CCE-P0605 and CCE-P0704 Hydrographic & Biological Data

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Database CCE Process Cruises

The hydrographic and some biological data from cruises CCE-P0605 and CCE-P0704 are in the attached data base. Each table and query is briefly described in the table 0_TableDescription or 0_QuerryDescription. Each field (i.e. column in a table) is documented in the 'Field Description'. You can view this by opening any table in 'Design View' or switching to 'Design View' if the table is already open in 'Datasheet View'.

Please read the information below before working with these data!!!

CTD Data

The CTD systems were set up, CTD data were collected and CTD data were processed by the R/V Knorr and R/V Thompson's techs. During the setup and data collection stages some mistakes were made. To the extent that these were identified during post-cruise processing these were corrected and corrections and changes to the data are described below.

General Notes on Data: The data are of two types, *calibrated* data and *uncalibrated* data. The calibrated data are those for which it is assumed that reliable and stable calibrations exist. These are pressure, depth, temperature, conductivity, salinity and ISUS-derived nitrate for P-0704. The uncalibrated data are fluorescence, light transmission, oxygen concentrations and % O2saturation and irradiance. Uncalibrated data were made with sensors that had undergone calibrations in the past but the stability of the sensors' response over the cruises or the relationship of sensor raw signal to desired variable could not be ascertained independently. Even though every effort was made to assure that 'uncalibrated data' were correctly acquired and processed (see below), these data can not be used to make inferences about differences between cycles and cruises. The main value of these data is and their original intended purpose was that these be used to reveal water column structure at each individual station.
To summarize, the accuracy of uncalibrated data is unknown and it must be assumed that the accuracy of these data differed between cycles and cruises!

General Notes on Data Processing: The .cnv and .btl files were further processed using a set of Matlab scripts that are in folder 'CCE-P0704\CTD\Matlab Scripts used for P0704'. These scripts are internally documented.
Cast information was extracted from the headers of .cnv files using CTD_info.m. The resulting file was e.g., CastInfo_Cy1.txt. These files were imported into the Access table CTD_CastInfo.
CTD bottle data were extracted from .btl files using CTD_ bottle.m. The resulting file was e.g., BottleData_Cy1.txt. These files were imported into the Access table CTD_BottleData.
CTD downcast data were extracted from .cnv files using CTD_ data.m. The resulting file was e.g., Downcastdata_Cy1.txt. These files were imported into the Access table CTD_Downcast.
CTD upcast data were only generated for P0605 as described above for the downcast data.

Salinity CCE-P0605: 5 salinity samples were taken from each noon cast and run ashore in the CalCOFI lab one week after the end of the cruise. A comparison between the CTD salinity sensors (Sal00 and Sal11) and the bottle salinities was made for the all samples – hardly any deep samples were available for this comparison. The offsets (CTD-Sensor_Sal minus Bottle Sal) and their standard deviations were 0.036 +/- 0.18 and -0.040 +/- 0.18 for sensors Sal00 and Sal11, respectively (yes, these are pretty bad data). This correction should be applied to all Sal data, e.g.: True Sal00 = CTD-Sensor_Sal00 – 0.036.

Salinity CCE-P0704: 5 salinity samples were taken from each noon cast and run ashore in the CalCOFI lab. A comparison between the CTD salinity sensors (Sal00 and Sal11) and the bottle salinities was made for the deep samples. The offsets (CTD-Sensor Sal minus Bottle Sal) and their standard deviations are 0.0003 +/- 0.0034 and -0.0030 +/- 0.0033 for sensors Sal00 and Sal11, respectively. Thus Sal00 should be used for all calculations without any correction.

PAR CCE-P0704: The PAR sensor used during the cruise was not properly calibrated.

Light Transmission: Data were collected with Wetlabs C-Star 660 nm on each cruise. As stated above, these are uncalibrated data. Transmissometers are not stable instruments. Their stability with time can be estimated from measurements at depth, 500 to 1000m, where concentrations of particles and dissolved material absorbing light at 660 nm are very low compared to the surface. Few such data are available for P0605 since CTD casts were usually only made to ~ 200 m. Thus %Trans was plotted for each cast in the depth range 150 to 250m (see below). Comments on this plot are found in cruise-specific sections.

