

Final data

Final CTD data have passed through the CalCOFI quality control process and are considered the best data we provide. After standard SBE Data Processing (Seabird's data processing suite) tuned for our SBE 911 or 911+, the CTD asc files are additionally processed by SIO-CalCOFI in-house software (BtlVsCTD). Averaged (4-sec or 1m binavg) CTD sensor data are matched with corresponding bottle data and corrected two ways: **cruise-corrected** and **station-corrected**.

The final CTD.csvs include three versions of sensor data:

1. **SBE-processed data**; no bottle corrections applied
2. **Cruise-corrected CTD data** (column labels '_CruiseCorr'); cruise-corrected data are CTD sensor data corrected using regression coefficients derived from 4-sec ave sensor data vs bottle data comparisons for the **entire cruise** (all casts with bottle samples; n~1400; fliers omitted).
3. **Station-corrected CTD data** (column labels '_StaCorr') are CTD sensor data corrected using regression coefficients generated dynamically for **each cast**, 1m binavg sensor data vs bottle data (n~20; fliers omitted). Since sensor behavior may vary from station-to-station, station-corrected CTD data for salinity, oxygen, estimated NO₃, estimated chlorophyll-a; corrected using the individual cast bottle samples **station-corrected CTD sensor data are considered the best**, particularly for estimated nitrate.

Data codes: if the primary sensor T, S, or O₂ data are questionable due to sensor failure or bio-fouling of the pump then secondary T, S, or O₂ sensor data are consider the best. Data quality codes of "8" for questionable sensor data or "9" for bad sensor data may be used to identify each sensors performance. If no data code is displayed then sensors were operating normally.

On Winter and Spring CalCOFI cruises, lines north of 76.7 may be occupied. There may be fewer bottle (0-12) samples collected due to analytical personnel limitations. **Cruise-corrected CTD sensor data** are available for those casts, using coefficients derived from earlier stations. Station-corrected CTD sensor data are only available on 500m casts with at least ~10 bottle samples; shallower than 500m stations require several bottle samples. Lastly, **upcast bottle data are used to correct both upcast AND downcast CTD sensor data** - both versions, cruise-corrected & station-corrected. This practice may be debated due to internal waves and hysteresis. If you disagree with bottle-correcting downcast sensor data, use the SBE-processed data whose column-headers do not include "_CruiseCorr" or "_StaCorr".

Final CTD data are offered as a single compressed .zip file (**YY-YYMMSS_CTDFinal.zip**) containing files in a folder structure **ASC-HDR, CSV_QC, CSV_QC/Plots, DB_CSV, and metadata**:

- **ASC-HDR** folder contains standard SBE data-processed CTD ascii-out files .asc & .hdr. The Seasoft data are processed according to Seabird's recommended protocol for our configuration of the 911+ CTD. The processing modules applied & their settings are listed in the individual .hdr files for each cast. These files are additionally processed using BtlVsCTD to generate the bottle-corrected CTD.csvs.
 - Filenames: *d* or *u*YYMM###.asc & .hdr, where *d* or *u* is down or upcast, YYMM is cruise year month, ### is cast number.
- **CSV_QC or CSV** folder contains the processed SBE .asc CTD sensor data, bottle-corrected CTD sensor data, & bottle data. The "**CSV_QC**" csvs are the latest CTD csv format with additional columns to list CTD sensor data quality codes.
 - **plots** subdirectory under **CSV_QC or CSV**, contains CTD T, S, O₂, Chl-a, & NO₃ sensor vs depth plots

plus bottle data for each cast. Filename: *YYMM_LLLLSSSS_###u* or *d*, where *YYMM* is cruise, *LLLLSSSS* is line.station, *###* is cast number, *u* or *d* is up or downcast. The axes labels distinguish which version of sensor data - cruise-corrected or station-corrected - are plotted. The symbols overlaid are the bottle data.

- **DB_CSV** folder contains two database-ready csvs files. Filename: *YY* is decade, *YYMM* is year-month cruise designation, *SS* is ship code, *###-###* are the beginning and end cast numbers, *D* or *U* denote down or upcasts
 - *YY-YYMMSS_CTDBTL_###-###U.csv* is the combined upcast file, all the individual upcast csvs combined.
 - *YY-YYMMSS_CTDBTL_###-###D.csv* if the combined downcast file, all the individual downcast csvs combined
 - *YYMM_CTDCast-ProcessingNotes.txt* contains the CTD cast & processing notes.
- **metadata** files include:
 - **cruise-correction regression pdfs:** *YYMMSS_FIVvsChla* = flurometer voltage vs chl-a; *YYMMSS_ISUVvsNO3* = ISUS voltage vs Nitrate; *YYMMSS_Ox1MLvsOxB* = primary oxygen ml/L vs bottle oxygen; *YYMMSS_Ox1UMvsOxB* = primary oxygen umol/kg vs bottle oxygen (Ox2 is secondary sensor vs bottle oxygen); *YYMMSS_SaltOffsets* = CTD primary & secondary salinities vs bottle salts >350m.
 - **bottle-correction regression coefficients tabulation.** *YYMM_DBcoeff_###-###.csv* is a tabulation of the coefficients used to bottle-correct CTD sensor data. Source: CTD vs Bottle regressions compiled by BtlVsCTD.exe
 - **sensor coefficients (xml).** *YYMM_xmlcoeff_###-###.csv* is a tabulation of the Seabird sensor coefficients used to derive standard Seabird data. Source: *.hdr* files extracted by BtlVsCTD.exe
 - **sensor spans (ranges).** *YYMM_span_###-###.csv* is a tabulation of the sensor measurement ranges extracted from the *.hdr* file by BtlVsCTD.
 - **.xls & .csv:** *YYMM_CTDCSV###-###.xls* is the BtlVsCTD-generated csv (*YYMM_CTDCSV###-###.csv*) imported into Excel so the CTD data processor can interact with the CTD+Bottle data. CTD data combined with corresponding bottle data are plotted then fliers & bad sensor data removed. The "cleaned" data are re-plotted and regressions for each data-type generated. This is done after post-cruise calibrations of analytical instrumentation are performed, preliminary bottle data are re-derived and combined with SBE-processed CTD sensor data for point-checking. Point-checking bottle & CTD data are performed by the sea-going CalCOFI Technical Group at SIO. Once bottle data are considered 'final', these data are again merged with SBE-processed CTD 1m binavg sensor data. Final regressions are generated in Excel and exported as jpgs & pdfs; the final correction coefficients are applied to CTD sensor data. Data are posted online along with the CTD Data Processing Notes. Preliminary CTD+bottle data may be posted but are for qualitative (non-quantitative) assessment of current conditions and should not be used for publications.
 - **YYMMSS_final.cfg** (for in-house use only) is the configuration files used by BtlVsCTD that contains the cruise-correction coefficients and sensor voltage configuration.
 - **YYMMSS_Events.csv** is the event log for a CalCOFI's cruise, typically to time & position (GPS) stamp data-generating cruise activities or events.

To summarize - if you want individual cast CTD data, look in the *asc-hdr* or *csv_qcf* folders for each cast's up & downcast data files. If you are interested in the entire cruise or all down or upcasts merged into two files then

