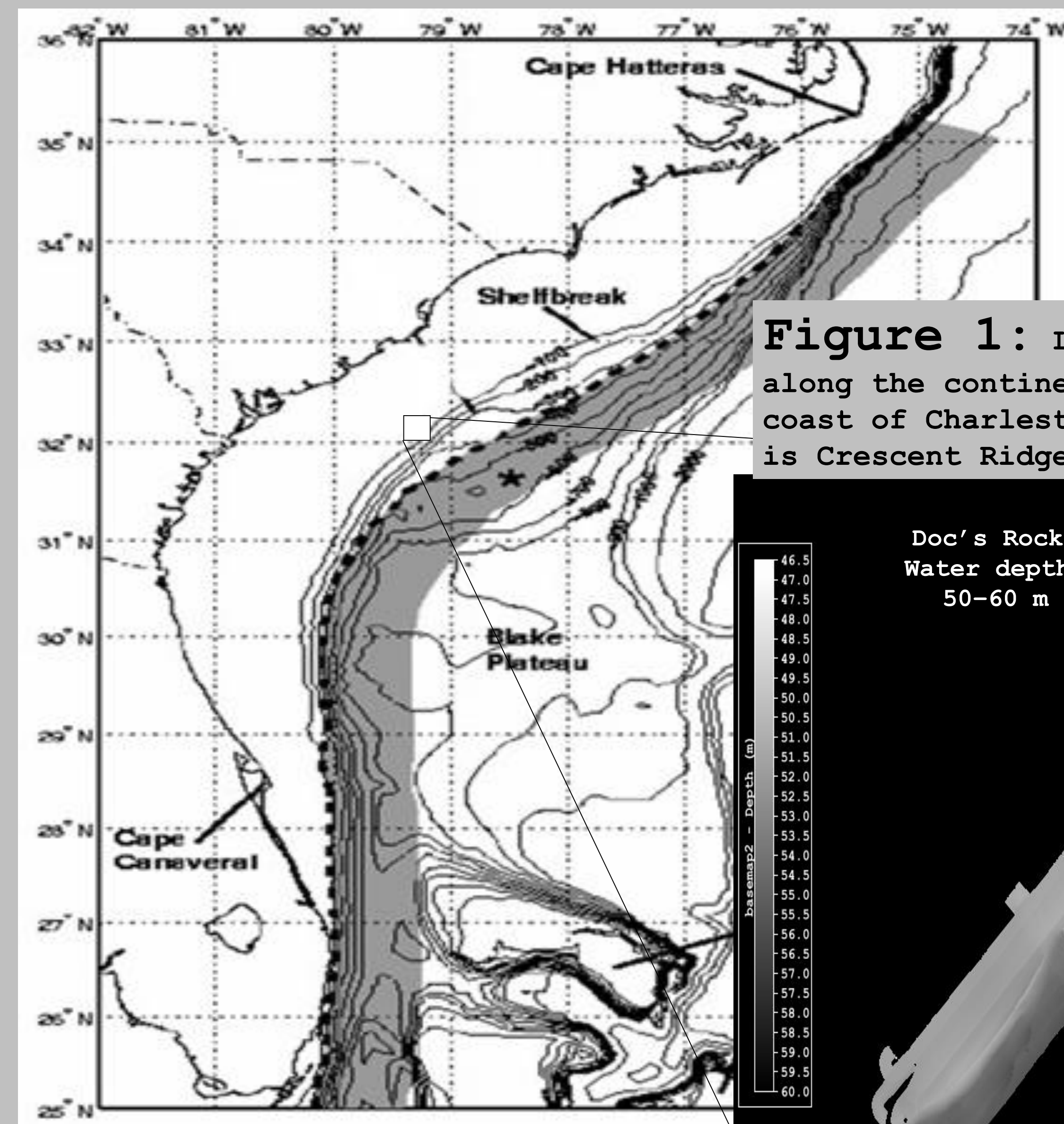
