SBCLTER - OCEAN
CTD Processing Methods

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Introduction: Much of this information is based on Seabird recommendations and defaults. Constants were taken from the current cfg files (prepared by David Salazar). All core-monthly CTD files collected between November 2000 and November 2002 were reprocessed during March 2003 using these methods.

A. General Protocols and Profile Collection:
This section applies only to collection of core-monthly and mooring turnover visits. With Seabird model SBE19, serial number 448 During channel-wide cruises, CTD data is collected by the ship's personnel (ref for this method).

Calibration: Instrument are calibrated once yearly. External sensors are removed and the CTD instrument returned to Seabird. (confirm. fluor? Trans? What about the external sensors?) Sent to seabird? Or sensors removed? The appendix shows the calibration files from the two calibration files used during this time period.

Field Procedures:
1. Power supply: The seabird sbe19 logs data internally, using x D-cell batteries as a power source. Batteries should be replaced every 3mo.
2. Equilibration: Lower the instrument several meters into the water and shake to loosen any bubbles clinging to the sensors. The instrument is allowed to equilibrate for several minutes. Bring back to the surface and shake again to ensure that no bubbles are left to escape.
3. Begin the cast. Lower the instrument as close to the bottom as possible.

B. Default parameters used during data collection (from the hdr of one cnv file):
* SEACAT PROFILER V2.1e SN 448 06/06/02 00:02:39.771
* pressure sensor: serial no = 135838, range = 300 psia, tc = 279
* clk = 32767.422 iop = 140 vmain = 12.6 vlith = 5.7
* ncasts = 9 samples = 4215 free = 2816 lwait = 0 msec
* sample rate = 1 scan every 0.5 seconds
* minimum raw conductivity frequency for pump turn on = 3000 hertz
* pump delay = 60 seconds
* battery cutoff = 7.2 volts
* number of voltages sampled = 2

C. Processing (dos version)
1. The CTD is often collecting data during equilibration. These excess lines should be deleted from the top of the file at the start of processing. View each hex file with Seasave to determine the number of lines to skip. Log this data for use in a dos batch file.

2. Run datcnv to edit the processing parameters in its cfg file
   a. Change input and output directory to the current.

b. units=metric
c. data conversion format=ascii
d. skipover=0 * default will be overridden in batch mode, below
e. data conversion variables:
units = metric

these channels should be selected:
name 0 = timeJ: time [julian days]
name 1 = scan: scan number
name 2 = pr: pressure [db]
name 3 = t090: temperature, ITS-90 [deg C]
name 4 = c0S/m: conductivity [S/m]
name 5 = v0: voltage, number 0 [V] * transmissometer raw voltage
name 6 = v1: voltage, number 1 [V] * fluorometer raw voltage
name 7 = depS: depth, salt water [m]
name 8 = wetBTrans: WET Labs, beam transmission [%]
name 9 = bat: beam attenuation coefficient
name 10 = wetStar: WET Labs, WETStar chlorophyll concentration [M-microg/l]

Run datcnv (input = binary *.hex and *.con files, output = *.cnv file)
Run this command from a bat file for all files in a directory. Put the calibration file (eg sep2002.con) and the datcnv.cfg file in the same dir as the hex files.
Batch file commands have this syntax:
datcnv -iNI020306.hex -oNI020306.cnv -x55
datcnv -iNR020306.hex -oNR020306.cnv -x95
datcnv -iNO020306.hex -oNO020306.cnv -x100
…
where the –x flag is followed by the number of lines to skip over at the top of the file.

The –ax flag on the following commands will act on all the files in a directory, and overwrite the input file with the new output file.

3. filter –ax
in filter.cfg file:
Low pass filter A Time Constant =0.5 (Temperature)
Low pass filter B Time Constant =2.0 (Conductivity)

4. alignctd –ax
in alignctd.cfg file:
Advance primary sensors relative to pressure (sec)
Conductivity: 0.05
Temperature: 0.5
Oxygen: 0 (no sensor)

secondary sensors: all 0

5. loopedit –ax (removes pressure "slow downs" and reversals)
    in loopdit.cfg file:
    *min velocity = 0 m/s
    *exclude scans marked bad = yes

