

## ITP41 Overview

**Deployment Location:** 10/3/2010, 00:00 UTC at 79° 5.3'N, 154° 16.9'E

**Last Location:** 10/11/2013, 23:00 UTC at 76° 34.7' N, 178° 23.7' E

**Duration:** 1105 days

**Distance Traveled:** 9546 km

**Number of profiles:** 1480 in 739 days

**Other instruments:** none

ITP 41 was deployed on a 2.5 m thick ice floe in the Beaufort Sea as part of the Beaufort Gyre Observing System (BGOS) during the JOIS 2010 cruise on the *CCGS Louis S. St. Laurent*. The ITP operated on a standard sampling schedule of 2 one-way profiles between 7 and 760 m depth each day.

## ITP41 Deployment Operations

Later the same day as ITP 35 was recovered, the first ITP deployment of the JOIS 2010 expedition was conducted. As it was already October, melt ponds had frozen and the ice was covered by snow, making it difficult to identify the thicker ice during the helicopter reconnaissance, but a 2.5 m floe was located and selected for the deployment of ITP 41. Once selected, operations proceeded rapidly as the lateness of the season meant that the daylight hours would be limited.

The first half-hour was spent transporting personnel and gear to the site by helicopter, and augering the hole through the ice floe. The deployment of the profiler, tether and surface package occupied the next 1.5 hours, while other scientists surveyed the ice floe. Forty minutes later all personnel were back on board and operations completed as the sun headed over the horizon, and the air temperature dropped to -20 °C.

## ITP41 Data Processing

The 1480 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 41 are shown in the figures to the right. The profiler performed well over most of the two year time period before the battery pack was exhausted. Buoy drift speeds did exceed 30 cm/s occasionally, causing the profiler difficulty to climb the wire, especially around profile 1350. Beginning with profile 1391, only half profiles were obtained in either direction, as the unit apparently began each profile around 200 m depth (where the instrument would be neutrally buoyant). Possibly one of the tension springs coupling the profiler to the wire failed.

Meanwhile, the SBE 41-CP CTD on the profiler had a unique problem where blocks of zeros were being recorded, so required special processing of the raw data. Fortunately, very little data were lost due to this problem. ITP Thermohaline staircases were present throughout the time series, enabling CTD lag corrections. Before profile 620, lags were in the typical range as previous systems, then the temperature lag shifted by more than 3 seconds. The difficulty (fouling, icing, or hardware problem) which influenced the temperature channel did not seem to occur in the conductivity channel, although the conductivity and thermal mass lags required shifting to compensate (which remained largely constant for the remainder of the time series). The potential conductivity correction exhibits some short term shifts and several spikes over the period, with good agreement between the up and down profiles attesting to the absence of fouling on the conductivity.

## ITP41 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.

Deployed in the northwest Beaufort Gyre, the buoy drifted with the anticyclonic circulation first east between 77 and 79 °N latitude, then south between 130 and 140 °W longitude. The hydrographic time series that was broadcast during this period shows the development of near surface temperature maximum (and freshwater) layers in June-July of both 2011 and 2012. After 2 years, the profiler battery expired, but the buoy continued south, then west, drifting up and back down Barrow Canyon, then northwesterly across the shallow topography just off of the Chukchi Shelf. Three years after deployment, the surface package ceased communicating over the southern Mendeleev Ridge after drifting over 9800 km.