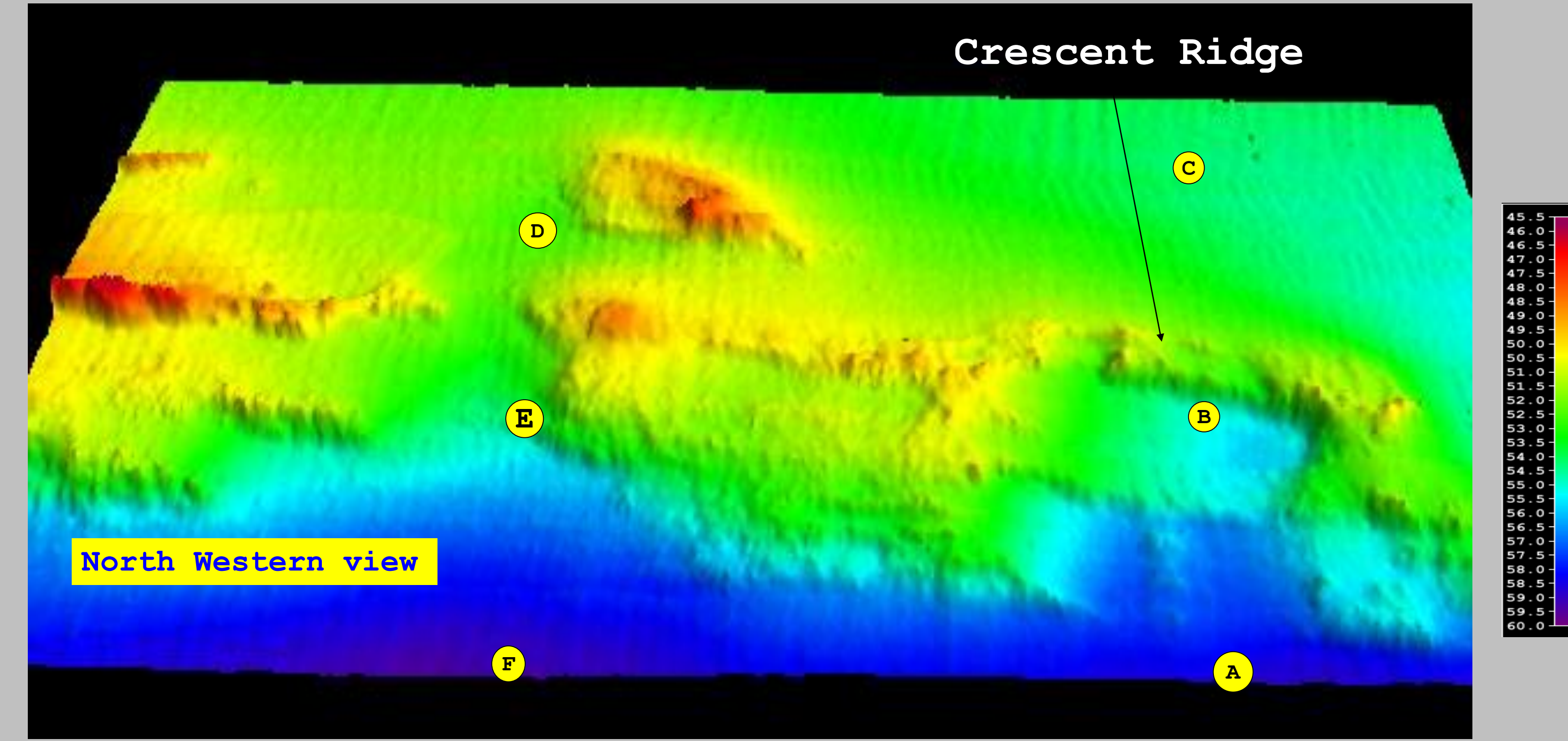
