

ITP 23 Overview

Deployment Location: 8/5/2008, 00:00 UTC at 81° 44.5'N, 150° 53.4'W

Last Location: 9/3/2011, 23:00 UTC at 80° 32.8' N, 107° 40.0' W

Duration: 1125 days

Distance Traveled: 6191 km

Number of profiles: 1410 in 702 days

Other instruments: AOFB 17

ITP 23 was deployed on a 1.9 m thick ice floe in the Beaufort Sea as part of the Beaufort Gyre Observing System (BGOS) during the JOIS 2008 cruise on the CCGS Louis S. St. Laurent. On the same icefloe, a Naval Postgraduate School Arctic Ocean Flux Buoy (AOFB 17) was also installed. The ITP included a dissolved oxygen sensor and operated on a standard sampling schedule of 2 one-way profiles between 7 and 760 m depth each day.

ITP 23 Deployment Operations

One day later and 120 miles north of the deployment of ITP 21, the ice conditions were still surprisingly thin and broken near 82° N latitude with only patches of remnant floes or old worn ridges from previous years. On morning reconnaissance to select the next ITP deployment site, the first landing of the helicopter was on a rafted floe (2 stacked floes) more than 5 m thick. The next landing site was too thin so also unacceptable, but finally a peanut-shaped floe that measured 4.07 m thick (with 0.34 m freeboard) on one side and 1.74 m thick on the other was selected. Rubble ridges 1-3 m thick surrounded the thick sides of the floe.

A few hours later, the operations began, all of the gear and personnel were transferred to the ice by the helicopter, and the AOFB was deployed on the thick side of the ice floe in 3 hours, with ice thermistor string installed at a spot 3.8 m thick. ITP 23 was deployed 80 m away on the thin 1.90 m side of the ice floe a little more than 2 hours later, and all the gear and personnel were returned to the ship by the helicopter.

ITP23 Data Processing

The 1410 profiles that were recovered from the ITP were processed according to the procedures described in the ITP Updated Data Processing Procedures. The processing parameters for ITP 23 are shown in the figures to the right. Buoy drift speeds were almost always less than 30 cm/s throughout the entire timeseries so the profiler covered the full extent of every profile, except 3 where profiler reset occurred. The CTD and dissolved oxygen data were largely free of icing and biofouling, providing 92% good data return over nearly 2 year long period.

Thermohaline staircases were present throughout the time series, enabling CTD lag corrections. All of the lags were in the typical range as previous systems for the first 400+ profiles then gradually shifted away from norm concurrent with deepening of the step region in the water column. Potential conductivity exhibits some small-scale shifts and several spikes over the period, with good agreement between the up and down profiles attesting to the absence of fouling. Similar correction to the dissolved oxygen sensor exhibits some modest shifts and creep during the first 400 profiles, but flattens out for the remainder of the data set.

ITP23 Data Description

The ITP profiler was configured to operate with a standard sampling schedule of 2 one-way profiles between 7 and 750 m depth each day. In the surface package, the GPS receiver was powered hourly to obtain locations, and buoy temperature and battery voltage status were recorded.

The buoy drifted moderately slowly along the northern perimeter of the Beaufort Gyre toward Ellesmere Island and Greenland towards Fram Strait for the first 18 months of its lifetime, then turned west. Quite unexpectedly, the profiler quit communicating 5 months later as the system was approaching the continental shelf, and the battery voltage of the profiler was still high. At the same time, GPS fixes became intermittent, suggesting that they buoy may have become involved in ice ridging which presumably broke the modem circuit with the underwater unit. Finally, after drifting over 6400 km in 3 full years, the surface packaged ceased communicating while heading towards the northern straits of the Canadian Archipelago.

The plots below are of the final, calibrated, edited data (as opposed to the raw data presented on the active instrument pages).

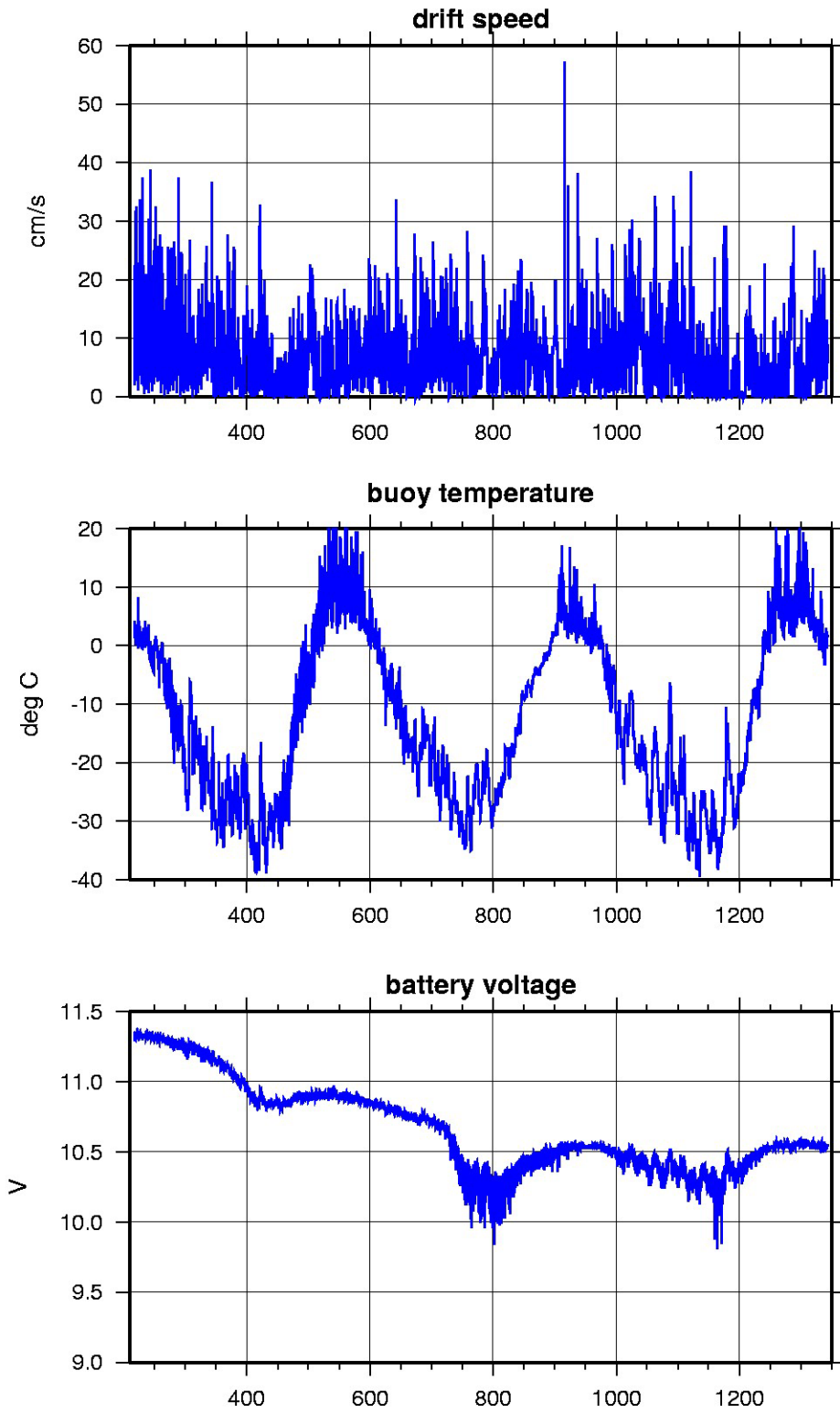
Level II hourly buoy location data in ASCII format: `itp23rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp23cormat.tar.Z` or `itp23cormat.zip`

