Cruise Report

RV/ISELIN Cruise CI9405
to Georges Bank

US GLOBEC

NW ATLANTIC/GEORGES BANK STUDY

May 7-10, 1994
Cruise Report

R/V COLUMBUS ISELIN Cruise 9405

Woods Hole to Georges Bank to Woods Hole

May 07 - May 10, 1994
Acknowledgments

This report was prepared by Jim Irish and Ann Martin from cruise notes and logs as a first draft at documenting the activities and position, etc. We gratefully acknowledge the excellent support provided by the Captain and crew of the R/V COLUMBUS ISELIN who filled in for the R/V ENDEAVOR at the last minute. Their hard work and dedication allowed this cruise to accomplish our primary goals.

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Cruise Report
R/V COLUMBUS ISELIN Cruise CI9405

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Cruise Report
R/V COLUMBUS ISELIN Cruise CI9405
US State Department Cruise No. 94-014
Woods Hole to Georges Bank to Woods Hole
May 07 - May 10, 1994

Purpose:
The primary purpose of CI9405 was to conduct Precision Depth Recorder (PDR) surveys of the proposed sites for the U.S. GLOBEC NW Atlantic/Georges Bank Program's Long-Term Moorings. Additionally, (1) test deployments of bottom stress measuring instrument frames were to be conducted in Vineyard Sound, (2) guard buoys were to be deployed at the WHOI buoy farm for later ADCP instrument tests, and (3) CTDs were to be taken on the Southern Flank of Georges Bank as time permitted.

Accomplishment Summary:
Two bottom stress tripods and a marker buoy were deployed for A.J. Williams III (WHOI) at 41° 31.15' N x 70° 38.83' W in Vineyard Sound on 7 May 1994 and then successfully recovered on 10 May 1994. Diver studies were conducted independently to study the stability of the instrument frames in strong currents. These instruments will be deployed as part of the Stratification Experiment's study of the bottom boundary layer in 1995. No scientific data were collected.

Three uninstrumented guard buoys were successfully deployed at the WHOI buoy farm in 43 meters of water as protection for future scientific instrument development tests. Buoy C was deployed in the Southwest Corner of the Buoy Farm at 41° 15.906' N x 71° 01.804' W in 43.0 meters (141') of water. Buoy B was deployed in the Northwest corner at 41° 15.792' N x 71° 01.814' W in 43.3 meters (142') of water. Buoy A was deployed near the center of the buoy farm at 41° 15.823' N x 71° 01.666' W in 43.3 meters (142') of water. Buoy B contained a Synergetics ARGOS PTT for testing. The unit did not transmit adequate signals for good satellite reception, although the Telonics uplink receiver said it was working on deck. The new radar reflectors on the buoys made them visible on radar for greater than 20 nm in calm seas.

A systematic PDR survey was made at both 12 kHz and 3.5 kHz around the NE Peak Mooring site (41° 44' N x 66° 32' W). A grid made up of 5 nm long legs separated by 0.5 nm centered on the proposed mooring location was run.

Then exploratory PDR lines were run through the proposed Crest sites A and B (41° 25' N x 67° 33' W & 41° 25' N x 67° 56' W). A PDR line was run from the Crest Site A through the Southern Flank mooring site (40° 58' N x 67° 19' W) and into deeper water.

Three CTD profiles were made along this last PDR line: CTD01 was made at 40° 47.6' N x 67° 14.6' W in 93 meters of water through the shelf-slope front, CTD02 was made at 40° 57.9' N x 67° 19.0' W in 75 meters of water at the Southern Flank mooring site in the stratified region, and CTD03 was made at 41° 07.8' N x 67° 23.7' W in 58 meters of water toward the Crest.
Cruise Results:

CI9405 was successful. We were able to deploy and recover two tripods and a marker buoy in local waters to test the mechanical design for Dr. Albert J. Williams III. These instruments will be deployed as part of GLOBEC in 1995. Then three buoys were deployed at the Woods Hole Buoy Farm to act as guard buoys for instrument testing. The moorings used old CODE style steel buoys and chain anchor cables. The configuration is shown in Figure 1 for reference. We had intended to deploy a new bottom mounted Broad Band Acoustic Doppler Current Profiler (ADCP) on this cruise between the buoys, but we were still having problems making the ADCP work reliably in the laboratory. It will be deployed for testing between these buoys at a later date. The positions for the tripods and buoy deployments are given in the accompanying Cruise Log and Table of Stations.

