

## ITP 27 Overview

**Deployment Location:** 9/9/2008, 21:00 UTC at 81° 36.5'N, 154° 33.7'E

**Last Location:** 5/1/2010, 20:00 UTC at 66° 42.3' N, 20° 3.1' W

**Duration:** 598 days

**Distance Traveled:** 7460 km

**Number of profiles:** 266 in 132 days

Other instruments: none

ITP 27 was deployed on a 2.0 m thick ice floe in the Transpolar Drift from the Russian Research Vessel *Academic Federov*. The ITP operated on a typical sampling schedule of 2 one-way profiles between 7 and 760 m depth each day. In April 2010, over a year after the last transmission of the buoy, the surface package (with severed mooring cable) was discovered at 66° 3.5' N and 21° 41.5' W near the remote village of Holmavik in Iceland, and with the assistance of Marine Research Institute of Iceland was transported to Reykjavik and subsequently shipped back to Woods Hole.

## ITP27 Deployment Operations

ITP 27 was the third ITP deployed from the *Federov* in 2008 and was installed on a 2 m ice floe adjacent to the ship, while Russian scientists performed a CTD cast. The location was selected by the captain and ice observer and was considered acceptable after a survey team drilled multiple 2" holes to determine thickness. All of the deployment gear was hoisted to the ice using the ship's aft crane while the deployment team were lifted to the ice on a wooden pallet and cargo net using the ship's forward crane.

Once the gear was on the ice, sleds and brute strength made the 100+ m transit to the deployment site relatively quick. The deployment proceeded smoothly and took only 2 hours, concluding with a successful inductive modem test to confirm communications between the ITP profiler and surface package. Nearby the deployment site, a Russian ice observer team took ice core samples and determined the floe's thickness in a pre-determined grid pattern. Once finished, the gear was hauled back over to the ship where a rigging team hoisted the items to the hangar deck.

## ITP27 Data Processing

The 266 profiles that were obtained from ITP 27 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. As usual, some conductivity (salinity) data were affected by 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 occurred where

larger portions of a profile were contaminated. In addition, however, there were two longer sets where whole profile were eliminated. For the first set, profiles 34 through 64, the onset of the large contaminations was very obvious, while the return to normal occurred more slowly. After differences between up- and down profiles had disappeared and the vertical salinity structure had returned to patterns observed before the onset of contaminations, a conductivity adjustment was still needed for a small number of profiles at the end of the set to align T/S over the deepest portion of the profiles. Given how well the alignment worked, however, we found the adjusted profiles fit to be included in the final record. Temperature profiles throughout the set showed no up/down differences or other obvious outliers, retained a sharp step region throughout the set, and were retained for the final data.

The second set lasted longer (profiles 116 through 154), and was characterized by very large up/down conductivity differences. The start of contaminations as well as the return to a clean cell was obvious. Further, no conductivity adjustment was needed for the first acceptable conductivity profiles. In contrast to the first set, however, temperature appeared to be affected as well, in that a distinct step region that was present before and after the set was missing while conductivity was contaminated. The observed pattern seemed consistent with significant flow obstruction of the TS duct that led to a vertical smoothing of the temperature profile. However, since there was no up/down difference, and since the larger scale vertical pattern of the profiles appeared reasonable, **we retained temperature for this set as well, but these data should be considered questionable.**

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 to remove overcompensation. Other parameters such as the thermistor lag corrections ("tlag" in the code) and the conductivity-temperature time offsets ("cshift") were slightly modified for a very small number of profiles. Aside from the larger conductivity adjustment (also called calibration, "fac") mentioned above, only one further profile saw a small adjustment to better align deep TS; the new value of "fac" also corresponded more closely to its neighboring values.

## ITP27 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. Following its deployment, ITP24 recorded 266 profiles while the system drifted north in the Makarov Basin and west of the Lomonosov Ridge until the profiler ceased communicating with the surface package on January 20, 2009. The buoy continued to provide daily status data including locations until March 2, 2009 when Iridium communications ceased (within 140 miles of the North Pole). Buoy drift speeds during this period were mostly between 10 and 30 cm/s, with a few spikes exceeding 40 cm/s.

However, data from the recovered surface package shows that the system continued to acquire GPS locations. The buoy drifted within 6 miles of the North Pole, proceeded through Fram

Strait, and washed ashore on Iceland on February 19, 2010 where it remained until it was discovered the following April.