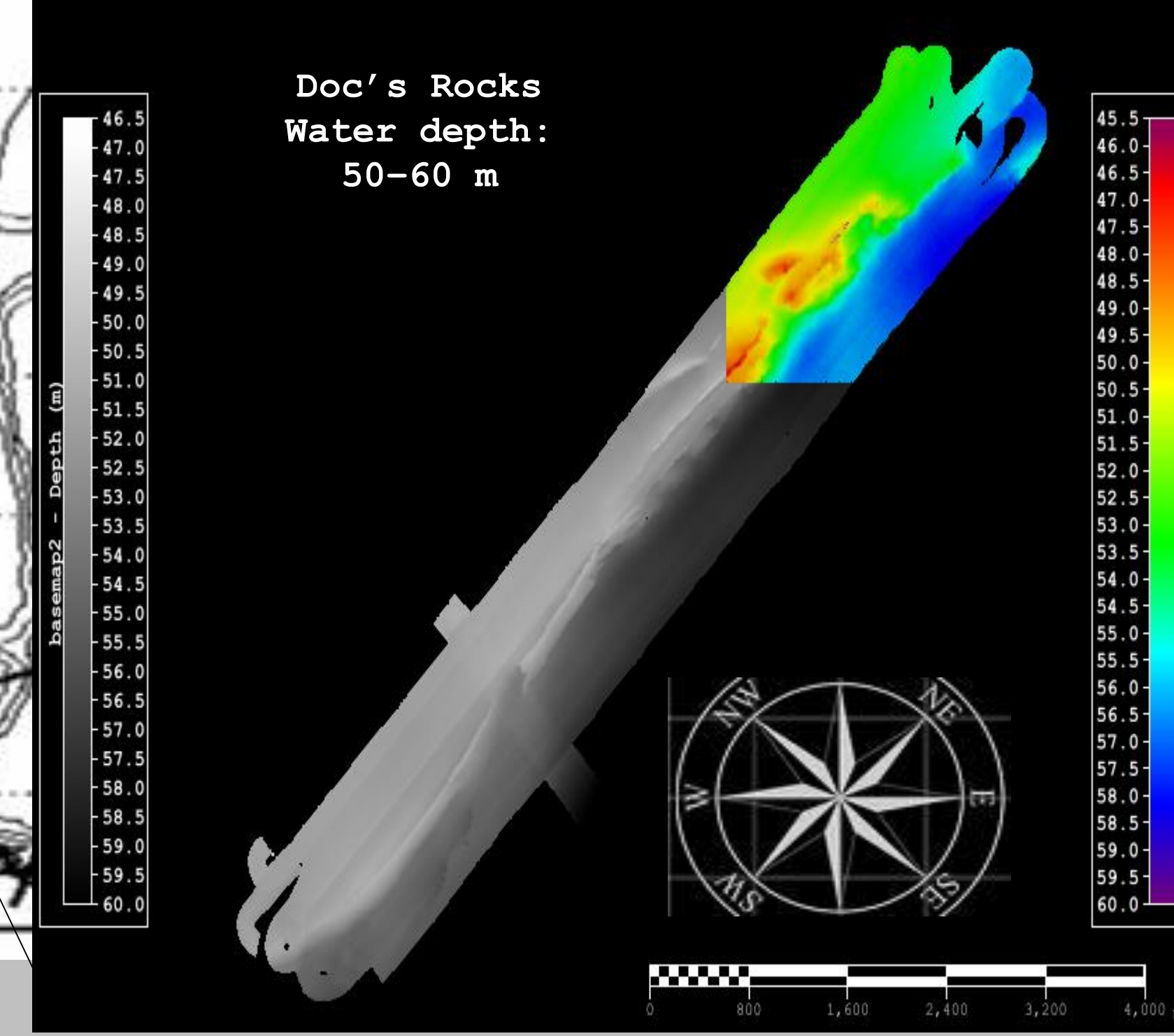