The main effort on CI9405 was the survey of the Northeast Peak of Georges Bank at the potential site of the proposed GLOBEC Long-Term Mooring. Figure 2 shows Georges Bank, the three long-term mooring sites and the NOAA/NDBC buoys 44011, 44008 and 44005. A series of 5 nm long lines were run at half nm spacing as shown in Figure 3. The center of the survey was the proposed NE Peak mooring site. Both the 12 kHz and 3.5 kHz bottom echo sounders were run continually during the survey. The ship slowed down to 8 kts during the survey in order to keep the return signal on the recorders strong. We guess that bubbles being trapping under the ship scattered the acoustic signal if the speed were any faster, so that good depths could not be determined. A quick computer contour plot of the digitized depth data from the SAIL system on the ISELIN is shown in Figure 4. The fairly flat 74 meter region to the south and west of the initial site should be an ideal mooring location. As the seas were large enough to slow down the ISELIN, the bottom records show ship heave, so any small-scale sand waves cannot be resolved. Therefore, we shall have to do detailed side scan surveys to determine if there are active features in this regions which might put the bottom-mounted ADCP at risk.

Two smaller bathymetric surveys were run at the GLOBEC Crest site on top of Georges Bank (see location in Figure 2). Here two crosses were run through each of the proposed sites to determine if our interpretation of the published bathymetric charts was accurate. We had anticipated seeing depressions in a 20 to 30 meter deep bottom. In reality the region appears to be about 40 meters deep with large sand/gravel waves/ridges sticking up from it. Some of these features extended more than 12 meters above the bottom. It appears that these large features are not very mobile, so that we should be able to pick a mooring site that will last for six months, but more detailed survey work will need to be done from the R/V ENDEAVOR in June 1994 at these sites to determine the best location.

In order to determine the bathymetric section going from the Crest through the South Flank site, a 60 nm line was run off Georges Bank. There were no surprises, and the section showed a regular, increasing depth with distance from the Crest. Coming back up the line, three CTD stations were taken at locations indicated in the Cruise Log and Table. The Neil Brown Mark III CTD included standard temperature, conductivity and pressure sensors as well as a transmissometer and fluorometer tuned to chlorophyll a fluorescence. Additionally, a General
Figure 1. Buoy configuration for Buoy farm marker buoys. Buoys are CODE style steel buoys with light and radar reflector. Mooring hardware is 1/2 and 3/4" galvanized chain, and the anchor is a steel 2000 lb weight.
Figure 2. Chart of the Georges Bank region with the locations of the three GLOBEC Long-term Moorings (Crest, NE Peak and South Flank) and NDBC buoys (44005, 44008, 44011) shown.
Figure 3. NE Peak survey track from the raw, unedited GPS fixes. The survey lines are numbered for comparison with the Table of Stations.
Figure 4. A computer contour plot of the NE Peak digitized depths at the locations of the GPS survey shown in figure 3. The positions of the digitized survey depths are shown as open circles.
Oceanics water sampler allowed samples to be collected at the bottom of each profile for salinity calibrations. A brief one page summary of these three raw, unedited profiles is given in Figure 4. One station was made in the shelf slope front (CTD01), one at the stratified location at the South Flank mooring (CTD02) and one up toward the Crest (CTD03). See the Cruise Log and Table of Stations for exact locations. CTD01 started out in shelf water, but around 20 meters depth showed a change to the warmer, saltier slope water indicating that we had crossed the shelf slope front which extends up from the bottom at an angle. CTD02, at the South Flank mooring, showed that the stratification was due largely to temperature (as the salinity was fairly uniform with depth). At the shallowest station, CTD03, the salinity was well mixed, and the temperature cooler and less stratified. The fluorometer profiles showed a marked chlorophyll a peak just below 20 meters in the offshore station, which was at the bottom of the transition from shelf to slope water. A lesser but broader peak was seen in CTD02, and no real chlorophyll a peak was seen at the shallowest site. No real features were observed in the transmissometer. All the raw data was contaminated to some extent by ship’s rolling and heaving effects; these effects will have to be removed in order to obtain good profiles for scientific analysis.

During the entire cruise, two ship’s ADCP profilers were run continuously. They consisted of RDI 150 and 600 kHz units, each with its own PC and logging system. They were initialized and set to standard GLOBEC sampling by Dr. Julio Candela of WHOI. Successful profiles were obtained for the duration of the cruise. In addition, the standard shipboard parameters of meteorology, and underway data were collected during the entire cruise. The 12 kHz bathymetry was recorded by this system only during the bathymetric surveys, and used for the quick contour plot given in Figure 4. All the data obtained on the cruise will be edited and processed and made available via Internet on our workstation at WHOI. This data eventually will be merged into the GLOBEC data base which is being set up at WHOI. An annotated ship’s track of the cruise is given for reference in Figure 6.