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

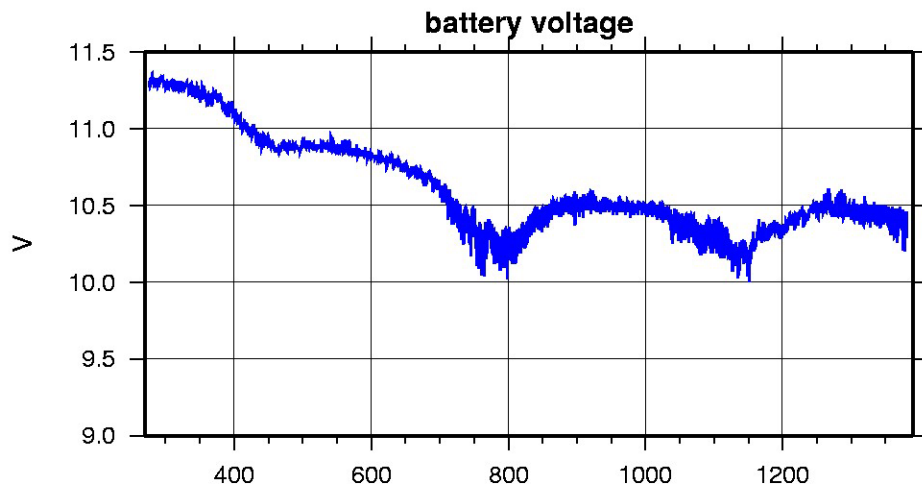
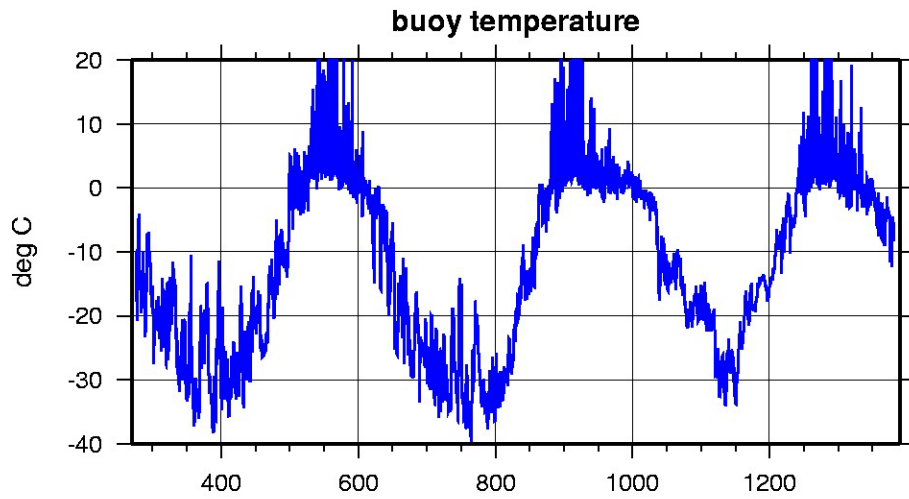
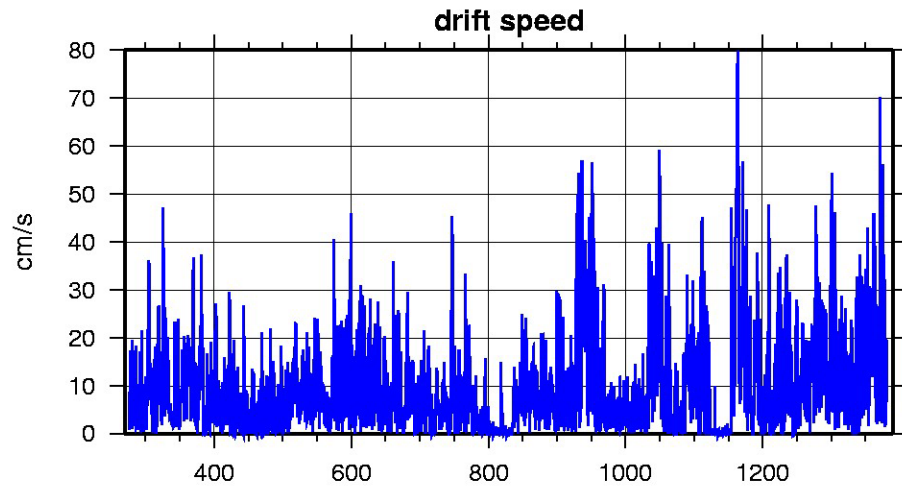
Level II hourly buoy location data in ASCII format: `itp41rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp41cormat.tar.Z` or `itp41cormat.zip`

Level III 1-db bin-averaged processed profile data in MATLAB format: `itp41final.mat`

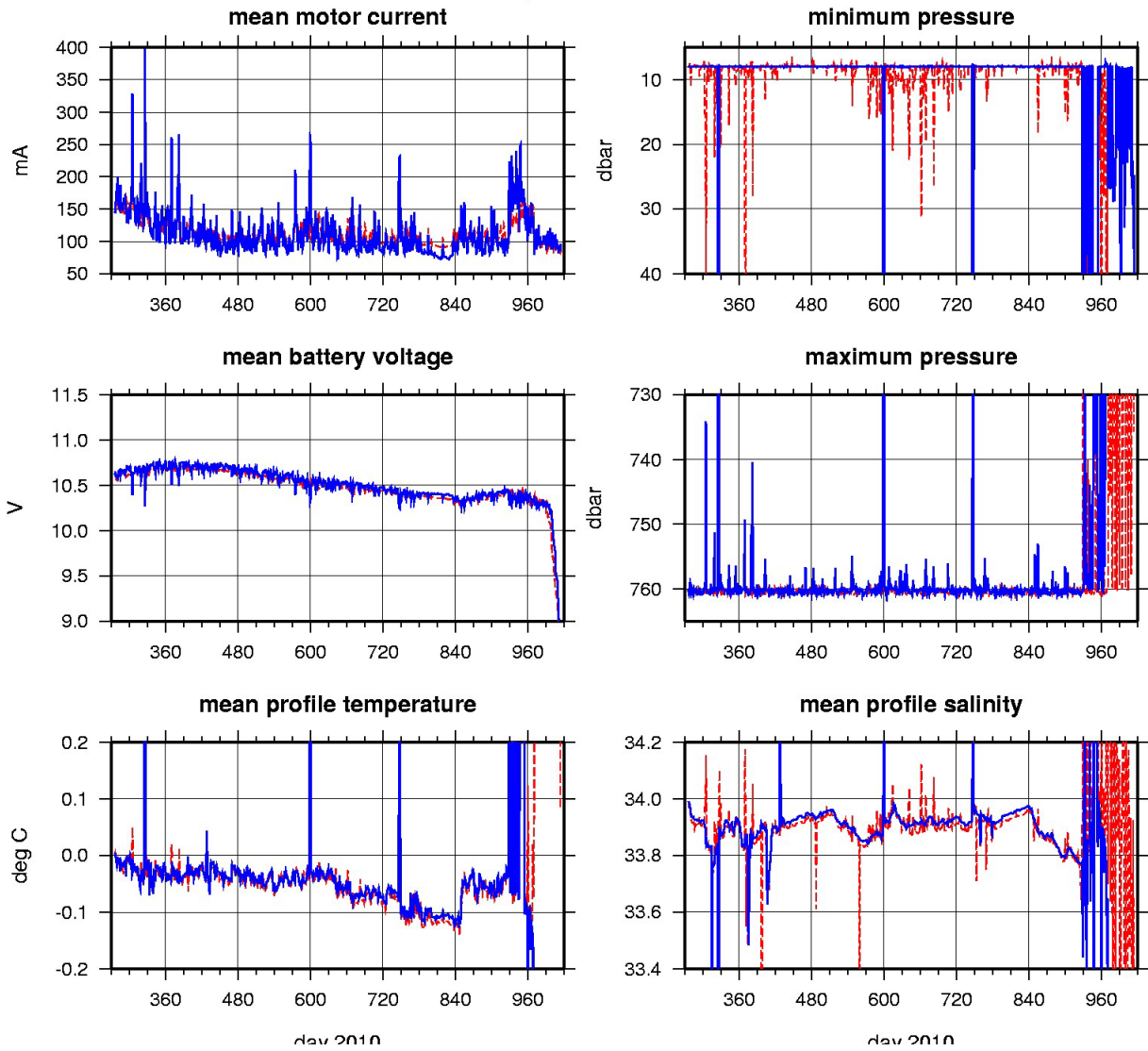
Level III 1-db bin-averaged processed profile data in ASCII format: `itp41final.tar.Z` or `itp41final.zip`

