

Physical Oceanographic Mooring Time Series Protocol

Instrumentation Procedures: T-string

Moorea Coral Reef LTER

By K.Seydel, 12 January 2010

LTER 1, 4 and 5 T-string instrument deployment/retrieval protocol

The LTER thermistor strings (t-strings) are serviced twice a year. Each time the CTDs (SeaBird 37's) are changed and the thermistors (SeaBird 39's) are changed as needed.

LTER 1 t-string's location is: -17 28.481, -149 50.21

LTER 4 t-string's location is: -17 32.835, -149 46.116

LTER 5 t-string's location is: -17 34.919, -149 52.517

Each t-string is in 20m of water and is comprised of 5 thermistors(3 39s and 2 39-P) and 2 CTDs. The CTDs are deployed just below the buoy at 5m of depth and also 13m. The two 39-P are at the base of the t-string in 17m of water as well as 9m. The other three 39s are in 7,11 and 15m.

Programming:

SeaBird 39s:

Before the deployment day the thermistors are programmed with a 120second interval, internal memory is cleared, clock set to current GMT and the start time set to 8am of the day of deployment. Once the 39 is programmed, save a capture file of the information. The program should look as follows:

```
SBE 39 v 2.0a SERIAL NO. 1923 15 Jul 2005 02:14:26
battery voltage = 9.3
not logging: waiting to start at 16 Jul 2005 18:00:00
sample interval = 120 seconds
samplenum = 0, free = 466028
serial sync mode disabled
real-time output disabled
SBE 39 configuration = temperature and pressure
Binary upload includes time
Temperature = 25.43 deg C
```

Make sure the battery voltage is close to or above 9V(if not replace the battery with a new 9V lithium battery), the temperature reading seems correct for where you are, the time reads correct and the samplenum is set to 0. Serial numbers of all units are recorded in the deployment log under "currently being deployed".

Once programmed, add a desiccant pack to the 39, check and lubricate the o-rings and seal the unit. Do not crank down hard with a wrench. The serial number of the unit is then written on the cage and the body of the thermistor taped to prevent fouling. The tape should not cover the water flow slots of the thermistor cage. Once taped the thermistors

are placed in a pond. The 39's should remain in the pond until at least 8:30am on the day of deployment – allowing 30min of cross calibration between the units.

SeaBird 37s:

These units take 12 AA lithium batteries. The end cap of the CTD is removed and then the battery pack is removed and the batteries replaced. See the SeaBird manual for complete directions. The CTDs are then programmed with a 120 second sample interval, the time is set to current GMT using time.gov, the internal memory is reset and the start time is set to 8am on the day of deployment. Once the 37 is programmed, save a capture file of the information. The program should look like this:

```
SBE37-SM V 2.6a SERIAL NO. 4230 15 Jul 2005 02:09:02
not logging: waiting to start 16 Jul 2005 18:00:00
sample interval = 120 seconds
samplenumber = 0, free = 190648
do not transmit real-time data
do not output salinity with each sample
do not output sound velocity with each sample
store time with each sample
number of samples to average = 1
serial sync mode disabled
wait time after serial sync sampling = 30 seconds
internal pump is installed
temperature = 24.22 deg C
```

Make sure the “numbers of samples to average” is set to 1, the temperature reading seems correct for where you are, the time reads correct and the samplenumber is set to 0. Serial numbers of all units are recorded in the deployment log under “currently being deployed”.

Once programmed the serial number of the unit is written on the upper white attachment point. The CTD is then taped to prevent fouling. Make sure to not tape over the water flow holes of the cage, the pressure sensor on the side or the thermistor probe. Check that the hole in the pressure sensor is clear of any obstructions. Once taped the CTDs are placed in a pond. The 37's should remain in the pond until at least 8:30am on the day of deployment – allowing 30min of cross calibration between the units. On the morning of deployment add the anti-fouling poison packs to the plastic cup holders in the top of the cage area.

Deployment/ retrieval:

Once all instruments are cross calibrated they can be removed from the pond – record the time they are removed.

Needed items for deployment/retrieval:

Med size game bag – 1

Large game bag - 1

2 - large bladed flat head screwdrivers

At least 4 spare 1 9/16” to 2 ½” diameter stainless steel hose clamps

2 - 3/8" ratcheting wrenches

Once moored on the LTER boat mooring load the thermistors into the med size game bag and the CTDs in the large one. One diver member will be in charge of the 39's and the other will replace the CTDs. Swim from the boat mooring to the t-string and descend to the chain attachment at the bottom. The chains and shackles are checked at the bottom and then the dive team starts up the mooring.

