**BREA-MFP, CBS-MEA CTD data summary**

* **Summary and derived CTD variables requested for reporting and analyses**
* **Last update 20 April 2023**

**Background:**

CTD data was provided by Bill Williams (IOS), PI for physical oceanography sampling. The data was QAQCed, verified, and binned according to IOS protocols.

FWI CBS-MEA team requires summary and derived CTD variables for multi-variate analyses of fish, benthos, zooplankton and food-web datasets.

A data frame in R was developed to house the individual casts for each station and to calculate the summary variables for analyses. The following variables were included in the summary for each station with CTD data. The data frame includes all available casts from 2012 to 2021. The data frame will continue to be updated with new years of data. In addition, this file will be updated as new/changed output requests are discussed and included.

**1) Full Cast:**

-average temperature, salinity, oxygen and fluorescence (single value output)

-potential temperature for TS plots (profile output)

**2) Phytoplankton and oxygen:**

-maximum fluorescence value (mg/m3) in the cast

-depth at which the maximum fluorescence value occurs. Multiple depths can be returned since the max value can occur at more than 1 depth. The shallowest depth of the max value is provided.

-minimum oxygen value (ml/L) in the cast

-depth at which the minimum oxygen value occurs. Multiple depths can be returned since the minimum value can occur at more than 1 depth. The shallowest depth of the minimum value is provided.

**3) Mixed layer – approach A. Based on N2 calculation.**

-N2 max depth (m)

-average transmissivity, temperature, salinity, oxygen and fluorescence of the N2 mixed layer (surface to N2 max)

-heat content in N2 surface layer

-FW content in N2 surface layer

-log(N2) (profile output)

**4) Mixed layer – approach B. Surface layer depth based on potential density (PD) as described by Peralta-Ferriz and Woodgate (2015), using 0.1 kg/m3 and the shallowest CTD measurement**

-PD max depth (m)

-average transmissivity, temperature, salinity, oxygen and fluorescence of the PD mixed layer (surface to PD max)

-heat content in PD surface layer

-FW content in PD surface layer

**5) Fish specific (Andy, Krystal request)**

- “Surface layer”: average temperature, salinity, oxygen and fluorescence between 0 and 50 m (or shallower if the station is <50 m)

-start and end depth (m) for water layer that has a temperature 0 or colder AND salinity between 30 and 33.5 PSU (approximate Pacific water mass/halocline)

-depth (m) of temperature minimum in halocline/Pacific layer. Multiple depths can be returned since the min value can occur at more than 1 depth. The shallowest depth of the minimum value is provided.

-average temperature, salinity, oxygen and fluorescence for estimated halocline

-start and end depth (m) for water layer with a maximum temperature of 1°C AND salinity between 33.5 and 34.95 PSU (approximate Atlantic water mass).

-depth (m) where salinity reaches 34.95 (approximate Upper-Atlantic Thermohalocline). Multiple depths can be returned since the target value can occur at more than 1 depth. The shallowest depth of 34.95 is provided.

-depth (m) of temperature max in Atlantic layer. Multiple depths can be returned since the max value can occur at more than 1 depth. The shallowest depth of the max value is provided.

-average temperature, salinity, oxygen and fluorescence for estimated Atlantic layer

-estimated thermocline: distance between estimated bottom of halocline and Tmax in Atlantic layer = thermocline, Rudels et al. 1991 DOI: <https://doi.org/10.3402/polar.v10i1.6724>). The Rudels et al. 1991 paper is from Barents Sea and Fram Strait – i.e., no Pacific water in this region, so their results will not be directly applicable to our stations. \*use this for investigative purposes only.

-average temperature, salinity, oxygen and fluorescence for estimated thermocline

-start and end depth where temperature is <0oC AND salinity is <34.95 PSU for station >800 m deep (approximate ‘Arctic’ water mass)

-average temperature, salinity, oxygen and fluorescence for estimated Arctic layer

**6) Benthos specific:**

-Bottom temperature in degrees C; average of 3 bottom-most CTD measurements

-Bottom turbidity in FTU; average of 3 bottom-most CTD measurements

-Bottom salinity in PSU; average of 3 bottom-most CTD measurements

-Bottom oxygen concentrations in mL/L; average of 3 bottom-most CTD measurements

**7) Zooplankton specific: (a separate file with tow and strata depths is provided)**

-average temperature, salinity, fluorescence, and oxygen for total zooplankton net tow distance (max tow depth to surface)

-average temperature, salinity, fluorescence and oxygen for each, individual multi-net tow strata