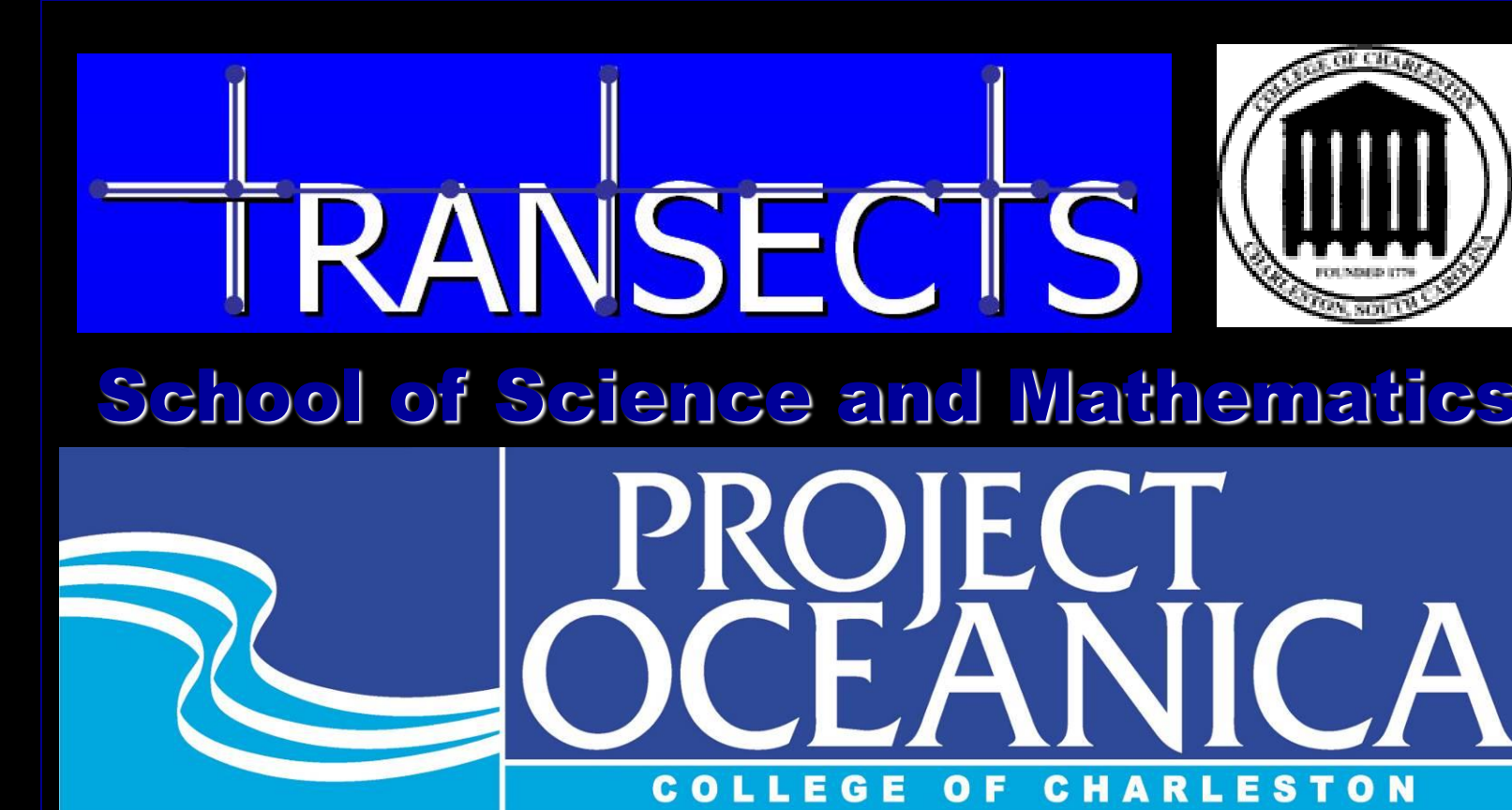
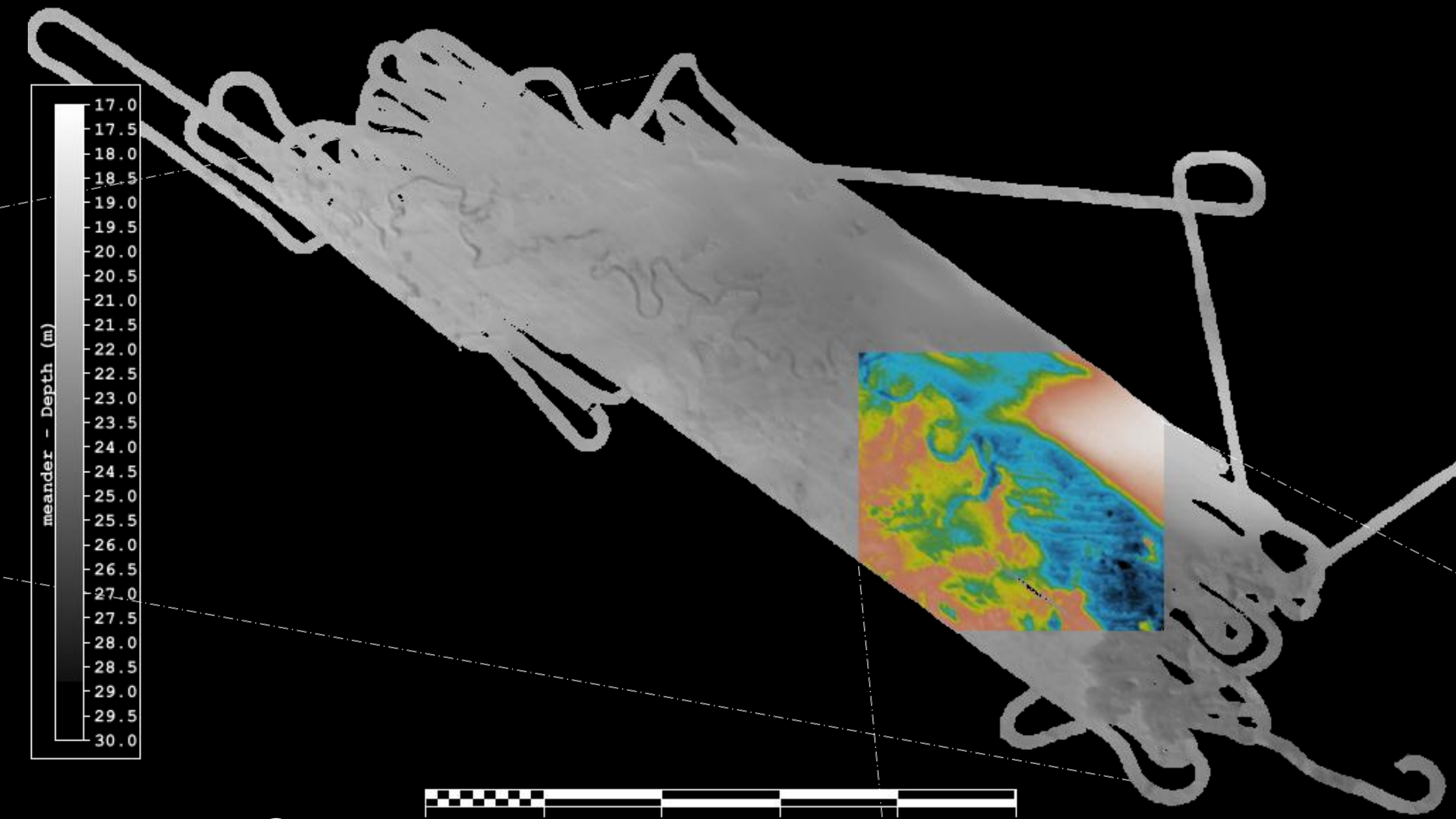
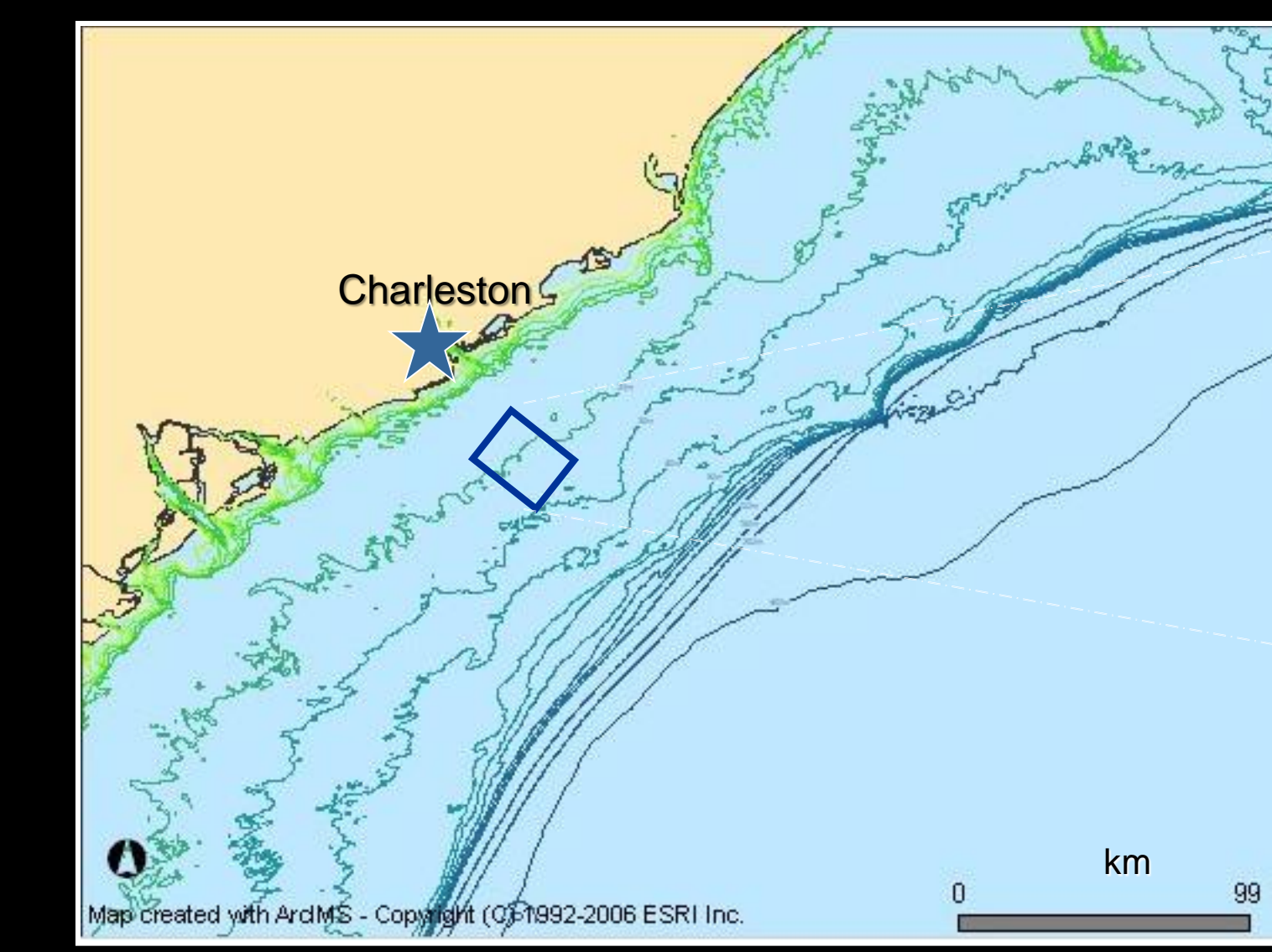


MULTIBEAM EXPLORATION OF THE TRIFECTA TERRAIN ON THE MID-CONTINENTAL SHELF OFF CHARLESTON, SC

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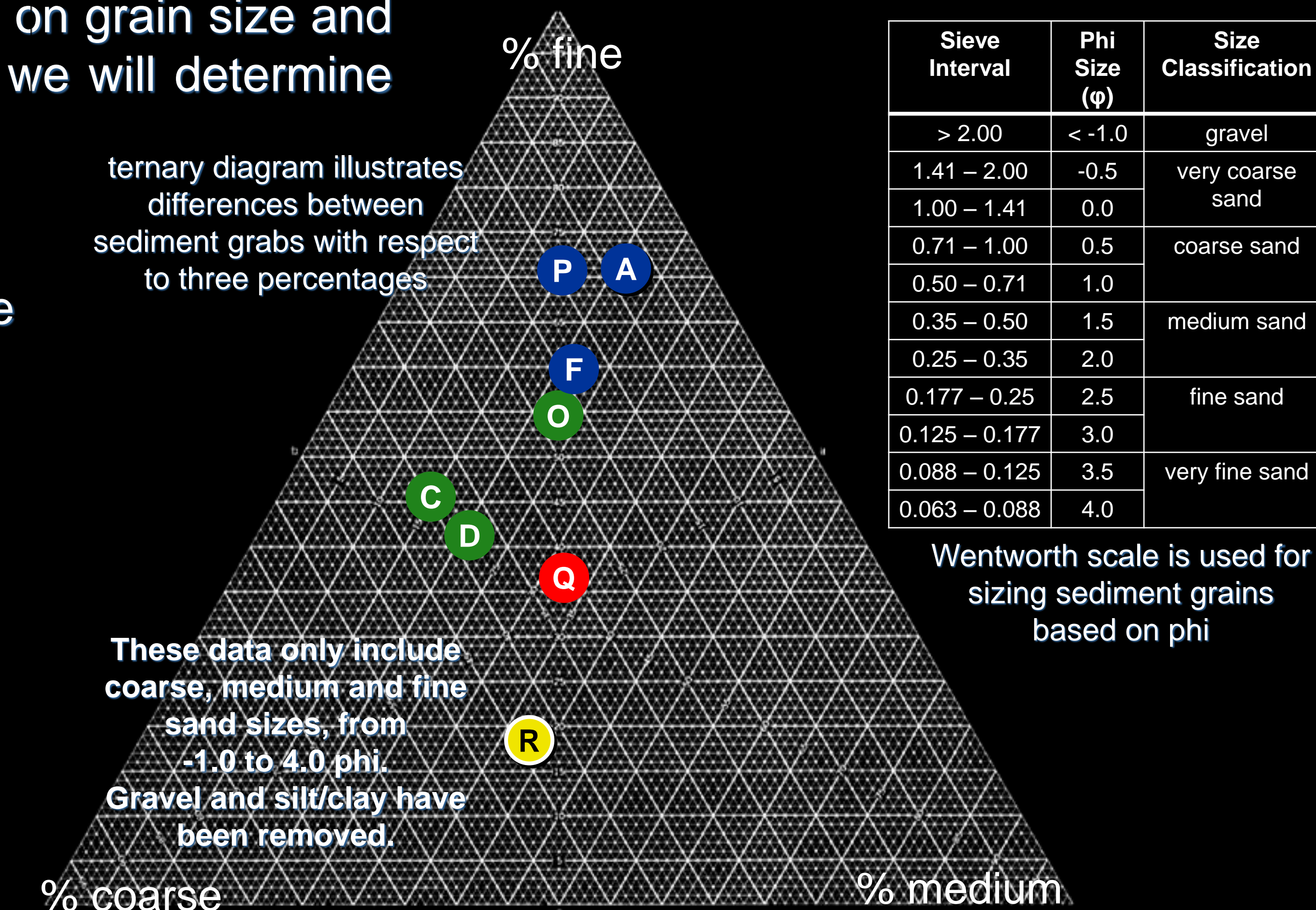


A multibeam survey was conducted off Charleston, SC in the mid-shelf region at a depth of 20-25 m, to examine a paleo-river channel previously investigated during the College of Charleston's 2004 Transect Program. This study took place November 9th-11th, 2006 on the NOAA Ship Nancy Foster. The Trifecta Terrain, part of the Transect River Channel, contains several geomorphological features, including a set of moderately incised meanders, evidence of current flow structures, and a relatively large, smooth sand bar adjacent to the system. Comprehensive bathymetric information was gathered using multibeam sonar. Soft-substrate analyses can be gleaned from multiple surface sediment grab samples that will provide information on grain size and ground-truthing. The goals of this study are to determine relative distributions grain sizes, and to ascertain if any previously unknown features or anomalies exist. Ultimately, we will determine which sites should be revisited for further investigation and what technologies are necessary.