# ANALYSIS OF SHELF-EDGE USING MULTIBEAM SONAR AND SEDIMENTOLOGY

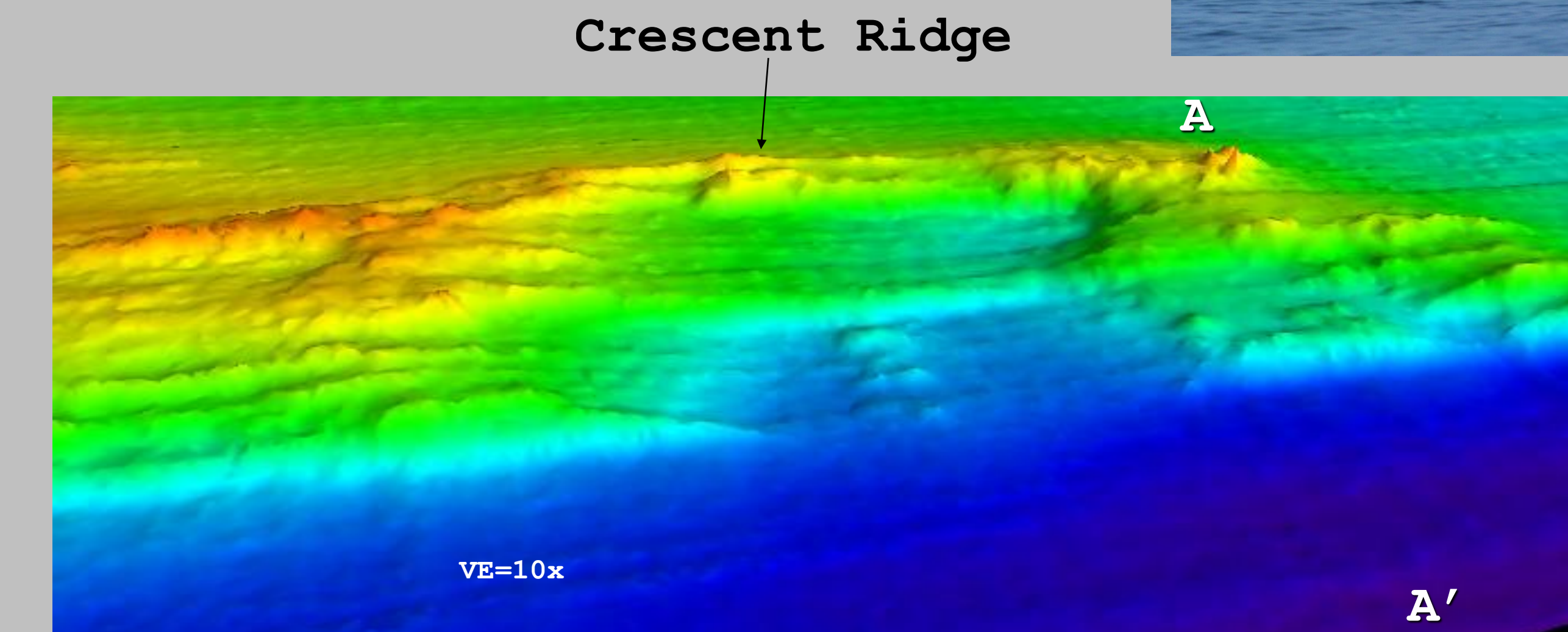
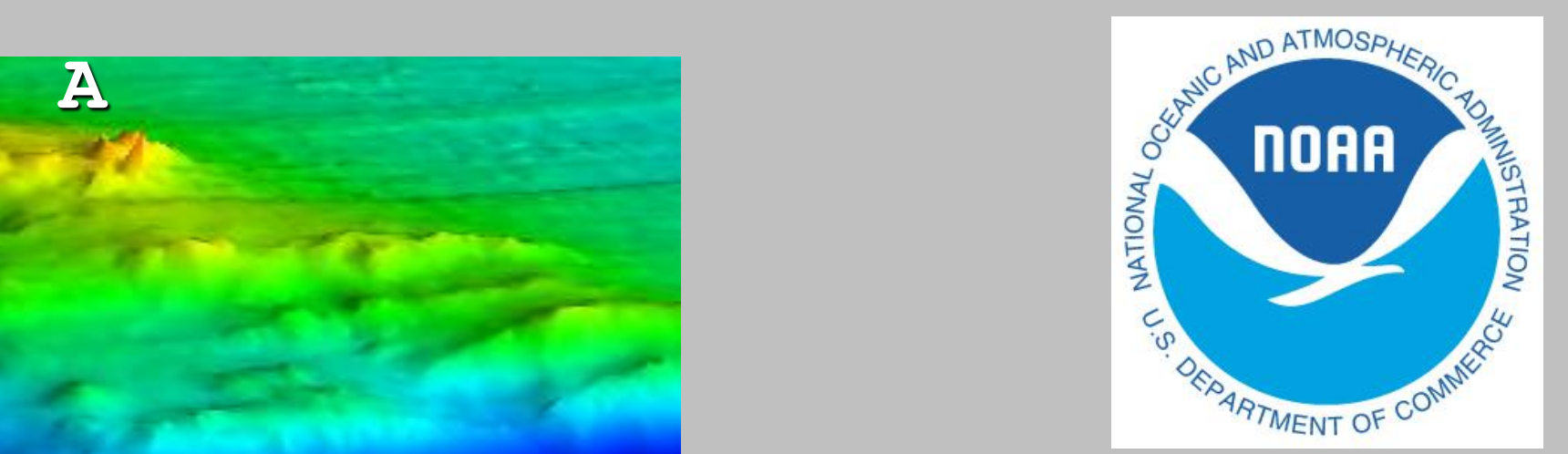
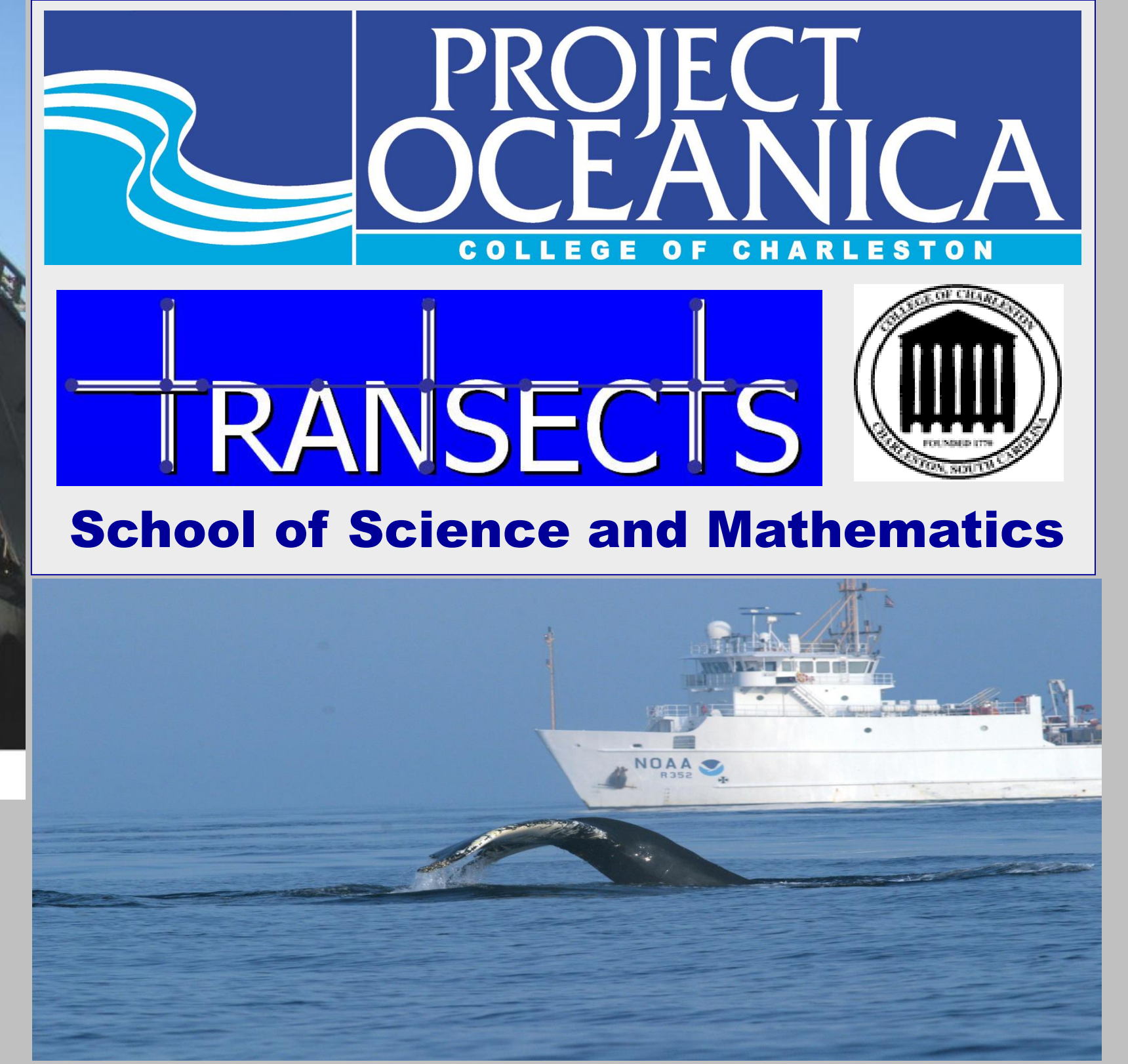
Michael Reed and Leslie Sautter  
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**Figure 1:** Location of Doc's Rocks along the continental shelf-edge off the coast of Charleston, SC, The color region is Crescent Ridge