Level III 1-db bin-averaged processed profile data in MATLAB format: `itp23final.mat`

Level III 1-db bin-averaged processed profile data in ASCII format: `itp23final.tar.Z` or `itp23final.zip`

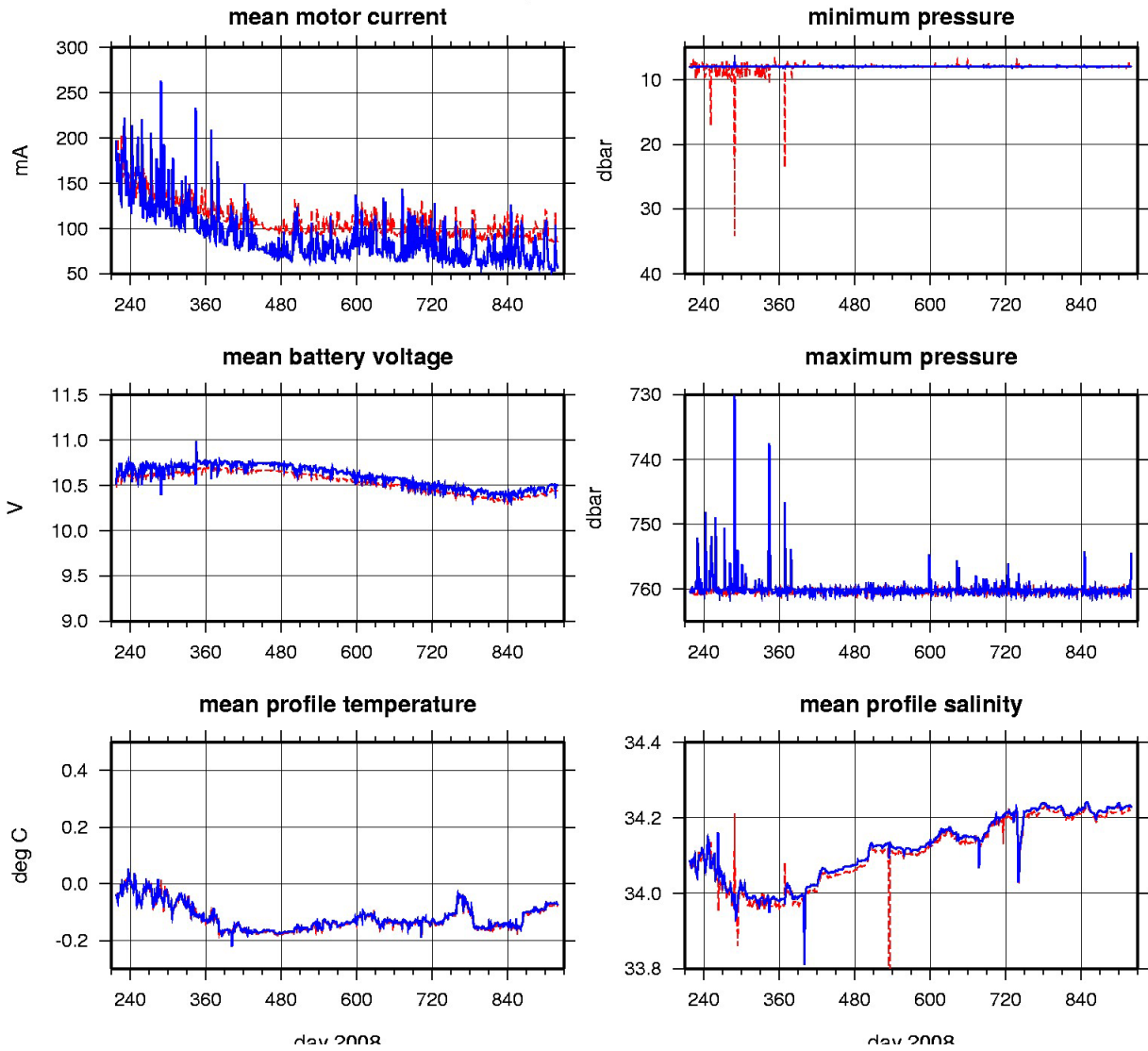
ITP23 Buoy Status (as of 2011/09/03)



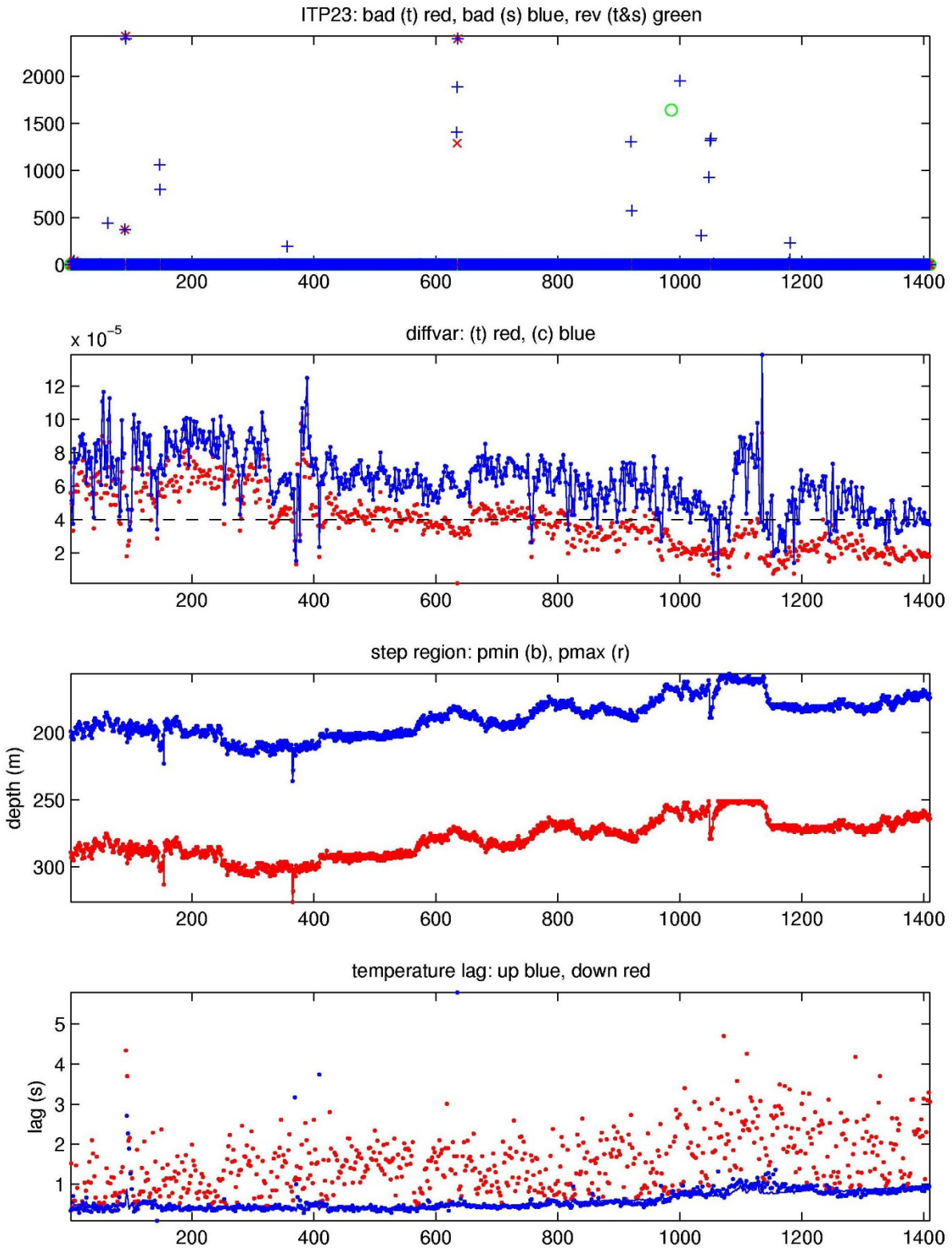
Nov 2008
ITP surface buoy status.

