

**TITLE:** CTD casts, BEST Spring Cruise 2010, R/V Thompson (TN249)

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SAME AS ABOVE and

This documentation/data/metadata: Peggy Sullivan [peggy.sullivan@noaa.gov](mailto:peggy.sullivan@noaa.gov)

Data Files: Dave Kachel [dave.kachel@noaa.gov](mailto:dave.kachel@noaa.gov)

**FUNDING SOURCE AND GRANT NUMBER:**

National Science Foundation through BEST (Bering Sea Ecosystem Study)

Award Numbers 0732430

**DATA SET OVERVIEW:**

**-Introduction or abstract**

This CTD data set, consisting of 245 casts, was collected during a multi-disciplinary Bering Sea ice cruise on the R/V Thompson (TN249, May 9- June 14, 2010). The cruise was funded by NSF for the BEST (Bering Sea Ecosystem Study) program, and supported by numerous agencies and institutions. The CTD operations on this cruise were managed by personnel from NOAA/PMEL in the EcoFOCI program, with deployment assistance from Thompson 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” in text data files, and as 1.0e-35 in NetCDF files. CTD data contacts: Phyllis Stabeno, Peggy Sullivan. Nutrient and bottle data contact: Calvin Mordy.

**-Time period covered by the data:** May 9- June 14, 2010

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

245 CTD casts deployed within latitude 55N to 63N and longitude 163W to 180W

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

Cruise Site: [http://www.ecofoci.noaa.gov/cruiseWeb/Thompson\\_May2010/](http://www.ecofoci.noaa.gov/cruiseWeb/Thompson_May2010/)  
BEST/BSIERP Site: <http://bsierp.nprb.org/>  
BEST Data Management: [http://bsierp.nprb.org/data\\_mgt/](http://bsierp.nprb.org/data_mgt/)  
NSF Award: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0732430>

## **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](http://www.seabird.com/products/profilers.htm)):

Conductivity S/N 2903

Conductivity S/N 2881

Temperature S/N 1703

Temperature S/N 2131

Pressure Digiquartz with TC S/N 94112-0216

PAR /Irradiance, Biospherical/Licor S/N 4747

Transmissometer, Chelsea/Seatech/Wetlab CStar S/N CST-401DR

Fluorometer, WET Labs ECO-AFL/FL S/N 229

Oxygen sensor, SBE-43 S/N 0023

Oxygen sensor, SBE-43 S/N 0542

Altimeter S/N 1137

### **-Figures (or links), if applicable**

Web reference to instrument:

[http://www.seabird.com/products/spec\\_sheets/911data.htm](http://www.seabird.com/products/spec_sheets/911data.htm)

Figure showing CTD transect map: tn249\_PMEL\_CTDmap.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 PMEL with assistance from ship 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 size fractionated using two methods; acidification and Welschmeyer). Phaeopigments (total and size fractionated) were obtained from Chlorophyll-a samples.

Not all variables were sampled from all bottles or on all casts. Selected variables have dual-unit listings. Two chlorophyll methods were used: the acidification technique (Holm-Hansen, O., et al, 1965), and the Welschmeyer method (Welschmeyer, 1985). Calibration coefficients for instruments are available in the attached file tn249\_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 3-5m 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, and some frozen for later analysis.

### **DATA FORMAT:**

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

Data sets include continuous profile data and bottle samples from discrete depths. Data files are provided in two formats: NetCDF, and tab-delimited ASCII text.

NetCDF (EPIC standard) format includes meteorological and other metadata. "Code" is an EPIC-NetCDF-specific key code defining variables and units (see list below). Missing data are denoted by 1.0e-35. The format is defined at Unidata and PMEL-EPIC Web Sites.

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

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

The text format is a tab-delimited file with 1-line header and .odv suffix, formatted for use with Ocean Data View and other ASCII-friendly software. Missing data are designated using -1.0e+10.

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

##### **List of Variables with Short Name and Units (included in header) and grid definition**

Axes:

code	name	type	lower corner	upper corner	units
501 x	lon	EVEN	174.3463 W		degree_west
500 y	lat	EVEN	58.2220 N		degree_north
1 z	dep	EVEN	0.00	895.00	dbar
624 t	time	EVEN	22-May-2010 04:20		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





tn249	001	C	00101	test	test	2010-05-11 00:17191.783	56.64617	110.0	1.000
	2.285000		59.08460		28.95600		26.38650	23.11437	0.4745780E-02
	4.535800		94.39170		0.2309000		0.6850000E-01	0.4560000E-01	2.700200
	13.84000		378.5420		342.8960		109.8225		-1.0e+10-1.0e+10-1.0e+10-1.0e+10
									-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10
tn249	001	C	00101	test	test	2010-05-11 00:17191.783	56.64617	110.0	2.000
	2.285000		59.08460		28.95600		26.38650	23.11437	0.9491529E-02
	4.535800		94.39170		0.2309000		0.6850000E-01	0.4560000E-01	2.700200
	13.84000		378.5420		342.8960		109.8225		-1.0e+10-1.0e+10-1.0e+10-1.0e+10
									-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10
tn249	001	C	00101	test	test	2010-05-11 00:17191.783	56.64617	110.0	3.000
	2.285000		59.08460		28.95600		26.38650	23.11437	0.1423725E-01
	4.535800		94.39170		0.2309000		0.6850000E-01	0.4560000E-01	2.700200
	13.84000		378.5420		342.8960		109.8225		-1.0e+10-1.0e+10-1.0e+10-1.0e+10
									-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10
tn249	001	C	00101	test	test	2010-05-11 00:17191.783	56.64617	110.0	4.000
	2.285000		59.08460		28.95600		26.38650	23.11437	0.1898294E-01
	4.535800		94.39170		0.2309000		0.6850000E-01	0.4560000E-01	2.700200
	13.84000		378.5420		342.8960		109.8225		-1.0e+10-1.0e+10-1.0e+10-1.0e+10
									-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10
tn249	001	C	00101	test	test	2010-05-11 00:17191.783	56.64617	110.0	5.000
	2.284200		59.08560		28.95630		26.38700	23.11466	0.2372845E-01
	4.531400		94.29800		0.2348000		0.6870000E-01	0.4750000E-01	2.630300
	12.79400		378.4990		342.6070		109.8123		-1.0e+10-1.0e+10-1.0e+10-1.0e+10
									-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10-1.0e+10

**-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](http://www.seabird.com/products/spec_sheets/911data.htm)
- CTD map: tn249\_PMEL\_CTDmap.gif
- CTD Calibration file: tn249\_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: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0732430>