

## ITP24 Overview

**Deployment Location:** 10/3/2008, 03:00 UTC at 81° 14.5'N, 121° 17.3'E

**Last Location:** 1/30/2010, 12:00 UTC at 73° 29.6' N, 15° 6.6' W

**Duration:** 756 days

**Distance Traveled:** 6264 km

**Number of profiles:** 718 in 357 days

**Other instruments:** PAWS

ITP24 was deployed on a 1.5 m thick ice floe in the Transpolar Drift from the German Research Vessel *Polarstern* as part of the European Union DAMOCLES Program. On the same ice floe, an University of Hamburg (ZMAW) PAWS meteorological station was also installed. The ITP operated on a typical sampling schedule of 2 one-way profiles between 7 and 760 m depth each day. In August 2010, twenty-two months after deployment north of the Laptev Sea and 13 months after the surface unit ceased transmitting, an Icelandic fishing vessel found the buoy (with torn tether and no profiler) drifting north of Iceland. With the help of the Icelandic Coast Guard and Marine Research Institute in Reykjavik, the surface package was eventually returned and an additional 3 months of profiler data (179 profiles) and 7 months of GPS locations were retrieved from the internal memory.

## ITP 24 Deployment Operations

The final ocean buoy deployment during the ARKXXIII/3 expedition on the *Polarstern* was near the Nansen-Gakkel Ridge in early October. Weather conditions were good for most of the deployment, and a suitable deployment site was easily located in the center of an ice floe, about 500 m from the open edge with a small ridge about 15-20 m away on the other side. The helicopter was able to get the gear out and the ship docked onto the floe, and deployments of the ITP 24 and PAWS (21.9 m apart) went well. The ice was about 1.5 m thick around the ITP, becoming gradually thicker toward the ridges. Unfortunately, thick fog appeared near the end of the deployment and the helicopter could not fly, so that some of the equipment had to be laboriously transported back to the ship by Nansen sledge.

More information on the buoy deployments and expedition is provided in the ARK-XXIII/3 cruise report.

## ITP 24 Data Processing

ITP 24 transmitted data for the first 538 profiles and an additional 180 profiles were retrieved from the surface unit when it was recovered, so that a total of 718 profiles were obtained. They were processed according to the procedures described in the ITP Updated Data Processing

Procedures. The processing parameters for this ITP are shown in the figures to the right. Buoy drift speeds stayed mostly below 20 cm/s, with around 10 events at or near 30 cm/s lasting a few days.

As usual, some conductivity (salinity) data were affected by suspected biofouling or similar glitches. This included a few instances of the typical short-term spikes that affected only one or a few vertical bins. A small number of cases where complete individual profiles or small groups showed contaminations were also edited out. In addition, however, there were two longer series of profiles with large differences between subsequent climb- and dive profiles. For the first set, profiles 263 through 303, the onset of contaminations as well as the return to clean data was very obvious. This was less clear for the second set at the end of the record, where sensor performance appeared to degrade more gradually. When noise started to increase, profiles 577 through 644 were flagged as "questionable" (qflag, see below) after attempts to modify sensor lags resulted in little improvements. Up/down differences became significant starting at 645 and continued to develop until the end of the record. Consequently profiles 645 through 718 were eliminated.

Thermohaline staircases were present for a large portion of the time series, enabling CTD lag corrections. The lags were in the typical range found for previous systems. During manual editing, thermal lag corrections were dialed back somewhat (primarily by reducing alpha) to remove overcompensation. We speculate that a large number of small TS steps in the shallow portion of the staircase range biased the thermal lag calculation towards higher amplitudes. A smaller set of thermistor lag corrections and, towards the end of the record, conductivity-temperature time offsets were also modified to reduce short-term noise.

The conductivity adjustment (also called profile-to-profile calibration) was fairly constant for this ITP. During visual editing, small adjustments were made to the calculated values (typically to bringing them closer in line with their neighboring values) for a few profiles to better align their deep TS and density profiles with surrounding data.

qflag definitions:

3: good (from "level 3 processing")

2: uncalibrated (flag not yet used)

1: questionable. No fault found, but noisier etc.

0: bad (data currently set to nan as well for backward compatibility)

## ITP24 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 profiler drifted with the Transpolar Drift current in the Eurasian Basins

telemetering location and profiler data until June 28, 2009, when the surface unit ceased communicating to shore. However, (based upon information obtained from the surface package when it was recovered in 2010) the profiler continued to operate and pass data to the surface package, and the GPS was able to acquire locations for another 3 months until the profiler ceased communicating on September 24, 2009. The GPS continued to acquire locations while the surface package drifted through Fram Strait until January 30, 2010. Apparent Iridium transmitter failure prevented the additional 180 profiles and location data to be relayed to shore, but these were retrieved when the surface float was spotted north of Iceland by a fishing vessel the following summer, recovered and returned so that the additional data was retrieved from the surface unit flash card.