# ITP41 Buoy Status (as of 2013/10/11)

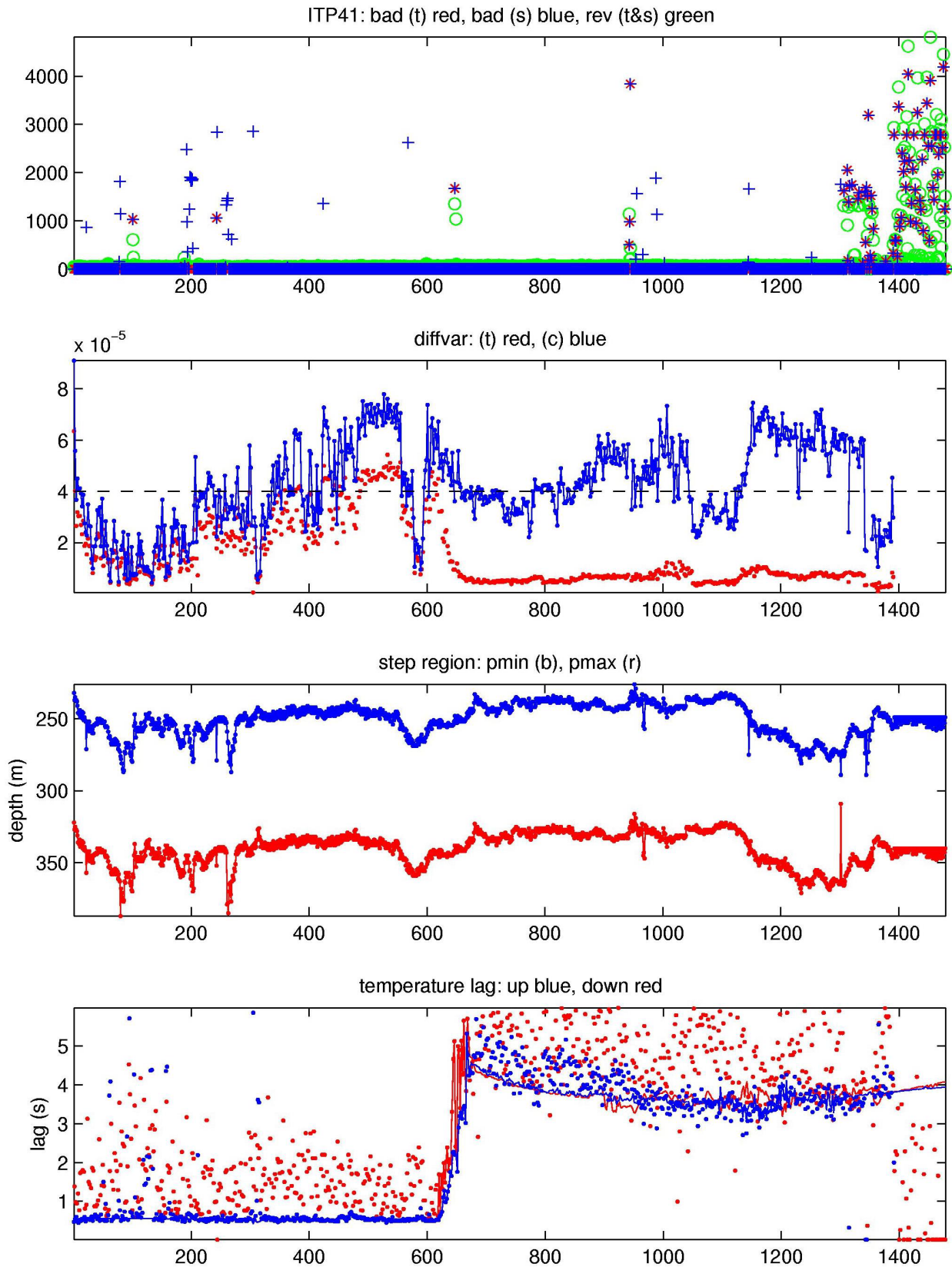


### ITP41 Profiler Status (up to profile 1480)

