**ARCTIC PRIZE 2018-2019 mooring data processing**

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Introduction

This document describes the quality check undergone for the Arctic PRIZE mooring hydrographic data from the 2018-2019 deployments. Calibration dips were not conducted given the tight mooring turnaround time, so analysis is based on comparison CTD casts near the mooring. Moorings were deployed on the JCR cruise JR17006 in June 2018 and recovered during Arild Sundfjord’s Kronprins Haakon cruise in November 2019. The western mooring was visited by the James Clark Ross in July 2019 on cruise JR18006. Although ice cover was too thick to attempt mooring recovery, it was possible to conduct CTD casts nearby. Mooring positions, length of deployment and time and proximity of CTD casts are summarised in table 1. Cast times and mooring times do not overlap on recovery as due to ice conditions, the moorings were recovered before CTD casts were conducted.

Without dedicated calibration dips where the mooring instruments are physically attached to the CTD for a profile, it is not possible to quantify precise offsets for the instruments. It is however, possible to show that instrument data are within the range of local variability, and in one case to flag a major salinity offset.

Once instruments have been recalibrated back in the lab at NOC, this offset may be confirmed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Instrument** |  | **Start** | **End** | **Latitude (°W)** | **Longitude (°E)** | **Distance from mooring (km)** |
| **Mooring East** |  | 20/06/2018 12:00 | 18/11/2019 15:30 | 81° 18.14 | 31° 20.49 |  |
| Deployment CTD | JR17006 036 | 23/06/2018 12:22 |  | 81° 18.17 | 31° 18.92 | 2.92 |
| Recovery CTD | KPH Stn0338 | 18/11/2019 18:13 |  | 81° 18.14 | 31° 20.44 | 0.10 |
| **Mooring West** |  | 22/06/2018 12:30 | 25/11/2019 05:00 | 81° 02.04 | 18° 24.84 |  |
| Deployment CTD | JR17006 033 | 22/06/2018 13:50 |  | 81° 02.32 | 18° 24.69 | 0.56 |
| Midway CTD | JR18006 012 | 21/07/2019 21:41 |  | 81° 02.51 | 18° 25.68 | 1.79 |
| Midway CTD | JR18006 013 | 21/07/2019 23:48 |  | 81° 02.37 | 18° 26.70 | 3.50 |
| Recovery CTD | KPH Stn0417 | 25/11/2019 12:03 |  | 81° 02.02 | 18° 25.23 | 0.72 |

**Table 1:** Mooring and cast locations and times.

Temperature and salinity profiles from each CTD cast are presented in turn along with the relevant series of moored instrument data. No quantitative analysis is really possible as temporal and spatial variability hydrographic variability in the region makes it hard to differentiate instrument error from natural variability. To illustrate this, Figure 1 shows the observed variability in the CTD casts at each site.



 

**Figure 1:** Hydrographic variability at each mooring site.

Western Mooring

*Temperature*

Temperature profiles for the deployment, recovery and July 2019 attempted recovery. In each case instrument serial numbers are aligned with their mooring depth; SBE instruments measuring both temperature and salinity in black and Star Oddi temperature loggers in red.



**Figure 2:** Temperature profile from JR17006 CTD033 (black line) with SBE temperatures in black and Star Oddi temperatures in red from half an hour each side of the profile. 0.56 km apart.

It would appear that the star oddi loggers might be under recording temperature here, especially as the SBE37s seem relatively aligned to the profile, but it’s not enough evidence to base corrections on.



**Figure 3:** Recovery cast at midday on 25th Nov 2019 with moored temperature data closest in time (6 hours prior to cast) from the SBE37 (black) and Star Oddi (red). Temperature data from 12 (blue and magenta) and 24 (cyan and yellow) hours before the cast.

The measurements nearest in time to the CTD cast would suggest underestimation of temperature here, but the data from 12 and 24 hour prior to the cast shows the extent of the local variability.



**Figure 4:** Temperature profiles from JR18006 CTD012 (black) and CTD013 (red) with concurrent hour of moored data from SBE instruments (black) and Star Oddi (red).

This is the best comparison we have between CTD data and this mooring instrumentation. Spatially still quite far away, but a relatively stable looking water column under thick sea ice cover. Gives good confidence in these instrument data.

*Salinity*

Salinity profiles for the deployment, recovery and July 2019 attempted recovery, along with SBE 37 salinity measurements from the mooring.





**Figure 5:** Salinity profiles from CTDs as per table 1 (black/blue lines) with SBE salinities in black. In the recovery figure (lower) , points in blue are from 12 hours prior to CTD as cast was after recovery.

One notable discrepancy within these profiles is that the SBE37 serial number 9395 consistently overreads salinity by at least 0.1 PSU. Suggest using stable mid-deployment profile to calculate offset and apply to data.

Eastern Mooring

 

**Figure 6:** Deployment temperature and salinity profiles with one hour of instrument readings. (Single point star for 50214 as recording every 2 hours).

A reassuring comparison in terms of both temperature and salinity.



**Figure 7:** Recovery cast at with moored temperature data closest in time (6 hours prior to cast) from the SBE37 (black) and Star Oddi (red). Temperature data from 12 (blue and magenta) and 24 (cyan and yellow) hours before the cast.

It would be very good to see the post-deployment lab calibrations for these instruments (SBE at least). It is unlikely that every single temperature sensor has drifted in the same way, and for the same to happen with salinity.