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

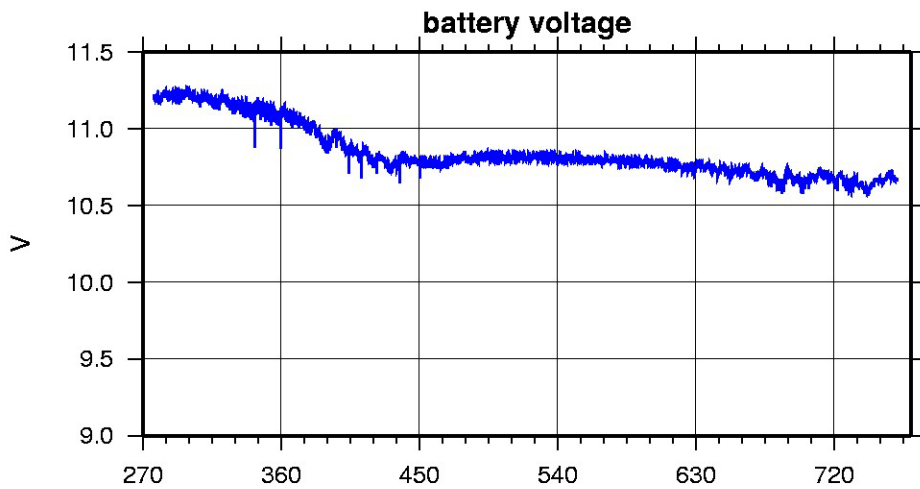
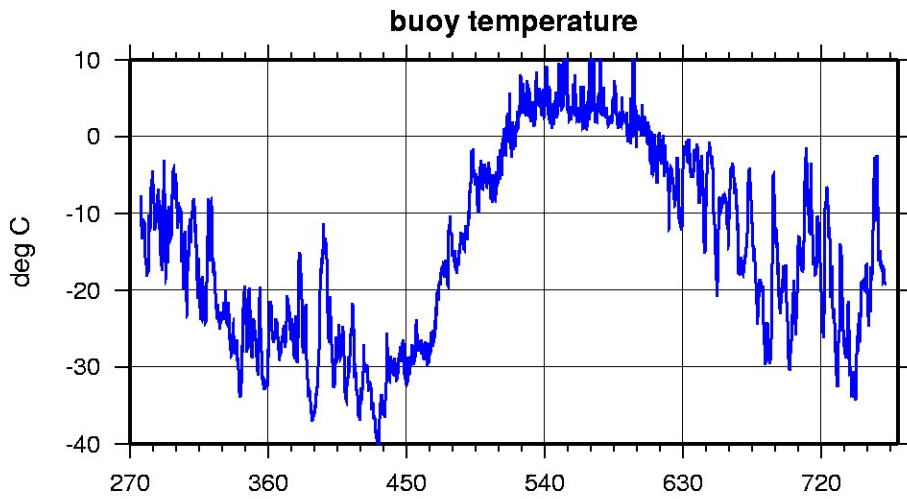
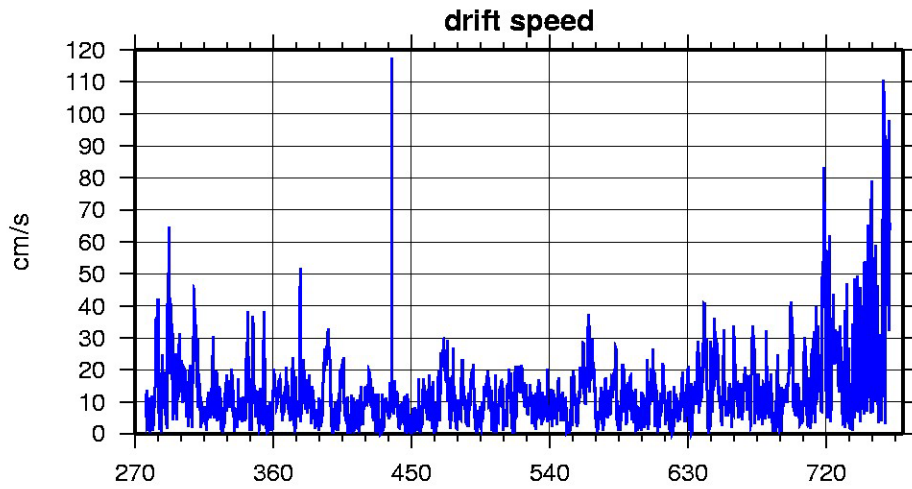
Level II hourly buoy location data in ASCII format: `itp24rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp24cormat.tar.Z` or `itp24cormat.zip`

Level III 1-db bin-averaged processed profile data in MATLAB format: `itp24final.mat`

