

TITLE: CTD casts, BEST Spring Cruise 2007, USCGC Healy (HLY0701)

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SAME AS ABOVE

Data/documentation/metadata: Peggy Sullivan peggy.sullivan@noaa.gov

Data Files: Dave Kachel dave.kachel@noaa.gov

FUNDING SOURCE AND GRANT NUMBER:

National Science Foundation through BEST (Bering Sea Ecosystem Study)

Grant Number NSF 07-533

DATA SET OVERVIEW:

-Introduction or abstract

This CTD data set, consisting of 231 casts, was collected during a multi-disciplinary Bering Sea ice cruise on the USCGC Healy (HI0701, April 10 - May 12, 2007). The cruise was funded by NSF for the BEST (Bering Sea Ecosystem Study) program, and supported by numerous agencies and institutions. CTD operations on this cruise were managed by personnel from NOAA/PMEL in the EcoFOCI program, with technical expertise from SCRIPPS, and deployment assistance from Healy personnel. Water samples from casts were collected by various parties relative to their research needs. Profile data from CTD instruments were processed at NOAA/PMEL/EcoFOCI using standard techniques. Data from bottle samples include phosphate, silicate, nitrate, nitrite, ammonium, and chlorophyll. Data files are an array on a 1-meter grid and combine both averaged CTD profile data, and bottle samples where depths with no data are listed as “-1E+10”. CTD data contact people: Phyllis Stabeno, Peggy Sullivan. Nutrient and bottle data contact: Calvin Mordy.

-Time period covered by the data: April 11, 2007 - May 11, 2007

-Physical location of the measurement or platform (latitude/longitude/elevation)

231 CTD casts deployed within latitude 54.24N to 62.85N and longitude 163.93W to 179.44W

-Any World Wide Web address references (i.e. additional documentation such as Project WWW site)

Cruise Site: <http://www.pmel.noaa.gov/foci/ice07/>
BEST Site: <http://www.fish.washington.edu/research/best/>
PolarTrek Teacher Site: <http://www.polartrec.com/bering-ecosystem-study/>
NSF BEST Proposal: <http://www.nsf.gov/pubs/2007/nsf07533/nsf07533.htm>

INSTRUMENT DESCRIPTION:

-Brief text describing the instrument with references

SeaBird SBE-911plus CTD unit with dual temperature and conductivity sensors, and added instruments as listed (www.seabird.com/products/profilers.htm):

Conductivity S/N 2545

Conductivity S/N 2619

Temperature S/N 2841

Temperature S/N 2824

Pressure Digiquartz with TC S/N 638 (83009)

PAR /Irradiance, Biosphere/Licor S/N QSP2300-70115

SPAR/Surface Irradiance, Biospherical Instruments S/N QSR2200-20270

Optical Transmissometer, Chelsea/Seatech/Wetlab CStar S/N CST-390DR

Fluorometer, Chelsea UV Aquatracka S/N 088234

Oxygen sensor, SBE-43 S/N 0904

Oxygen sensor, SBE-43 S/N 458

Altimeter S/N PSA916 – 1062

-Figures (or links), if applicable

Web reference to instrument:

http://www.seabird.com/products/spec_sheets/911data.htm

Figure showing CTD transect map: hly0701_PMEL_CTDmaplabels.gif

-Table of specifications (i.e. accuracy, precision, frequency, etc.)

Page 10 of Seabird instrument reference (above)

DATA COLLECTION and PROCESSING:

-Description of data collection

Data were collected via CTD platform operated by Scripps Institution of Oceanography technicians. At each CTD location, the CTD rosette was lowered to 10 meters to equilibrate, brought to surface, then lowered to within 5m of the bottom, at ~30m/minute down to 150 m (on average) and ~50m/minute below that. Water bottles were fired at desired depths on the upcast. Once on board, numerous water samples were taken from Niskin bottles by members of the interdisciplinary science team.

-Description of derived parameters and processing techniques used

All data are either instrument variables, calculated variables, or measured from bottle samples.

Instrument variables: pressure, temperature (primary, secondary), oxygen, transmissivity, attenuation, PAR, fluorometer.

Calculated values: salinity (primary and secondary, derived from conductivity and temperature, corrected by calibration with salt samples), chlorophyll-a (factory calibration), sigma-t, and dynamic height.

Bottle samples: nutrients (phosphate, silicate, nitrate, nitrite, ammonium), chlorophyll-a (total) and Phaeopigments (total) were obtained from Chlorophyll-a samples.