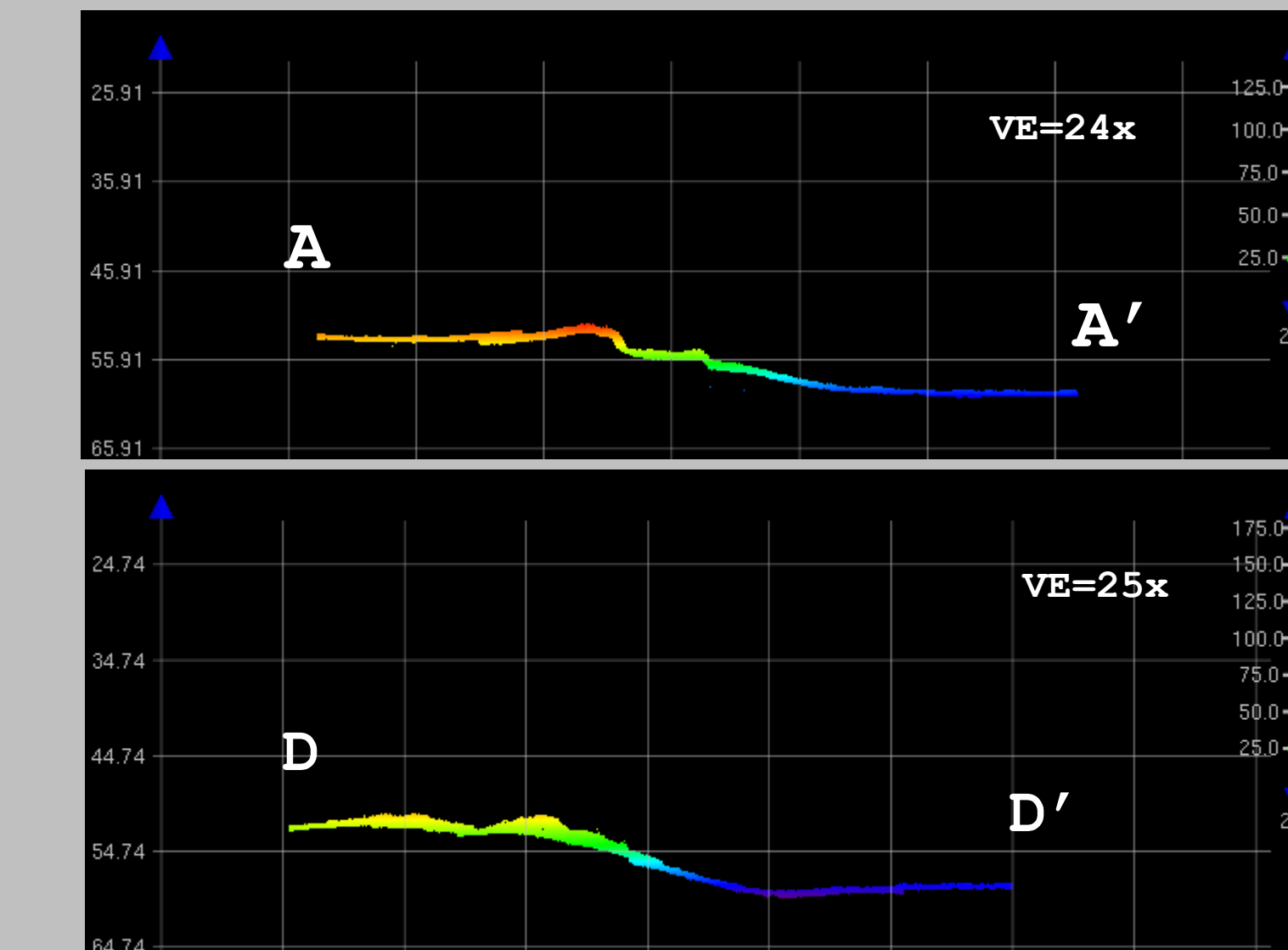
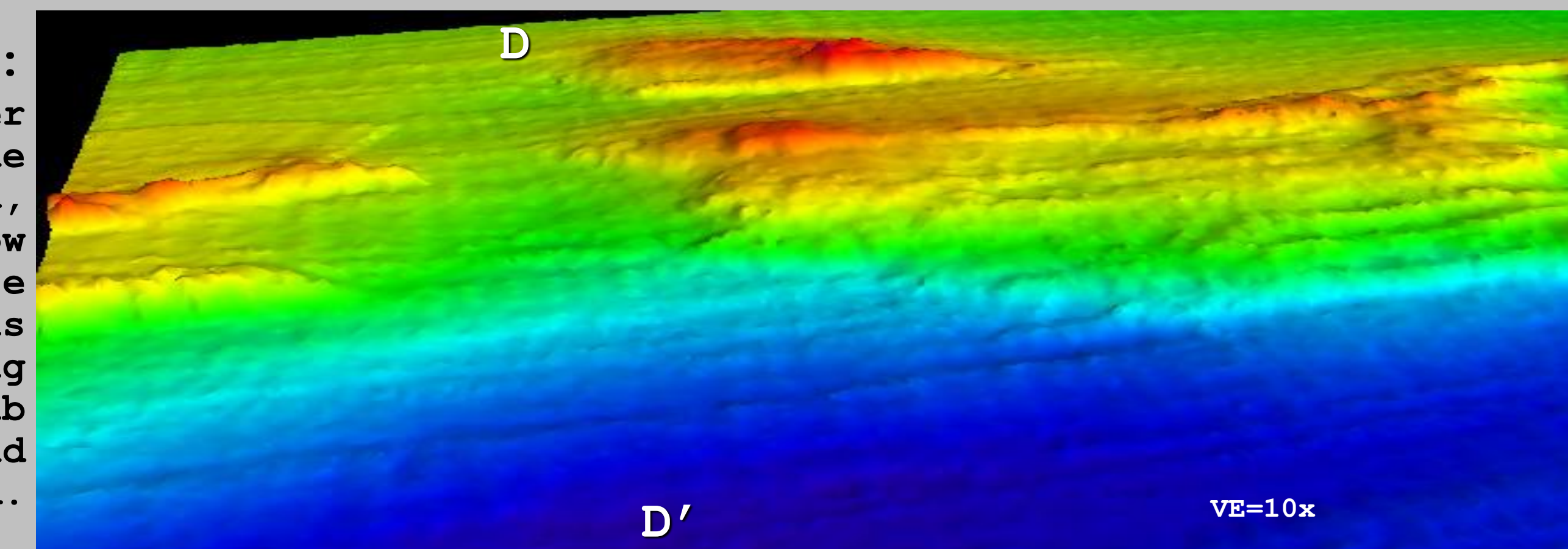
**Figure 2:** Base map, area under study by College of Charleston. Field sheet area, Crescent Ridge area of Doc's Rocks with sediment grab sample locations marked.



