

Cruise Report for NSF OCE-1031050: R/V Endeavor Cruise 531

I. Quick Summary

- Cruise number: EN-531
- Chief Scientist: Dr. Ruoying (Roy) He
- Port of Origin: Morehead City, NC
- Port of Termination: Morehead City, NC
- Estimated Far Point of Cruise: Lat 32.496737 °N Lon 76.191269 °W
- Cruise Schedule:
 - Mob – 8/14 (Wed)
 - 1 Transit out – 8/15 (Thurs, depart Morehead City)
 - 2 Science – 8/16-17 (Fri-Sat)
 - 1 Transit in – 8/18 (Sun, arrive at Morehead City)
 - 1 De-Mob – 8/19 (Mon)
- Transit time:
 - (1) Morehead City to Blake Ridge mooring: 13.5 hours at 10 knots
 - (2) Blake Ridge mooring to Cape Fear mooring: 3 hours at 10 knots
 - (3) Cape Fear mooring to Morehead City: 11 hours at 10 knots

II. Scientific Party Members (9 males, 6 females)

1. Dr. Ruoying (Roy) He, Chief Scientist/co-PI, NC State University (rhe@ncsu.edu) (M)
2. Dr. Craig Young, Co-PI, Oregon Institute of Marine Biology (cmyoung@uoregon.edu) (M)
3. Dr. Brandon Puckett, North Carolina State University (bjpuckett@ncsu.edu) (M)
4. Doreen McVeigh, Ph.D. Student, North Carolina State University (dmmcveig@ncsu.edu) (F)
5. Jason Peters, M.S. Student, North Carolina State University (jwpeter2@ncsu.edu) (M)
6. Seth Theuerkauf, Ph.D. student, North Carolina State University (sjtheuer@ncsu.edu) (M)
7. Joseph Zambon, Ph.D. Student, North Carolina State University (jbzambon@ncsu.edu) (M)
8. Yanlin Gong, Ph.D. Student, North Carolina State University (ygong3@ncsu.edu) (M)
9. Yuchuan Liu, Master student, North Carolina State University (bjtlyc@gmail.com) (M)
10. Amy Burgess, Ph.D. Student, Oregon Institute of Marine Biology (amykeita@gmail.com) (F)
11. Kirstin Meyer, Ph.D. Student, Oregon Institute of Marine Biology (kirstinm@uoregon.edu) (F)
12. Terra Hiebert, Ph.D. Student, Oregon Institute of Marine Biology (terrah@uoregon.edu) (F)
13. Bernie Ball, Research Technician, Duke University (bernieb@duke.edu) (M)
14. Katie Thomas, Ph.D student, Duke University (kate.thomas@duke.edu) (F)
15. Shannon Brown, M.S. student, NCSU (swbrown@ncsu.edu) (F)

II. Cruise Objectives

The specific objectives of research cruise are to:

1. Recover a deep-sea mooring at each of two seep sites: Blake Ridge & Cape Fear Diaper. The moorings contain a current meter, two types of larval traps, and a hydrophone (Blake Ridge only).

2. Deploy CTD casts to characterize hydrography.
3. Perform a single MOCNESS tow at Blake Ridge site at a maximum depth of 2100m. If there is time, we will do another MOCNESS tow at a maximum depth of 2500m at Cape Fear site. (1-m net, 150 um mesh)

III. Cruise Activities

1. August 14, 2013 (Wednesday):

Science Team mobilized on RV Endeavor

2. August 15, 2013 (Thursday):

- 1) RV Endeavor departs Morehead city at **0900**
(Transit time to Blake Ridge: ~14 hours)
- 2) One CTD cast at the shelfbreak (200 m isobaths)

3. August 16, 2013 (Friday):

- 1) **0100 - 0300**: CTD sampling at Blake Ridge (32 29.84N 76 11.46W)

Successful CTD deployment

- 2) **0300-1000**: A single MOCNESS tow at 2100 m

Only the bottom net was good and produced useful data. The other 7 nets got entangled and didn't catch much larval samples.