The diver in charge of the thermistors changes all thermistors on the way up the mooring cable. Each thermistor is attached to the line with 2 hose clamps. Both hose clamps are released and the deployed 39 is placed in the game bag and a fresh one is taken. The new 39 is aligned on the mooring line with the thermistor probe facing down and attached with the two hose clamps. Make sure the location of the replacement is exactly the same, the depth where the thermistor probe is marked on the cable with a ziptie. Record the time that the 39 was removed from the mooring line and also the time the new 39 was placed on the line, as well as the serial number of the new unit. Work your way up the line replacing the thermistors and checking and cleaning the condition of the mooring cable. Make sure to replace 39's with 39's and 39-P's with 39-P's. When finished with the replacement of the last 39-P clean the buoy and then return to the boat mooring, swimming at 15' depth to start your safety stop.

The diver in charge of the CTD's ascends to the first CTD at 13m deep and first releases the upper connection on the existing CTD and then the lower connection. The CTD is replaced in the exact location with a new CTD. Lower clamp first and then the upper clamp. The location of the thermistor probe is marked on the cable with a ziptie. Make sure to record the time the CTD was removed, the time it was replaced and the serial number of the new CTD. The second CTD is right below the buoy and the "CTD diver" ascends to 5m depth after finishing the first CTD. The timing works out to where the two divers should finish about the same time.

When the instruments are returned to the station place them in a pond for at least 30min to again cross calibrate before cleaning.

Cleaning:

Remove thermistor from pond and note the time the unit is removed. To clean the thermistors, peel off the tape that is covering the body of the unit. Most of the fouling should come off with the tape. Unscrew the cage that protects the thermistor probe and leave it to soak in a vinegar solution. Make sure that special care is taken when cleaning around the probe. Using a soft tooth brush and vinegar, gently brush away the algae and CCA that are left on the thermistor. Zip-ties are acceptable to use to pick things out of the hole in which the probe sits. After the cage has had sufficient time to soak in vinegar, scrub the remaining fouling off and give everything a fresh water rinse.

To clean the CTDs – remove from pond(recording the time), rinse with fresh water, remove the 6 screws that keep the cage in place, remove the plastic pump tube and poison cup, throw the poison in the trash, remove the o-ring from the base of the conductivity cell and place all parts aside in a container. The cage and the CTD itself can then be untaped and cleaned with a vinegar solution. Be careful to not soak any parts that have rubber or o-rings for an extended duration in the vinegar. Be careful not to scratch any

part of the CTD while cleaning. To clean the CTD salinity cell, pump warm Triton X dilute solution through the cell several times with a syringe tube. Fill cell with Triton X and let stand for 30 minutes before rinsing thoroughly with warm water.

Download:

When the 39 is clean dry it and open the unit using a large wrench on the flat flanges by the threads of the cage. Be careful when doing this because the wrench can slip off the flanges and break the thermistor probe. Once open put the desiccant pack in the bag marked “to be dried” and attach the thermistor to the computer. Open www.time.gov and get the correct GMT time. Open seaterm and connect to the 39 and do a status check on the 39 – simultaneously checking the time on time.gov so that you can see how many seconds the internal clock of the 39 has drifted since deployment. Record this number. Then “stop” the 39 from logging and initiate an upload of the data stored on the thermistor. In the “comment” section of the upload record the site and depth that the thermistor was collected as well as the outplant and retrieval dates. For file naming see the file called “file name structure.txt” Once the 39 has finished downloading use a flash drive to back up the data file on another computer.

To download the 37 attach it to the computer using either the 3 prong or 4 prong cable, open seaterm and set the configuration to 37. Open www.time.gov and get the correct GMT time. Do a status check on the 37 – simultaneously checking the time on time.gov so that you can see how many seconds the internal clock of the 37 has drifted since deployment. Record this number. Then “stop” the 37 from logging and initiate an upload of the data stored on the CTD. In the “comment” section of the upload record the site and depth that the CTD was collected as well as the outplant and retrieval dates. For file naming see the file called “file name structure.txt” Once the 37 has finished downloading use a flash drive to back up the data file on another computer.