ITP23 Profiler Status (up to profile 1410)

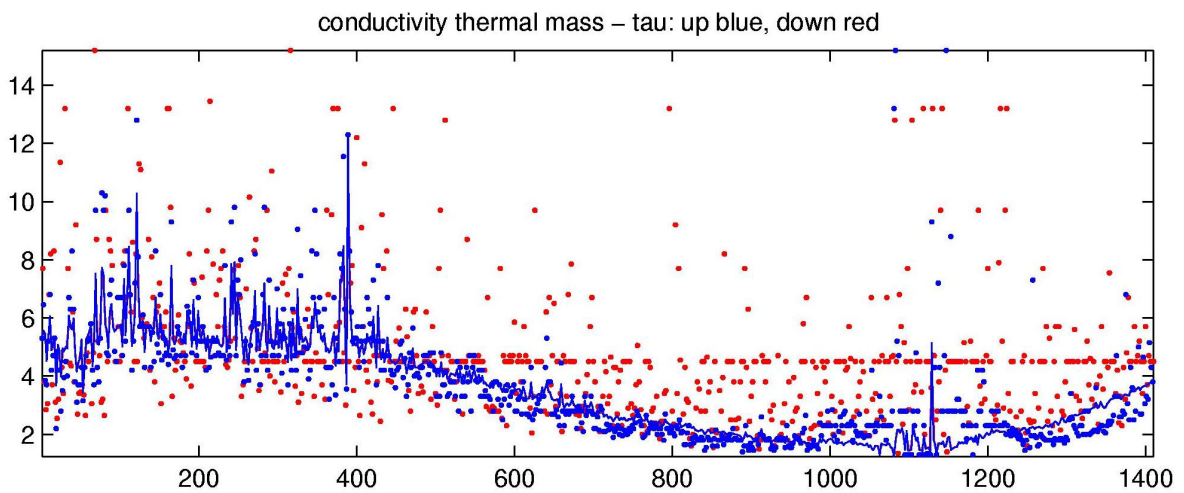
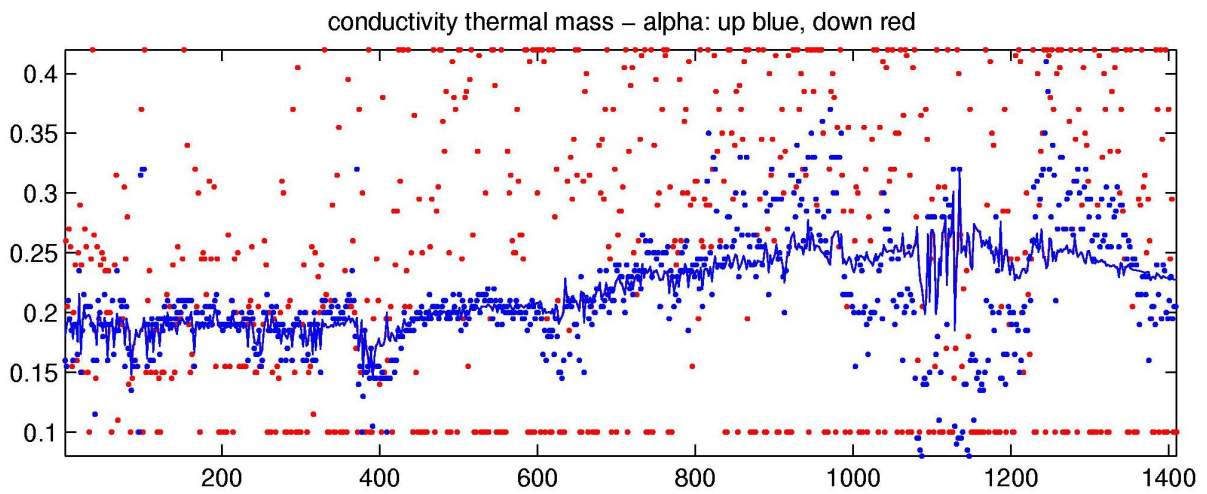
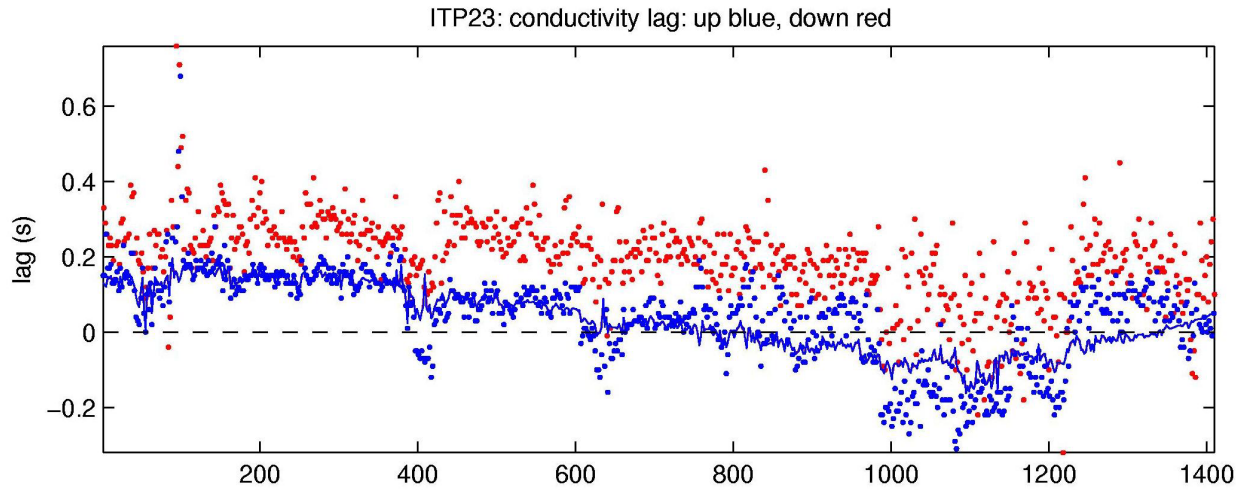
up solid, down dashed