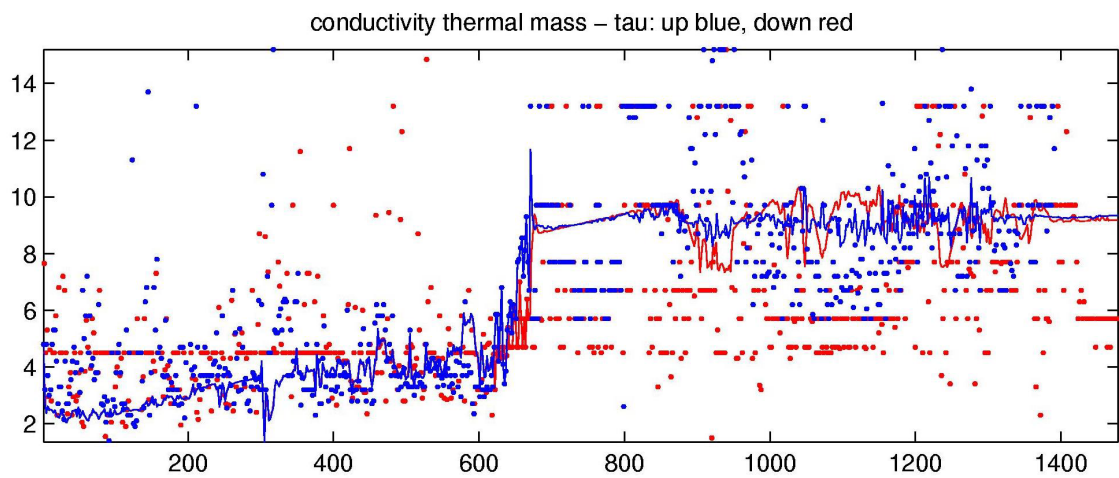
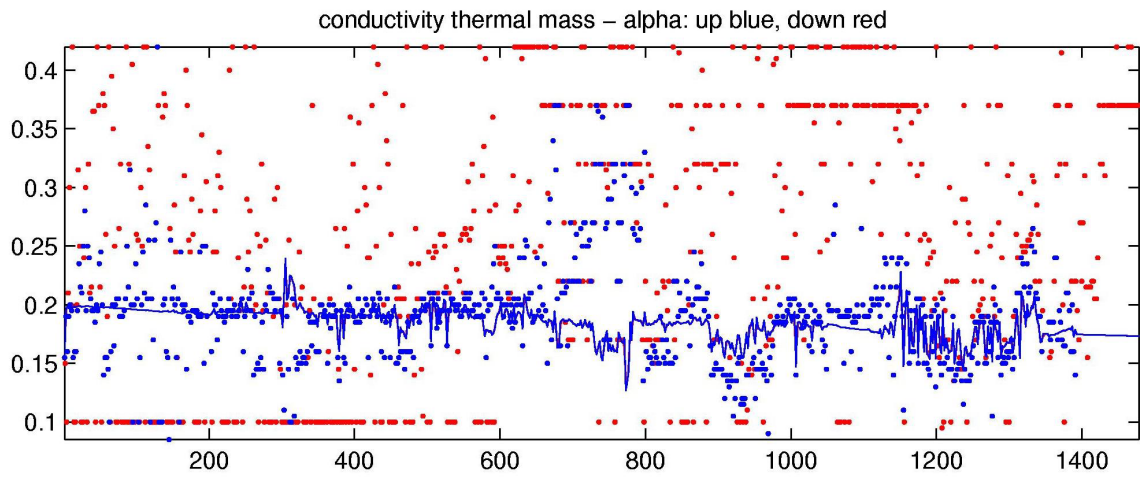
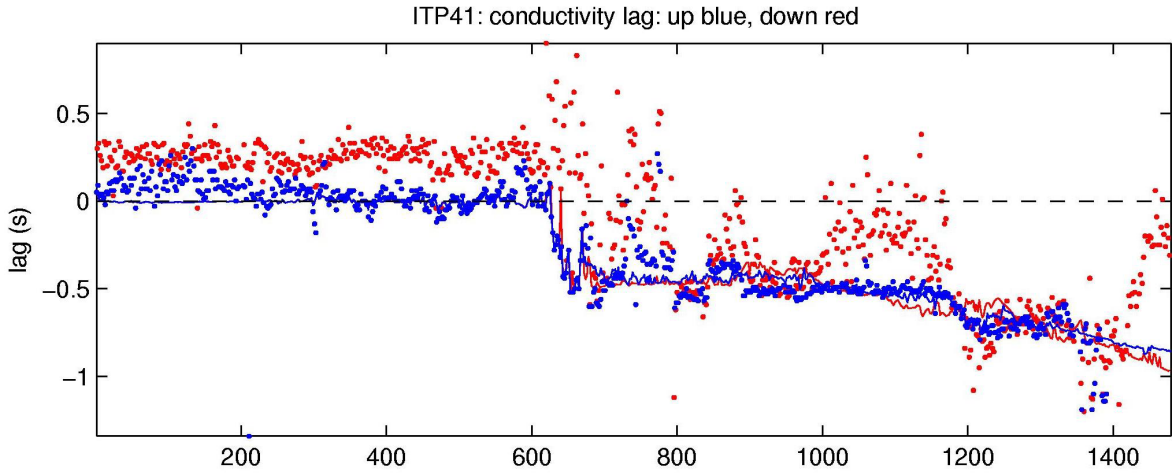
*up solid, down dashed*