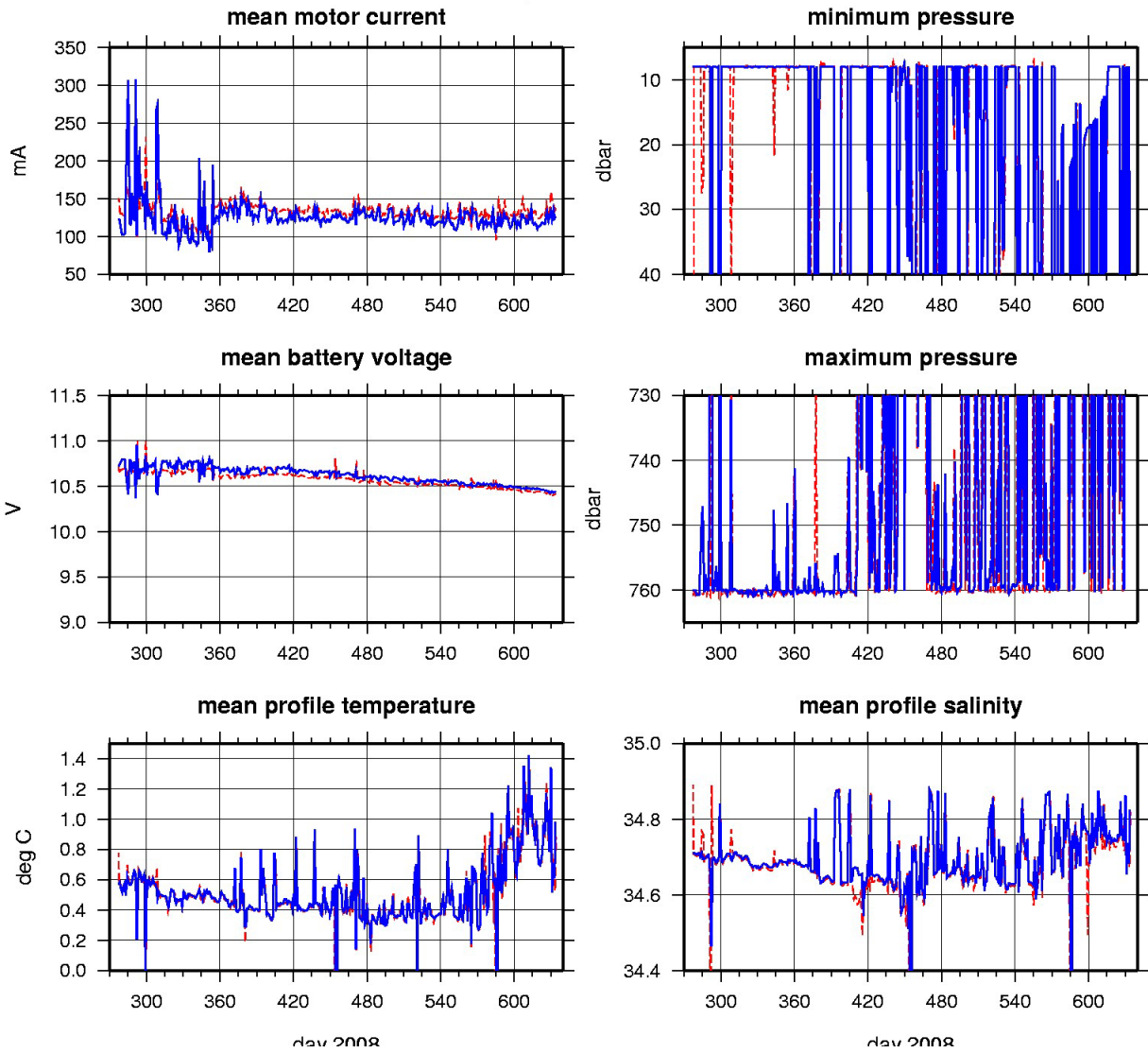
Level III 1-db bin-averaged processed profile data in ASCII format: `itp24final.tar.Z`  
or `itp24final.zip`