CRUISE PERSONNEL:

Long-Term Survey Program
James D. Irish, Chief Scientist
Patrick O’Malley, Deck Chief
Sean Kery, Engineer
Ann Martin, Programmer
Audrey Rogerson, Post Doc Observer

Short term instrument test participants:
Albert J. Williams, III, Scientist
Janet Fredericks, Programmer
Allan G. Gordon, Engineer
Tod Morrison, Grad. Student
Fred Thwaites, Grad. Student
Figure 5. Summary plot of the three CTDs. The raw, unedited temperature, salinity, fluorometer and transmissometer output are plotted versus depth and marked for identification.
Figure 6. Computer screen dump of the ship's track for CI9405 from the unedited GPS positions gathered during the entire cruise and plotted in the ships lab during the cruise.
Cruise Log
COLUMBUS ISELIN CI9405

Friday 6 May (JD126) 1994

Load buoys, anchor, chain, deck boxes etc. on board ship. Williams tripods not ready, so will load them at 0700 of the morning we sail.

Computer equipment in ship's laboratory and connected to ship's PC on ship's network

Saturday 7 May (JD127) 1994

EDT - (GMT=EDT+4)
0650 - Arrive at COLUMBUS ISELIN at WHOI dock
0700 - Pat O'Malley will run crane to load Sandy's tripods
0730 - Moving tripods to ship
0805 - Loading tripods on ship

Leg 1 - Tripod Deployment off Nobska Point
0830 - Departing WHOI dock for tripod launch site (1/4 nm from shore on 30' contour)
0857 - Marker Buoy over side and towing to position
0919 - Marker Anchor aweigh - rigging 12' tripod for launch
0925 - Picking up 12' tripod for launch
0931 - holding over rail at water level
0935 - 12' tripod released
0940 - Picking up hex-tripod and moving to launch position
0953 - hex-tripod released
1000 - MYTALIS alongside and transferring Sandy, Allen, Todd, Fred, and Janet

Leg 2 - Buoy Deployment at Buoy Farm
1005 - heading slowly for site while transferring Gulf of Maine/Buoy C into launch position
1100 - rigging deck for launch - ETA 1200
1200 - Near Buoy Farm - given positions are slightly out - water depth 135'
1220 - NW corner first, then 0.13 nm south, then 0.13 nm at 60° to put buoys into a triangle
1227 - Moving into position
1247 - Buoy C over side
1257 - Buoy being towed on chain to anchor - ready to deploy
1310 - Anchor aweigh, buoy position: 41° 15.906'N x 71° 01.804'W in 43.0m (141') water
Moving Buoy B (ARGOS & ODAS) into position
1342 - Electronics hooked up - light working, solar panels connected - anchor in position
1350 - Steaming into launch position
1411 - Buoy B in water
1419 - Buoy on chain to anchor - ready to deploy
1423 - Anchor aweigh, buoy position: 41° 15.792'N x 71° 01.814'W in 43.3 m (142') water
Moving anchor into position, moving buoy A into launch cradle
1445 - Buoy A laying down on deck - hooking up light, solar panels, anchor chain, etc.
1450 - Electrical hooked up - dressing wires
1458 - Moving into launch position - turning upwind
1505 - Buoy A in water
1535 - Anchor aweigh, buoy position: 41° 15.823'N x 71° 01.666'W in 43.3 m (142') water
1549 - Drive-by Buoy Positions and Check positions - buoys to starboard just off bridge:
       Buoy A (Center of Farm): 41° 15.823'N x 71° 01.666'W
       Buoy B (Northwest Corner): 41° 15.792'N x 71° 01.814'W
       Buoy C (Southwest Corner): 41° 15.906'N x 71° 01.804'W
1600 - depart Buoy Farm for NE PEAK
       Observing buoys on radar - can see reflection out to 12.2 nm!

