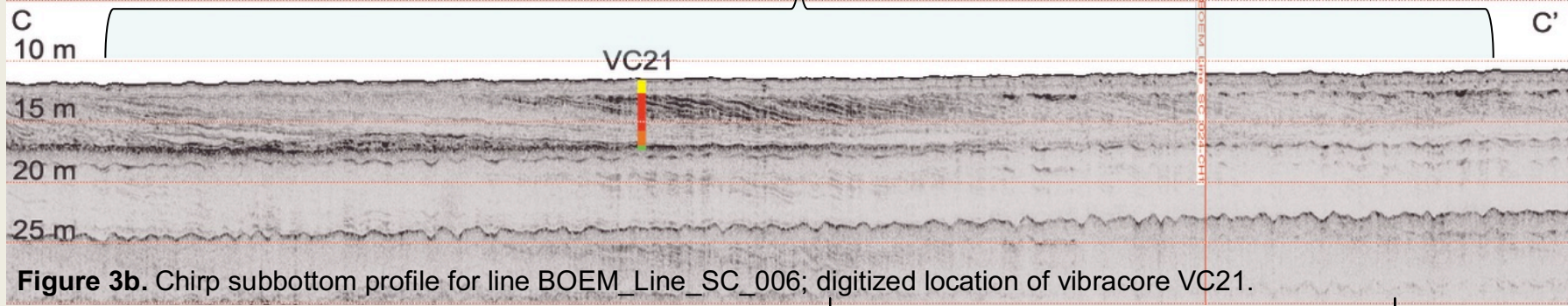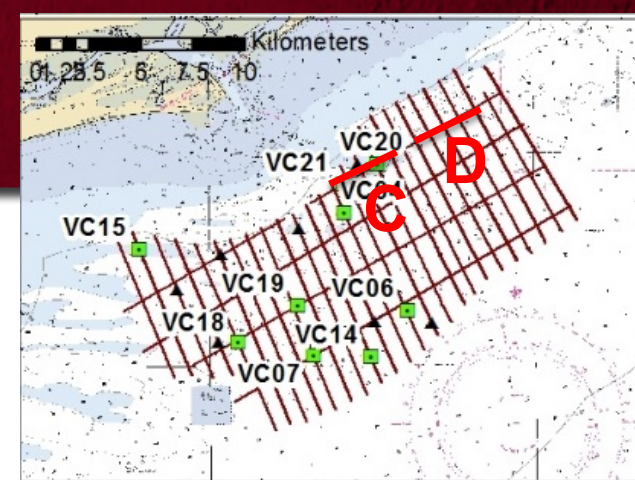- Nominal Cost: $ 308,347,002
- 2018 Real Cost: $ 433,592,526

BOEM-DNR SAND Project (SC)

Paleochannels

Figure 3b. Chirp subbottom profile for line BOEM_Line_SC_006; digitized location of vibracore VC21.
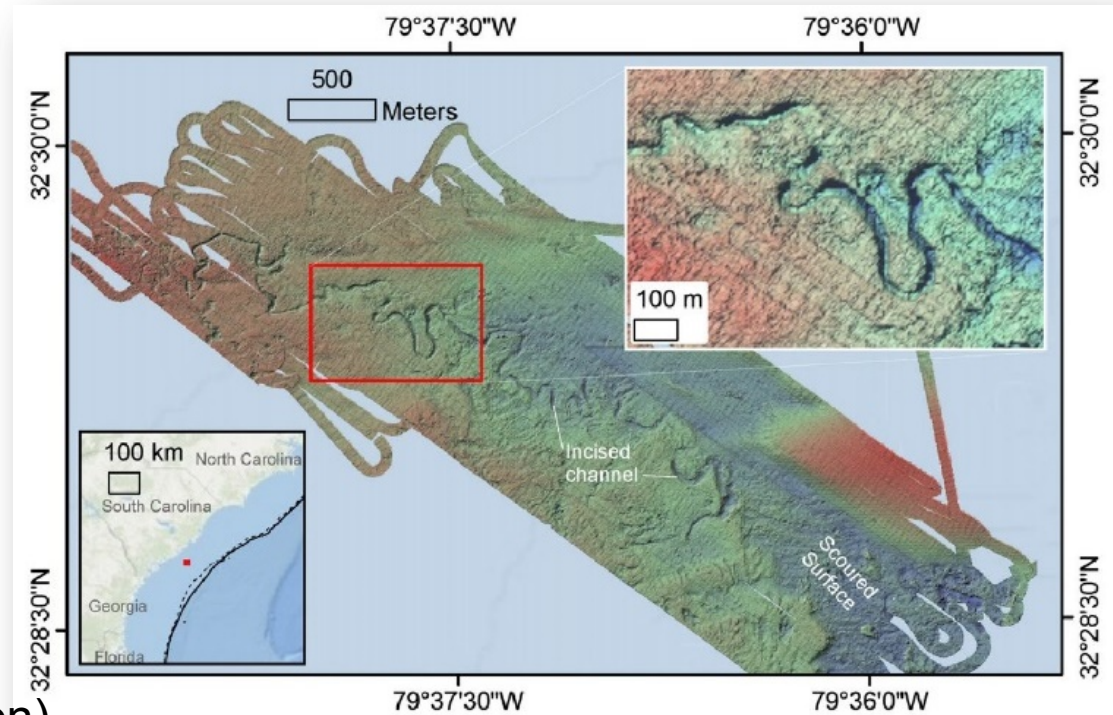
Figure 3c. Chirp subbottom profile for line BOEM_Line_SC_006.