# ITP24 Buoy Status (as of 2010/01/30)

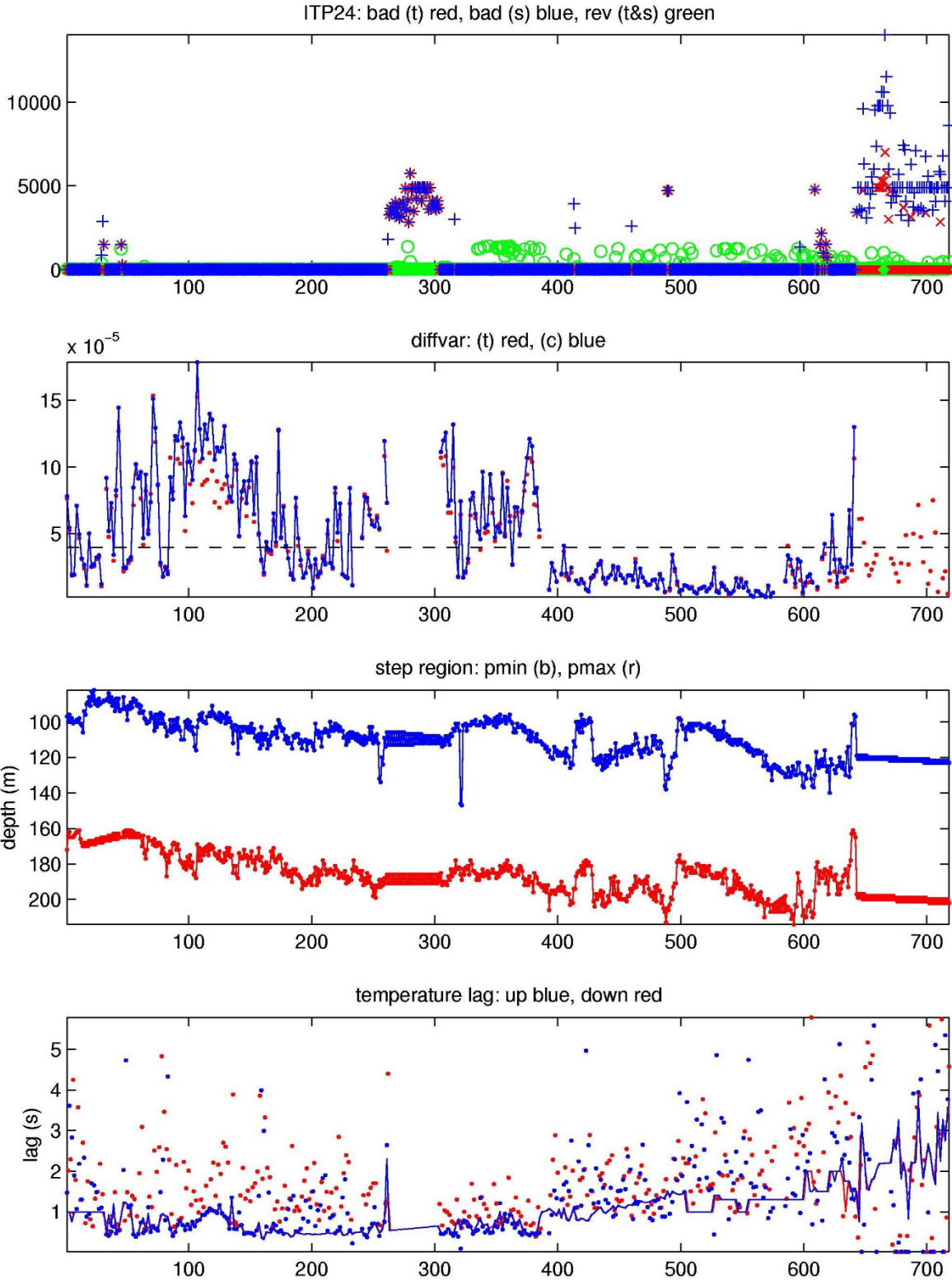


### ITP24 Profiler Status (up to profile 718)

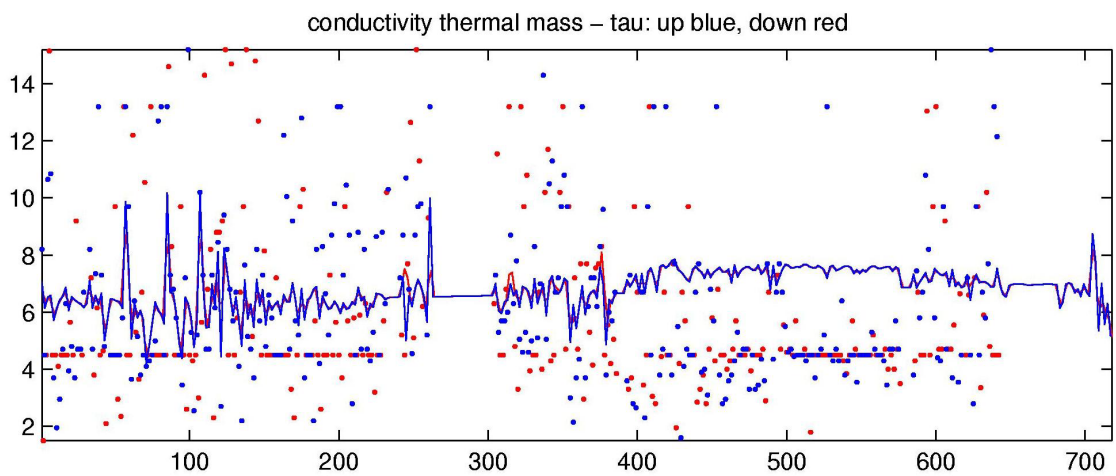
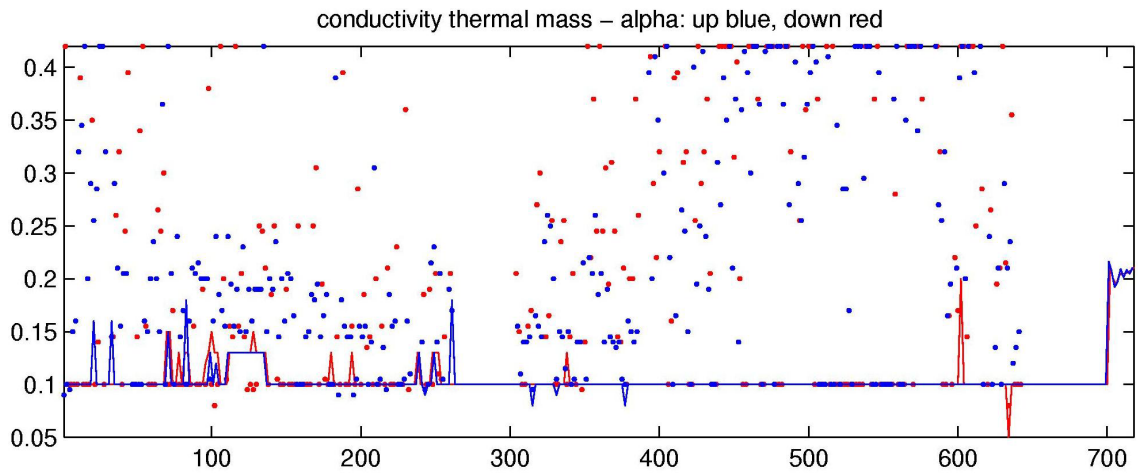
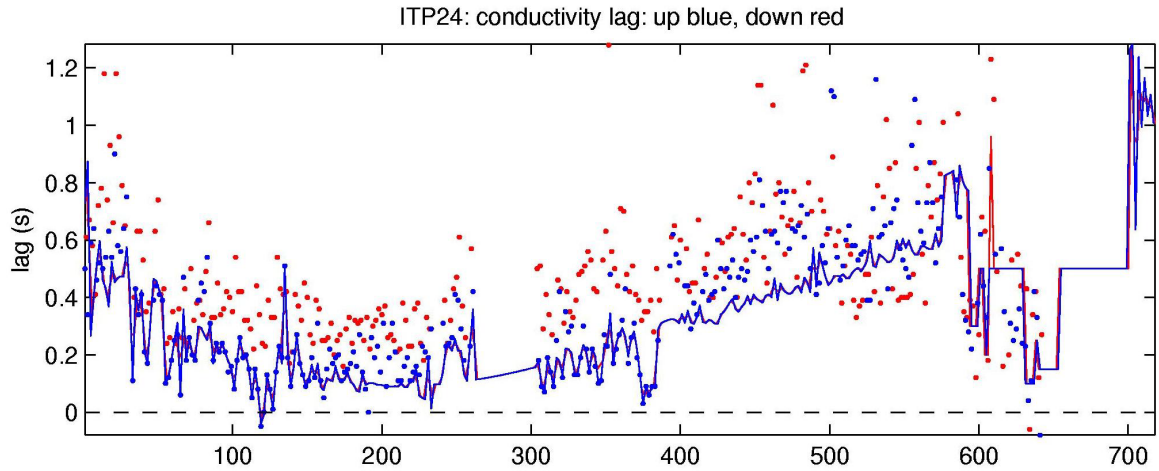
*up solid, down dashed*