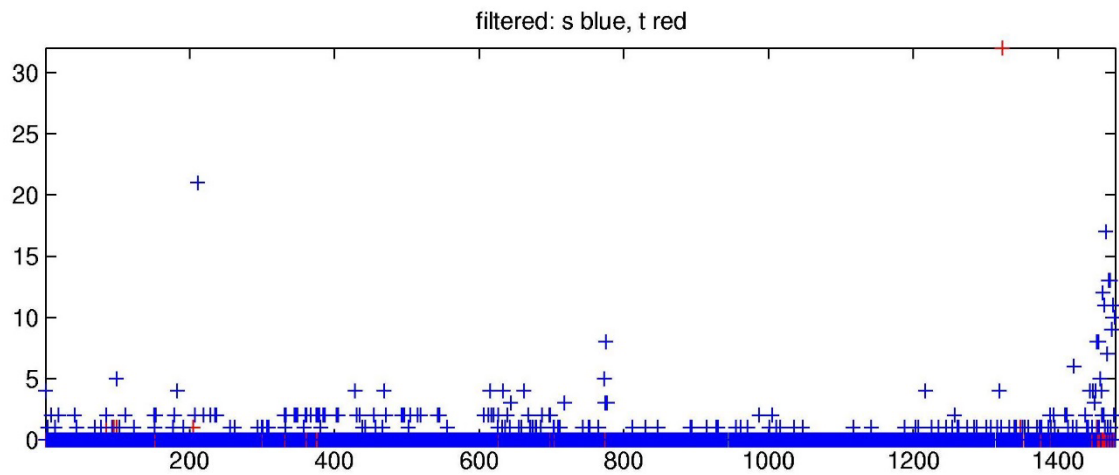
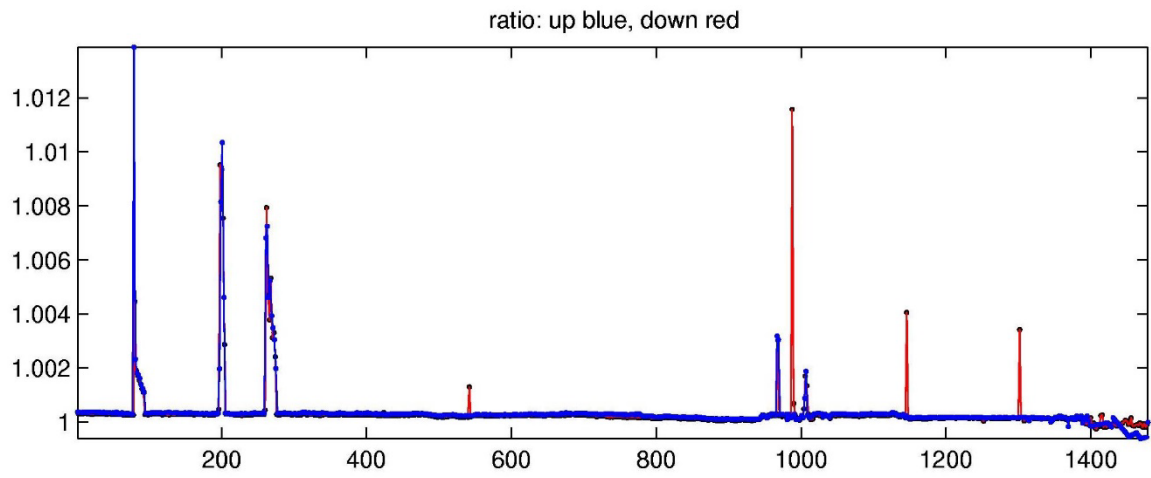
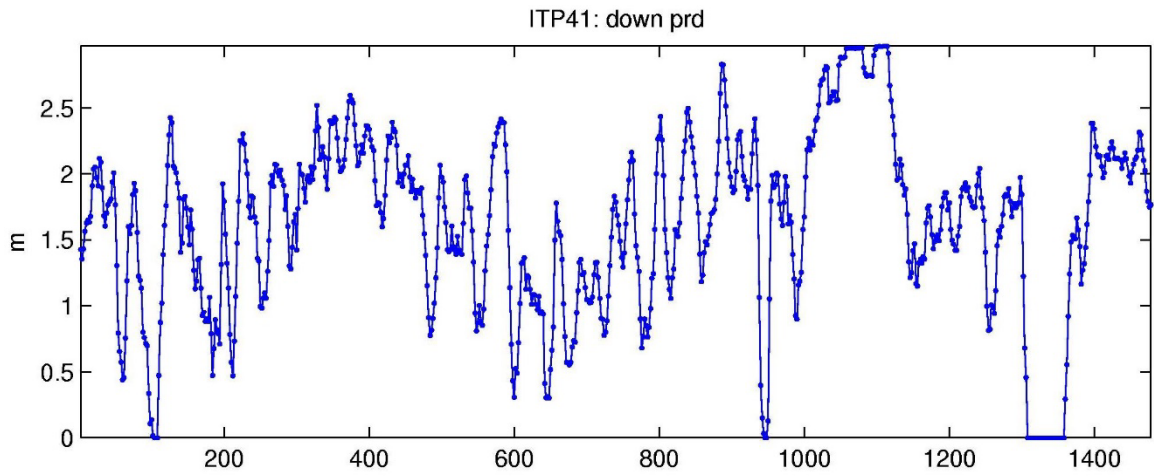
ITP profiler engineering data.



