

Files CTD_NBP2202_***.txt

Post processed data from the SeaBird sensor packages.

Data fields:

Time (Matlab time) - Time (UTC) as serial date number in Matlab convention (where 01-Jan-1900 00:00:00 is 693962.0)

Pressure (dBar)

Latitude

Longitude

Absolute Salinity (g/kg) calculated according to <http://www.teos-10.org>

Conservative temperature (degrees) calculated according to <http://www.teos-10.org>

Dissolved Oxygen (ml/l)

Meltwater Fraction (dimensionless), calculated according to Wåhlin et al, 2024

Instrument:

Dual packages consisting of one SBE19plus, one SBE43, and one pump (SBE5T) operating simultaneously. The packages had separated tubing systems but with inlets close to each other (Fig. 1).

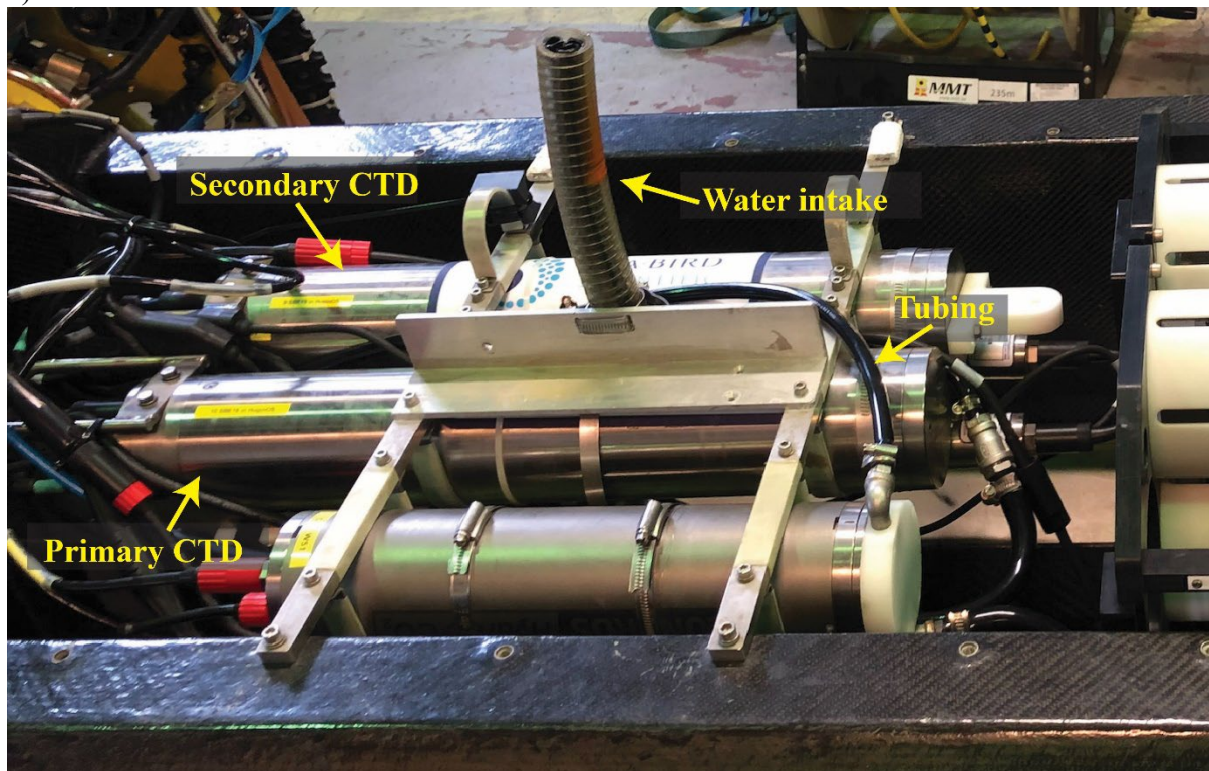


Figure 1: The two CTD packages mounted inside the vehicle

The following are the serial numbers of the sensors:

Port: SBE19plus, serial number: 19-7869, no SBE43 mounted

Starboard: SBE19plus, serial number: 19-7880 and SBE43, serial number: 0081

The SBE43 had the following calibration coefficients: Soc = 0.5418; Voffset = -0.4828; Tau = 1.14; A = -4.1263e-003; B = 1.3268e-004; C = -2.1621e-006; Enom = 0.036;

Post processing:

The following post processing was done to the raw data:

1) General check of data, removal of data while the vehicle was still in air. The pump for the port sensor had a bad cable. Since there was no growing offset we discarded all port data and only post processed the starboard data.

2) Spike removal using the following low pass filter:

`[b,a] = butter(5,0.1,'low');`

The following were the spike size limits: Temperature: 0.1; Salinity 0.01 and dissolved oxygen: 0.1.