P0605 & 0704 Beam Trans (%) at depth (150 to 250 m)
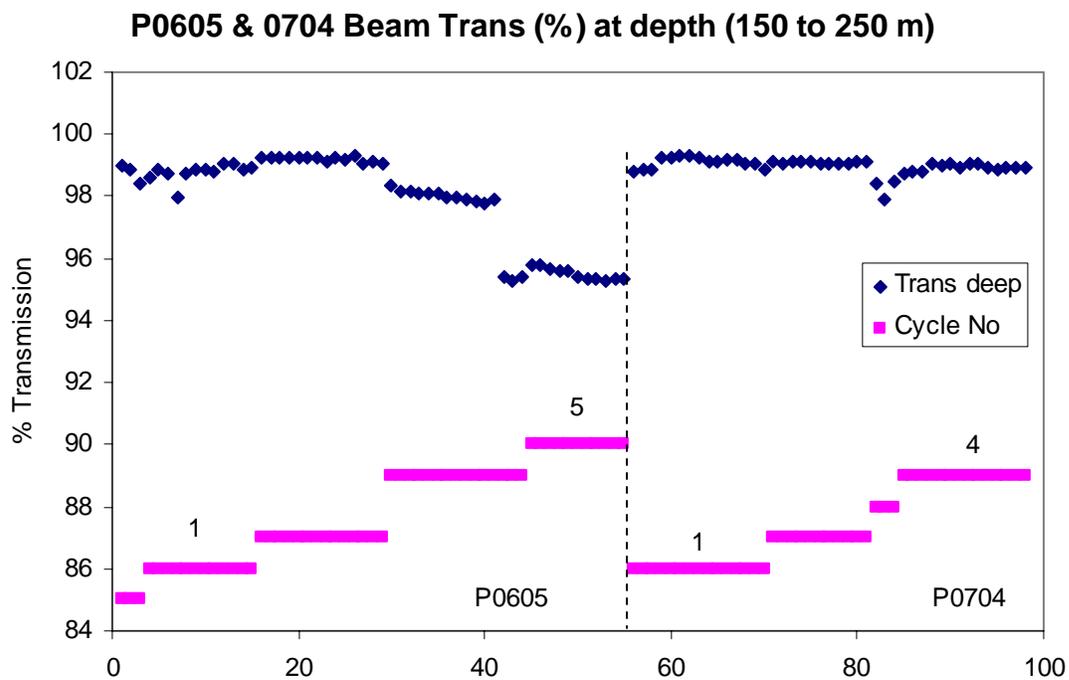
Average beam transmission (%) in the depth range 150 to 250 m for each cast for both 0605 and 0704 (blue diamonds) and cycle number + 86 (pink square) plotted against cast number. These

data represent those derived after corrections described below were made. The vertical dotted line separates the two cruises. Note that no data for cycle 3 P0605 are available for the depth range 150 to 250m.

A general impression of how surface layer data from different cruises and cycles compare can be gleamed from plots of beam-c vs. Chl a for depths < 21m.

CCE-P0605 & 0704 Chl a vs Beam-c
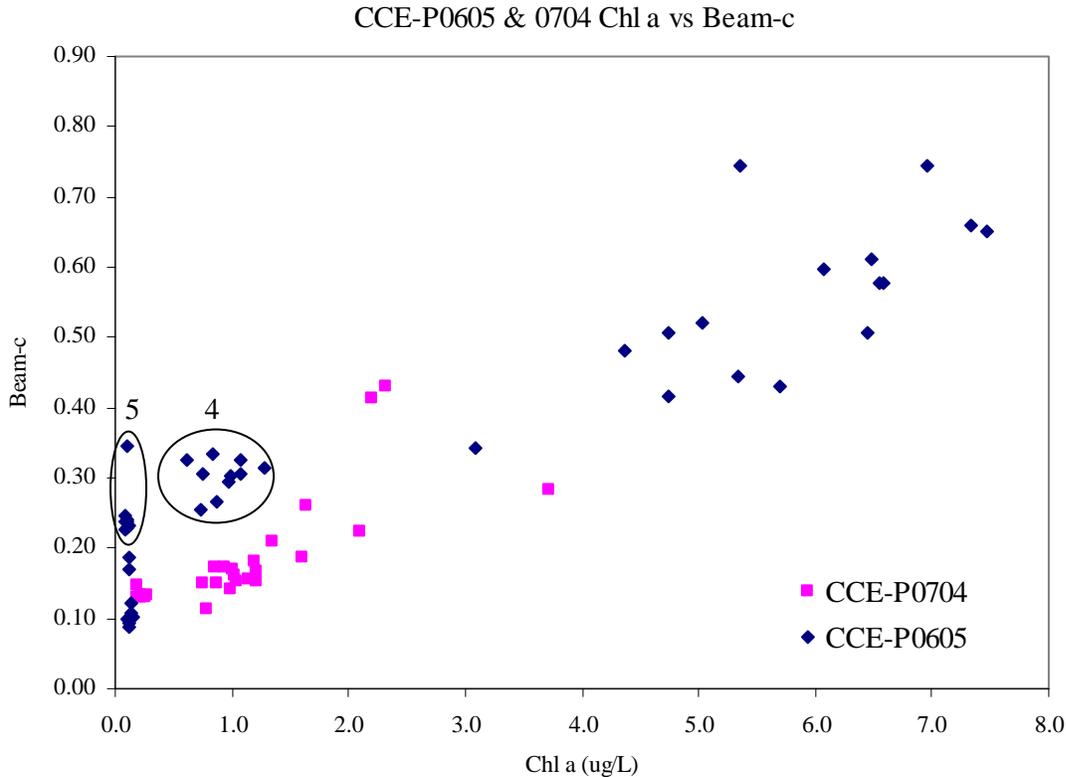
Data above are average values of Chl a and beam-c (calculated from: $c = -1/z \ln(\text{light transmission-decimal})$) for the surface layer (upper 20 m) for each cast. Values for P0605 cycle 4 and 5 are circled.