Sunday 8 May (JD128) 1994

Leg 3 - Survey on Georges Bank at NE PEAK
0800 - Wind 22 kts and strengthening, seas growing, barometer falling
       0930 ETA at NE PEAK site - changed orientation of survey to
       best align with wind and seas. Way points for NE PEAK Survey are:
       0 - 41° 35.288'N x 66° 55.490'W
       1 - 41° 44.000'N x 66° 32.000'W
       2 - 41° 45.315'N x 66° 28.397'W
       3 - 41° 43.067'N x 66° 26.934'W
       4 - 41° 42.847'N x 66° 27.534'W
       5 - 41° 47.343'N x 66° 30.465'W
       6 - 41° 47.123'N x 66° 31.065'W
       7 - 41° 42.627'N x 66° 28.139'W
       8 - 41° 42.407'N x 66° 28.739'W
       9 - 41° 46.903'N x 66° 31.670'W
      10 - 41° 46.648'N x 66° 32.270'W
      11 - 41° 42.187'N x 66° 29.344'W
      12 - 41° 41.968'N x 66° 29.944'W
      13 - 41° 46.463'N x 66° 32.873'W
      14 - 41° 46.244'N x 66° 33.474'W
      15 - 41° 41.747'N x 66° 30.548'W
      16 - 41° 41.528'N x 66° 31.148'W
      17 - 41° 46.023'N x 66° 34.077'W
      18 - 41° 45.804'N x 66° 34.678'W
      19 - 41° 41.307'N x 66° 31.752'W
      20 - 41° 41.088'N x 66° 32.353'W
      21 - 41° 45.583'N x 66° 35.281'W
      22 - 41° 45.364'N x 66° 35.882'W
      23 - 41° 40.867'N x 66° 32.957'W
      24 - 41° 40.648'N x 66° 33.557'W
25 - 41° 45.143' N x 66° 36.486' W
0922 - Setting up 3.5 and 12 kHz PDRs, 0.25 sec/scan, or:
6.25 m per division and 187.5 m overall depth
Set automatic time and position labels for fifteen minute annotations, didn't work on
both units at same time always
System #1 is 3.5 kHz on right as facing aft
System #2 is 12 kHz on left as facing aft
0926 - Adjusting 3.5 kHz for sub-bottom profiling - no go
Use manual gain in low mode, rather than fast or slow AGC
0940 - Start survey of NE PEAK site - reduce ship speed to 10 kts
3.5 kHz still noisy and skipping bottom occasionally
1024 - Turning from end of Line 2
1030 - Turning to start Line 3
1054 - 12 kHz recorder having problems - slippage in pen drive
1141 - Start of Line 5
1245 - Tightening set screw in 12 kHz drive
1254 - End of Line 6 starting turn
1339 - Start of Line to SE, Winds about 24 kts from SE
1354 - Over NE PEAK site
1459 - End of Line 9
1502 - 12 kHz out of paper
1508 - 12 kHz back on line
1530 - 3.5 kHz doing poorly - (skipping because of bubbles under hull?)
1544 - Completed Line 10
1550 - Started Line 11
1626 - End Line 11
1753 - End Line 13 - terminate survey ops and shut down PDRs
proceeding to Crest Site A. Winds down to 18 kts from south

Monday 9 May (JD129) 1994

0240 - Nearing Crest Site, setting up PDR's - 3.5 kHz still skipping
0251 - Start E to W pass across site A - Steady on 265-270° T.
0255 - Sand waves up to 25 m from 38 m depth - ships speed 10 kts
0304 - On top of Crest A site - flat bottom! Some sand ridges at ends of line.
0316 - End of line & heading SE to next line.
0340 - Steady on N-S line heading north, Line 2.
   3.5 kHz unit slowed down sampling by about factor of 2, then fixed itself??
0359 - Over Crest A site, sand wave nearly on this site
0420 - End of Line 2 at Crest A site heading for Crest B
0600 - Ann and Pat on watch
0612 - Start of Crest B line 1
0615 - Depth gets up to 12 m!
0630 - Depth 29 m
0704 - Start of Line 2 of Crest B site
0741 - end of Line 2 at Crest B site
0915 - Start of Main Section from the Crest off the shelf passing through the South Flank mooring site (from 41° 30.89' N x 67° 35.889' W to 40° 35' N x 67° 07' W).
1312 - Wind down to 16 kts
1320 - Slowing down for fishing boat
1327 - At South Flank Site (40° 58.7' N x 67° 19.3' W)
1330 - Only 12 kHz working well
1342 - VAX clock appears 1 minute ahead of lab GPS receiver
1539 - Depth 103 meters, deepest yet. 600 kHz ADCP shows larger currents than 15-kHz unit. 600 kHz set to 3 minutes averaging and 150 to 2 minutes averaging.
1613 - 3.5 kHz on 1/2 second sweep or 375 meters full scale
1615 - 12 kHz switched to 1/2 second sweep
1618 - End PDR survey, and steam back to first CTD
1810 - Setting up for CTD01
1823 - moving CTD to rail and setting up deck
1827 - Start CTD01 (40° 47.92' N x 67° 14.43' W) in 93 meters at 30 meters/minute
1839 - End of CTD01 (40° 47.539' N x 67° 14.614' W) in 93 meters of water
1842 - Proceeding to Station for CTD02 (Southern Flank Site)
1959 - On station getting set up, water depth 75 m
2005 - Start CTD02 (40° 57.86' N x 67° 18.98' W) in 75 meters at 30 meters/minute
2018 - End CTD02 - Shipboard software died on way back to surface @ about 17 m depth.
2125 - On station getting set up, water depth 58 m
2131 - Start CTD03 (41° 07.28' N x 67° 23.67' W) in 58 meters at 30 meters/minute
2142 - End CTD03 (41° 07.17' N x 67° 23.84' W)
2150 - secured operations and heading for WHOI.