Subbottom profiling and Cores
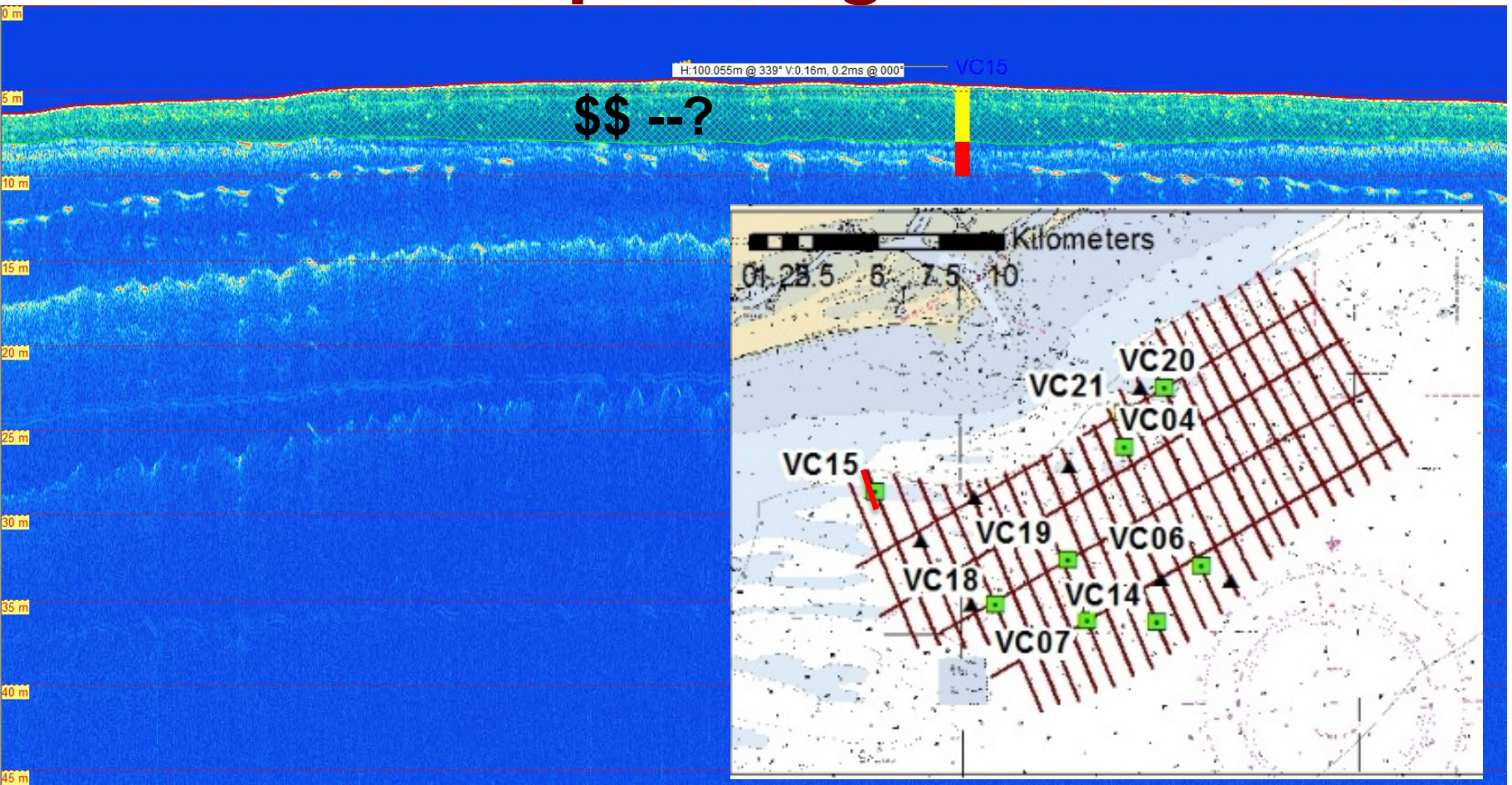
WIND Project (SC)

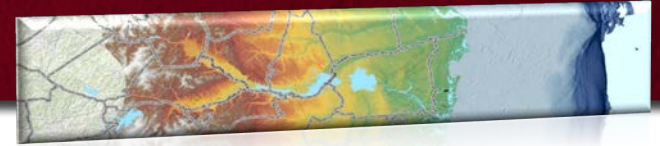• See talk later in meeting

(but enjoy this image off Charleston).