Top: number of bad points removed, Middle: variance of verticle difference of temperature and salinity in step region for up-going profiles, Bottom: temperature lag.

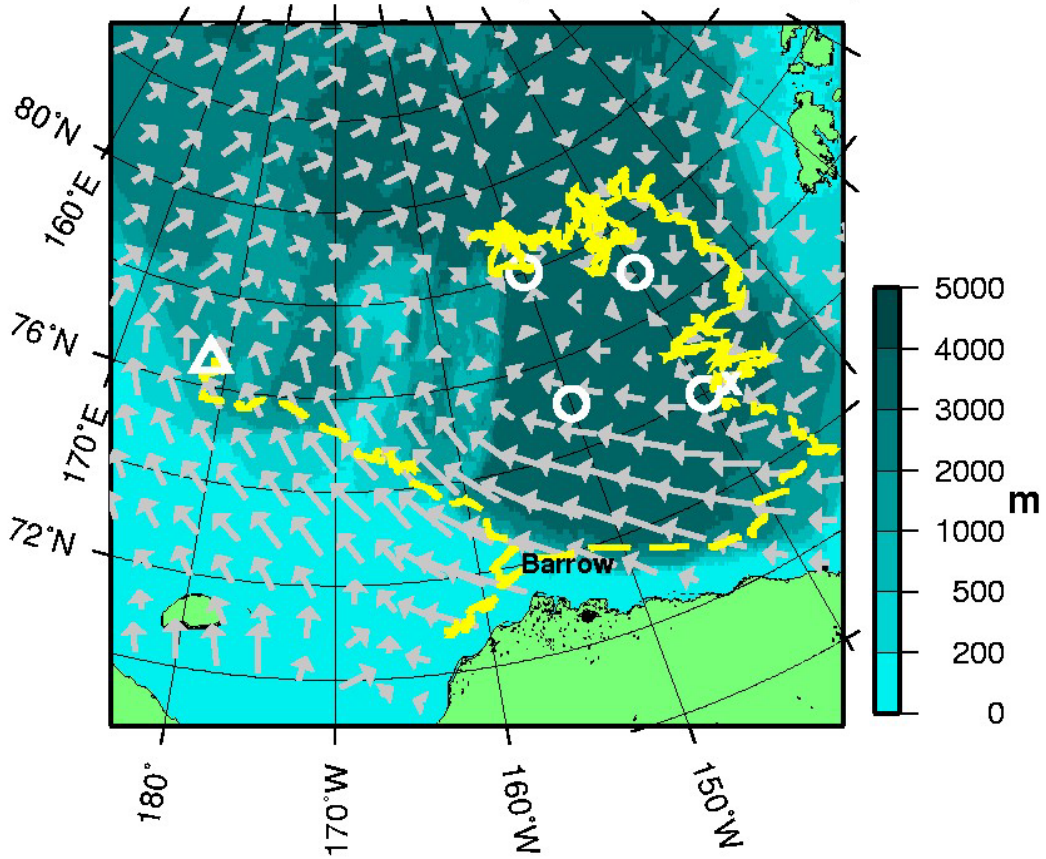


Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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