**Background:** On November 9, 10, and 11 the NANCY FOSTER set sail to obtain sediment samples and Multi-beam sonar off the coast of Charleston, SC. These data were obtained in an attempt to better understand the past, present and possible future of the shelf-edge.

**Doc's Rocks** (Figure 1) is located 60 km off the coast of Folly Beach, SC. Doc's Rocks is broken down into three separate areas. Thumbprint Ledge, located on the lower end of the base map, consists of one ridge running parallel to the coast, with a break about 2400m up the ridge, this break intrudes the ridge at a northern direction. Triple ledges, located above Thumbprint ledge consists of two ridges running parallel to one another and the coast, while the third ridge comes close to intersecting with the other ridges. Crescent Ridge, Figure 2, consists of one ridge running parallel to the coast consisting of two breaks. One that breaks the ridge perpendicularly, and one that seems to offset the ridge.

**Figure 4:** The lower portion of the field sheet, with a low relief. Profile D to D' runs roughly along where grab samples D, E and F were sampled.



**Figure 5 (above):** The upper portion of the fieldsheet with a low relief. Profile A to A' runs roughly where grab samples A,B and C were collected.

## Methods:

1. Multibeam sonar (100 Kilohertz) aboard the NOAA Ship Nancy Foster
2. Sediment grain size analysis using sieve analysis
3. Processing and characterizing multibeam data using CARIS HIPS/SIPS software
4. Phantom 300 ROV video was collected from surrounding hard ground locations.

**RESULTS:** Crescent ridge is a continuation of the dominant feature running through Thumbprint Ridge and Triple Ledges. The offset of Crescent Ridge is caused by slumping from the weaker underlying sediment. The sediment analysis shows a dominance of medium grained sediment along the profile of A to A'. A fracture splits the lower part of the ridge, running parallel to D to D'. The sediment analysis showed a medium grain dominance at D and no type of dominant flow regime for grab samples E and F.

**SEDIMENTOLOGICAL RESULTS:** Sediment analysis (Figure 3), showed some deviation between samples A,C,D,F and B if the coarse grain shell material was removed. There were also grain size similarities between E and F. The modes varied, samples A,B,D and F all had a mode of 1.5 phi, while C had a mode of 2.0 phi, and sample E had a mode of -1.0 phi. The means also varies with 1.5 phi being the mean for samples A,B,C,D and F. The mean of sample E lied at 0.5 phi. A compositional test was run on samples A,B and C. Samples A and B consisted of dominantly shell fragments and clastic materials. Sample C was made up largely of clastic material with shell fragments.