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

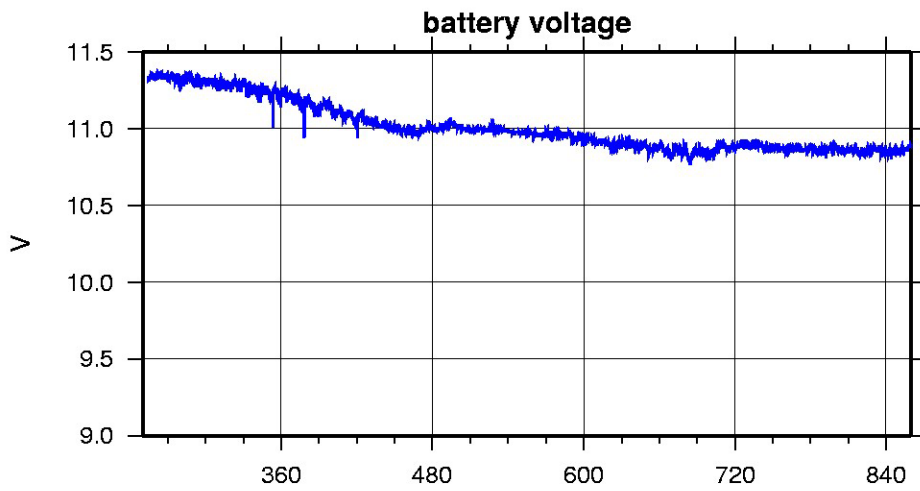
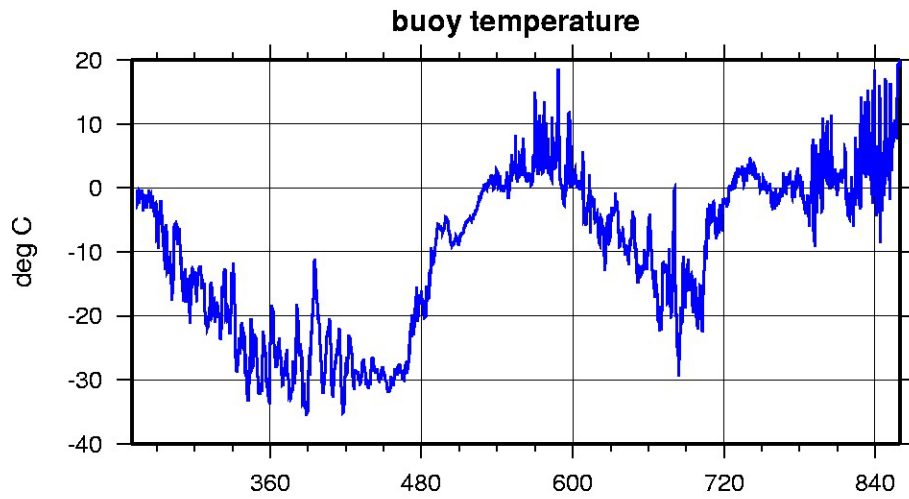
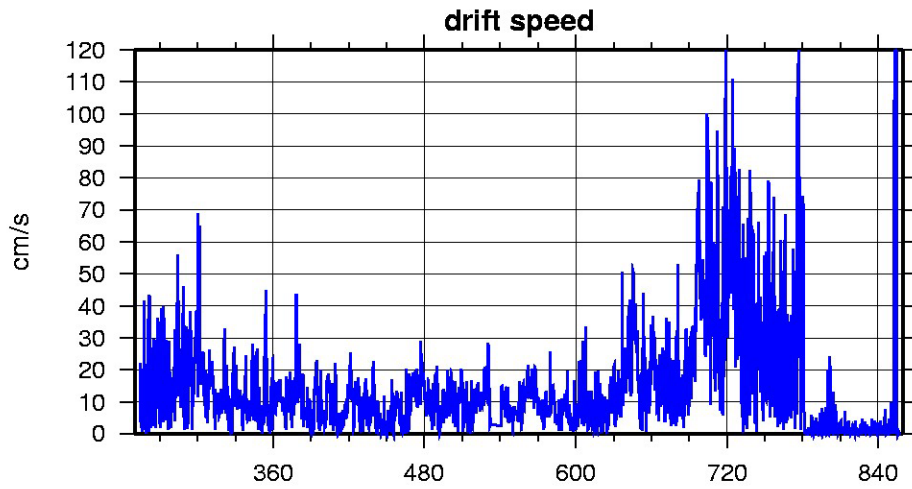
Level II hourly buoy location data in ASCII format: `itp27rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp27cormat.tar.Z` or `itp27cormat.zip`

Level III 1-db bin-averaged processed profile data in MATLAB format: `itp27final.mat`