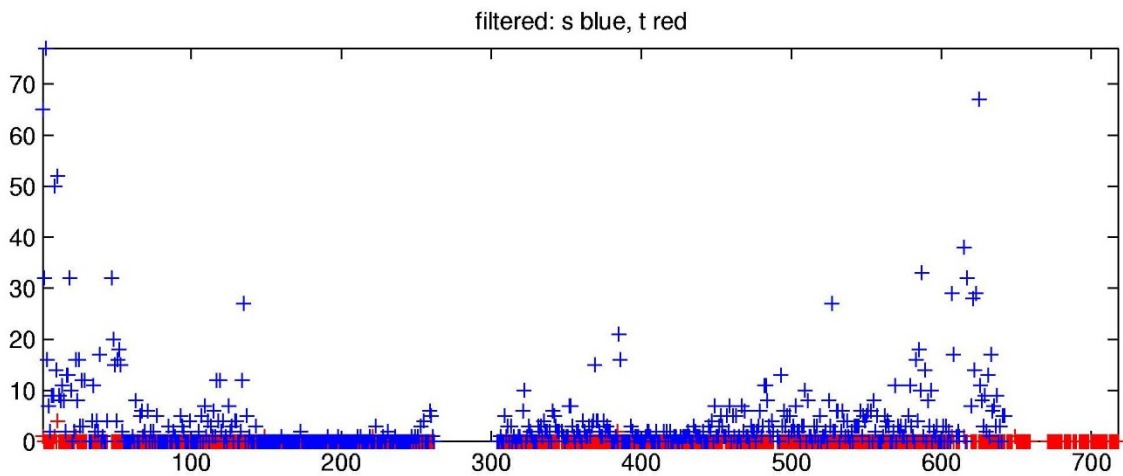
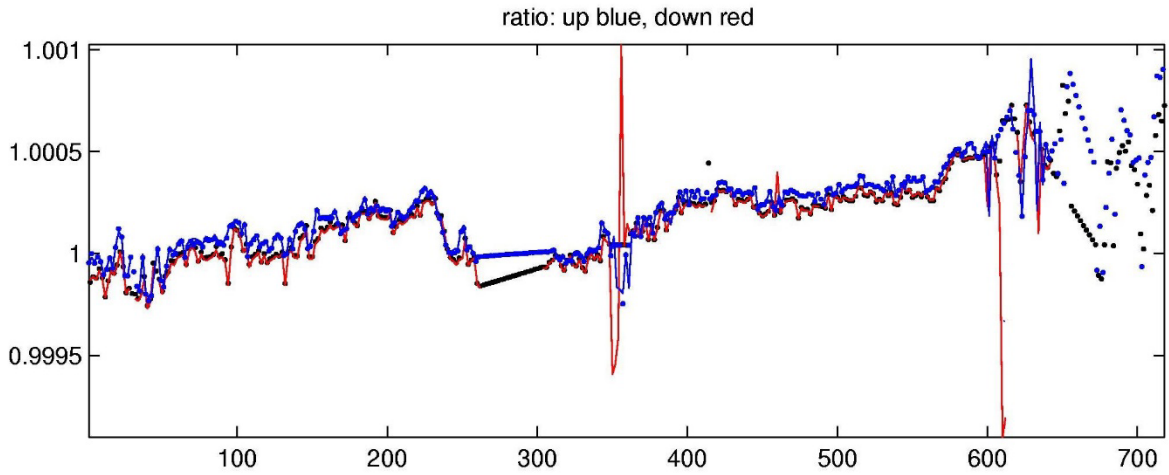
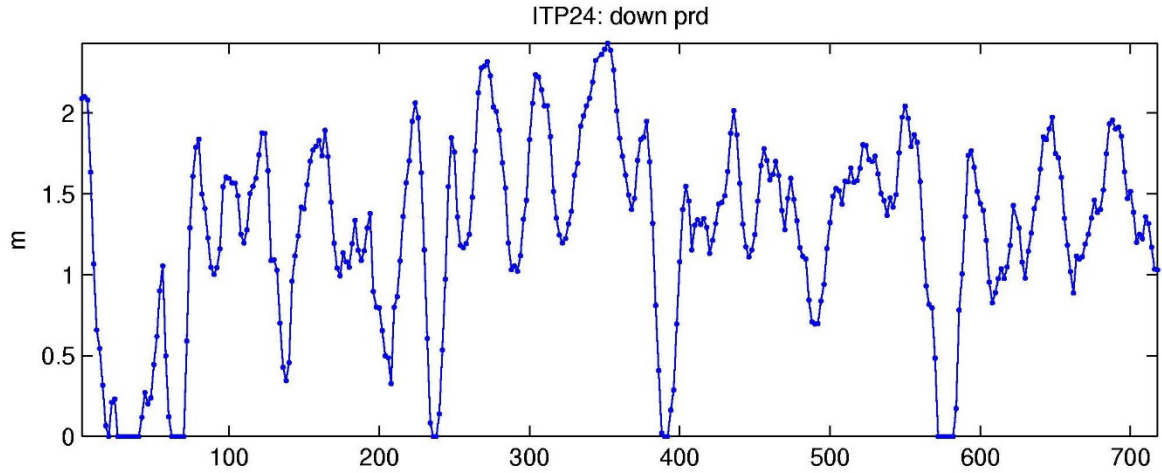
ITP profiler engineering data.