3) Bin average to 1 Hz from the 4 Hz raw data

4) Offset adjustment based on the post-cruise calibrated ship CTD data (<https://www.usap-dc.org/view/project/p0010249>). These offsets were +0.026 mS/cm for conductivity, +0.0002 °C for temperature, and 0.22 ml/l for dissolved oxygen (Wåhlin et al, 2024).

Files NBP2202__10m.txt**

Ice draft (i.e. depth of the ice-ocean interface) as identified from the EM2040CX multibeam with serial number 2105. The instrument was mounted looking upwards, and operated at 300 kHz frequency. Data of quality higher than 13 was read into Eiva Navimodel Producer and gridded at 10 m grid. The data fields are:

latitude (decimal degrees),
longitude (decimal degrees)
ice draft (m)

Files NBP2202__2m.txt**

Ice draft (i.e. depth of the ice-ocean interface) as identified from the EM2040CX multibeam with serial number 2105. The instrument was mounted looking upwards, and operated at 300 kHz frequency. Data of quality higher than 13 was read into Eiva Navimodel Producer and gridded at 2 m grid. The data fields are

latitude (decimal degrees)
longitude (decimal degrees)
ice draft (m)

Files NBP2202__1m.txt**

Ice draft (i.e. depth of the ice-ocean interface) as identified from the EM2040CX multibeam with serial number 2105. The instrument was mounted looking upwards, and operated at 300 kHz frequency. Data of quality higher than 13 was read into Eiva Navimodel Producer and gridded at 1 m grid. The data fields are

latitude (decimal degrees)
longitude (decimal degrees)
ice draft (m)

File CTD_PostProcessed.txt

Temperature, salinity and depth from a SBE49 CTD cast through a hot-water borehole at 74° 22' 12.5328" S, 112° 32' 26.2782" W (74.370062 S, 112.540718 W). A Seabird SBE49 (SN 0219) FastCAT CTD profiler was mounted on a purpose-built deployment frame and attached to a winch cable with a mechanical termination and an electrical termination for live data collection. A downward and upward cast of temperature and salinity with pressure was made at 14:46 UTC on 7 Feb 2022, sampling at a rate of 16 Hz. Data collection took about an hour each way. The CTD spent a couple of minutes at the seabed (1226 dB, recorded by an RBRsolo), which introduced artifacts in the salinity observations during the upcast. The data were filtered, aligned in time, and averaged into 0.05 m vertical bins using the Seabird processing routines version 7.26.7.129. No thermal mass corrections were applied. The data were calibrated with CTD data from the RV/IB *Nathaniel B. Palmer* and CTD data from the AUV, and conductivity was shifted by +0.015 mS/cm. The manufacturer-stated accuracy of the temperature and conductivity sensors are ± 0.002 °C and ± 0.0003 S m⁻¹, respectively.

Data fields:

pressure (dB)

Conservative temperature (deg)

Absolute salinity (g/kg)

File dotson_cast_downcast.cnv

Raw data of the drill site CTD

Data fields:

Pressure (dB)

Conductivity (mS/cm)

Temperature (in situ, °C)

Scan (count)

Flag

Files DVL_velocities_despike_binavg_10s_mission_.txt**

Velocity as measured by the two acoustic doppler velocity loggers (ADCP), one mounted looking upward, and one mounted looking downward, on the AUV. The AUV was operated with speed control applied and hence had a stable speed in the surge (along-vehicle) direction. The bottom-track data provide the AUV's velocity over ground (measured by the downward mounted ADCP), and similarly for ice-track, velocity relative to the near-stationary glacier ice (measured by the upward mounted ADCP). From the bottom/ice-track velocity, water-track velocity, and orientation, the ocean current is derived subtracting the water-track data from the earth/ice-track data, followed by a rotation to geographical coordinates. The velocity data is binned in 10 s bins and detided using the Cats2008 model (Erofeeva et al, 2020).

Data fields

Time (Matlab time) - Time (UTC) as serial date number in Matlab convention (where 01-Jan-1900 00:00:00 is 693962.0)

Depth (m)

Latitude

Longitude

Northward velocity (m/s)

Eastward velocity (m/s)

References

S. Erofeeva, L. Padman, and S. L. Howard (2020). Tide Model Driver (TMD) version 2.5, Toolbox for Matlab

(https://www.github.com/EarthAndSpaceResearch/TMD_Matlab_Toolbox_v2.5), GitHub.

Wåhlin, A., Alley, K.E., Begeman, C., Hegrenæs, Ø., Yuan, X., Graham, A.G.C., Hogan, K., Davis, P.E.D., Dotto, T. S., Eayrs, C., Hall, R.A., Holland, D., Kim, T.W., Larter, R.D., Ling, L., Muto, A., Pettit, E.C., Schmidt, B.E., Snow, T., Stedt, F., Washam, P. M., Wahlgren, S., Wild, C., Wellner, J., Zheng, Y., Heywood, K.J., 2024. Swirls and Scopes - a new view of how the ocean melts Antarctica's ice shelves. Science Advances, accepted.