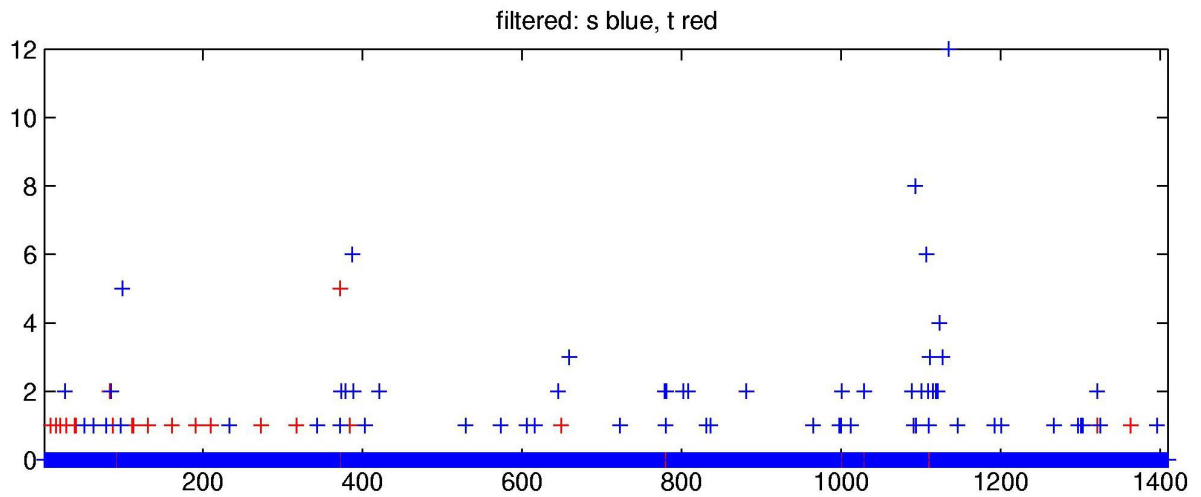
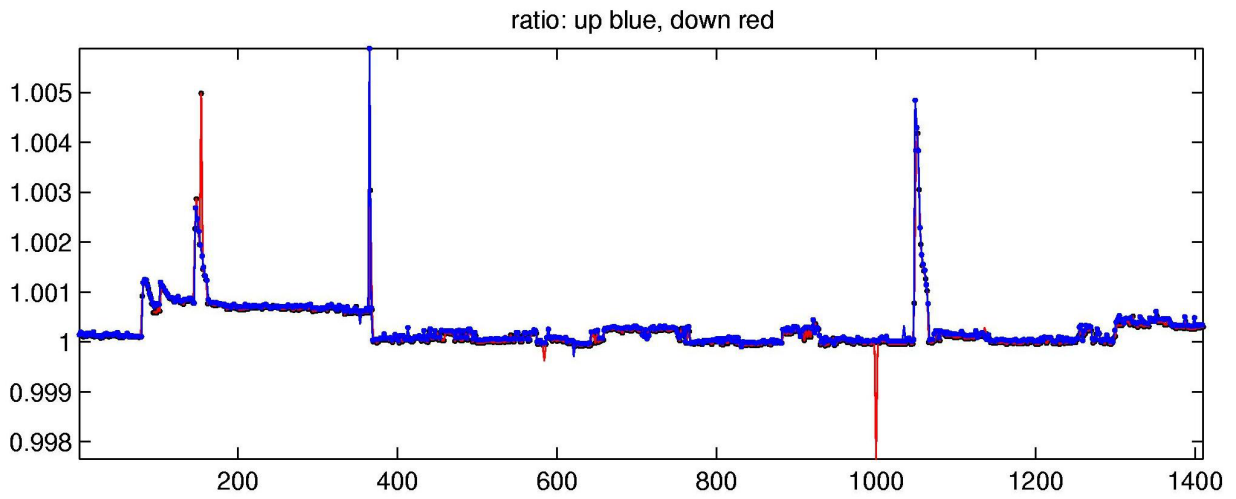
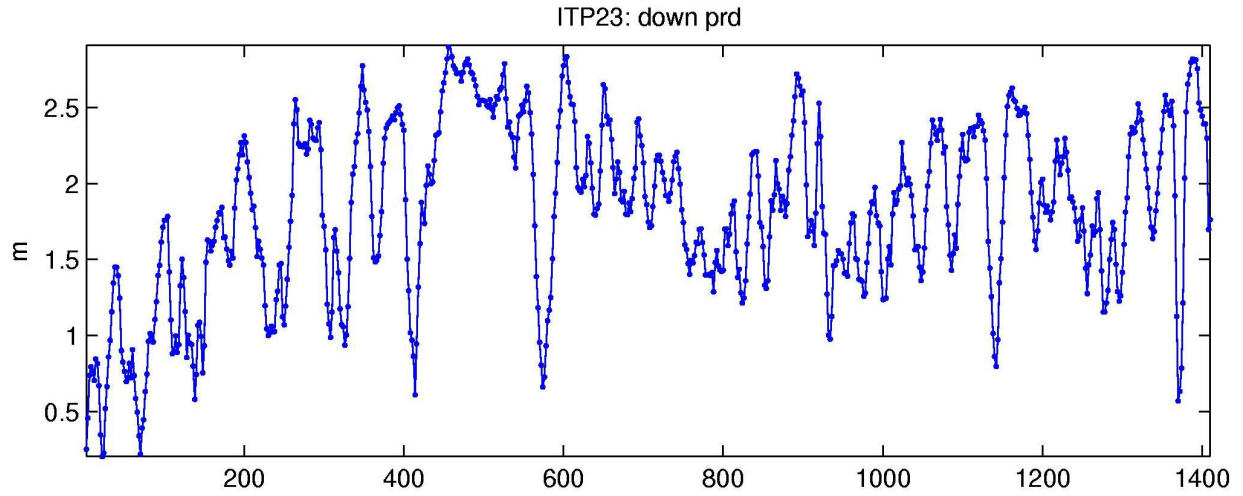
ITP profiler engineering data.