- 3) **1000-1100**: Mooring recovery at Blake Ridge (32 29.84N 76 11.46W)

The acoustic release did NOT respond to repeated signals from the ship-based transponder to engage. Tried 8-9 times. no luck. We have to rely on the fallback plan, i.e., using the ROV Jason to cut the nylon line to release this mooring in 2014 or 2015.

- 4) **1100-1500**: Transit to Cape Fear Diaper
- 5) **1500-1800**: Recover mooring at Cape Fear Diaper.

The acoustic release did NOT respond to repeated signals from the ship based transponder to engage. All other ship based acoustic devices were turned off to reduce background noise, but we still didn't have response from the mooring. Captain approved a small boat operation. 2st mate Chris, NCSU team members: Brandon and Doreen went on and searched the area for more than 1 hour, but still could not establish communications with the mooring. It was getting dark, we decided to suspend the search for the night, and resume the recovery effort tomorrow

morning. Around 10:30 pm. We called the Edgetech customer support (CS) using satellite phone. Brandon followed up with an email detailing the problem we faced and the procedures we have tried. The CS representative sent us a user manual several hours later, and indicated that he would get in touch an engineer in the morning.

- 6) **1830-2030**: CTD sampling at Cape Fear Diaper.

Successful CTD deployment

- 8) **2130- 0430**: A single MOCNESS tow at 2500 m

Successful MOCNESS deployment. All 8 nets catch useful larval samples.

4. August 17, 2013 (Saturday)

- 1) **0830 -11:45** Recover mooring at Cape Fear Diaper

We spent the entire morning trying to locate CFD mooring. Captain moved the ship around in adjacent to CFD mooring. The communication between deck unit and acoustic release varied from very weak (for only a few times) to no response (for the majority of tries we made). During only a few times that the range info shown up on deck unit, its values jumped over 500- 8000 m, very inconsistent. Edgetech didn't get back to us. When Brandon called again, no body answered the phone. After many times of tries, we decided to leave the site and go to the Blake Ridge mooring site. That mooring had relatively better communication with deck unit, so may present a better chance for recovery.

- 2) **1145 -1500** transit from Cape Fear to Blake Ridge

We were on the way to Blake Ridge. A storm was translating through the region, sea state conditions deteriorated as winds were picking up

- 3) **1500-1900** Recover mooring Blake Ridge

When we are on station, weather and sea state significantly improved, allowing us to proceed with mooring recovery. After hour-long effort trying to establish the connection failed, we decided to go straight into the release mode. A circle area with BR site as the center, and 0.25 nm as radius was defined. The ship was moving inside the circle, while Mooring Team kept entering the release code every a couple of minutes. The rest of science party members were mobilized to the observing deck to eye spot the mooring. This effort lasted 1:30 hours, and BK mooring was not spotted. CTD cast (see figure 1) shows that the water is highly stratified, with seasonal thermocline and permanent thermocline located at 350m and 1000m, respectively. The CTD profile at Cape Fear Diaper (see figure 2) shows similar feature. We suspect that sound waves generated from deck unit are too weak to penetrate through these strong thermoclines and reach 2600 m, and that's why the deck unit and acoustic release can't establish communication. We would need a more powerful deck unit, a longer cable that can put the transducer deeper in the water column, and conduct recovery effort in Fall or Winter when seasonal thermocline

somewhat eroded. Unfortunately, none of them are in our disposal, so there is little we can do to recover the two moorings at this time. We have reasonable confidence that both BR and CFD moorings are still staying at the ocean floor.

4) **1900** Depart to Morehead City

Started transiting back to Morehead. Because MOCENSS team was still doing sorting work, the ship was moving at 4-5 knots.