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



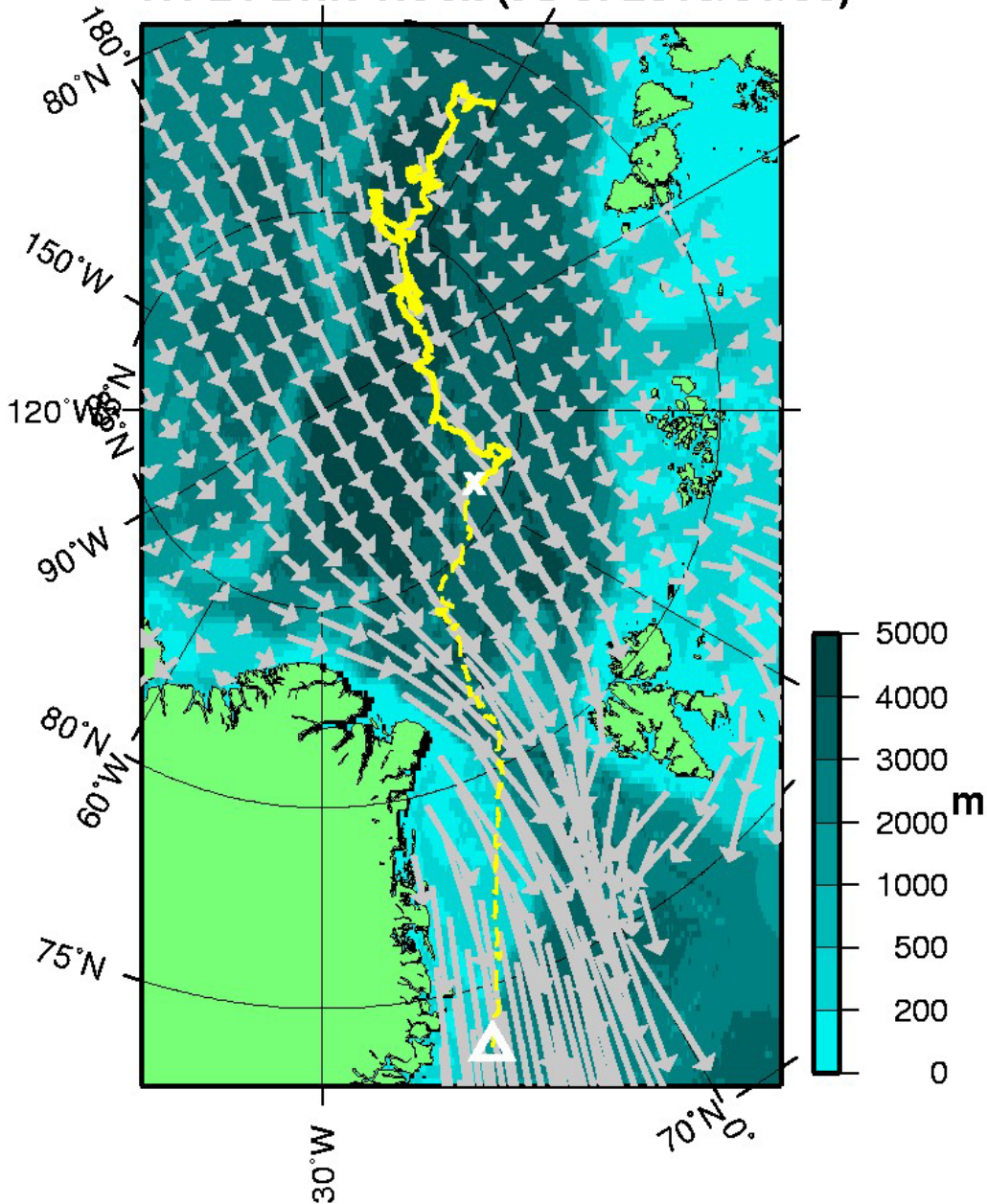
Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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