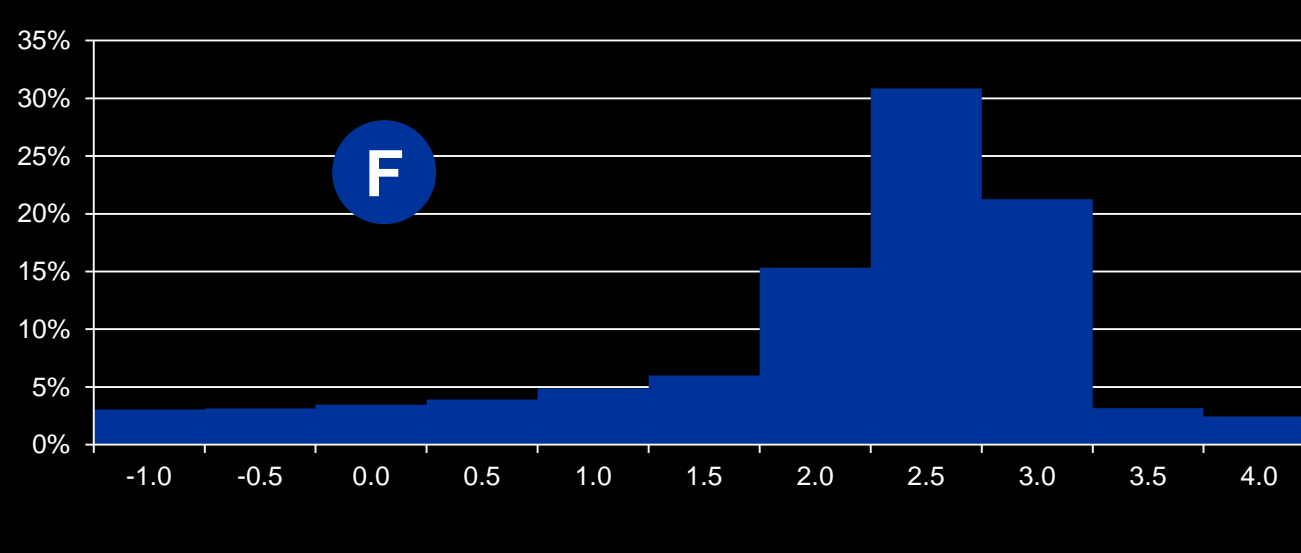
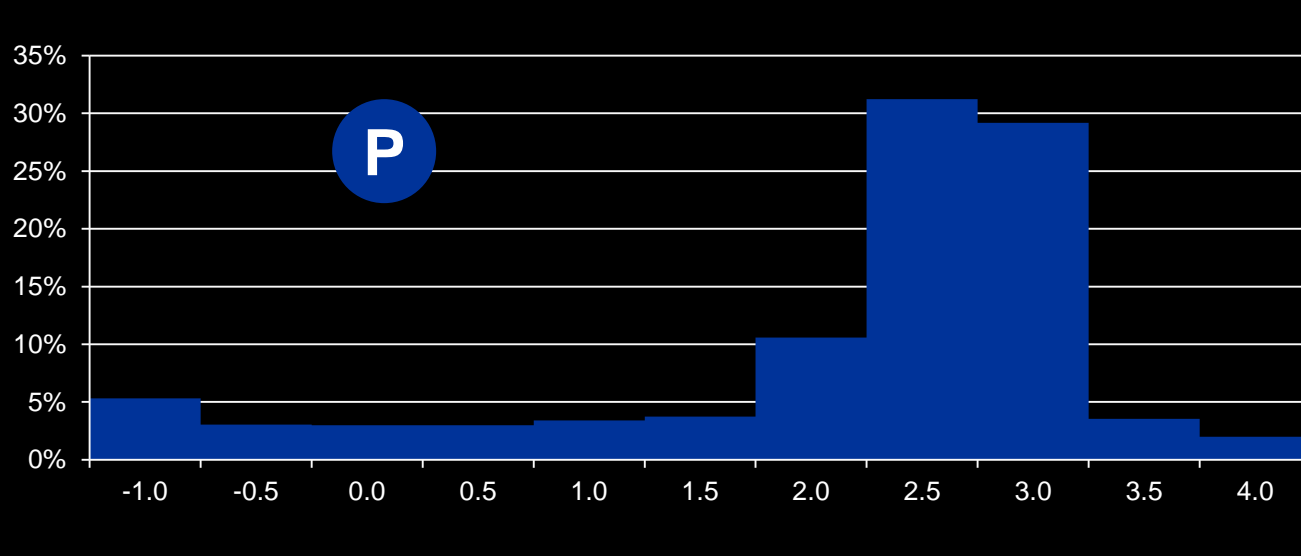
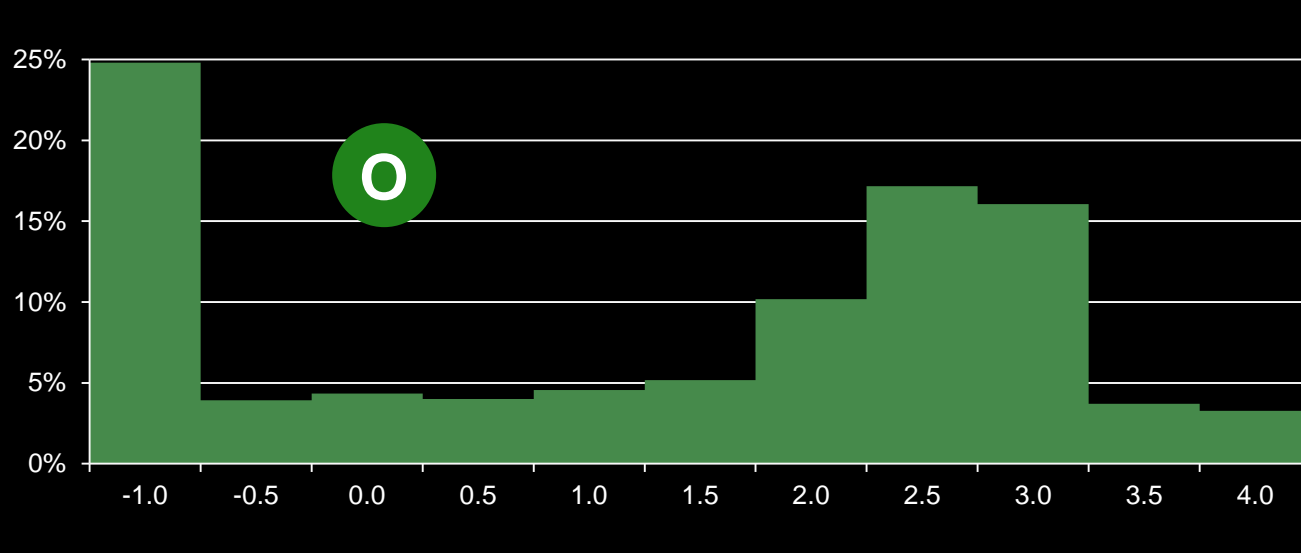
METHODS

- raw multibeam sonar data and sediment grabs were acquired from Nancy Foster cruise
- data were loaded into CARIS HIPS & SIPS 6.0 to be cleaned and processed
- sediment was sorted and analyzed by grain size via sieve system
- video from previous cruise was analyzed for further understanding of seafloor habitat
- data plotted in ternary diagrams and histograms



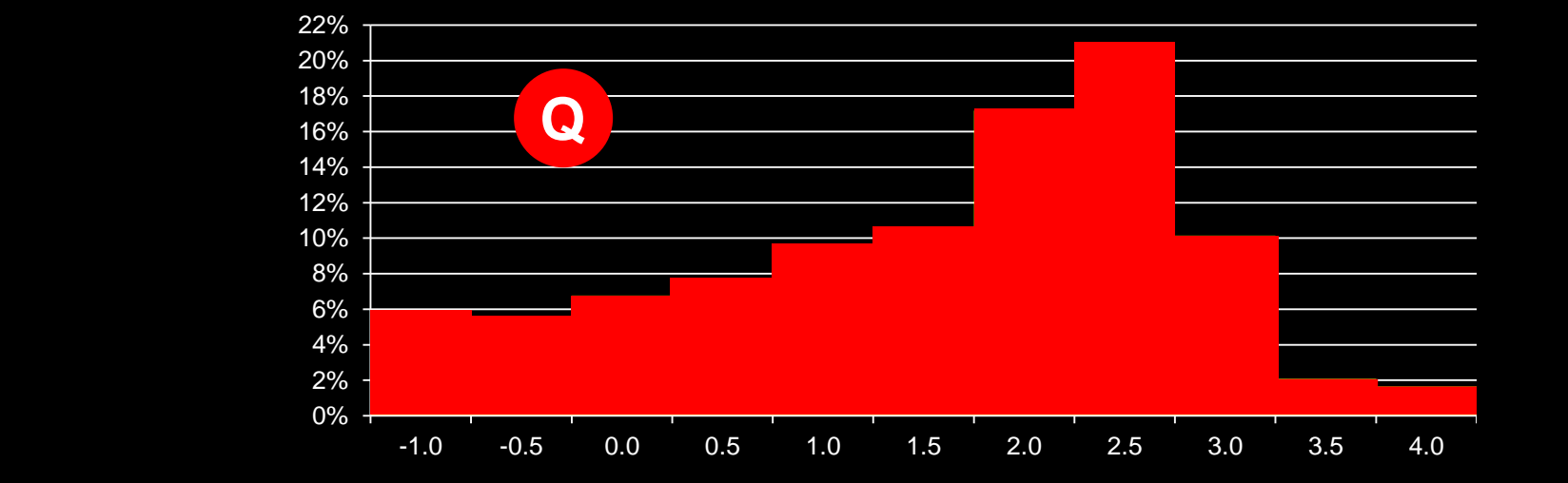
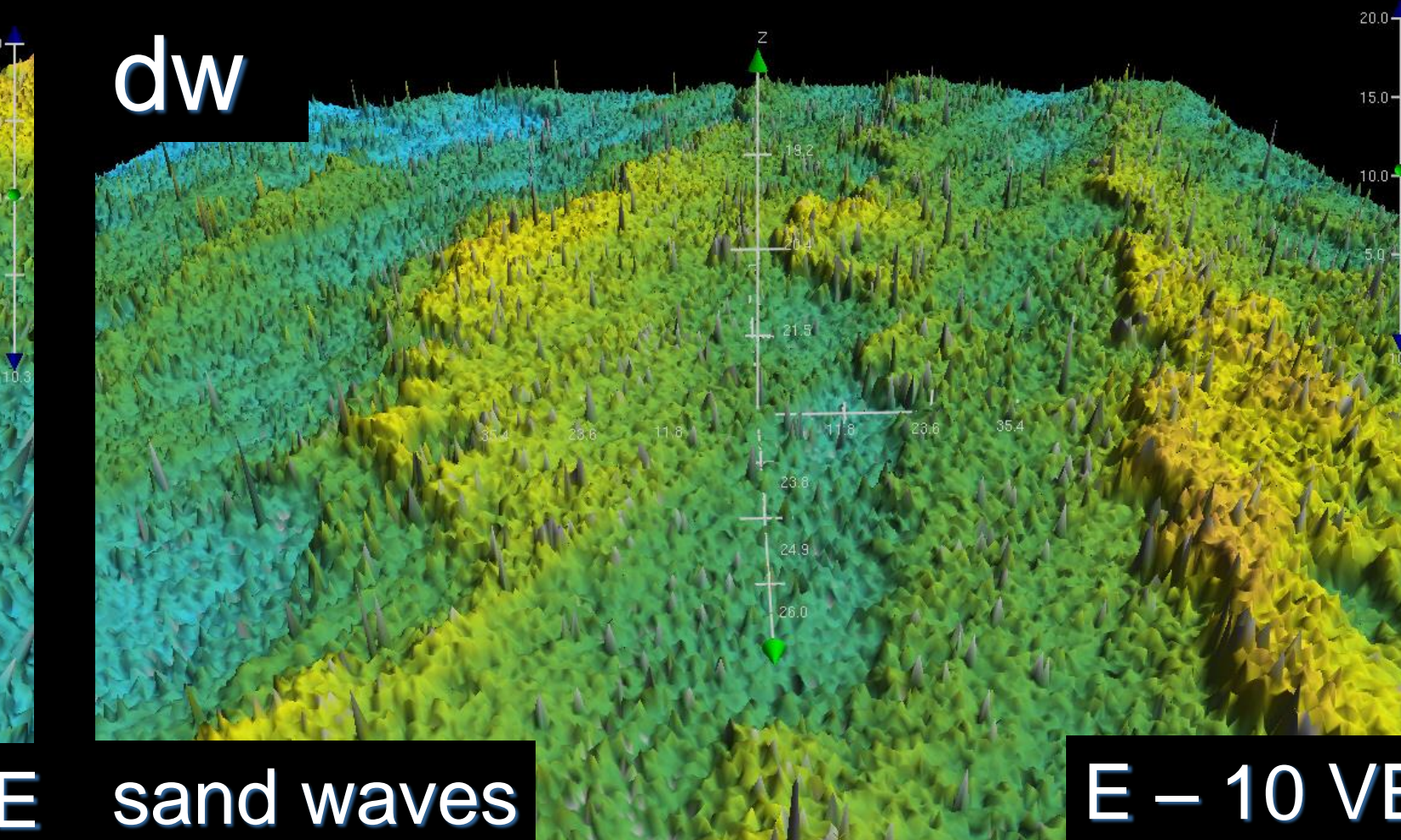
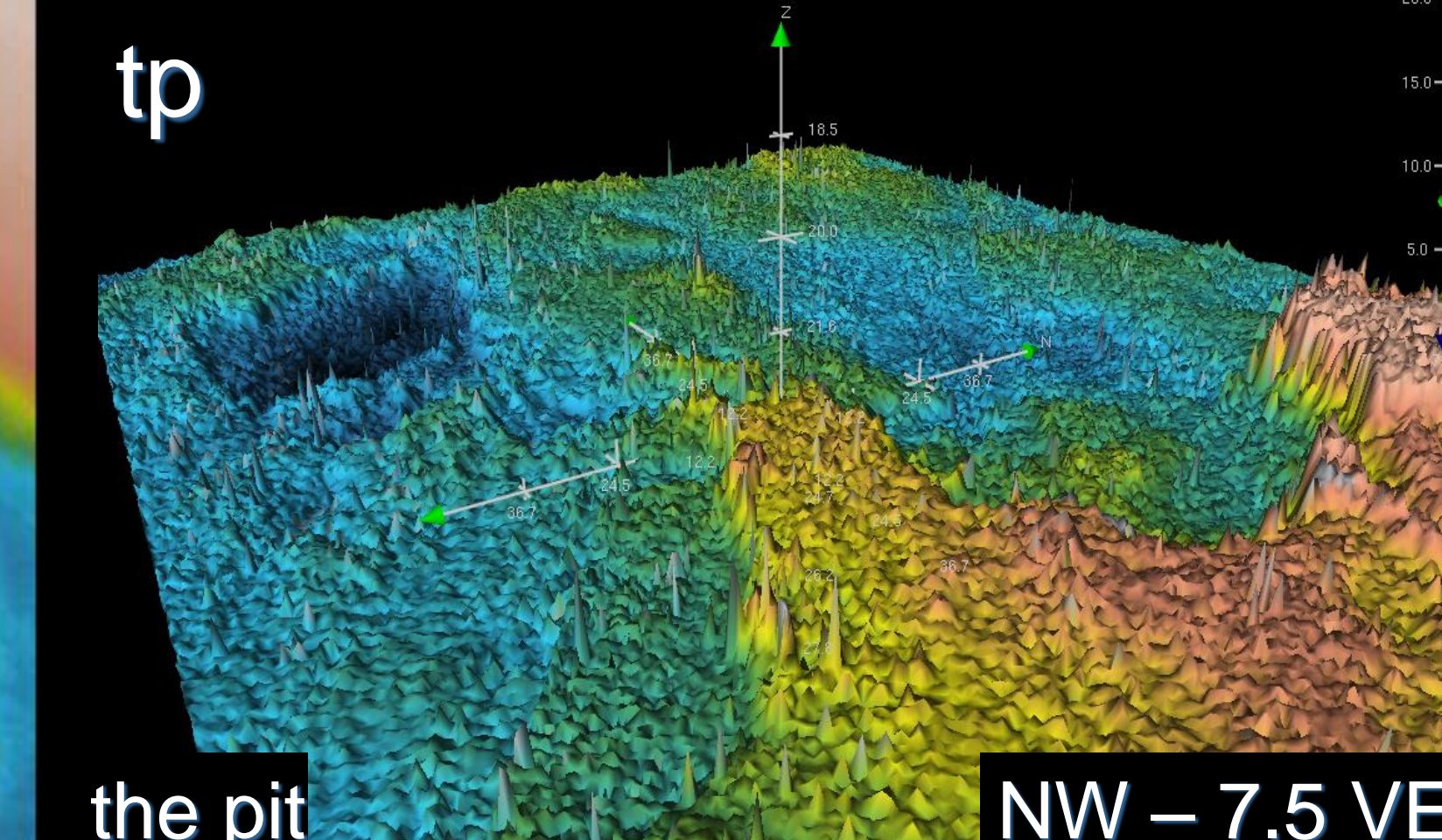
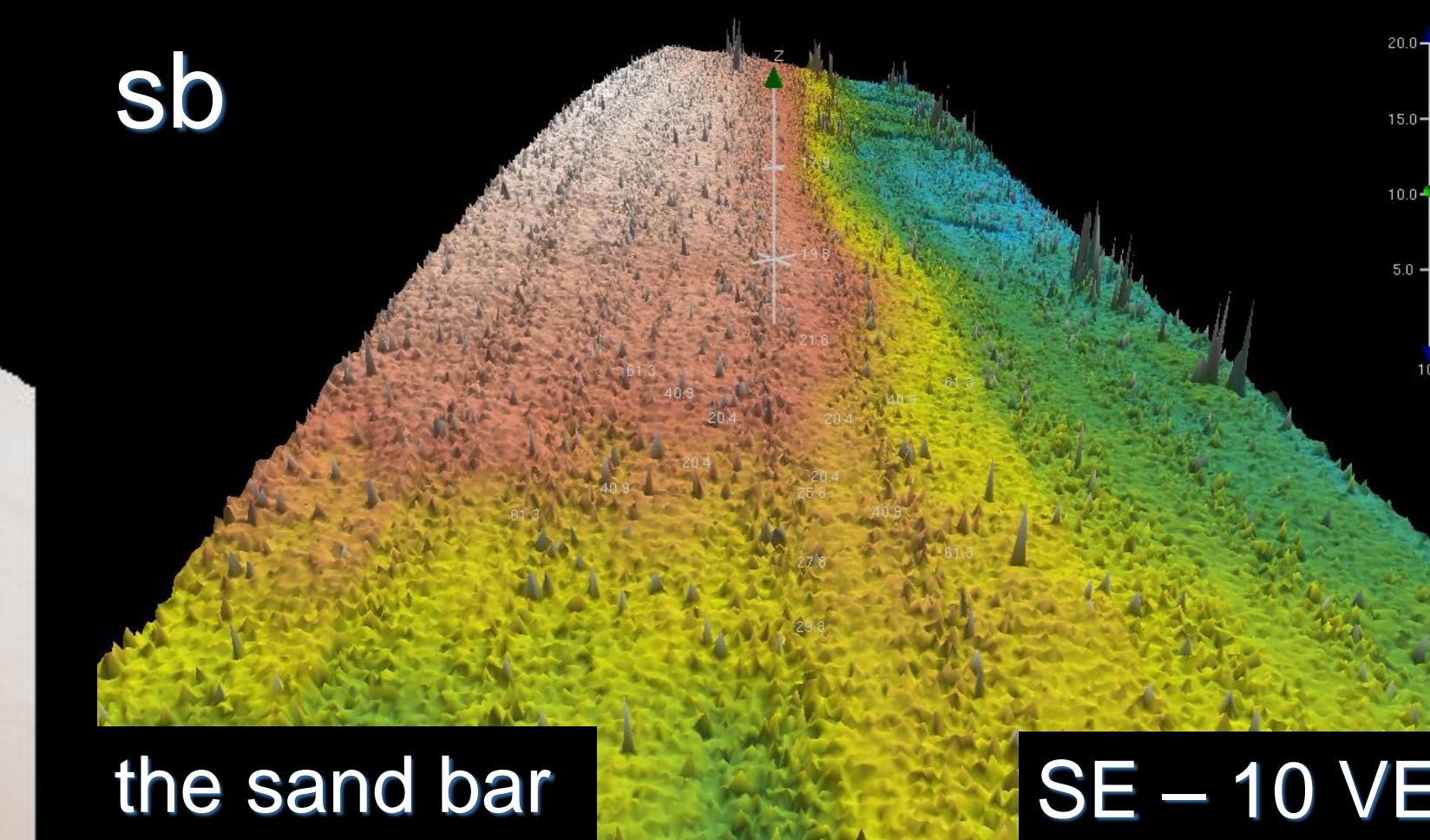
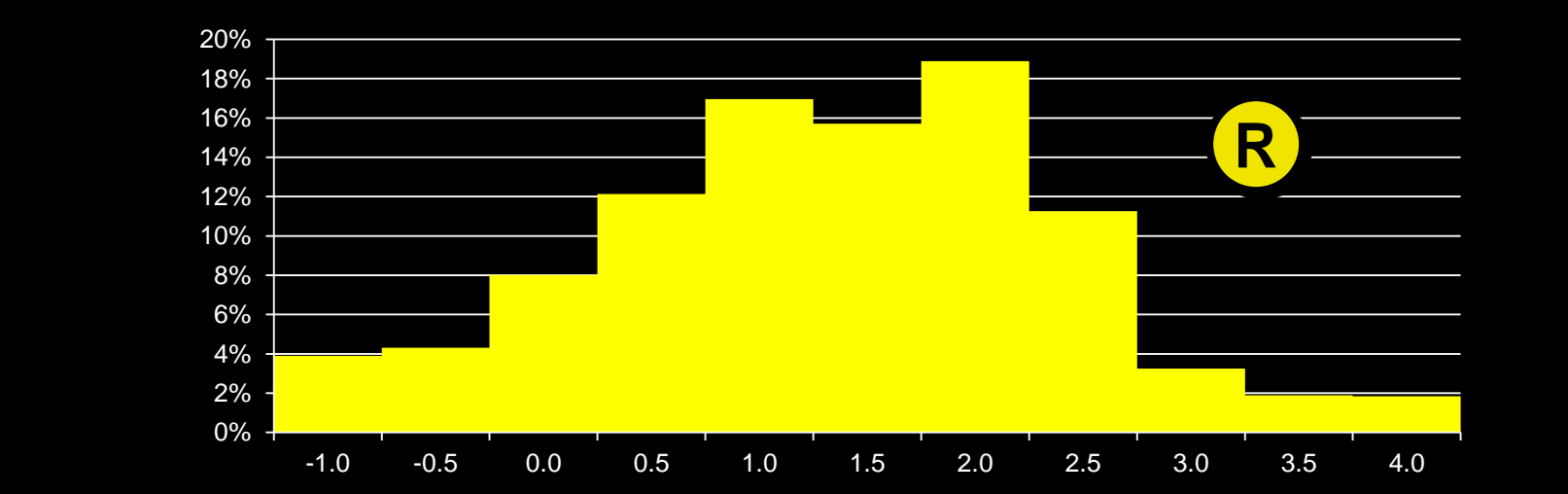
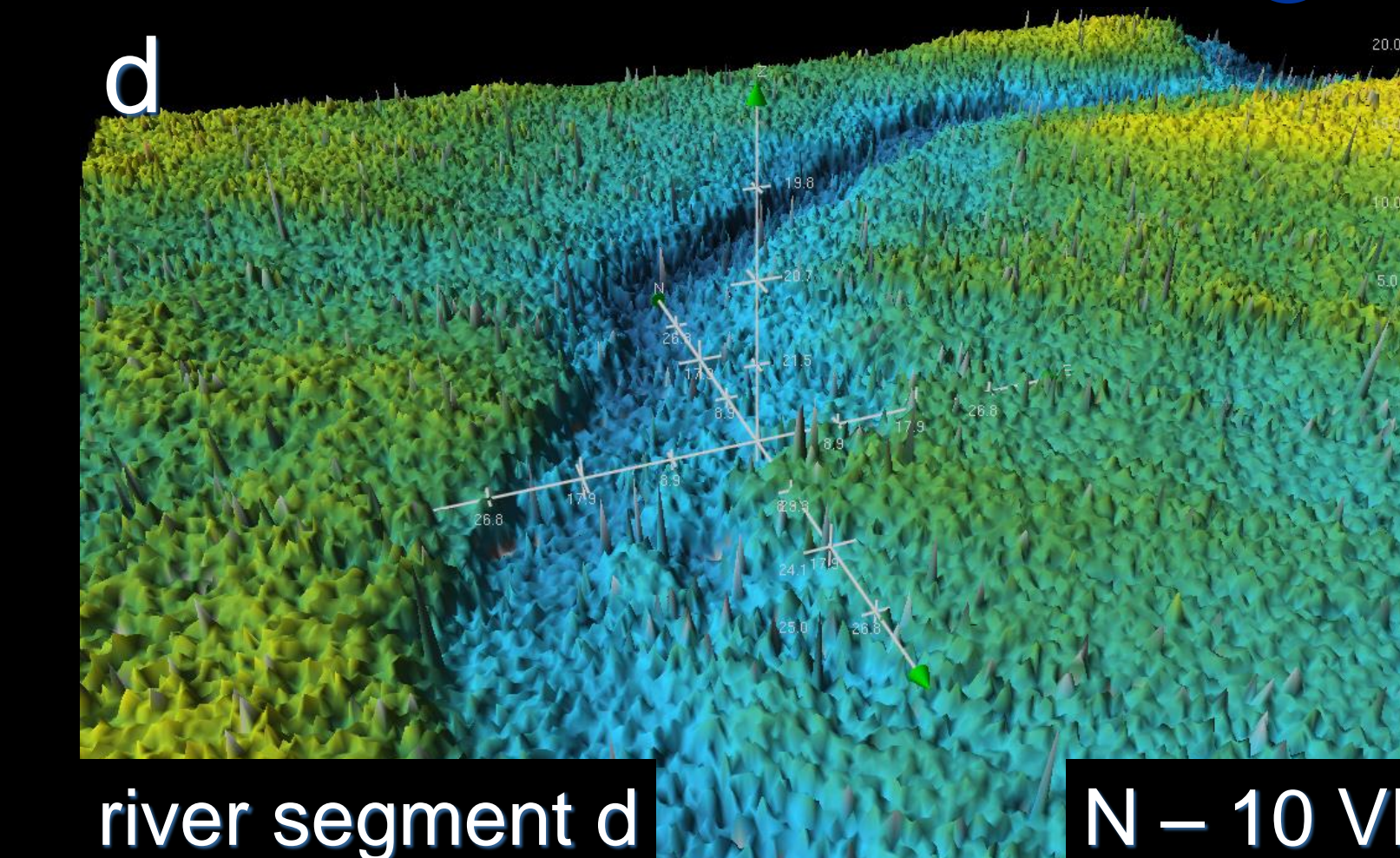