5. August 18, 2013 (Sunday)

(1) **10:00** Arriving at Morehead City, Science Team de-brief and ship off-load

IV. Science Team Working Groups

Chief Scientist: Roy He

CDT and XBT Team (3):

Joseph Zambon (lead), Yanlin Gong, Yuchuan Liu

Mooring Team (3):

Brandon Puckett (lead), Bernie Ball, Doreen McVeigh

MOCNESS Team (8):

Craig Young (lead), Amy Burgess, Kirstin Meyer, Terra Hiebert,
Kati Thomas, Shannon Brown, Jason Peters, Seth Theuerkauf

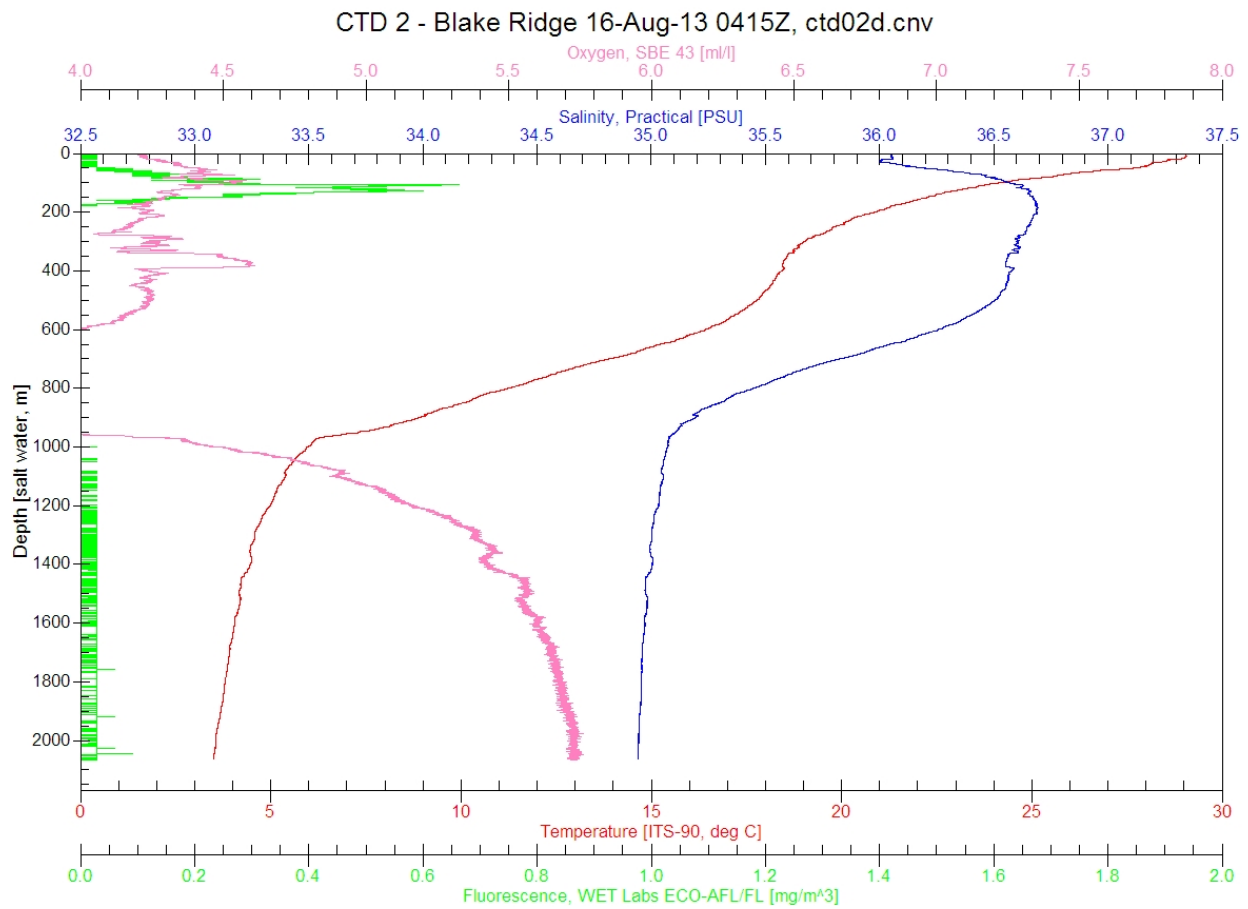


Figure 1: CTD cast data at Blake Ridge Mooring site

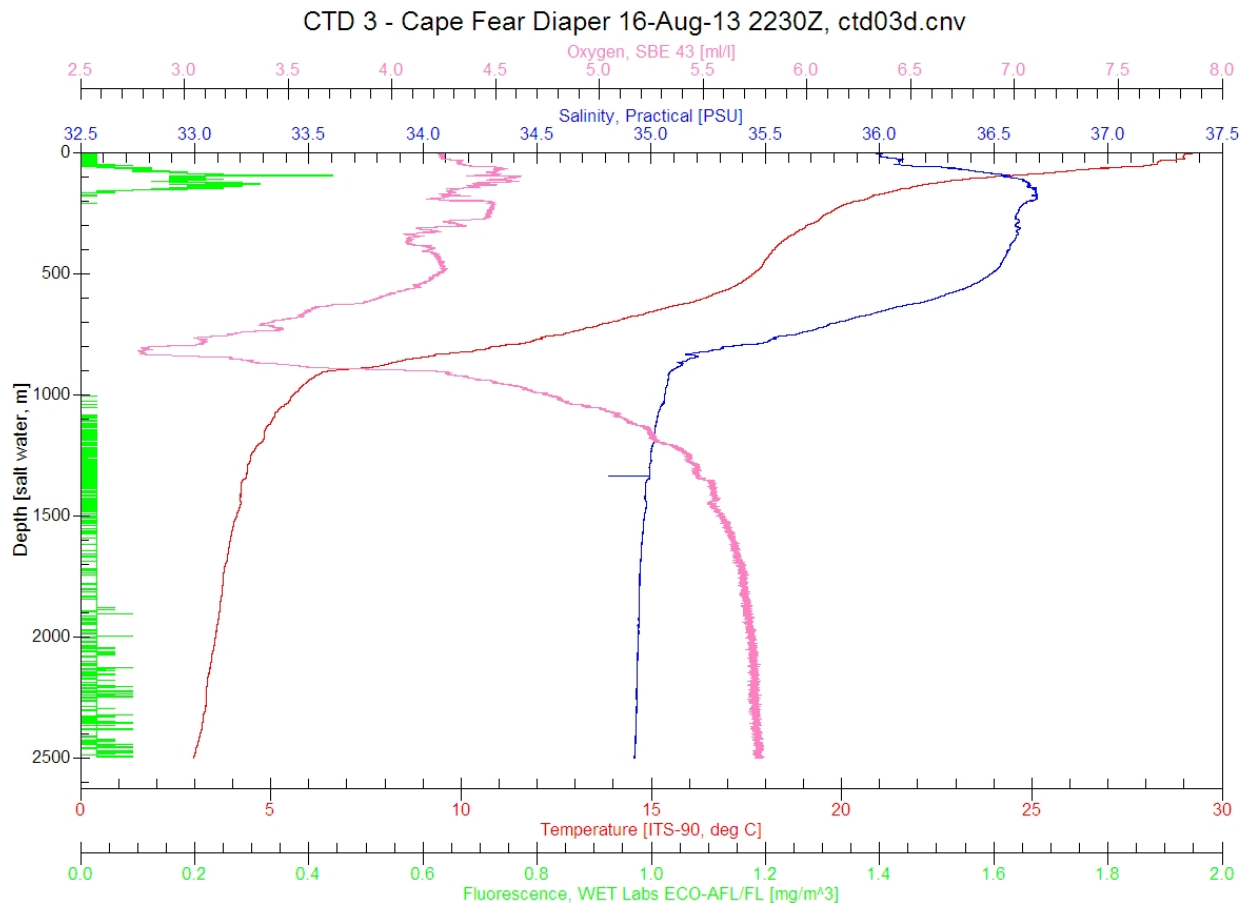
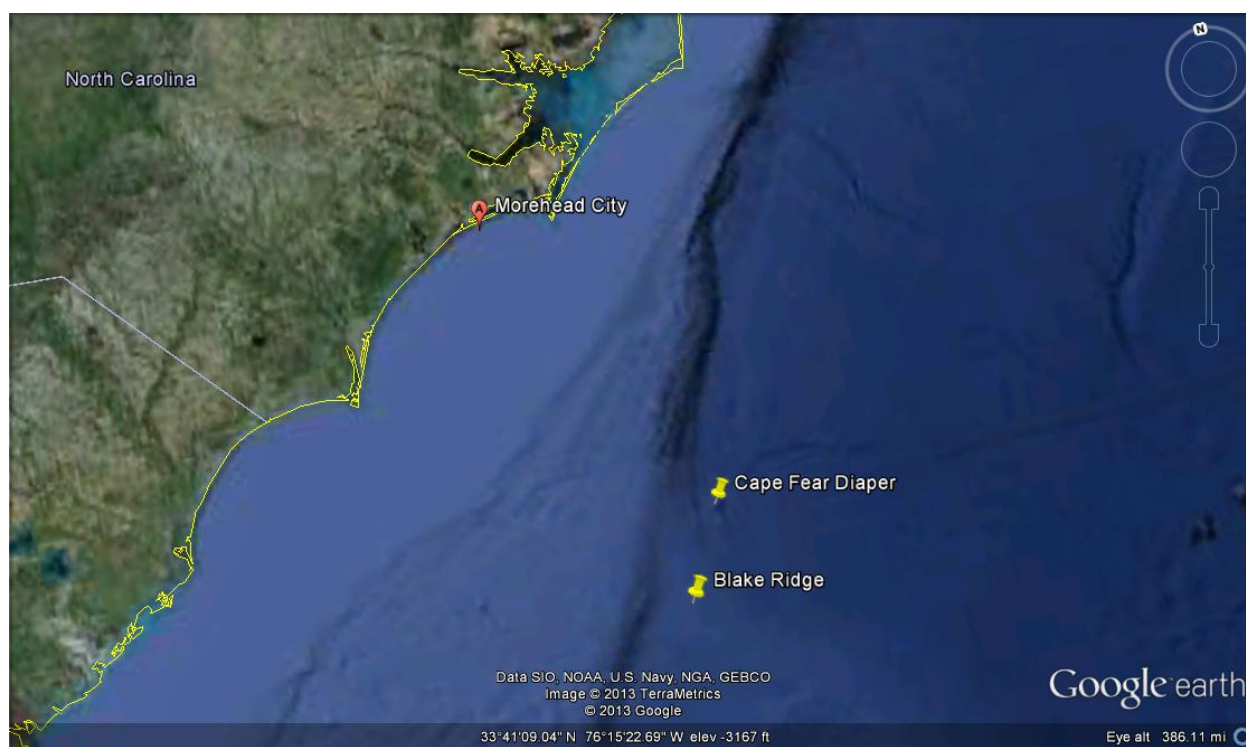