Harris et al. 2013

# Cultural Heritage

- Historic
- Pre-historic
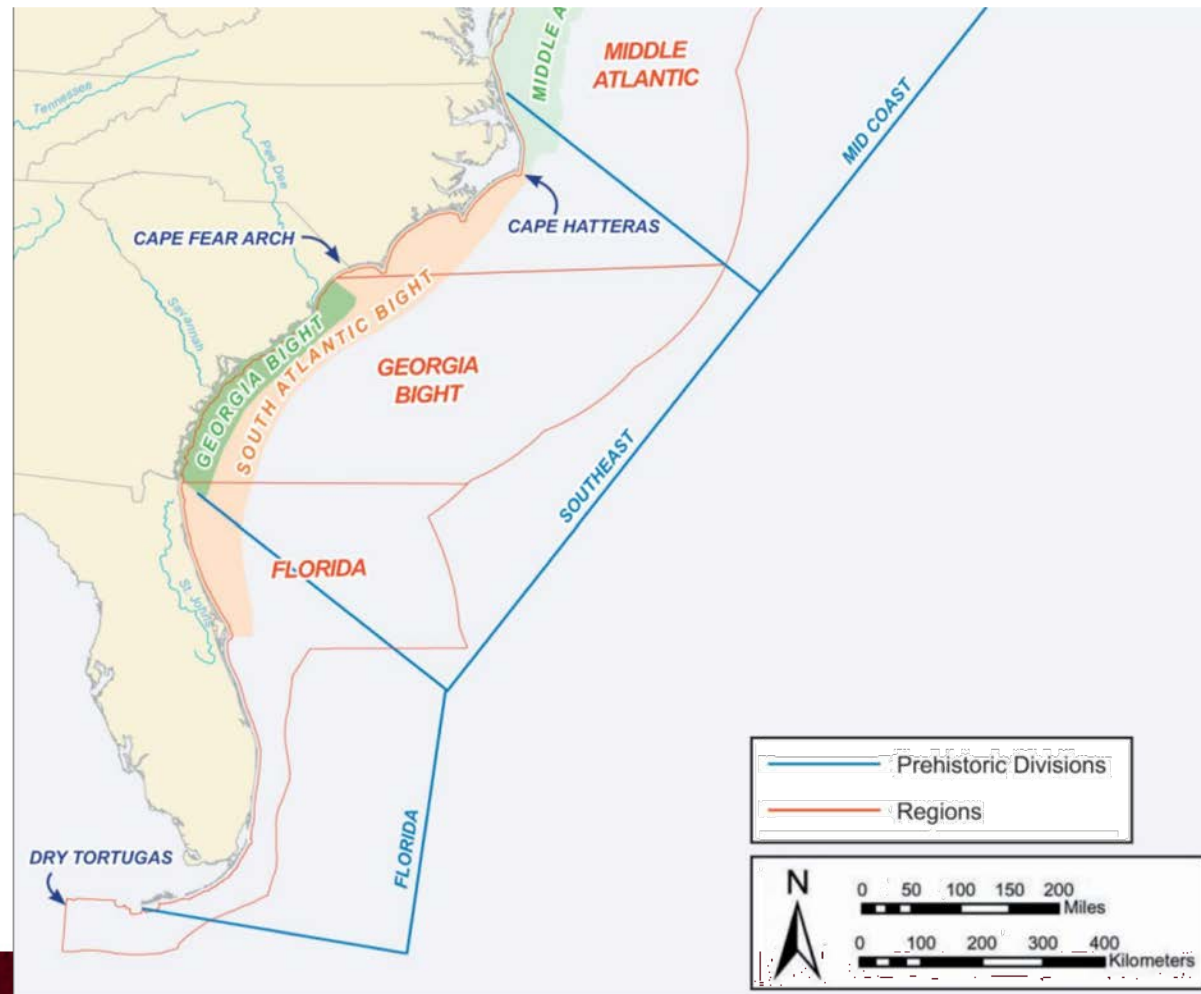
Ancient Shorelines