Tuesday 10 May (JD130) 1994

1123 - At buoy "26" and R/V Asterias alongside for personnel transfer
1149 - surface marker buoy from large tripod hooked
1214 - Recovering Large tripod
1230 - Large (West) tripod on deck
1303 - Recovering small hexpod
1312 - Small (East) hexpod on deck
1324 - Marker buoy hooked
1329 - Marker buoy on deck and heading for WHOI dock
1400 - Moored at WHOI dock unloading.
## Table of Stations

### CL9405

<table>
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<th>GMT Time</th>
<th>N Latitude</th>
<th>W Longitude</th>
<th>Comments</th>
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<tr>
<td>7 May 1994</td>
<td>1319</td>
<td>41 31.15</td>
<td>70 38.83</td>
<td>Deploy marker buoy for tripods off Nobska Point lighthouse.</td>
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<td>1335</td>
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<td>Large Stress tripod 50' west of marker</td>
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<td></td>
<td>1353</td>
<td></td>
<td></td>
<td>Hex vorticity tripod 50' east of marker</td>
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<td>41 15.906</td>
<td>71 01.804</td>
<td>Buoy C marked ODAS with ARGOS Southwest Corner of Buoy Farm</td>
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<td>Buoy A Center of Buoy Farm</td>
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<td>41 35.288</td>
<td>66 55.490</td>
<td>Started Crest Survey on line1 from crest</td>
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<td>1340</td>
<td>41 44.000</td>
<td>66 32.00</td>
<td>Turning to Southeast for line 2</td>
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<td>66 29.344</td>
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<td>66 32.00</td>
<td>Over proposed NE Peak mooring site</td>
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<td>66 34.678</td>
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<td>66 31.752</td>
<td>Turning from end Offline 10</td>
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<td>66 32.353</td>
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<td>66 35.281</td>
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<td>2153</td>
<td>41 45.143</td>
<td>66 36.486</td>
<td>Turning from end of line 13 and survey</td>
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# Table of Stations

**CI9405**

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<th>Date</th>
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<th>W Longitude</th>
<th>Comments</th>
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<td>0651</td>
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<td>Start of West to East survey across Crest site A</td>
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<td>0704</td>
<td>41 25.00</td>
<td>67 33.00</td>
<td>Over Crest site A</td>
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<td>0716</td>
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<td>End of West to East survey across Crest site A</td>
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<td>Start of South to North survey across Crest site A</td>
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<td>41 25.00</td>
<td>67 33.00</td>
<td>Over Crest site A</td>
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<tr>
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<td>End of South to North survey across Crest site A</td>
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<td>Start of line 1 across Crest B site</td>
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<td>Start of line 2 across Crest B site</td>
</tr>
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<td>1315</td>
<td>41 30.89</td>
<td>67 35.889</td>
<td>Start of main section off Georges Bank</td>
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<td>1727</td>
<td>40 58.7</td>
<td>67 19.3</td>
<td>At South Flank Site</td>
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<td>2018</td>
<td>40 35.00</td>
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<td>2227</td>
<td>40 47.92</td>
<td>67 14.43</td>
<td>Start of CTD01 in 93 meters</td>
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<td>0005</td>
<td>40 57.86</td>
<td>67 18.98</td>
<td>Start of CTD02 in 75 meters</td>
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<td>Start of CTD03 in 58 meters</td>
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<td>0142</td>
<td>41 07.17</td>
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