Figure 2: CTD cast data at Cape Fear Diaper Mooring site

APPENDIX:

1. Mooring sites:

Site	Decimal Degrees		Degrees Decimal Minutes		Degrees Minutes Seconds		Depth
	Lat	Lon	Lat	Lon	Lat	Lon	
Blake Ridge	32.496737	76.191269	29.80422	11.47614	32 29' 48"	29"	-2163 m
Cape Fear	32.978578	75.925103	58.71468	55.50618	32 58' 43"	30"	-2598 m



Physical Oceanography Cruise Log, recorded by Joseph B. Zambon
Cruise Dates: 15-August 2013 through 18-August 2013

Cruise Stations (approximate):

Morehead City (34°41'25.81"N, 76°42'13.91"W)
Blake Ridge (32°30'0.10"N, 76°10'56.07"W)
Cape Fear Diaper (32°58'50.26"N, 75°55'18.91"W)
Blake Ridge (32°30'0.10"N, 76°10'56.07"W)
Morehead City (34°41'25.81"N, 76°42'13.91"W)

All Times in GMT (Z)

15-August

1300: Departing Morehead City (34°41'25.81"N, 76°42'13.91"W)

1845: **CTD 1 (200m Isobath)**

33°48'49.20"N, 76°28'45.00"W, Depth: 170m

1850: CTD in the water

1857: CTD at maximum depth (150m)

1905: CTD secured

Techs: Joseph Zambon, Yuchun Liu, Yanlin Gong

Notes: Successful CTD cast, data saved to CTD_01

2103: **XBT 1**

33°33'33.18"N, 76°24'23.70"W

Techs: Joseph Zambon, Bill Fanning (Marine Technician)

Notes: Successful launch, data saved to T6_00001.EDF

22:54: **XBT 2***

33°18'30.29"N, 76°21'38.23"W

Techs: Joseph Zambon, Seth Theuerkauf

Notes: Non-successful launch, data was garbled, data deleted

16-August 2013

00:21: **XBT 2**

33° 5'48.49"N, 76°19'4.92"W

Techs: Joseph Zambon, Shannon Brown

Notes: Successful launch, data saved to T6_00002.EDF

01:43: **XBT 3**

32°52'47.09"N, 76°16'46.93"W

Techs: Joseph Zambon, Yanlin Gong

Notes: Successful launch, data saved to T6_00003.EDF

02:50: **XBT 4**

32°41'26.70"N, 76°14'16.93"W

Techs: Joseph Zambon, Yuchun Liu

Notes: Successful launch, data saved to T6_00004.EDF

04:15: **CTD 2 (Blake Ridge)**

32°29'55.20"N, 76°11'24.00"W, Depth: 2172m

0415: CTD in the water

0455: CTD at maximum depth (2065m)

0555: CTD secured

Techs: Joseph Zambon, Yuchun Liu, Yanlin Gong

Notes: Successful CTD cast, maximum depth of cast limited to 100m above sea floor to avoid fouling the mooring, data saved to CTD_02.

17:38: **XBT 5**

32°45'13.97"N, 76° 3'10.87"W

Techs: Joseph Zambon, Kirsten Meyer

Notes: Successful launch, data saved to T6_00005.EDF

22:30: **CTD 3 (Cape Fear Diaper)**

32°58'43.20"N, 75°55'16.80"W, Depth 2582

2230: CTD in the water

2325: CTD at maximum depth (2500m)

17-August 2013

0025: CTD secured

Techs: Joseph Zambon, Yuchun Liu, Yanlin Gong

Notes: Successful CTD cast, maximum depth of cast limited to 100m above sea floor to avoid fouling the mooring, data saved to CTD_03.

18-August 2013

0130: Cruise plan changed to return to port from Blake Ridge. As this transect had been completed 2 days ago, Science party discontinued further XBT launches.

1400: Arrived Morehead City (34°41'25.81"N, 76°42'13.91"W)

EN-531 Mooring Recovery Cruise

Mooring recovery team: Brandon Puckett, Doreen McVeigh, Bernie Ball (extensive assistance from Roy He and Joe Zambon)

Summary: Mooring recovery was unsuccessful at both Blake Ridge and Cape Fear Diaper.

Details:

- 1) 8/16/13 @ ~0900 – 1100: Blake Ridge
 - Changed batteries in deck unit (8/15/13)
 - Attempted to enable PORTLF acoustic release with AMD 200 deck transducer
 - Entered enable code 461646 for 9-10 attempts and received between 0 and 13 return “pings” at intervals of 2 to > 30 sec (expecting 15 pings at 2 second intervals or 7 at 2).
 - After first 3 enable attempts, ship was in “silent” mode (turned off adcp, echo sounder, doppler speed log, and disengaged clutch).
 - Ship was generally positioned W of mooring waypoint (between 30m and 0.3nm away) drifting easterly.
 - Last attempt(s) were made with boat positioned SW of waypoint. After sending enable command, deck unit never received a tone at the receive frequency (i.e., the cursor never moved across digital screen on deck unit).
 - During transit to Cape Fear Diaper, contacted EdgeTech (through technician at CMAST) that suggested deck unit and length of deck unit transducer cable may be insufficient to send signal through thermocline.