- Finding the ancient shorelines provides a baseline for:
    - Developing models for ancient geological landscapes and sedimentary deposits
    - Identifying potential human habitation sites
    - Gathering information on post-depositional processes (the modern system)

Recent Sea Level Rise

Harris et al., 2013
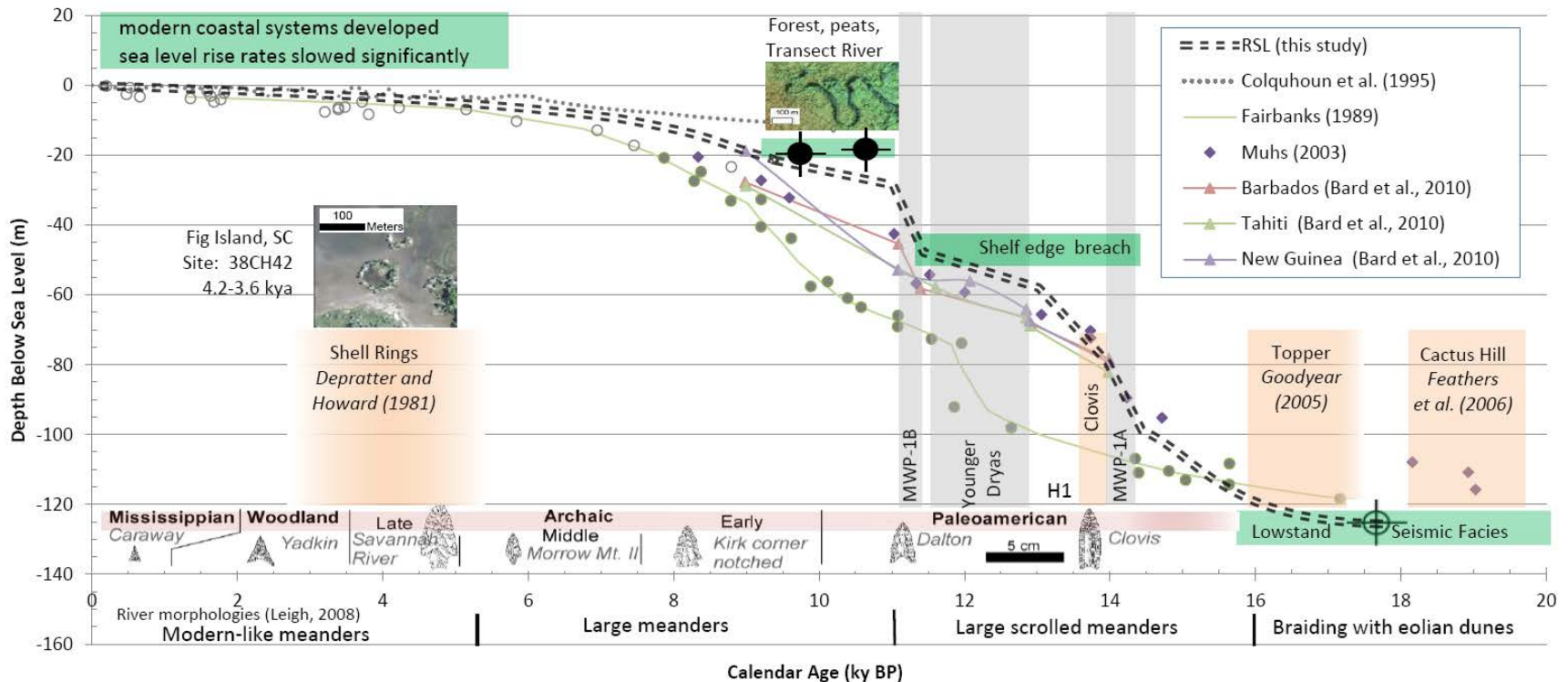
Ancient Shorelines
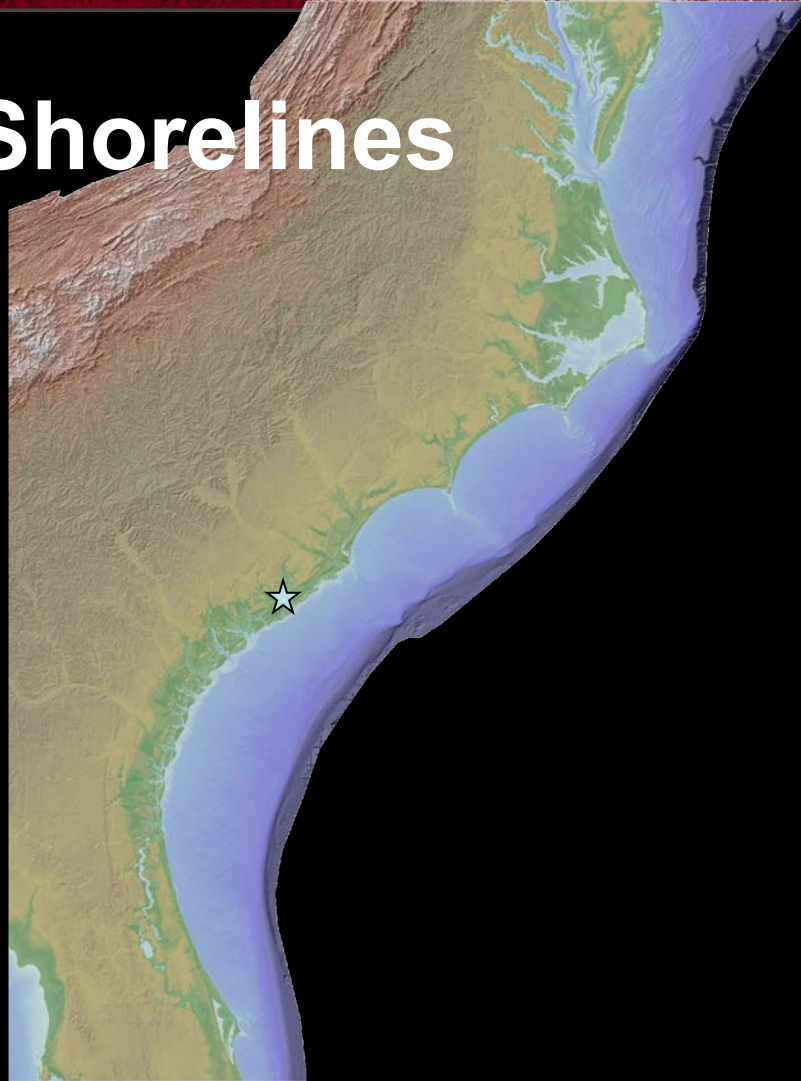
NOW