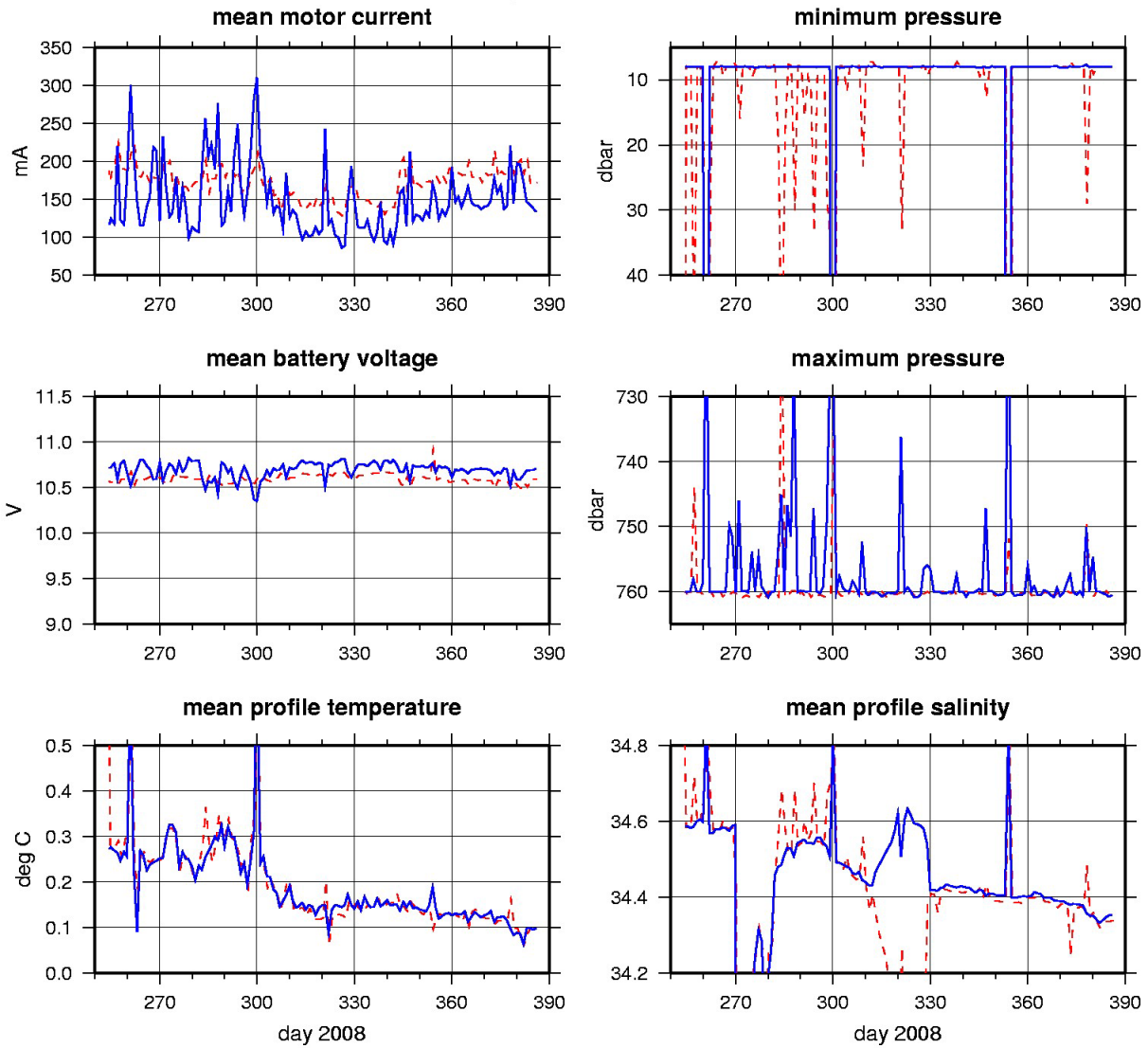
Level III 1-db bin-averaged processed profile data in ASCII format: `itp27final.tar.Z`  
or `itp27final.zip`