### ITP24 Drift Track (as of 2010/01/30)

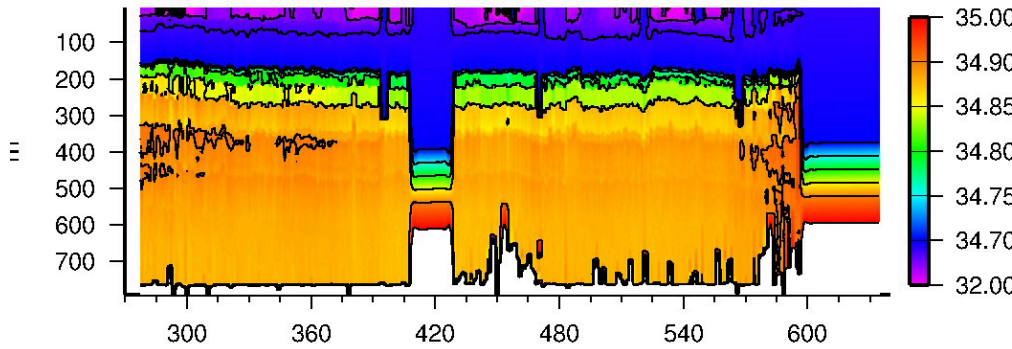
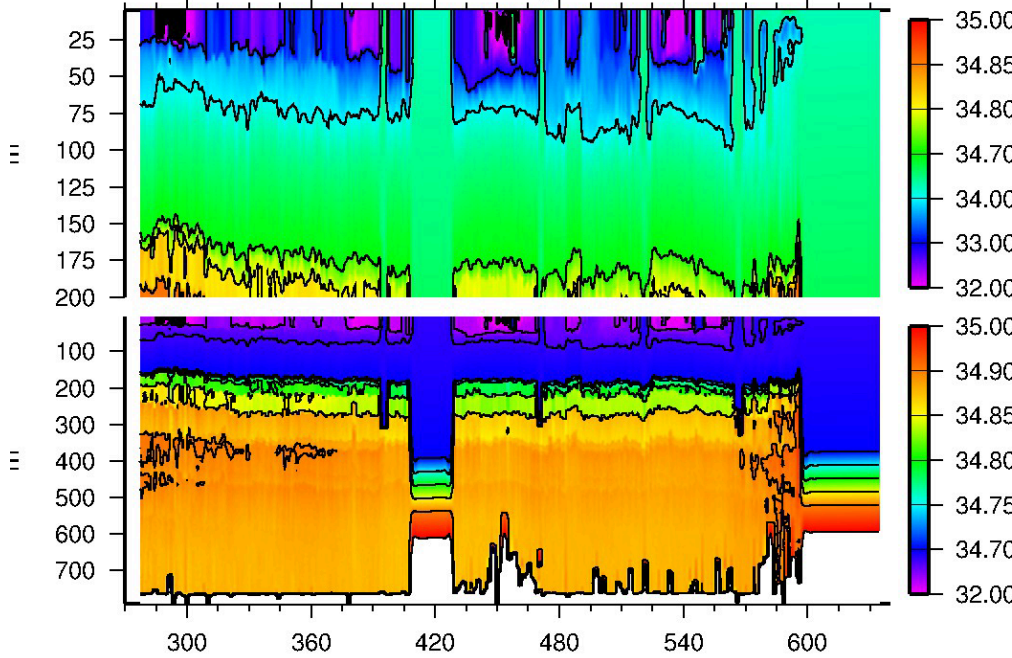
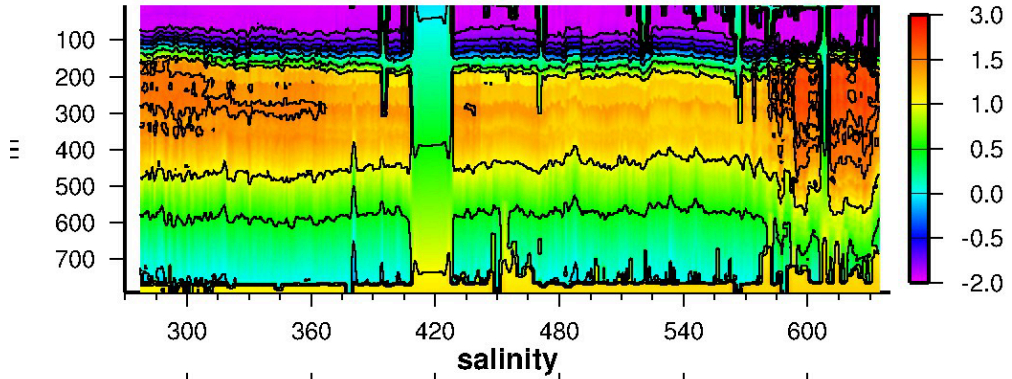
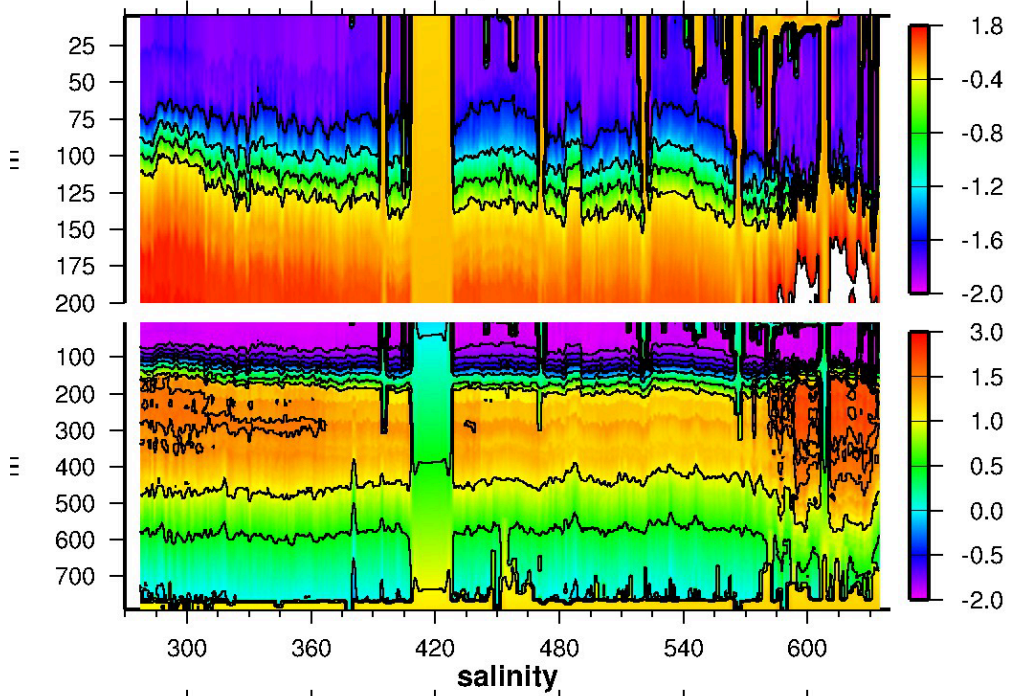


**ITP drift (yellow line), last profile (cross), and last location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).**

Plot of buoy locations.