- 2) 8/16/13 @ ~1500 – 1730: Cape Fear Diaper
 - Attempted to enable PORTLF acoustic release with AMD 200 deck transducer
 - Entered enable code 136162 for >15 attempts and received between 0 and 4 return “pings” at intervals of 2 to > 30 sec. After first 2 enable attempts, ship was in “silent” mode (turned off adcp, echo sounder, doppler speed log, and disengaged clutch).
 - Ship was generally positioned N and W of mooring waypoint (between 200m and 0.3nm away).
 - Concerned ship hull was interfering with deck transducer, we deployed a small zodiac and attempted to enable PORTLF ~10 times positioned at the mooring waypoint and 0.01nm SE of waypoint followed by NW drift over and past mooring waypoint. After sending enable commands, deck unit never received a tone at the receive frequency (i.e., the cursor never moved across digital screen on deck unit).
 - After returning to ship, changed batteries in deck box.
 - Called the EdgeTech after hours emergency technical support number (1-508-942-8043) and spoke with Dylan Lynch. He suggested trying a range command. He emailed a copy of an updated AMD 200MF deck unit transducer manual with details on how to use the range command. Dylan attempted to contact EdgeTech engineer that specializes in acoustic releases, but was unable to do so.

- 3) 8/17/13 @ ~0830 – 1130: Cape Fear Diaper

- Used range command. Received slant range (horizontal and vertical) distances of ~500m (mathematically impossible), ~800m (mathematically impossible), ~2000m, ~4000m, ~8000m, and several “no response”.
- Attempted to enable PORTLF acoustic release with AMD 200 deck transducer
- Entered enable code 136162 for ~5 attempts and received between 2-3 return “pings” at intervals of 5 to 10 sec.
- Ship was generally positioned SSW of mooring waypoint.
- Concerned that we were not at correct waypoint, Bernie pulled up R/V Hatteras cruise log from November mooring deployment. Appeared from log that actual deployment location was ~150m S of waypoint.
- Attempted to enable and range PORTLF acoustic release near new waypoint. Range attempts returned “no response”. Enable attempts never received a tone at the receive frequency (i.e., the cursor never moved across digital screen on deck unit). Attempted using enable command for Blake Ridge mooring with no response.
- Attempted changing positions of deck transducer on ship—off starboard, off port, and stern of ship deck.
- Attempted changing receive and interrogate frequencies on deck transducer for range test. No response.
- Note: photos from 2012 mooring deployment confirmed that PORTLF acoustic release deployed at Cape Fear Diaper does NOT have anti-rotation block.

4) 8/17/13 @ ~1500 – 1900: Blake Ridge

- Attempted to range and enable PORTLF acoustic release with AMD 200 deck transducer from waypoint that Bernie provided from R/V Hatteras November deployment log (~150m S of original waypoint). No response from acoustic release after ~10 attempts. Ship was positioned as close as 10m from waypoint.
- Setup a 0.25nm radius circle around waypoint (Roy’s pre-cruise waypoints). Attempted to range and enable PORTLF acoustic release @ ~1min intervals around circle. Received no response from acoustic release.
- Ship navigated from perimeter of circle to mooring waypoint @ ~1700. Release command (445666) sent every 2 minutes until ~1830. 10-15 of the science party was on the 02 deck looking (some w/ binoculars) in 360 degrees from 1700-1900. No sighting of mooring and no return pings from acoustic release during release commands.
- Last attempt to range PORTLF returned ~6000m. Disable command was sent with no return pings from acoustic release.

5) 8/19/13

- Attempted to contact EdgeTech engineer (Mike Emory) to troubleshoot. Mike is on vacation, returning on 8/20. Will place follow-up call and report to chief scientist.