# ITP27 Buoy Status (as of 2010/05/06)

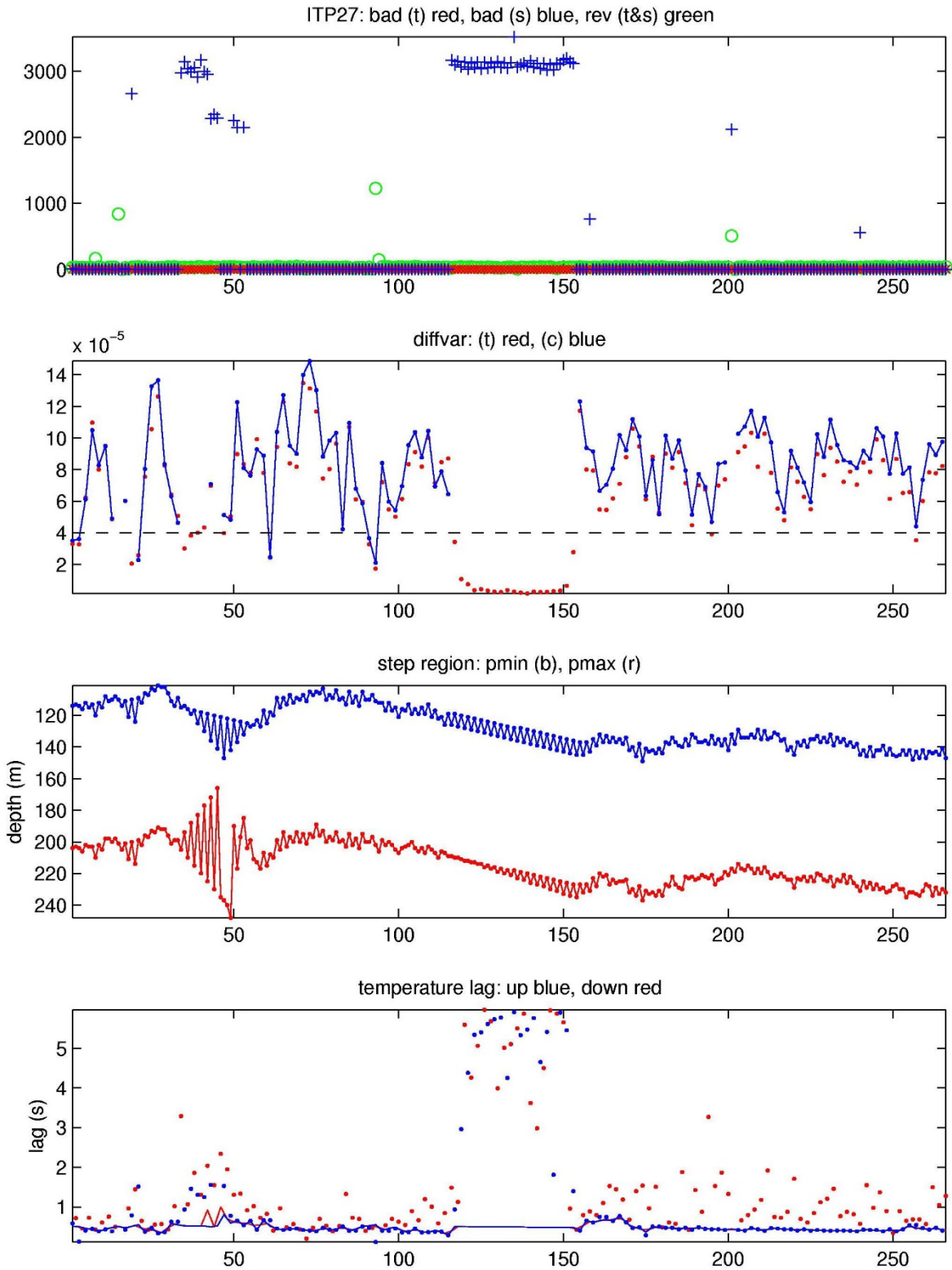


### ITP27 Profiler Status (up to profile 266)