# ITP24 Up Profile Contours (to profile 718)

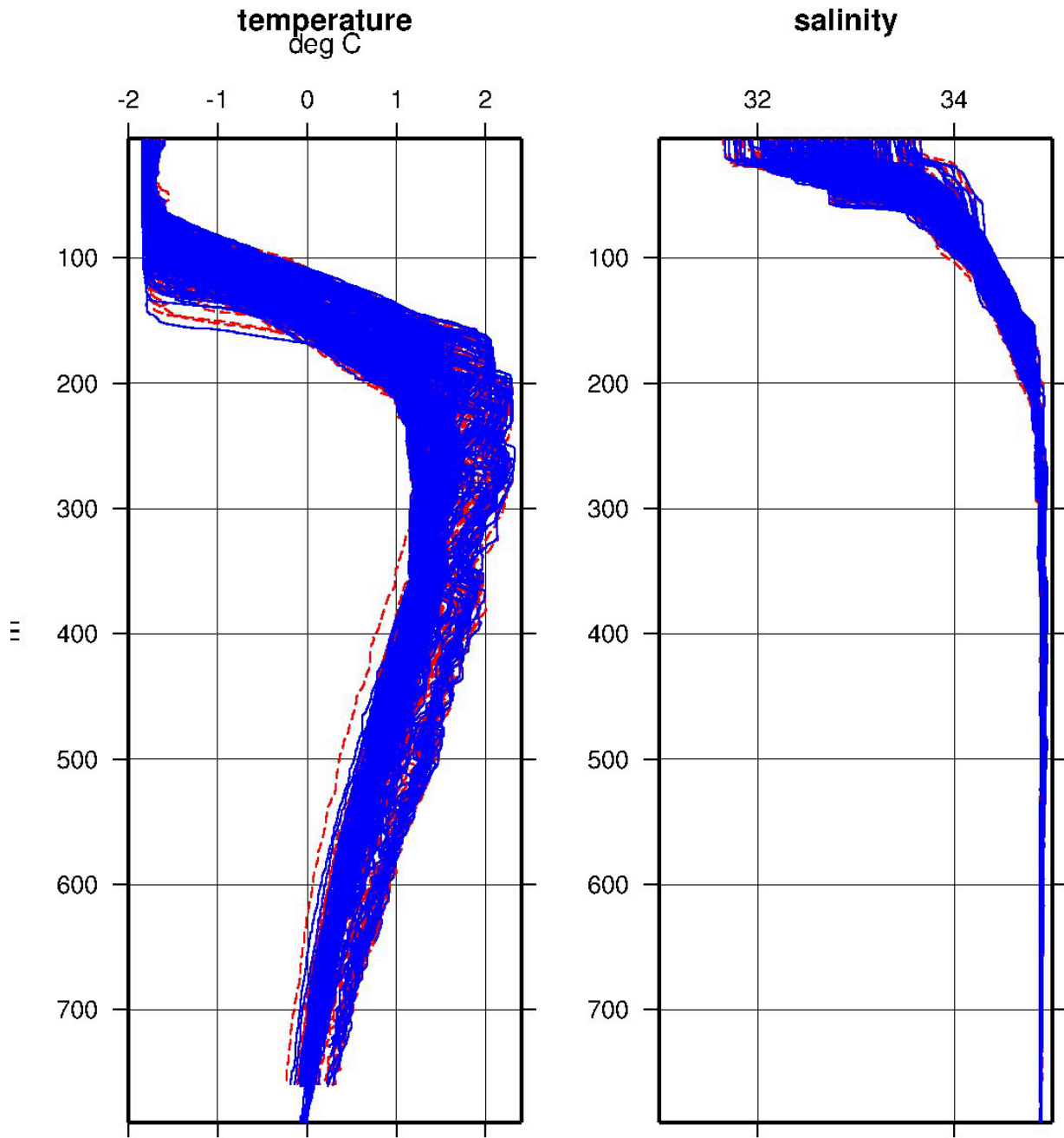
temperature



day 2008

ITP24 temperature and salinity contours.

# All ITP24 Profiles (up to profile 718)



*up solid, down dashed*

Composite plot of ITP temperature and salinity contours.



Two years after being deployed north of the Laptev Sea in the Eurasian Basin of the Arctic Ocean, ITP 24 surface package, supplementary foam and a portion of the tether was found floating in the Greenland Sea and recovered by an Icelandic fishing vessel. (Photo by Marvin Ingolfsson)



ITP 25 was deployed on a 1.5 m floe about 20 m from the ridge shown in rear. All of the gear was transported to the deployment site by helicopter.



ITP 25 was deployed on a 1.5 m floe about 20 m from the ridge shown in rear. All of the gear was transported to the deployment site by helicopter.