### ITP41 Drift Track (as of 2013/10/11)



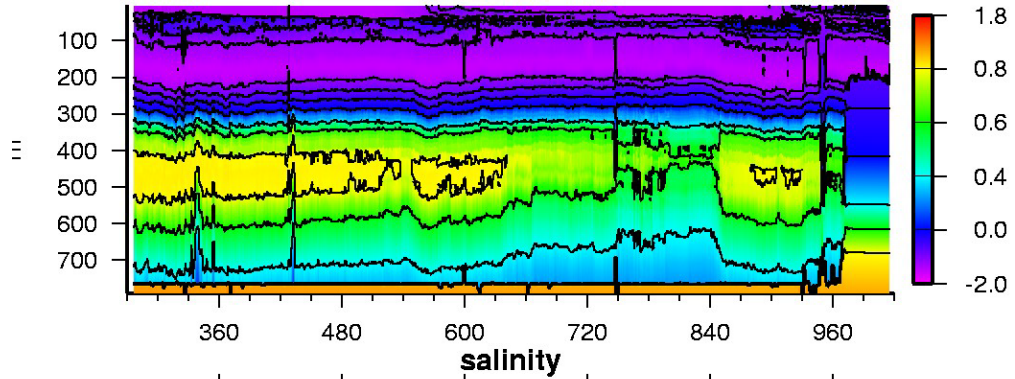
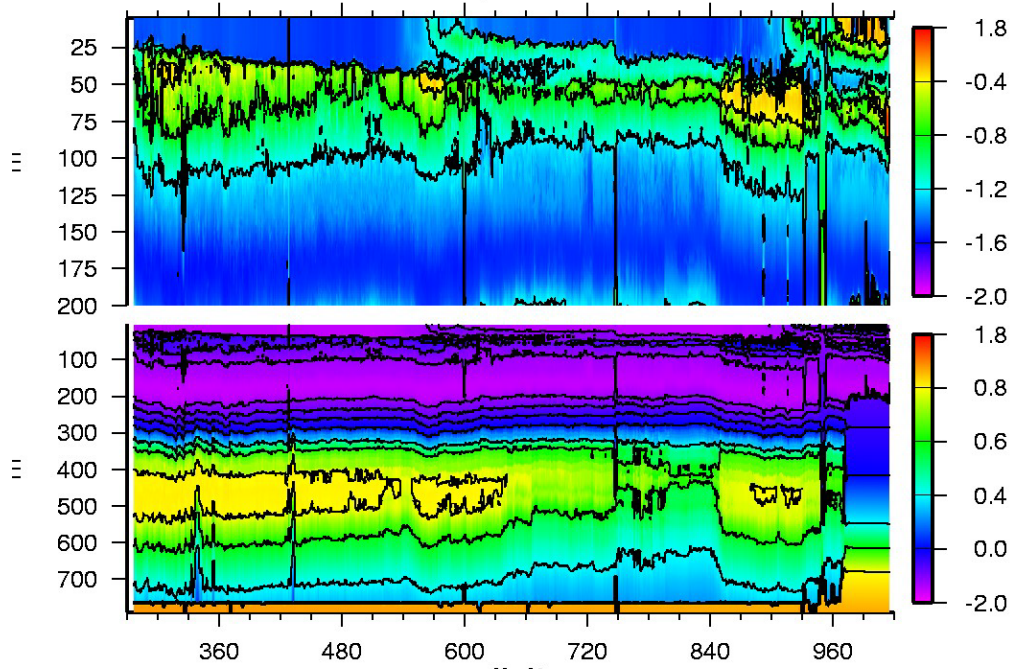
**ITP drift (yellow line), last profile (x), last location (triangle),  
BGOS moorings (white circles) and annual ice drift  
from IABP (grey vectors) on IBCAO bathymetry (shading).**

Plot of buoy locations.

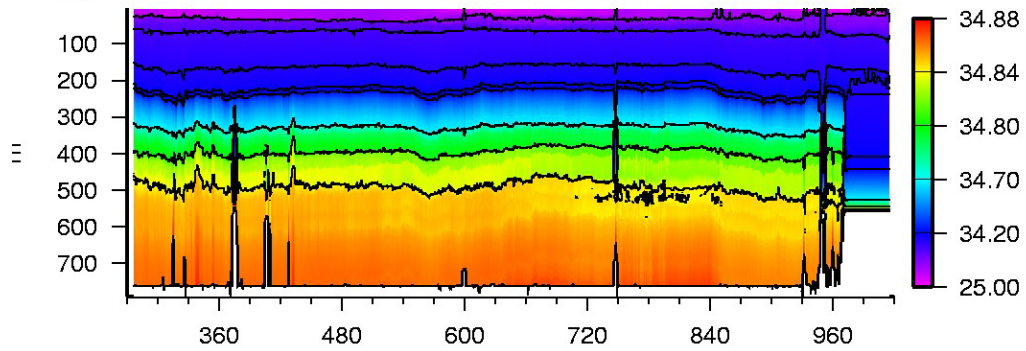
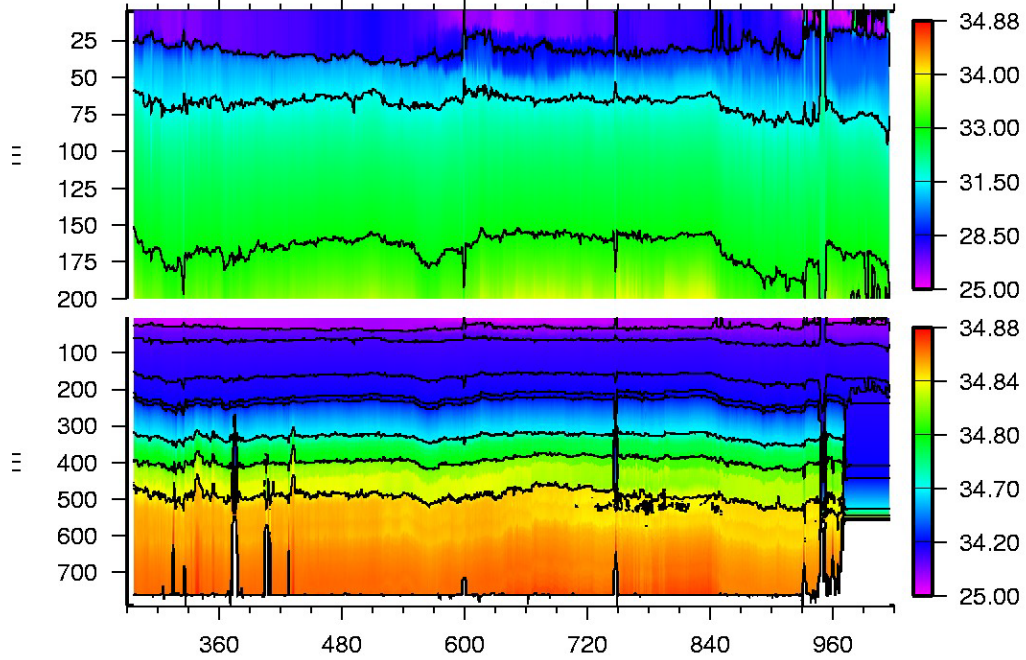