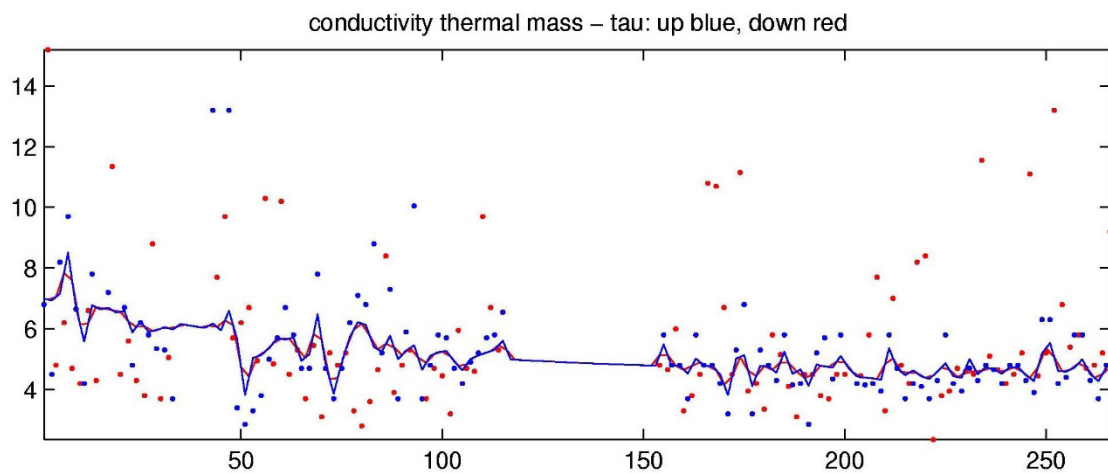
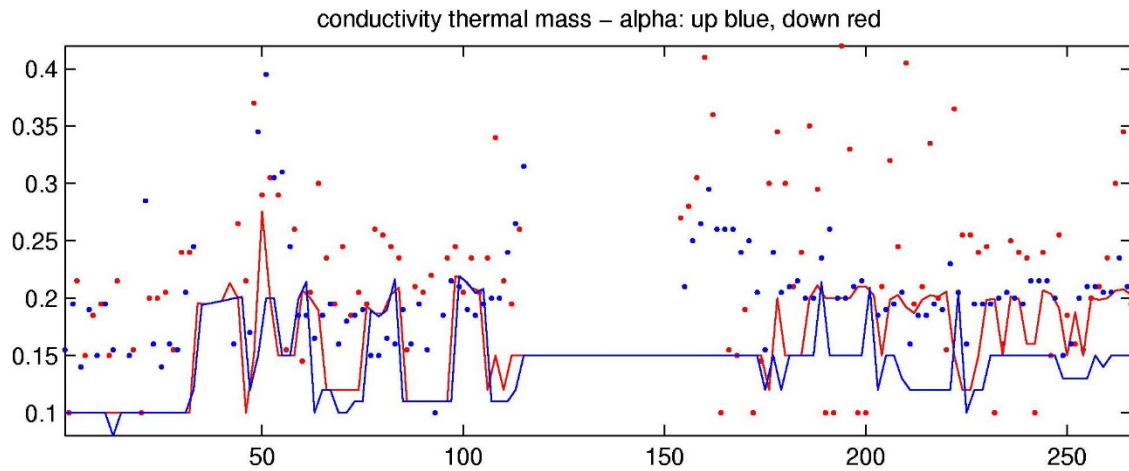
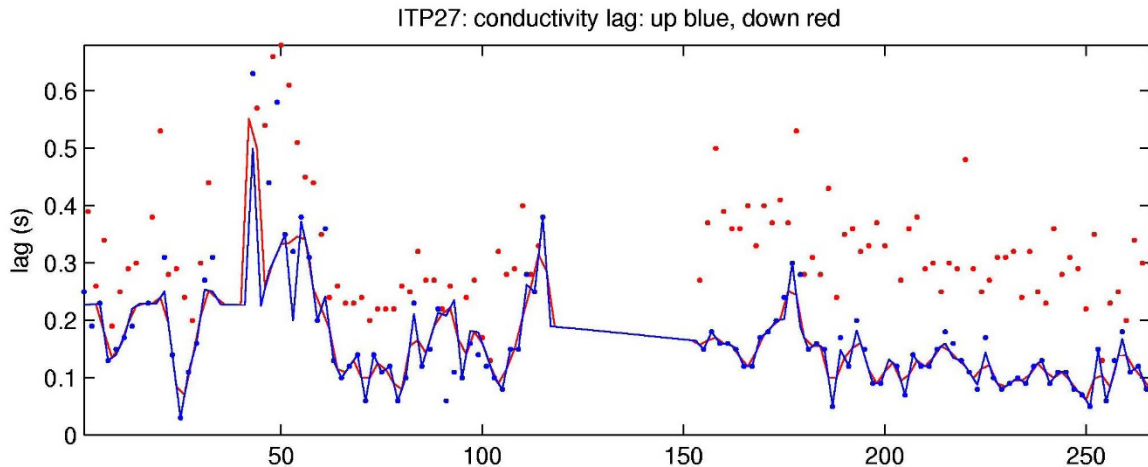
*up solid, down dashed*