CCE-P0605: The instrument's calibrations were out of date (07-2004). However, the data appear to be generally consistent with data collected during P0704.. The calibration coefficients for casts 1-3 and 5-7 were incorrect; values of M= 20.34 and B= -1.1424 were used. Instead values of M= 22.53 and B= -1.2390 should have been used. Since B = - M * dark Voltage, data were corrected by multiplying data from these casts with the ratio of M(correct) / M(incorrect); i.e. 22.53 / 20.34 = 1.1077.
Plots of % Trans at depth (see above) show that corrections applied to casts 1-3 and 5-7 corrected the calibration coefficient problem. Values for cycles 4 and 5 are below expected values for the depth range (150 to 250 m). The same difference between cycles is also evident when data for the depth range 400 to 500 m are used (far fewer casts are available for this comparison).   The relationship between surface layer (upper 20 m) beam-c and Chl a for P0605 is similar to that for P0704. It is possible that values for cycle 4 and 5 deviate from this

relationship (see values above in circles); patterns similar to those observed for % Trans at depth. Deviations of %Trans or Beam-c for cycles 4 and 5 from expected values suggest that the instrument started drifting significantly. A correction could be made for this hypothesized drift by applying corrections of +1.79 and +3.55 % to the data from cycles 4 and 5, respectively, assuming that the expected value for %Trans between 150 and 250 m for these cycles is the average of the values observed at these depth for cycles P0605 1 and 2 and P0704 cycles 1, 2 and 4.

CCE-P0704: For cast 2 to 8 and 41 the wrong BeamTrans coefficients must have been used which resulted in low beam transmission values at depth. This error could not be traced to calibration values noted in existing con-files. Thus, the data were corrected by assuming that beam transmission for casts 2-8 and 9-20 should be identical at depth, i.e 400 and 500 m. A comparison of values at that depth showed that the offset was 12.76 %. This offset was applied to the data from casts 2-8 and 14.
Plots of %transmission at depth (see above) show that the instrument was stable over the course of the cruise. Note that cycle 3 values were collected in shallow water; lower %trans at depth for this cycle likely represents resuspended sediment. The relationship between surface layer (upper 20 m) beam-c and Chl a is stable too.

Oxygen CCE-P0704: Calibration coefficients had been entered incorrectly into all con-files for this cruise; i.e. the Voffset was entered as 0.5114; the correct value is -0.5114. To correct this OxymicroM values were converted to Oxy_ml/L values by multiplication with $1/(2 * 22.3916)*((1000 +Density)/1000)$.. The correction was calculated from $0.3411 * 2* (-0.5114)* EXP(0.0009*TempK) * O2Sat * EXP(0.000135*Pressure)$. The correction was added to the erroneous value of Oxy_ml/L. This value was converted to uM as described above.

ISUS Calibration CCE-P0704: Nitrate bottle samples were merged with CTD bottle data and measured NO3 regressed against ISUS_V1. The result of the comparison is shown below. Using the derived regression (NO3 = -10.03+25.92*ISUS_V1), NO3 concentrations were calculated from all ISUS_V1 and the data were deposited into the database as a separate table.