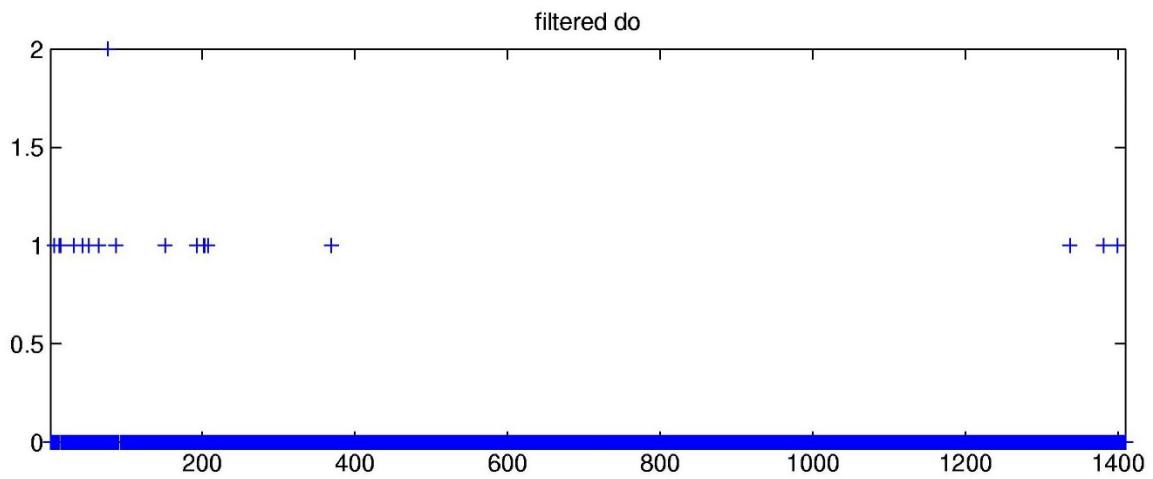
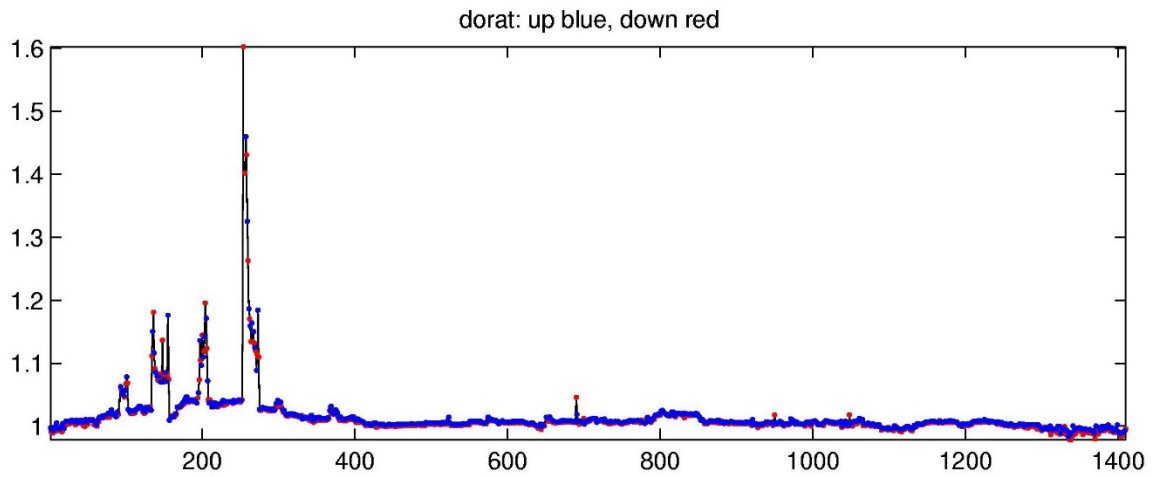
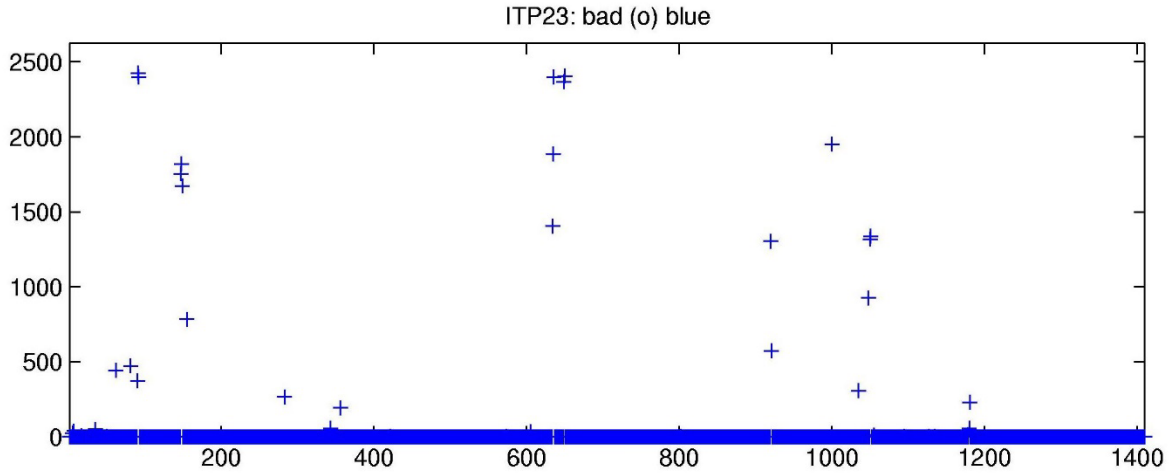
Number of bad points removed (top); variance of vertical difference of temperature and salinity in step region for up-going profiles; depth of staircase layer; temperature lag (bottom).



Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.