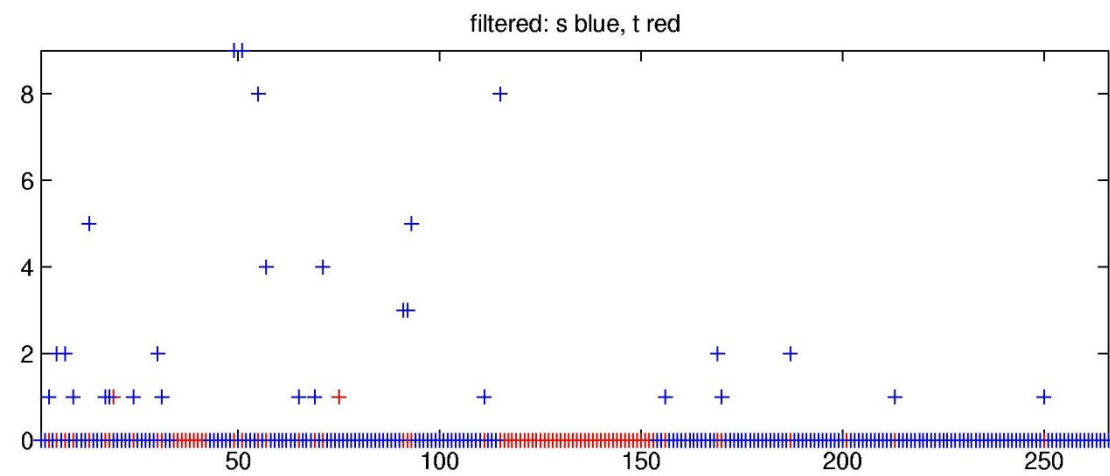
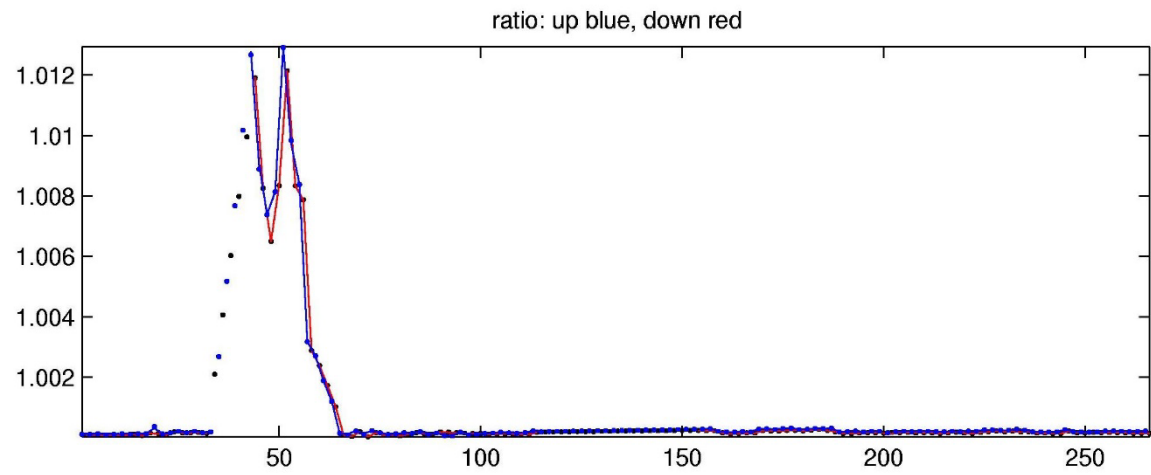
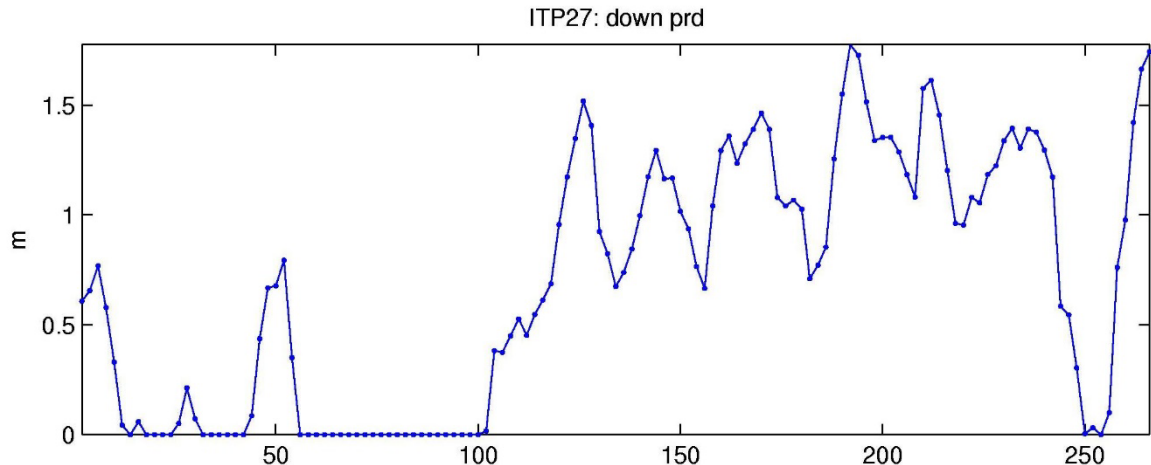
ITP profiler engineering data.