**Figure 6:** Screen grabs of ROV video taken of the adjacent hard ground.

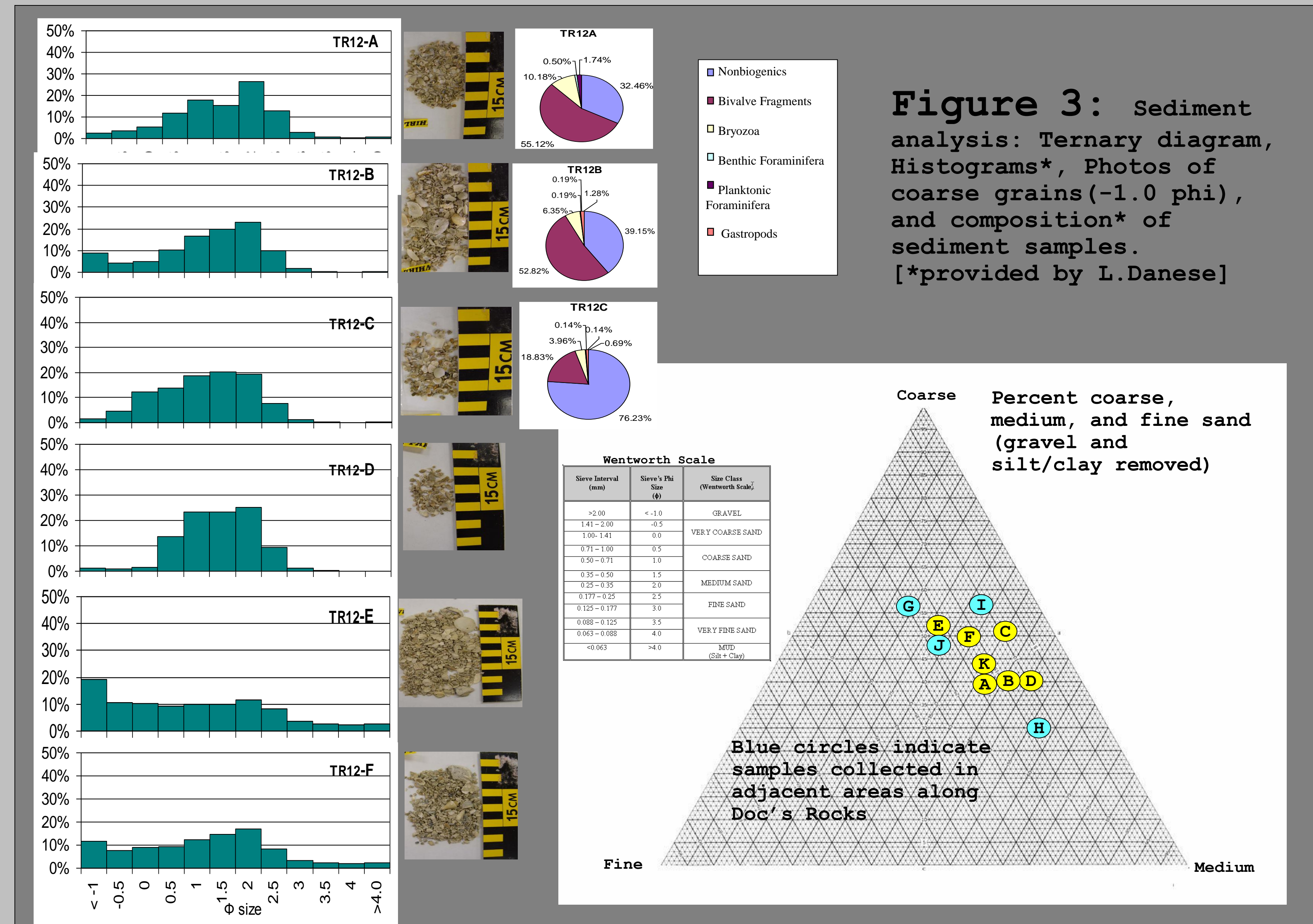


Top left photo shows a linear ridge of hard ground while the other photos show piles of the hard ground and or layers of broken hard ground.

**DISCUSSION:** The linear ridges that run through these three locations is possibly that of a geomorphic feature created during one of the last low stands of sea-level; possibly a series of stratigraphic layers tilted and differentially eroded by currents. The Gulf Stream current and/or semi-diurnal tidal currents could be responsible for the differential erosion, while basal sapping could explain why the hard ground lies on top of the sediments and is not buried by the deposition. The sediment samples did not help in determining the flow regime but did allow us to better understand the type of currents that are changing this area.

## Acknowledgements:

I would like to thank NOAA, Project Oceanica, and Transect Program for the ship time; Dr. George Sedberry and SC-DNR for funding Dan Boles for the technical training. Leslie Sautter for her help, Loren Danese for the histogram data. Chris Stubbs for the ROV video. Last but not least, my MOM and GOD!



**Figure 3:** Sediment analysis: Ternary diagram, Histograms\*, Photos of coarse grains (-1.0 phi), and composition\* of sediment samples. [\*provided by L.Danese]