NO3 vs Isus Voltage

Residuals - NO3 - pred NO3
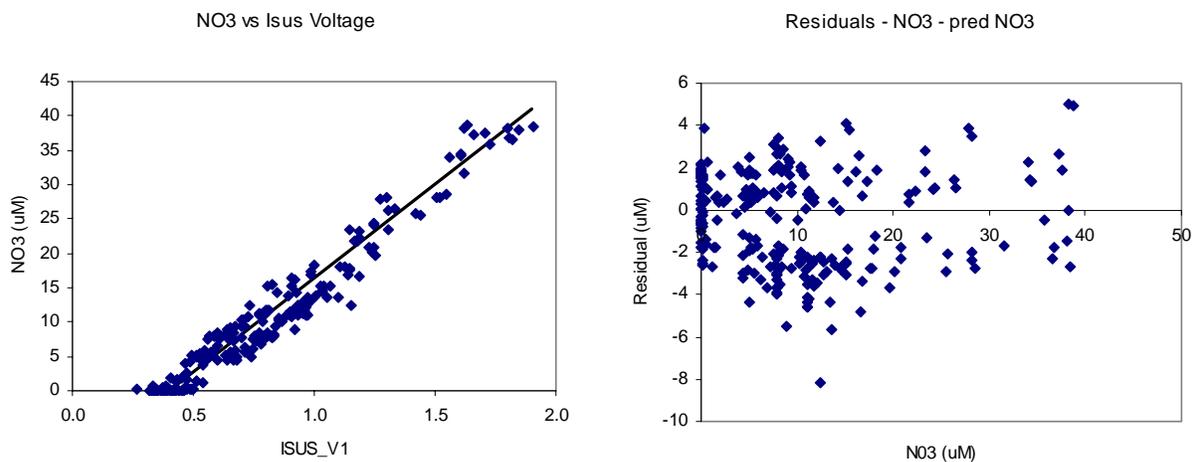
Chl a Fluorescence: The interpretation of in vivo fluorescence is difficult due to Fluor quenching, a photo protective mechanisms employed by phytoplankton particularly during the day. Thus a comparison was only made between extracted Chl a and CTD fluorescence for data collected at night (for UTC between 4 and 14) in the upper 20 m of the water column. The relationships are surprisingly good for the two cruises cruise, following the equations:
CCE-P0605: Chl a (ug/L) = 1.11 * Fluor (V) + 1.24
CCE-P0704: Chl a (ug/L) = 0.36 * Fluor (V) + 0.27.
Note that these relationships are substantially different, precluding comparisons between cruises using fluorescence data. *NOTE: The CCE-P0704 Fluorescence values plotted were increased by a 3-fold factor (see CTD cruise data), as a result of this relationship – RWS.*

Fluor (V) vs Chl a (ug/L)
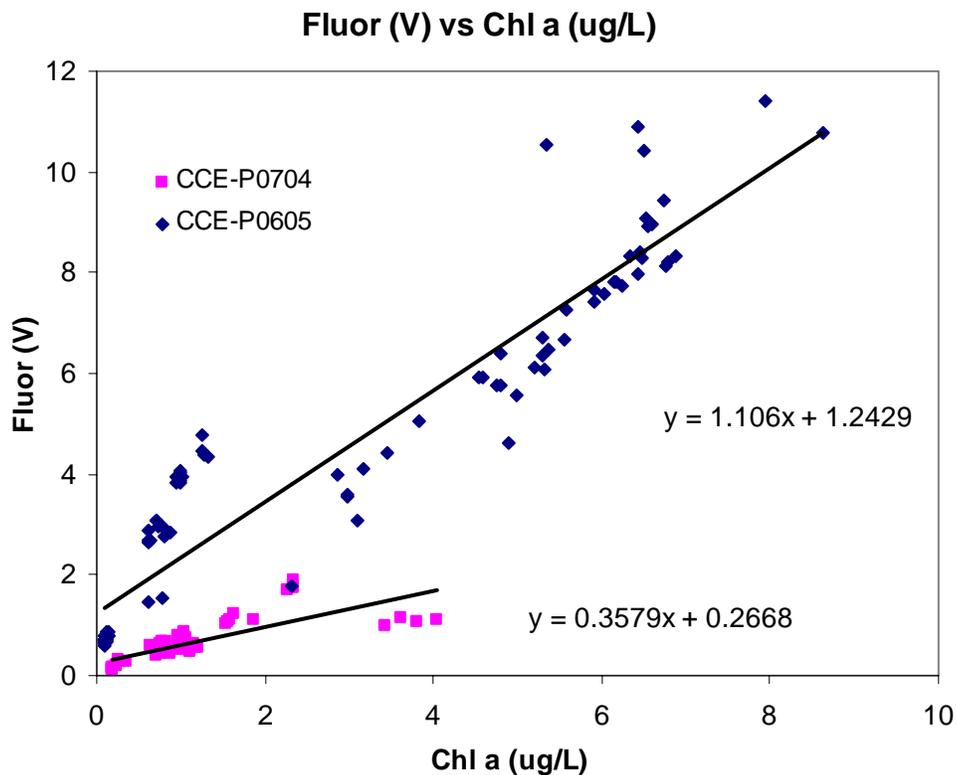
CTD Access Tables

CTD-Downcast
This table consists of the concatenated Seabird data files (.cnv) that were generated by the ship's techs using the seabird processing software. The form of the table was modeled after the one generated after cruise CCE-P0605. Thus data not available for P0704 - Surface Par, Cpar – are left empty.