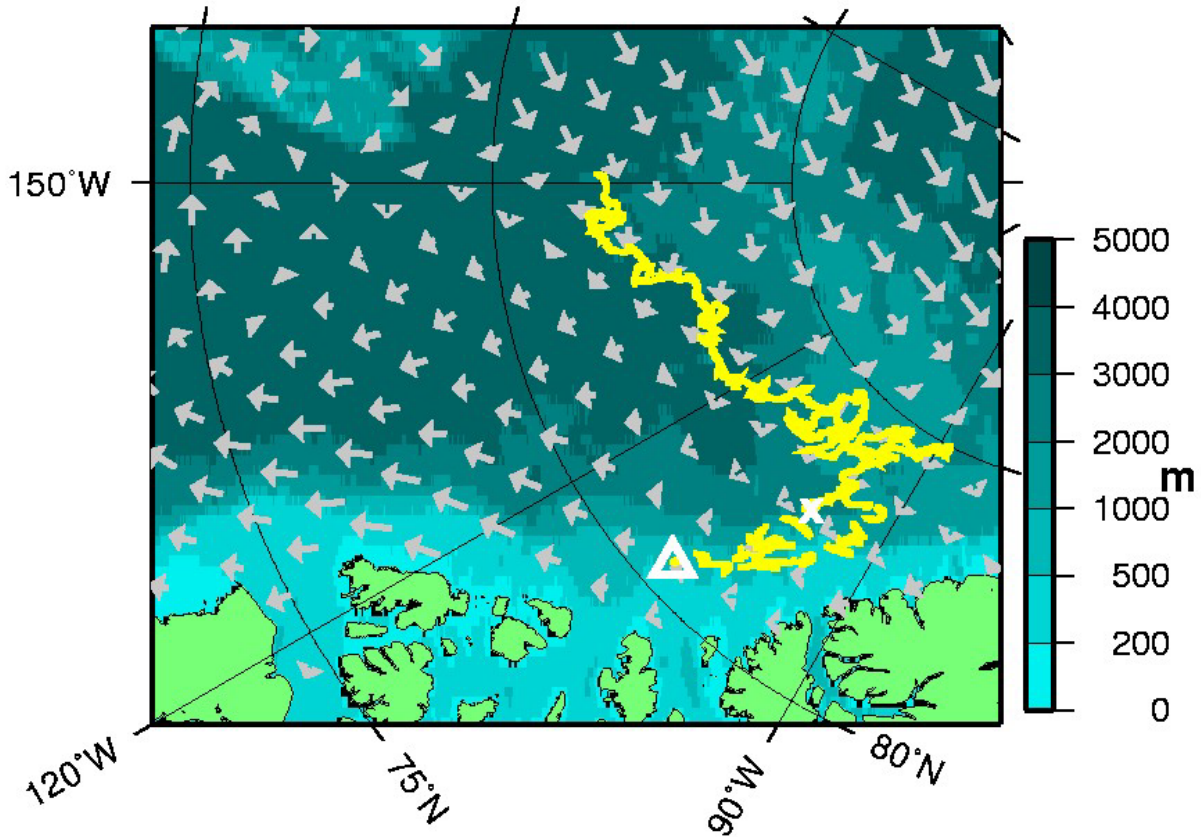


Top: down pressure deviation correction, Middle: salinity ratio adjustment, Bottom: Number of filtered spikes.



Top: number of bad dissolved oxygen points removed, Middle: dissolved oxygen ratio adjustment, Bottom: Number of filtered spikes.

ITP23 Drift Track (as of 2011/09/03)

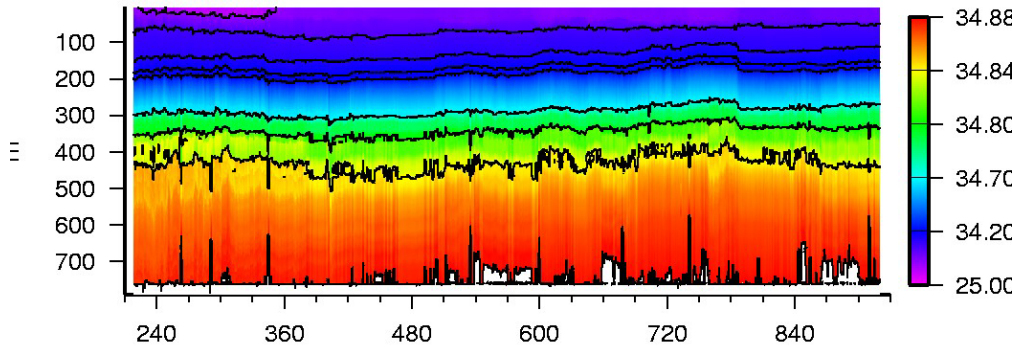
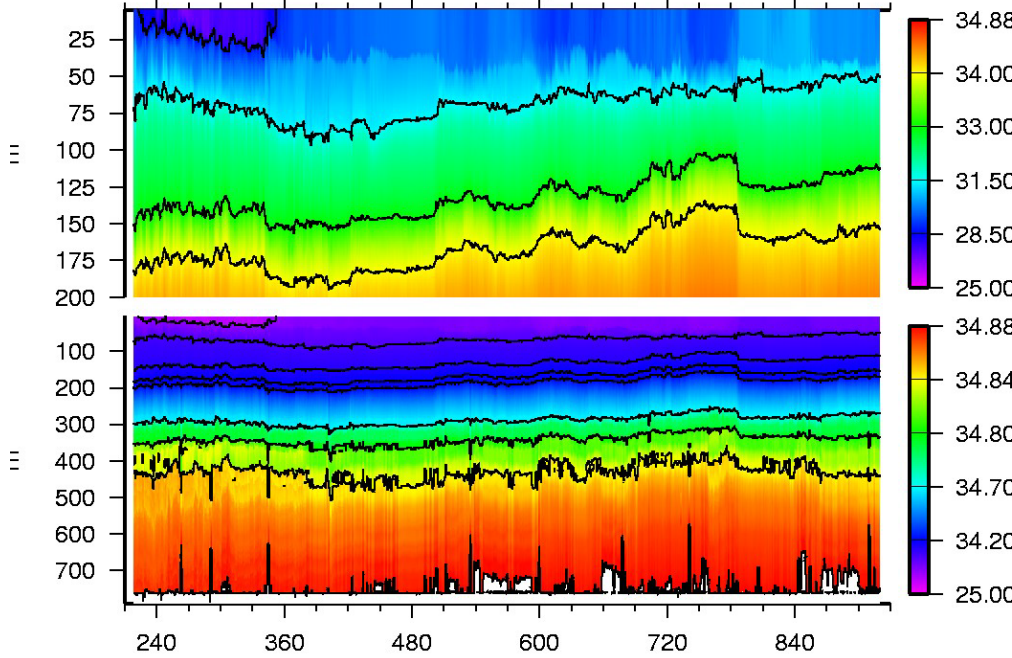
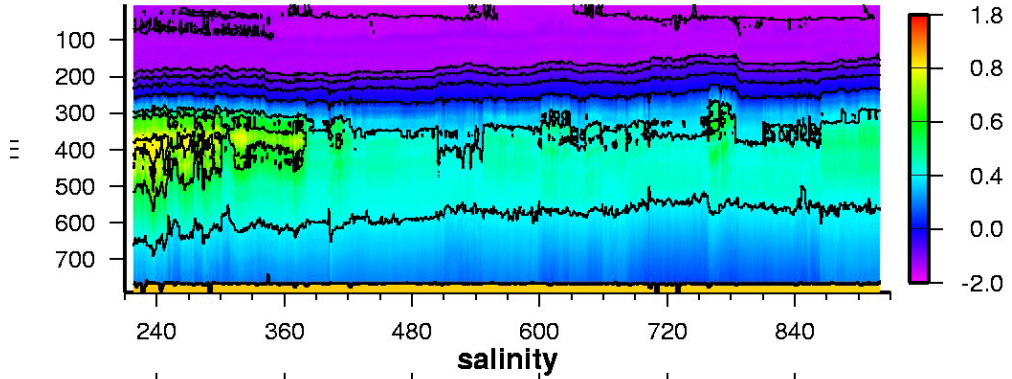
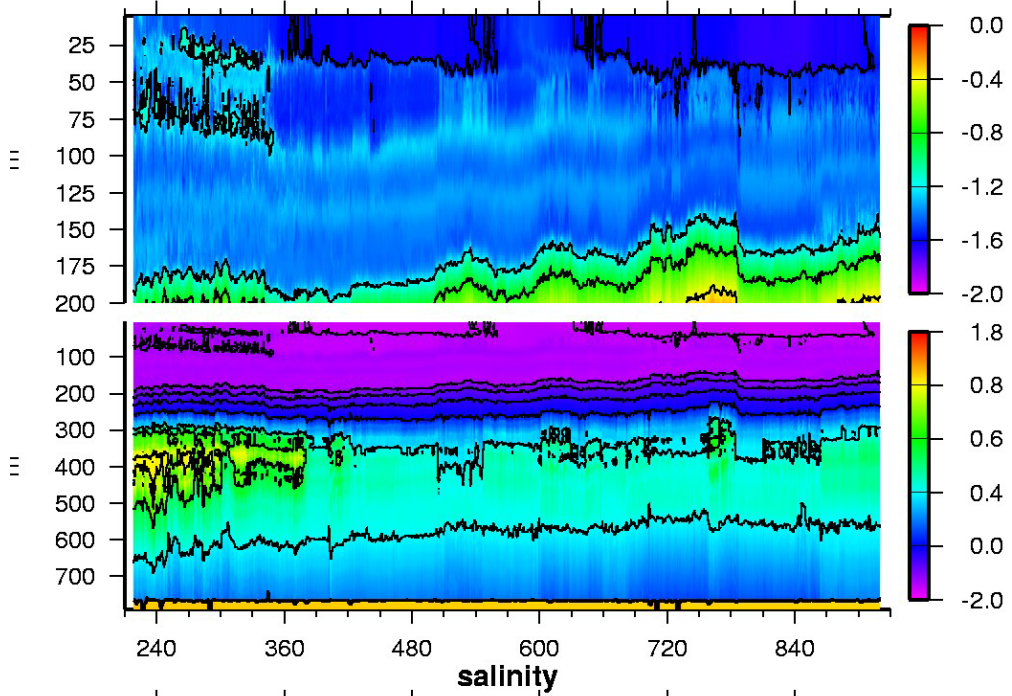