Not all variables were sampled from all bottles or on all casts. Selected variables have dual-unit listings. Chlorophyll method used: acidification technique (Holm-Hansen, O., et al, 1965).

Calibration coefficients for instruments are available in the attached file hly0701_CTDCalFile.txt

-Description of quality control procedures and Processing

Data are processed using Seabird CTD software and calibration file. Post-processing at the Pacific Marine Environmental Laboratory includes filtering extreme outliers, extrapolation of values from the top value collected at 3-4m to the surface. Each cast is visually reviewed for reasonableness and density inversions (greater than 0.02 sigma-t) caused by spurious measurements. This process is facilitated by comparison of the outputs of the 2 temperature and conductivity sensors. Profile data are bin-averaged to 1 meter. Nutrient samples were analyzed according to the methods of Gordon, et al (see reference below). Samples were collected in 50 ml high-density polyethylene bottles that were rinsed first with 10% HCl prior to each station, and rinsed at least three times with sample before filling. Some samples were refrigerated for 3-12 hours prior to analysis.

DATA FORMAT:

-Data file structure, format and file naming conventions (e.g. column delimited ASCII, NetCDF, GIF, JPEG, etc.)

Data files are in two formats. The first is a comma-separated text file with 1-line header and .odv suffix, formatted for use with Ocean Data View software. Along with profile data, discrete bottle samples are included at sampled depths, with other depths in those columns designated as non-data using -1.0e+10. The second file format is NetCDF (EPIC standard) format with meteorological and other metadata bundled in the file. "code" is an EPIC-NetCDF-specific key code and is self-explanatory. This format is defined at Unidata and PMEL-EPIC Web Sites.

<http://www.epic.noaa.gov/epic/software/>

<http://www.unidata.ucar.edu/software/netcdf/>

-Data format and layout (i.e. description of header/data records, sample records)

List of Variables with Short Name and Units (included in header)

Axes:

code	name	type	lower corner	upper corner	units
501	x lon	EVEN	165.3775 W		degree_west
500	y lat	EVEN	56.9935 N		degree_north
1	z dep	EVEN	0.00	67.00	dbar
624	t time	EVEN	13-Apr-2007 04:18		True Julian Day

Variable(s):

code	name	units
28	T TEMPERATURE (C)	C
35	T2 Secondary Temperature	C
41	S SALINITY (PSU)	PSU
42	S SALINITY (PSU)	PSU
70	ST SIGMA-T (KG/M**3)	kg m-3
10	DYN DYNAMIC METERS	dyn-m
971	rFv raw fluorometer Volts(CTD)	Volts
2930	Cl a CTD Chlorophyll-a factory cali	ugrams/l
916	PAR Photosynthetically Active Radi	V

905 PAR Photosynthetic Active Radiatio uEin m-2 s-1
 904 Tr Transmissometry (CTD) %
 55 ATTN ATTENUATION m-1
 65 O OXYGEN (UMOL/KG) umol/kg
 62 OST OXYGEN, %SAT %
 103 BTL NISKIN BOTTLE NUMBER
 286 PO4 PHOSPHATE (micromoles/kg) uM/kg
 288 SI SILICATE (micromoles/kg) uM/kg
 282 NO3 NITRATE (micromoles/kg) uM/kg
 284 NO2 NITRITE (micromoles/kg) uM/kg
 289 NH4 AMMONIUM (micromoles/kg) umol/kg
 933 Cla Chlorophyll ugrams/
 2933 Cla Chlorophyll-a total ugrams/l
 907 Fph Phaeopigments ugrams/l

Sample Data Records with Column Headers (NetCDF format):