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.

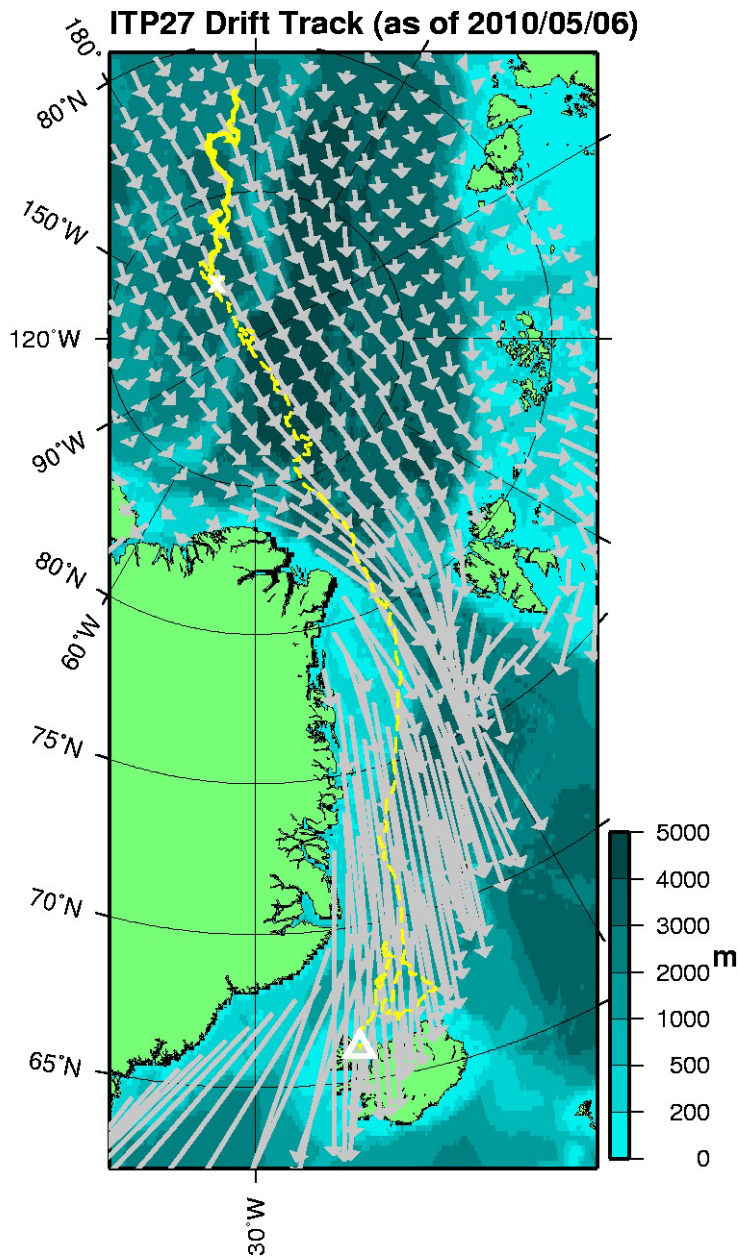


Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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



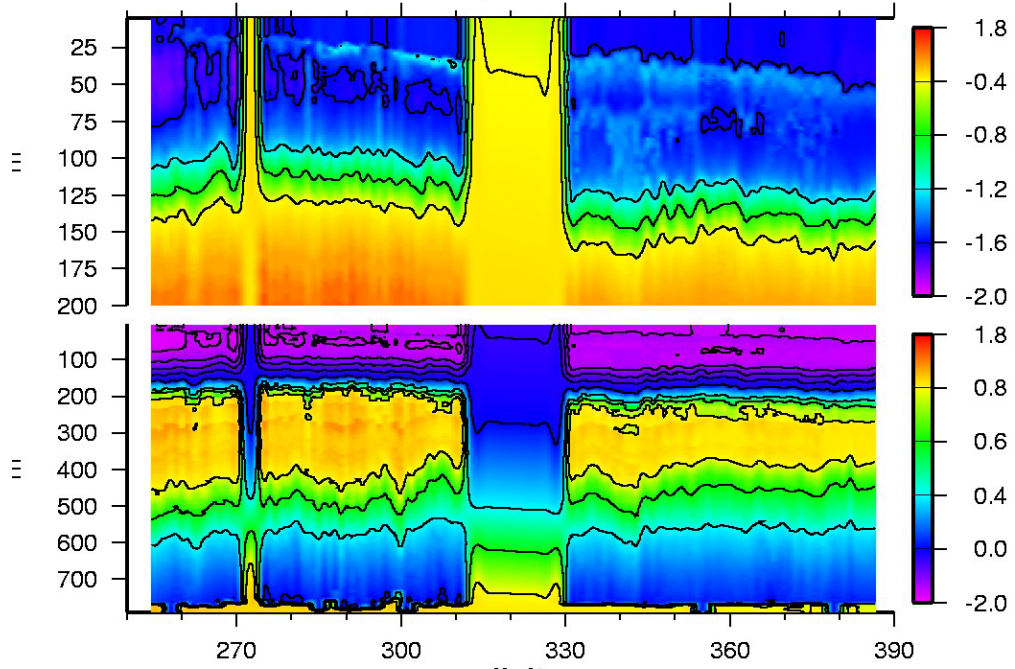


**ITP drift (yellow line), last profile (cross), last location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).**

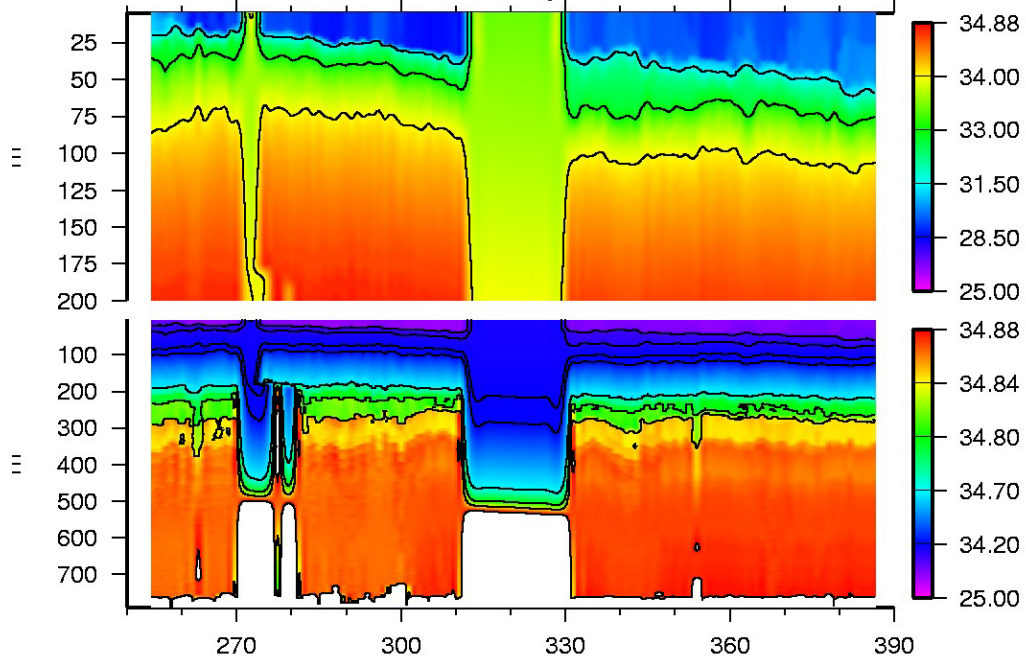
Plot of buoy locations.