# ITP41 Up Profile Contours (to profile 1480)

## temperature



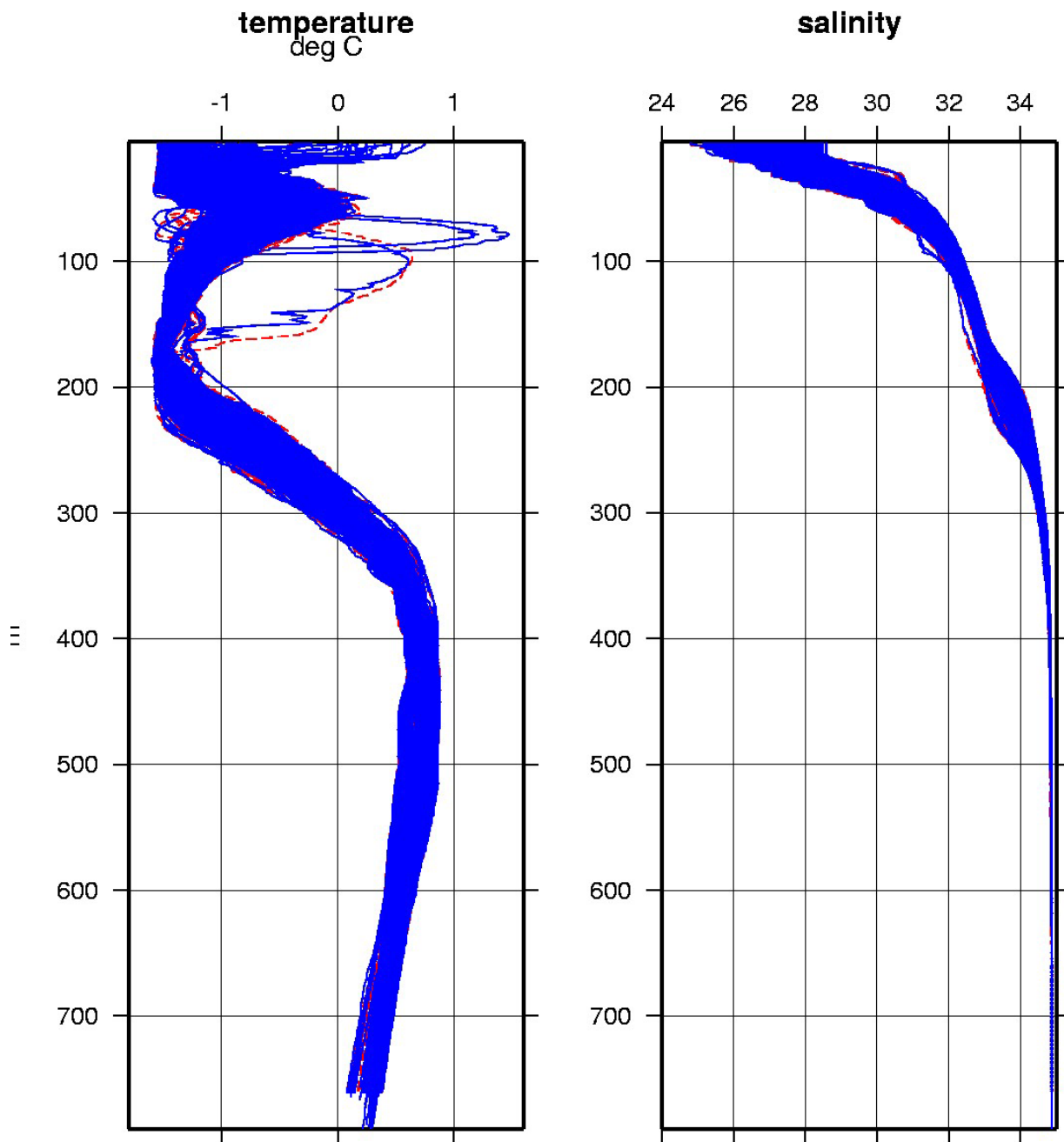
## salinity



day 2010

ITP41 temperature and salinity contours.

### All ITP41 Profiles (up to profile 1480)



*up solid, down dashed*

Composite plot of ITP temperature and salinity contours.



ITP 41 is silhouetted by the setting sun shortly after deployment. (Rick Krishfield)



ITP 41 installed with the CCGS Louis S St Laurent in the background. (Rick Krishfield)



Ice floe cleared, the helicopter is ready to take off and leave ITP 41 alone in the Arctic. (Rick Krishfield)