Estimated shoreline with adjustments for glacial isostatic adjustment

Ancient Shorelines
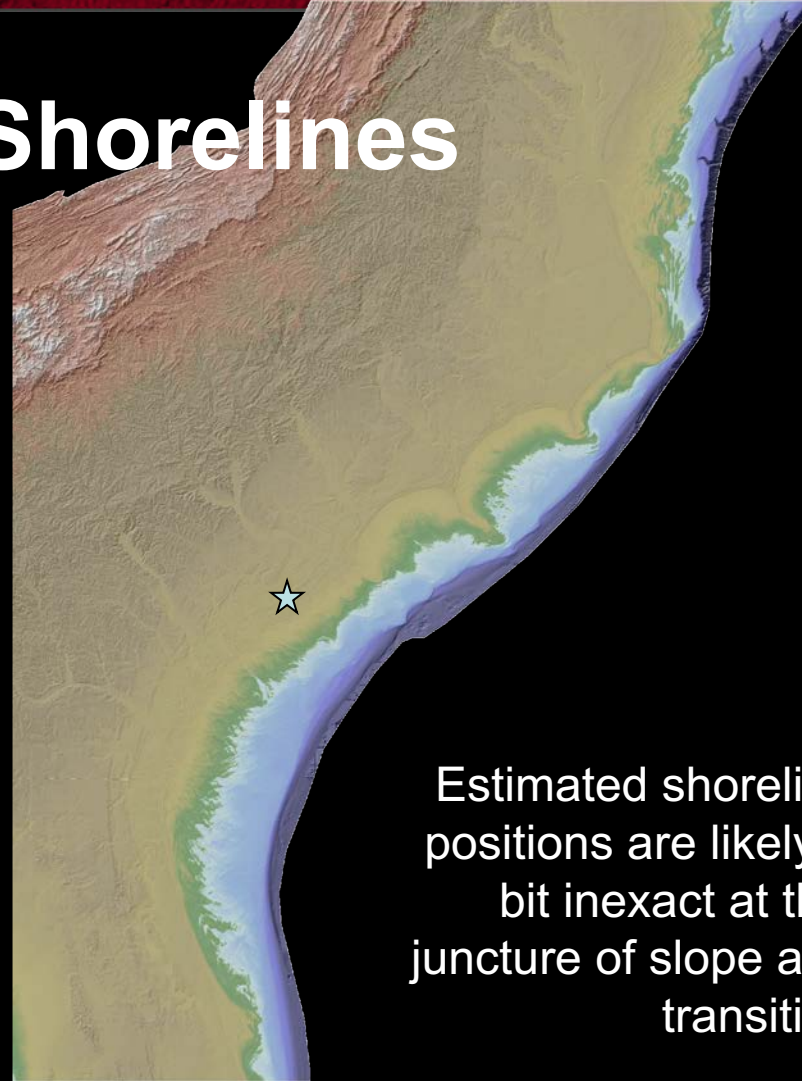
EXCITEMENT!!
SHELF BREACH!!!!