Variables

scan, T, T2, S, S, ST, DYN, rFv, Cla, PAR, PAR, Tr, ATTN, O, OST, BTL, PO4, SI, NO3, NO2, NH4,
 Epic codes 28,35,41,42,70,10, 971, 2930, 916, 905, 904, 55, 65, 62,103, 286, 288, 282, 284, 289
 Pres(db) T T2 S S ST DYN O OST TRN Tr ATTN
 PAR PAR SPAR BTL PO4 SI NO3 NO2 NH4 rFv Cla
 Chl Cla Cla Cla Cla Cla Cla Fph
 1, 0.00,-0.59310 ,-0.59400 , 31.820 , 31.820 , 25.563 , 0.0000 , 0.10000E+36, 0.10000E+36,
 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36,
 10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36,
 2, 1.00,-0.59310 ,-0.59400 , 31.820 , 31.820 , 25.563 , 0.24122E-02, 0.10000E+36, 0.10000E+36,
 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36,
 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36
 3, 2.00,-0.59310 ,-0.59400 , 31.820 , 31.820 , 25.563 , 0.48243E-02, 0.10000E+36, 0.10000E+36,
 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36,
 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36
 4, 3.00,-0.59310 ,-0.59400 , 31.820 , 31.820 , 25.563, 0.72364E-02, 2.7064, 3.9592 , 3.0897, 115.19, 62.194,
 1.8997 , 459.45, 126.8 , 8.0000 , 0.49800 , 13.60 , 0.90000 , 0.30000E-01, 0.90000 , 10000E+36, 0.10000E+36,
 0.10000E+36
 5, 4.00,-0.59450,-0.59480, 31.820 , 31.821, 25.563, 0.96484E-02, 2.7273 , 4.1766 ,
 2.8836, 68.250 , 62.194 , 1.8996 , 460.39, 127.08, 0.10000E+36, 0.10000E+36, 0.10000E+36,
 0.10000E+36, 0.10000E+36, 0.10000E+36, 10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36
 6, 5.00,-0.59140,-0.59180, 31.820 , 31.821, 25.563, 0.12060E-01, 2.7321, 4.1731, 2.6849, 44.295 , 62.120,
 1.9044, 460.93 , 127.24 , 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36, 0.10000E+36,
 10000E+36, 0.10000E+36, 0.10000E+36

Sample Attributes (Metadata) in NetCDF files

Attribute(s):

Number of attributes listed: 24 Number of attributes in file: 24
 CREATION_DATE = 11:48 15-MAR-11
 CRUISE = H10701
 CAST = 016
 INST_TYPE = Sea-Bird CTD SBE 9
 DATA_TYPE = CTD
 DATA_CMNT = Data from Seasoft File 016.cnv:using vars,sal41
 COORD_SYSTEM = GEOGRAPHICAL
 WATER_MASS = B
 BAROMETER = 1002
 WIND_DIR = 354
 WIND_SPEED = 16
 AIR_TEMP = -2.70000005

-Description of flags, codes used in the data, and definitions (i.e. good, questionable, missing, estimated, etc.) Missing data are denoted by 1.0e-35 (NetCDF) or -1.0e+10 (text files). All data points are either accepted (retained) or rejected (deleted) during processing, so data are all defined as good. Data values above 5-10 meters depth may have been extrapolated to surface.

DATA REMARKS:

-Software compatibility (i.e. list of existing software to view/manipulate the data)

Software for viewing and manipulating NetCDF data are listed at the Unidata/UCAR site <http://www.unidata.ucar.edu/software/netcdf/software.html>. "ncdump" tool is suggested as a start. Ferret software (NOAA/PMEL) and Matlab can read and manipulate NetCDF files and grids..

REFERENCES:

-List of documents cited in this data set description

- Seabird SBE 911plus CTD manual
http://www.seabird.com/products/spec_sheets/911data.htm
- CTD map: hly0701_PMEL_CTDmap.gif
- CTD Calibration file: hly0701_CTDCalFile.txt
- Gordon, L.I., Jennings, J.C., Jr., Ros, A.A. and Krest, J.M., 1993. A suggested protocol for continuous flow automated analysis of seawater nutrients (Phosphate, nitrate, nitrite and silicic acid) in the WOCE Hydrographic Program and the Joint Global Ocean fluxes Study. WOCE Operations Manual, Part 3.1.3 "WHP Operations and Methods" (WOCE Hydrographic Program Office, Methods Manual 91-1) Bundesamt für Seeschifffahrt und Hydrographie, Postfach 30 12 20, 2000 Hamburg 36 Germany.
<http://chemoc.coas.oregonstate.edu:16080/~lgordon/cfamanual/whpmanual.pdf>--N.A.
- Welschmeyer. 1985(1994). Fluorometric analysis of chlorophyll- a in the presence of chlorophyll b and pheopigments, Limnol.Oceanogr. 39(8), 1994, 1985-1992.
- HOLM-HANSEN, O., C. J. LORENZEN, R. W. HOLMES, AND J. D. STRICKLAND. 1965. Fluorometric determination of chlorophyll. J. Cons. Int. Explor. Mer 30: 3-15.
- NSF Award: NSF07-533