6. binavg –ax (averages into either depth or pressure bins)
    in binavg.cfg file:
    *bin type=pressure bins (needed if "buoyancy" will be run later)
        also, pressure field can become the nominal depth in database
    *binsize=1 (may be to large for some inshore stations, ie carp)
    *exclude points marked bad = yes (excludes flagged points from above)
    *scans to skip = 0
    *surface bin = yes, label 0, range= 0-.5m

7. derive (gives higher processed variables, salinity, potential temp, etc)
    in derive.cfg file:
    Time Window size for doc/dt [s] = 2.000
    Time Window size for Descent Rate and accel [s] = 2.00
    # name 11 = potemp090: potential temperature, ITS-90 [deg C]
    # name 12 = sal00: salinity, PSS-78 [PSU]
    # name 13 = sigma-M-i00: density, sigma-theta [kg/m^3]
    # name 14 = flag: 0.000e+00
    # name 15 = nbin: number of scans per bin

Calibration files:

SEPT2000.con
Instrument Type: SBE 19 Seacat Profiler
Pressure sensor type: Strain Gauge
Number of external Voltages Sampled: 2
Number of 0.5 second intervals between samples: 1
Firmware version: Less than 3.0
No Lat/Lon added by NMEA interface
No Surface PAR voltage added by NMEA interface
Frequency 0: Temperature
Frequency 1: Conductivity
External Voltage 0: Transmissometer
External Voltage 1: WET Labs, WETStar fluorometer
Pressure Voltage

Calibration Coefficients
Temperature
Serial Number 448

Calibration Date: 07-Sep-00
G: 0.00415101657
H: 0.000576137284
I: -4.65431891e-006
J: -3.62059415e-006
F0: 1000
Slope (nominally 1.0): 1
Offset (nominally 0.0): 0
Conductivity
Serial Number: 448
Calibration Date: 07-sep-00
G: -3.80938283
H: 0.455354705
I: 0.000807615041
J: -1.02424037e-005
CPcor (nominally -9.57e-08): -9.57e-008
CTcor (nominally 3.25e-06): 3.25e-006
Slope (nominally 1.0): 1
Offset (nominally 0.0): 0

Transmissometer
Serial Number: CST-252PR
Calibration Date: 27-May-99
M: 20.4459
B: -1.1654
Path Length (meters): 0.25

WET Labs, WETStar fluorometer
Serial Number: (blank)
Calibration Date: 05-20-99
Vblank: 0.094
Scale Factor: 16.984

Pressure
Strain Gauge
Serial Number: 192933-448
Calibration Date: 07-sep-00
A0: 153.6997
A1: -0.03909199
A2: 3.382543e-008
Offset (nominally 0.0): 0

JUNE2002.con

Configuration for SBE19 Seacat CTD
ASCII file opened: june2002.con
Pressure Sensor Type: Strain Gauge
External Voltage Channels: 2
Firmware Version: Version < 3.0
0.5 second intervals: 1
NO Surface PAR voltage added
NO NMEA position added
Channel Sensor
1. Frequency: Temperature
2. Frequency: Conductivity
3. A/D voltage 0: Transmissometer, Chelsea/Seatech/Wetlab Cstar
4. A/D voltage 1: Fluorometer, Wetlab Wetstar
5. Pressure Voltage: Pressure, Strain Gauge

Calibration Coefficients
Temperature
Serial Number: 448
Calibration Date: 15-May-02
G: 4.15014772e-003
H: 5.73448474e-004
I: -7.21529924e-006
J: -4.40082027e-006
F0: 1000.000
Slope: 1.00000000
Offset: 0.0000

Conductivity
Serial Number: 448
Calibration Date: 15-May-02
G: -4.00670578e+000
H: 4.79081299e-001
I: 7.99517006e-004
J: -7.83292853e-006
CTcor: 3.2500e-006
CPcor: -9.57000000e-008
Slope: 1.00000000
Offset: 0.00000

Transmissometer, Chelsea/Seatech/Wetlab Cstar
Serial Number: CST-252PR
Calibration Date: 27-May-99
M: 20.4459

B: -1.1654
Path Length (m): 0.250

Fluorometer, Wetlab Wetstar
Serial Number: WS3S-537P
Calibration Date: 05-20-99
Vblank: 0.094
Scale Factor: 16.984

Pressure, Strain Gauge
Serial Number: 135838
Calibration Date: 14-May-02
A0: 1.537510e+002
A1: -3.910739e-002
A2: 3.350895e-008
Offset: 0