ITP drift (yellow line), last profile (x), last location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).

Plot of buoy locations.

ITP23 Up Profile Contours (to profile 1410)

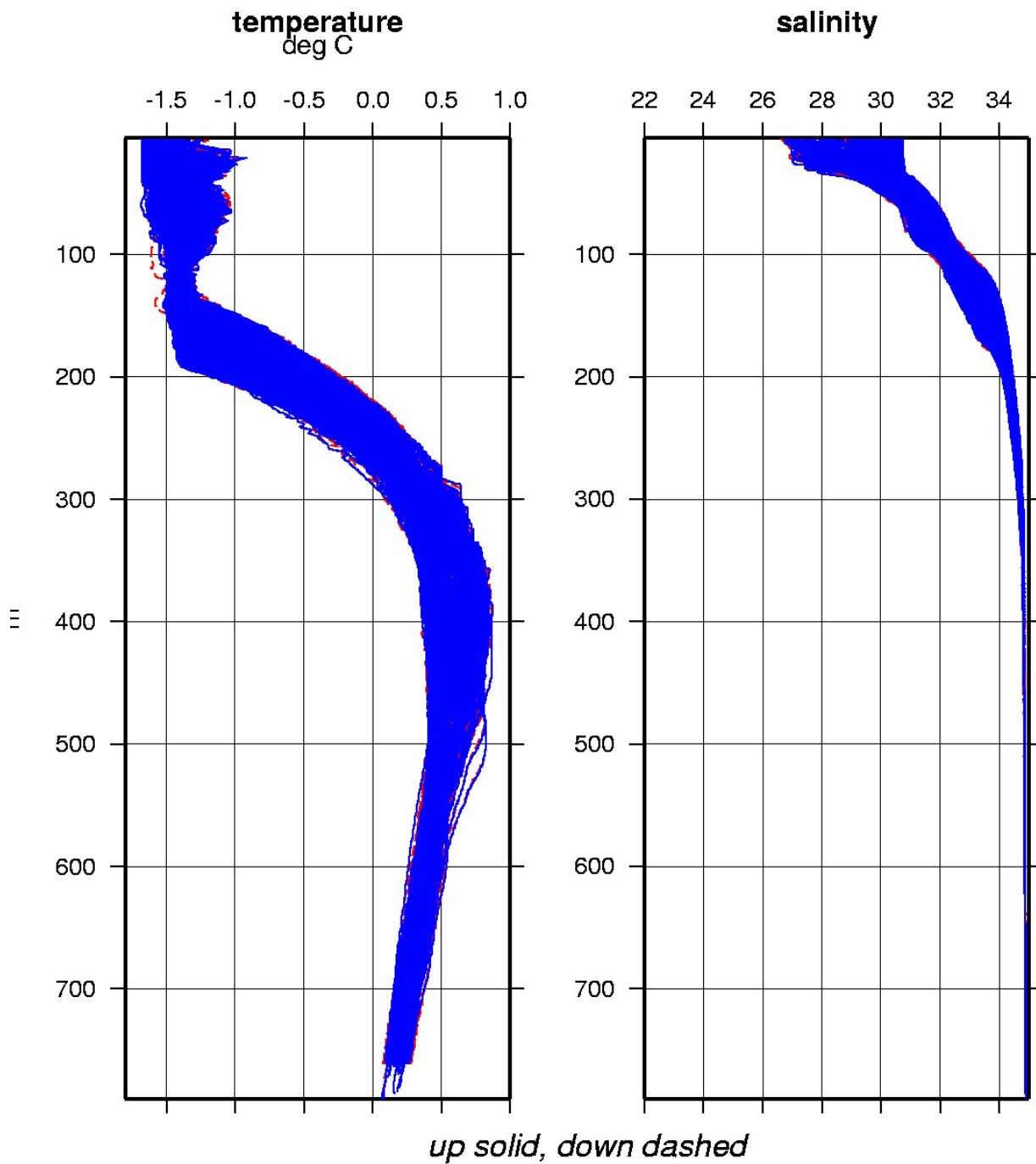
temperature



day 2008

ITP 23 Temperature and Salinity contours.