CTD-Upcast

This table consists of the concatenated Seabird data files (.cnv) that were generated by the ship's techs using the seabird processing software. These files were only generated during cruise

P0605. These are not available for cruise P0704. If required, these could be generated from the raw CTD data.

CTD-Bottle Data

This table consists of the concatenated Seabird bottle data (.btl) files that were generated by the ship's techs using the seabird processing software. The form of the table was modeled after the one generated after cruise CCE-P0605. Thus data not available for P0704 - % O2 saturation, Surface Par, Cpar, TimeSec, and Scan – are empty columns.

P0704: The transmissometer data – 'TransPer' – don't make any sense relative to the transmissometer data listed in table CTD_Downcast. %O2 Saturation was not calculated by the Seabird software. This was done during processing of the Seabird .btl files.

CTD_SampleLog

This table only contains data for P0605 since its utility was questionable.

Underway Data

The systems employed aboard the R/V Knorr and Thompson to collect data while underway on environmental conditions and ship's status differed a lot. Thus it was not attempted to merge these disparate data sets. Differences are calculated CTD minus IMET.

P0605_IMET Data:

Comparison between CTD and IMET data: Data extracted using query 'Comp CTD & IMET' for IMET_Time between CTD_Time and CTD_Time + 5 min and Pressure between 3 and 5 m.

Comp CTD & IMET							
Cruise	Cycle	CTD_Temp	IMET_Temp	del_Temp	CTD_Sal	IMET_Sal	del_Sal
CCE-P0605	1	12.13	12.14	-0.02	33.60	33.80	-0.21
CCE-P0605	2	14.61	14.68	-0.07	32.93	33.13	-0.20
CCE-P0605	3	13.78	13.72	0.07	33.41	33.59	-0.19
CCE-P0605	4	14.77	14.79	-0.02	33.30	33.44	-0.14
CCE-P0605	5	16.41	16.41	0.00	33.13	33.26	-0.13

The difference between CTD and IMET temperatures is ranges from 0.00 to -0.07, possibly reflecting the warming of water in the sea-chest. The difference for some casts was substantially higher, ranging from -0.28 to +-0.65. The salinity differences decreased with time from -0.21 to -0.13, suggesting that the IMET conductivity sensor drifted with time (fouling?).

P0704_DAS Data:

Comparison between CTD and DAS data: Data extracted using query 'CTD_DAS Comparison & SurfPAR' for DAS_Time between CTD_Time and CTD_Time + 5 min and Pressure between 3 and 5 m. Differences are calculated CTD minus DAS.

Comp CTD & DAS							
Cruise	Cycle	CTDTemp	DAS_Temp	delTemp	CTDSal	DAS_Sal	delSal
CCE-P0704	1	12.45	12.48	-0.03	33.54	33.45	0.09
CCE-P0704	2	14.25	14.27	-0.02	33.17	33.08	0.10
CCE-P0704	3	11.92	11.93	-0.01	33.67	33.53	0.14
CCE-P0704	4	12.26	12.27	-0.02	33.59	33.47	0.11

The difference between temperatures is -0.03 C or less, likely reflecting warming of water in the sea-chest. The salinity differences ranged from +0.09 to +0.13. This is a bit large; the DAS Cond sensor may be off producing a biased DAS Salinity on the order of about +0.1.

Plots

Contour plots: The data base was used to extract data for contour plotting using the query 'CTD_Contour Data'. The result of the query was saved as, e.g. 'CCE-P0704 Cy1 CTDContour.xls'.   The entire file was read into Matlab using 'xlsread.m' and the data were plotted using the various contour plot scripts, e.g. CTDContour_Temp.m. The contour plots that were generated are in the folder 'CCE-P0704\Analysis\CTD Contour Plots'.

Depth Plots: The data base was used to extract data for depth plots using the query 'CTD_DownCasts'. The result of the query was saved and the entire file was read into Matlab using 'xlsread.m'. The data were plotted using either 'CTD_Plot_TFN.m' or 'CTD_Plot_TSD.m'.