EXCITEMENT!!
SHELF BREACH!!!!

11,500 years ago

Estimated shoreline with adjustments for glacial isostatic adjustment

Positions on shelf likely +/- 10 km

Harris, 2018

Ancient Shorelines

8,500 years ago

Estimated shoreline with adjustments for glacial isostatic adjustment

Estimated shoreline positions are likely a bit inexact at this juncture of slope and transition

Positions on shelf likely +/- 10 km

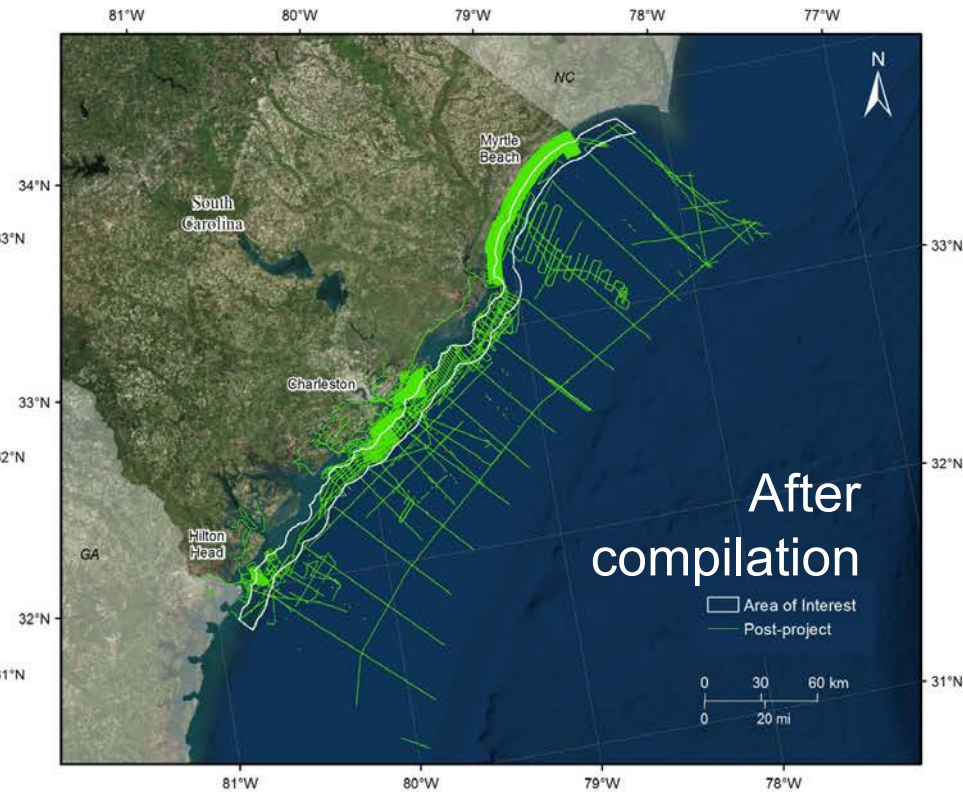Harris, 2018
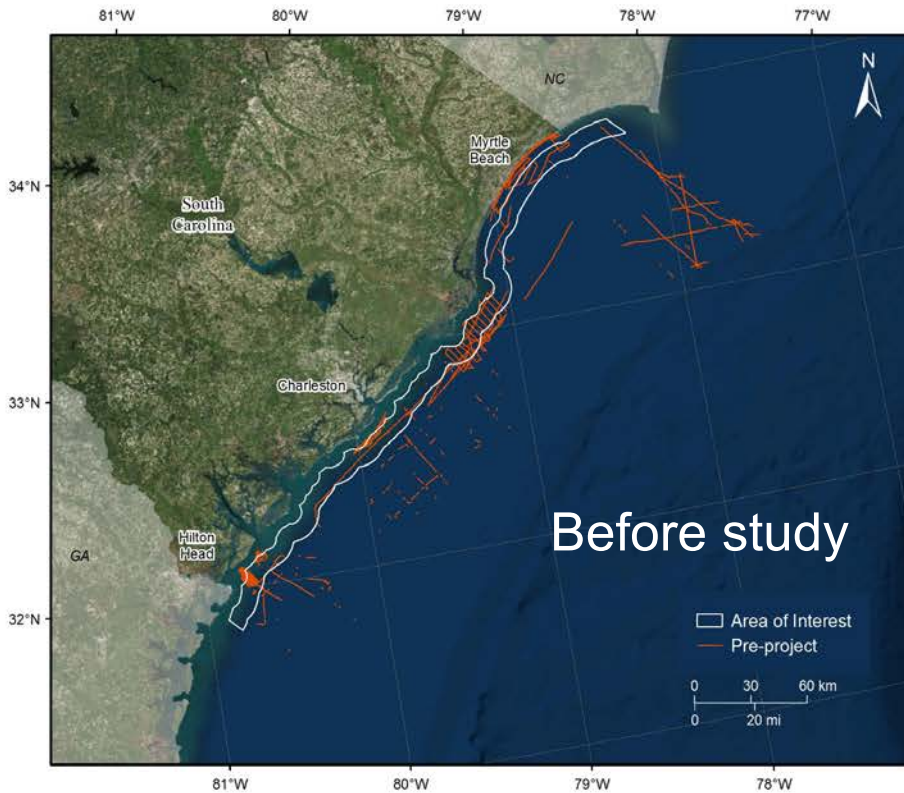
Ancient Shorelines