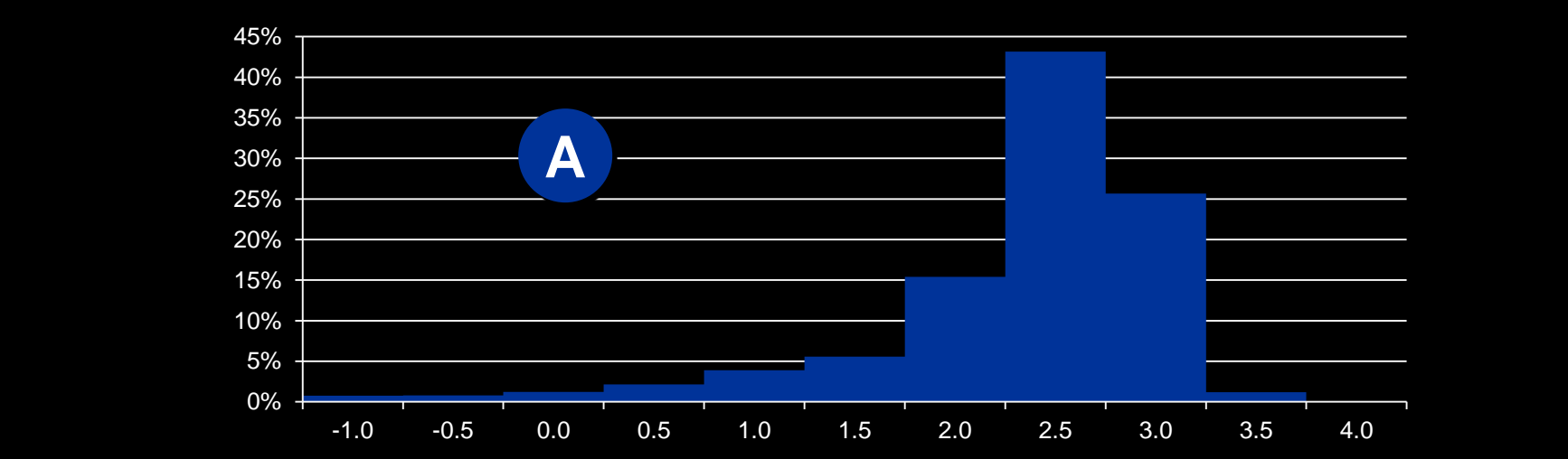
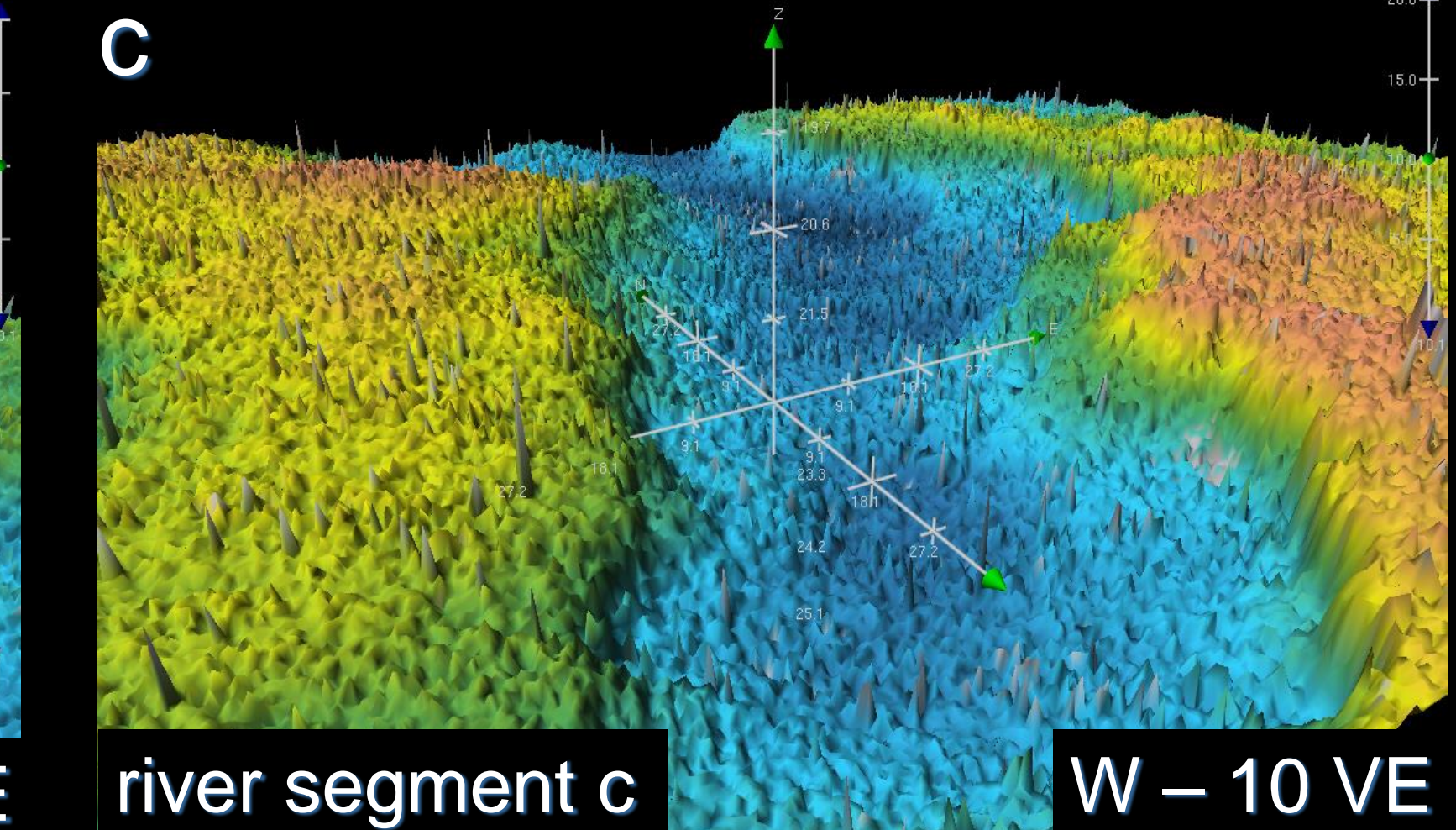
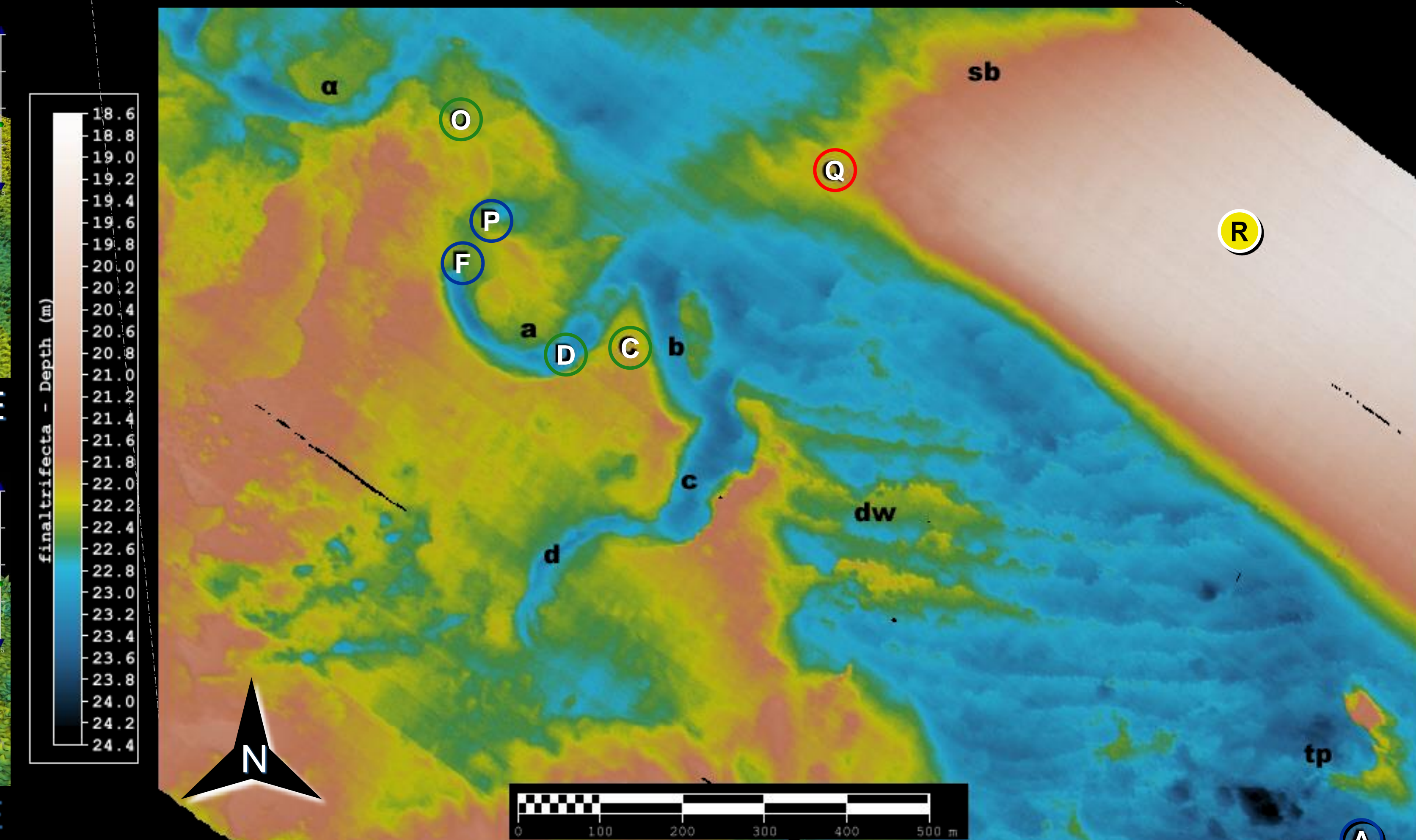
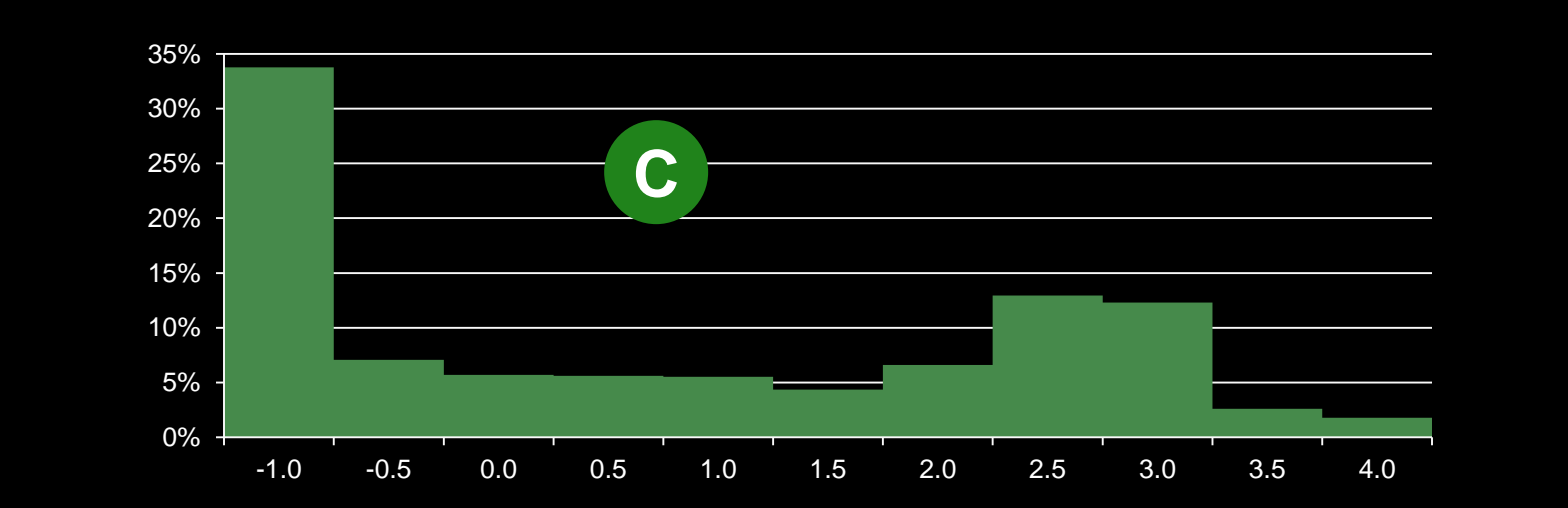
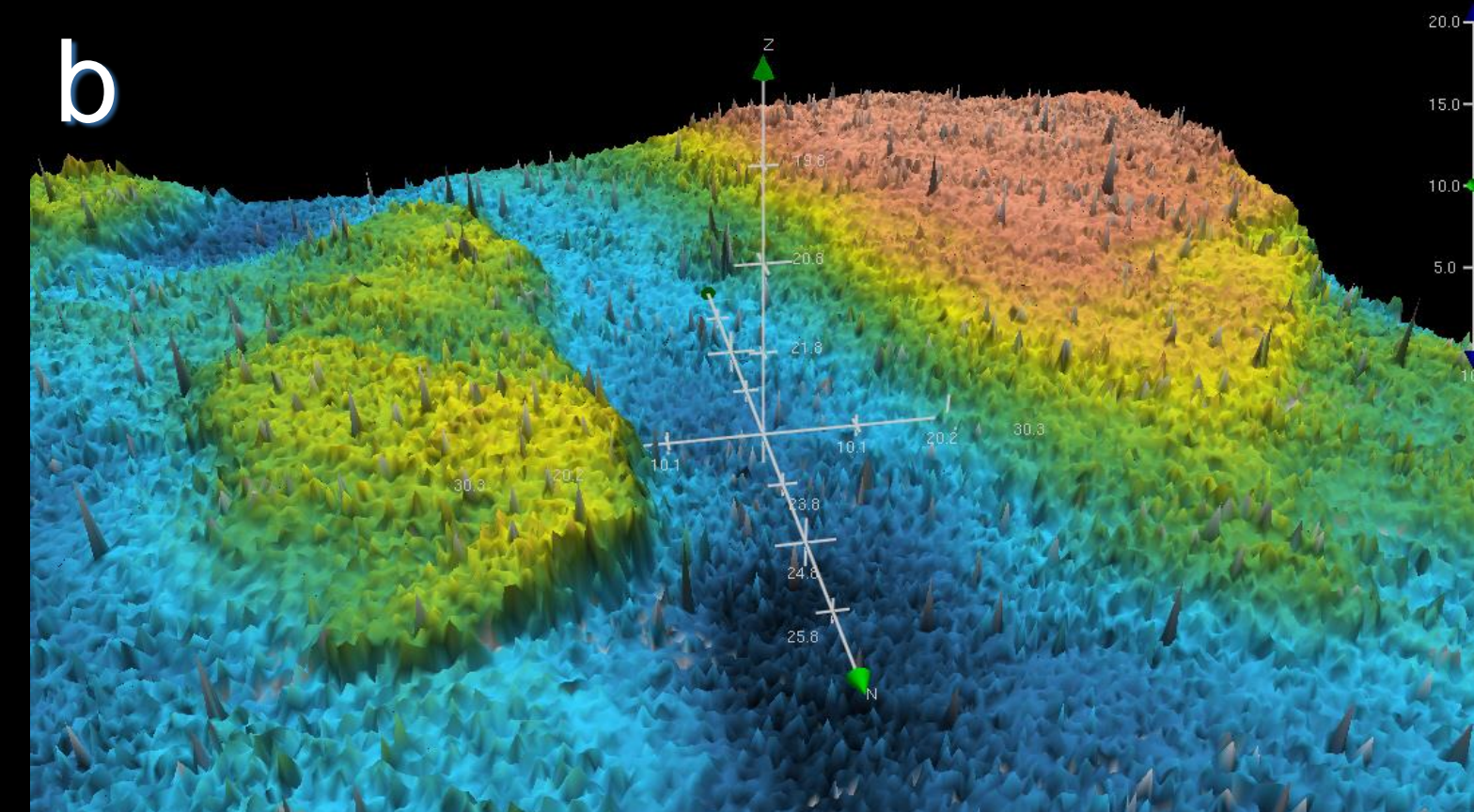
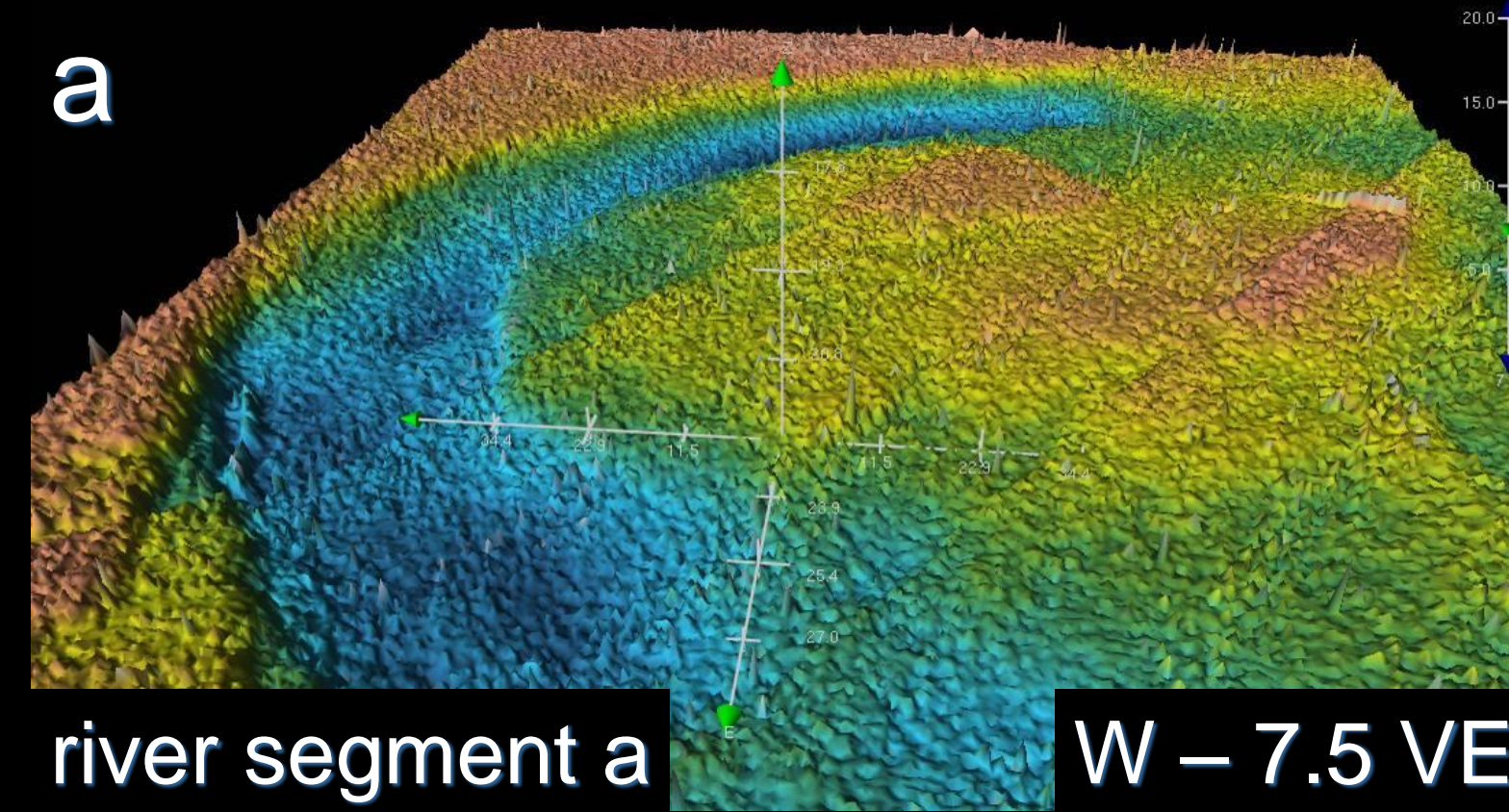
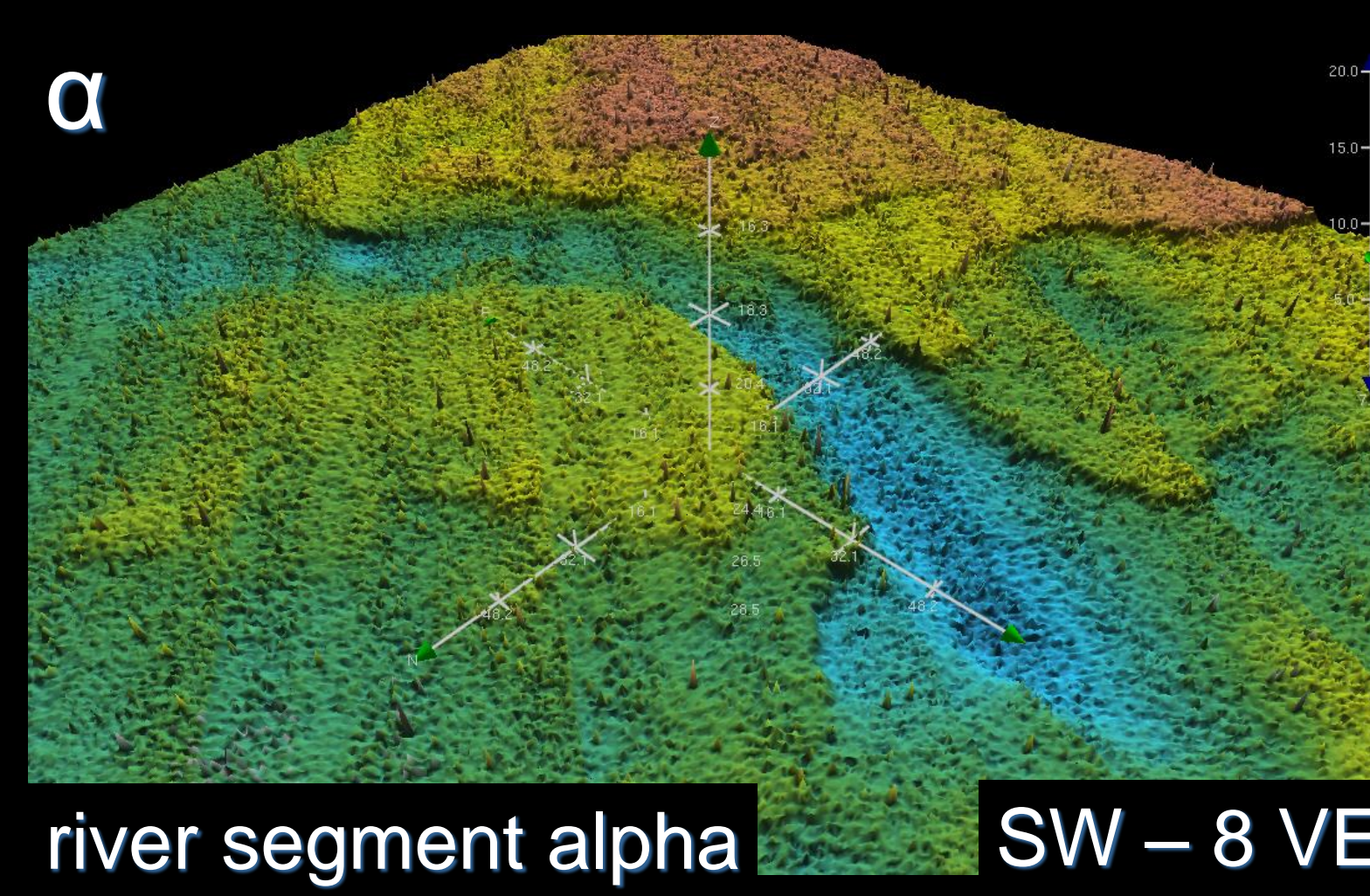
Trifecta Terrain is contained within the large center map. Counterclockwise around the map are locations of interest, highlighted in 3-D views. These 3-D views consist of Transects river segments alpha through d (α, a, b, c, d), dune (sand) waves (dw), the pit (tp), and the sand bar (sb). Counter-clockwise outside of these figures, histograms of sediment grab sites O, P, F, D, C, A, R, and Q display phi versus weight %. Grain size data