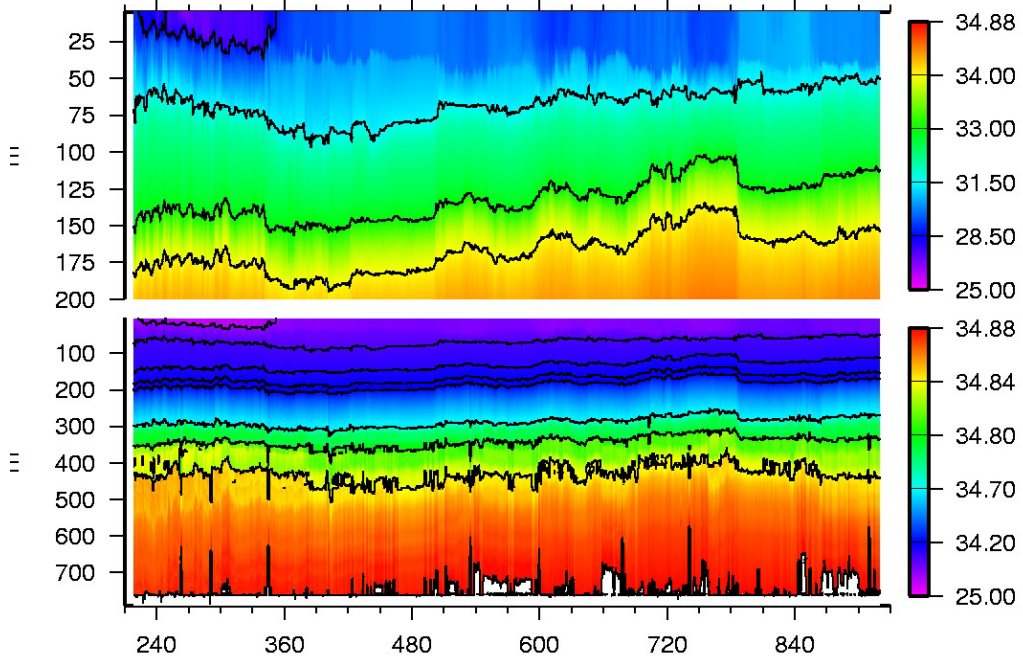
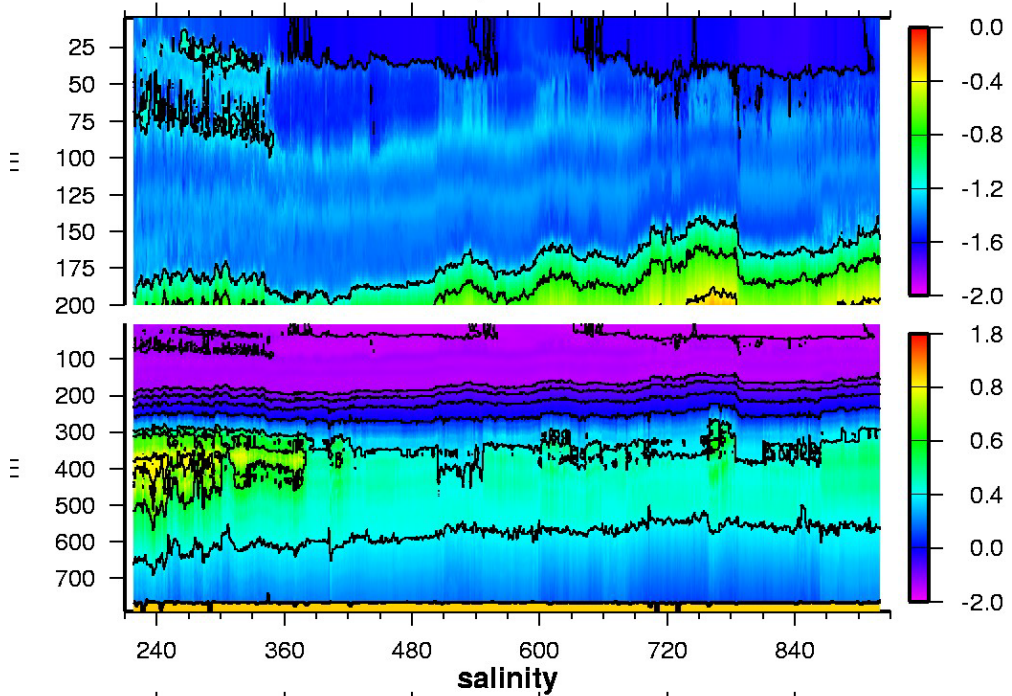
All ITP23 Profiles (up to profile 1410)



Composite plot of ITP temperature and salinity profiles.

ITP23 Up Profile Contours (to profile 1410)

temperature

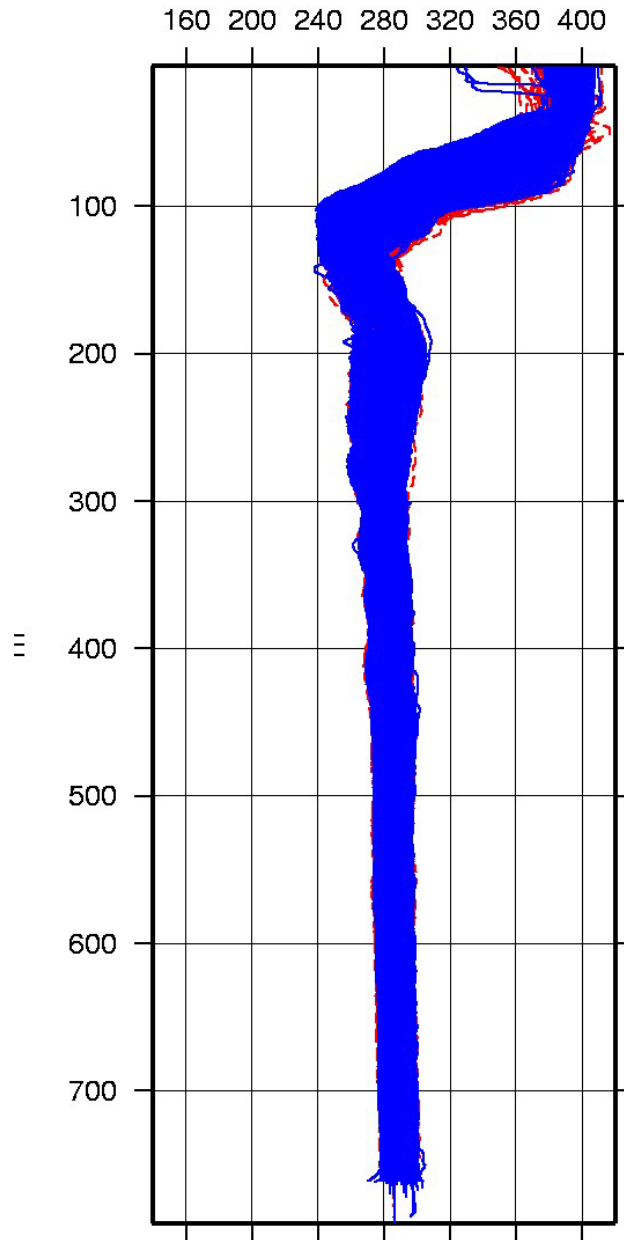


day 2008

ITP23 dissolved oxygen contours.

All ITP23 Profiles (up to profile 1409)

dissolved oxygen
 $\mu\text{mol/kg}$



up solid, down dashed

Composite plot of dissolved oxygen profiles.



Surface package and supplemental flotation of ITP 23 after deployment near 82° N in the Beaufort Gyre. (Photo by Rick Krishfield)



The peanut-shaped, half-raftered ice floe that was the third choice amongst poor ice conditions, but became the platform for ITP 23 and an AOFB. (Photo by: Rick Krishfield)



While the ship maneuvers to approach the ice party, gear is slung by long line from the helicopter to the deployment site. (Photo by: Gary Morgan)



The large black crater which contained the AOFB is slung back to the CCGS Louis S. St. Laurent by the helicopter. (Photo by: Gary Morgan)



A view of the last remaining members of ice party and buoys on the ice as seen from the ship at the end of the deployment. (Photo by: Rick Krishfield)