NOW

Shoreline has been close for ~6-8,000 years

Dating beach ridges from Winyah Bay to Edisto Island

Harris, 2018

SC BOEM ASAP data finds (SC DNR)
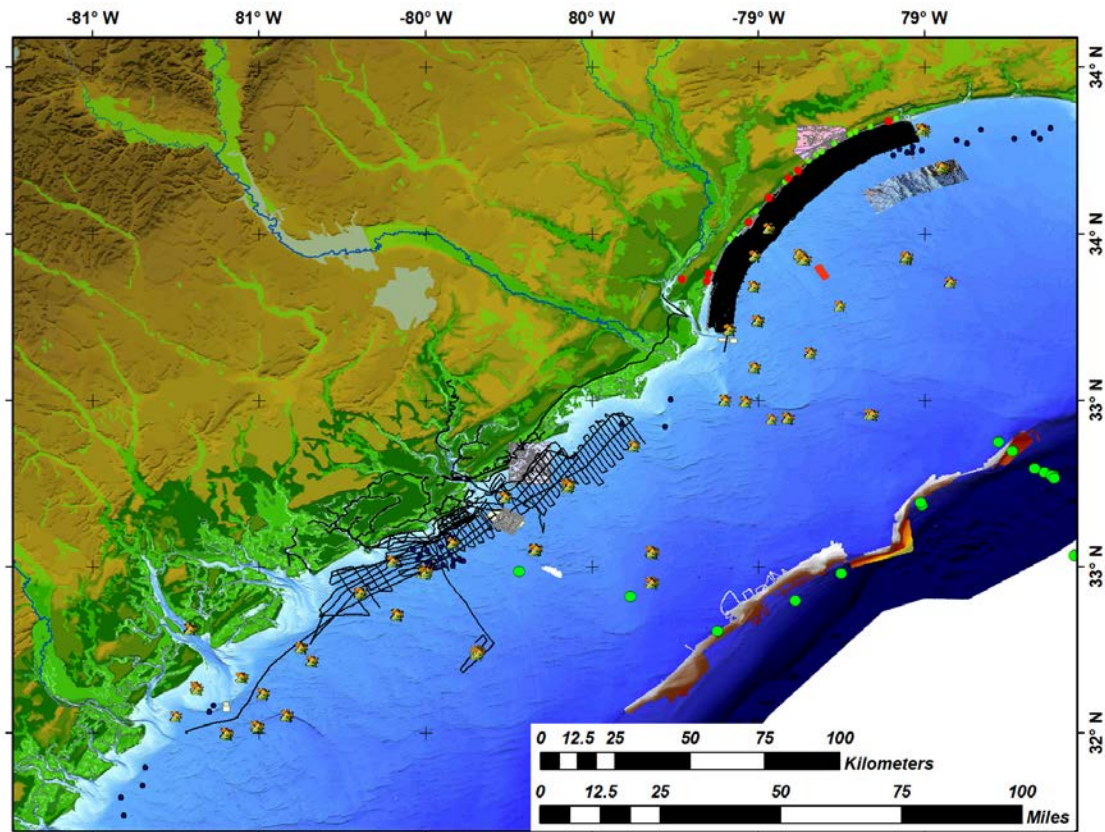

Before study
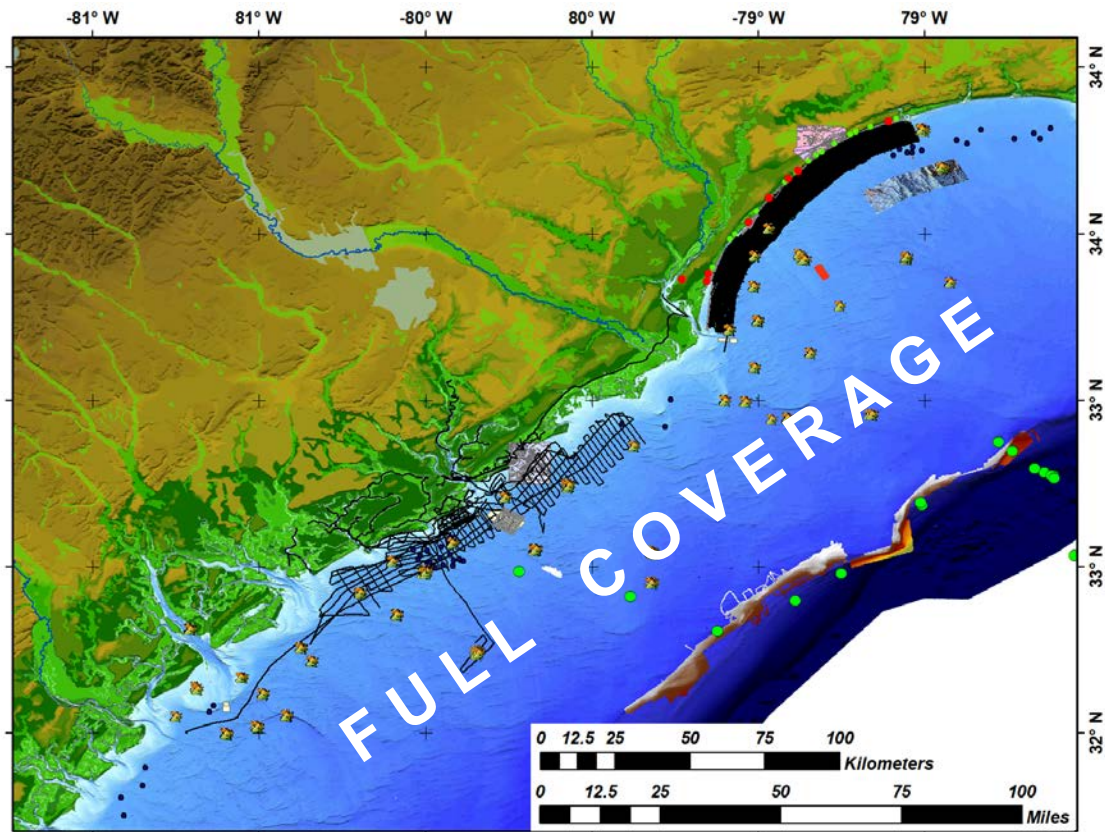
After compilation

Tweel et al., 2016

Data We Have
(plus a lot on the shelf…bookshelf)

This map does not include any real-time datasets, such as those provided by SECOORA, but rather physical baseline data

Data We are Working Towards

Data We Need

- Resource-scale information
- Initial depth maps for the whole region
  - Multibeam, LiDAR on clear-water days—*really*
- Sediment cover/thicknesses
- A clear understanding of the near-surface geology
- Well modeled seafloor features with an understanding of subsurface content
- **Real-time data to understand change and dynamics**.

Challenges

- Working with(in) certain sectors -- *academe*
- Getting **good data**, on time, without delay
- **Available data**– get it off the shelf and into hands of scientists and engineers
- **Online access** and easy to find data:
  - *e.g.*, NOAA(!), BOEM, USGS(~), DNR, DHEC, Universities (ha!), SECOORA and IOOS(!!!)

Opportunities

- Working with certain sectors -- *academe*
- Ongoing federal coordination with States, such as in the SC DNR data projects
- A well-trained, skilled, and **supervised** workforce with our students
- Technology is changing daily, becoming small, and easily deployed from shore, small boats, autonomous craft, and buoys.

Best Program Qualities FTW! (for the win!)

- Good political leadership

- Good technical leadership

- Collaborative data gathering, processing, analysis, and interpretation

- Clear communication between partners

- Workflow for immediate data flow to archives (e.g. see SECOORA, NOAA)

- …and don't just say it, make it work!

Thanks to our partners

College of Charleston, BEAMS, Geology, Archaeology, Grice Marine Lab

NOAA, **Sea Grant**, **USGS**, **SCDNR-Geology**, **SCDNR-Fisheries**, **SCDHEC, NPS**, Navy, **SCIAA, U.SC, CCU**

SonarWiz, QPS, Hypack, Edgetech, Teledyne, R2Sonic, Seafloor Systems, USM

Eleven BEAM-Teams
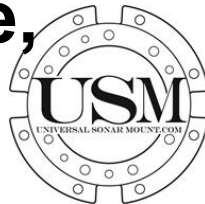
Thank you

Scott Harris
HarrisS@cofc.edu