are grouped into four categories, bimodal with gravel (majority larger than -1 phi) and medium to fine sand (between 2 and 3 phi) (shown by green histograms); moderately well sorted with a mean of fine sand (blue); poorly sorted with mean of fine sand (yellow and red).

Removing the gravel (<-1.0 phi) and clay/silt (>4.0) fractions, sediment sand size distributions (-0.5 to 4.0 phi only) for each sample are plotted on the ternary diagram to the right.



ACKNOWLEDGEMENTS

- Dan Boles for training and assistance with CARIS software
- Scott Harris for starting research on this area
- All C of C students who analyzed my sediments
- Google Earth



RESULTS

- Four main sites of interest were found: Transects river segments α – d, dune (sand) waves, the pit, and the sand bar
- All samples contained more medium to fine sand than any other size
- Sediment samples F, P & A (blue) have very similar sediment distributions, consisting almost exclusively of sediment 2.0 – 3.0 phi
- Sediment samples O, D & C (green) have very similar sediment distributions, consisting mostly of gravel and medium to fine sand. These samples are likely from areas containing hardground, accounting for the large biogenic contribution in the gravel size fraction.
- R & Q (yellow and red) have poorly sorted distributions, and are statistically similar.

DISCUSSION

- F & P both appear to be a channel fill from migrating sand, but it is unknown why A shares so many similarities with F & P. The entire area appears to be blanketed in medium to fine sand. Likewise, samples O & C are analogous because they both are part of the shallower ground where hardground exposures contribute biogenic gravel. Sample D is not significantly different and was either retrieved from the shallower ground or the sands have infilled the channel.
- R & Q have curious distributions unlike any of the other sites, also the feature they lie on, the sand bar, is abnormally smooth. I hypothesize that the sand bar is a moving massive body of sand that is slowly covering the other features in this area.
- Another minor feature is the portion of Transects river segment b: a small remnant of the channel bank appears as an 'island'. This geomorphological feature may be an ancient oxbow remnant.
- The dune waves (sand waves) are an indicator of modern subaqueous flow conditions. Their morphology indicates they are possibly caused by water moving in a dominant north direction – possibly due to storm events or Gulf Stream incursions on the shelf. They consist almost entirely of medium-fine sand that appears to be ubiquitous to the region.
- The pit is a high relief area that appears to be a scour feature, however it is not possible to determine its origin with our current data.
- The river channel overall is clearly an old feature, dating at least back to the last sea level low stand of -20 meters, possible coincident with the Younger Dryas shoreline of 11,000 ybp.