### ITP27 Up Profile Contours (to profile 266)

temperature



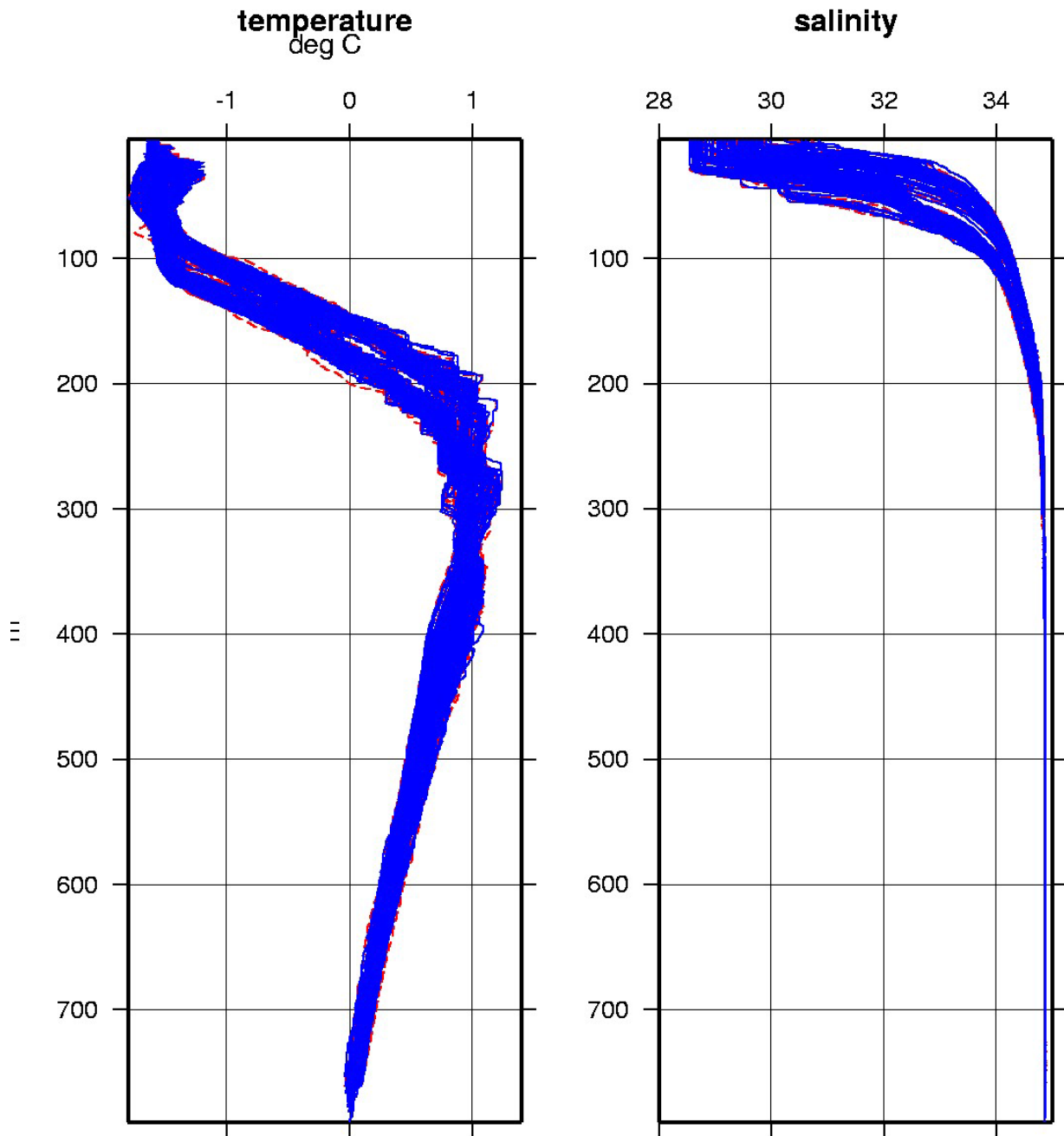
salinity



day 2008

ITP27 temperature and salinity contours.

### All ITP27 Profiles (up to profile 266)



*up solid, down dashed*

Composite plot of ITP temperature and salinity contours.





The deployed ITP with supplemental flotation package with the Federov in the background.  
(Photo by Jeff Pietro)



The ITP surface package as discovered on a northern Icelandic beach. (Photo by Bjorn Torfason)