ITP 53 Overview

Deployment Location: 8/4/2011, 18:00 UTC at 77° 34.2'N, 145° 56.4'W

Last Location: 8/12/2012, 23:07 UTC at 75° 44.5' N, 147° 57.4' W

Duration: 374 days

Distance Traveled: 3419 km

Number of profiles: 750 in 375 days

Other instruments: none

ITP 53 was deployed on a 3.80 m thick ice floe in the Beaufort Sea as part of the Beaufort Gyre Observing System (BGOS) during the JOIS 2011 cruise on the *CCGS Louis S. St. Laurent*. The ITP operated on a typical sampling schedule of 2 one-way profiles between 7 and 760 m depth each day.

ITP53 Deployment Operations

ITP 53 was the first of four ITPs installed in the Beaufort Sea during the 2012 JOIS expedition aboard the *CCGS Louis St. Laurent* and consisted of hardware recovered and refurbished from previous deployments. The surface unit was originally ITP 27, which was originally deployed in the Transpolar Drift in 2008, and the buoy was found washed ashore in Iceland in April 2010, returned to WHOI, refurbished, provide with new batteries, and retested with the refurbished profiler from ITP 8 that had been recovered in October 2009. The system with new tether was dock tested in the spring of 2011 before shipment to the JOIS expedition.

The day of this deployment started off as a beautiful, sunny, and warm day with some fog arriving late. Helicopter reconnaissance in the clear morning quickly located a small but suitable floe which stood out amongst the neighboring floes and was found to be over 3 m thick when landed on and surveyed. An hour later the entire deployment team, supporting crewmembers, other scientists to perform ice measurements, and all equipment had been transferred to the floe and the work began. In the warm conditions, many removed their outer cold weather layer and performed their tasks in jeans and lighter wear for much of the day -- atypical for the Arctic.

While the 3.8 m thick ice at the ITP deployment site was ideal for ensuring a robust platform for the buoy, drilling the 10.5" diameter hole through the thick ice becomes difficult as the auger goes deeper the ice shavings load the small auger engine. To assist, the tripod was assembled and the chainfall used to take some of the load of the auger head to facilitate the hole drilling which took about 45 minutes to complete. Twenty minutes later the inductive modem test completed, and the profiler lowered through the ice hole. The ITP system was completely installed and tested only 60 minutes after the hole was drilled, when the fog bank arrived. Half an hour later all were back onboard the ship.

ITP53 Data Processing

The 750 profiles that were transmitted from ITP53 were processed according to the procedures described in the ITP Updated Data Processing Procedures. The processing parameters for are shown in the figures to the right. Buoy drift speeds were almost always less than 30 cm/s until the last 40 days of the time series, so the profiler covered at least 700 m in nearly 95% of the profiles that it communicated to the surface package.

Thermohaline staircases were well defined for the first 500 profiles to generate initial estimates for CTD lag corrections. They were further tuned to reduce small spikes at the base of TS steps as well as to reduce the slight up/down hysteresis present for much of the record, but were overall within typical ranges, with little drift and typical variability. Two significant fouling events, centered around profiles 335 and 580 respectively, were addressed by editing a number of profiles or portions thereof as well as by an increase in the potential conductivity calibration correction (variable "rat").

ITP53 Data Description

The ITP profiler was configured to operate on a standard 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 hourly, and buoy temperature and battery voltage status were recorded.

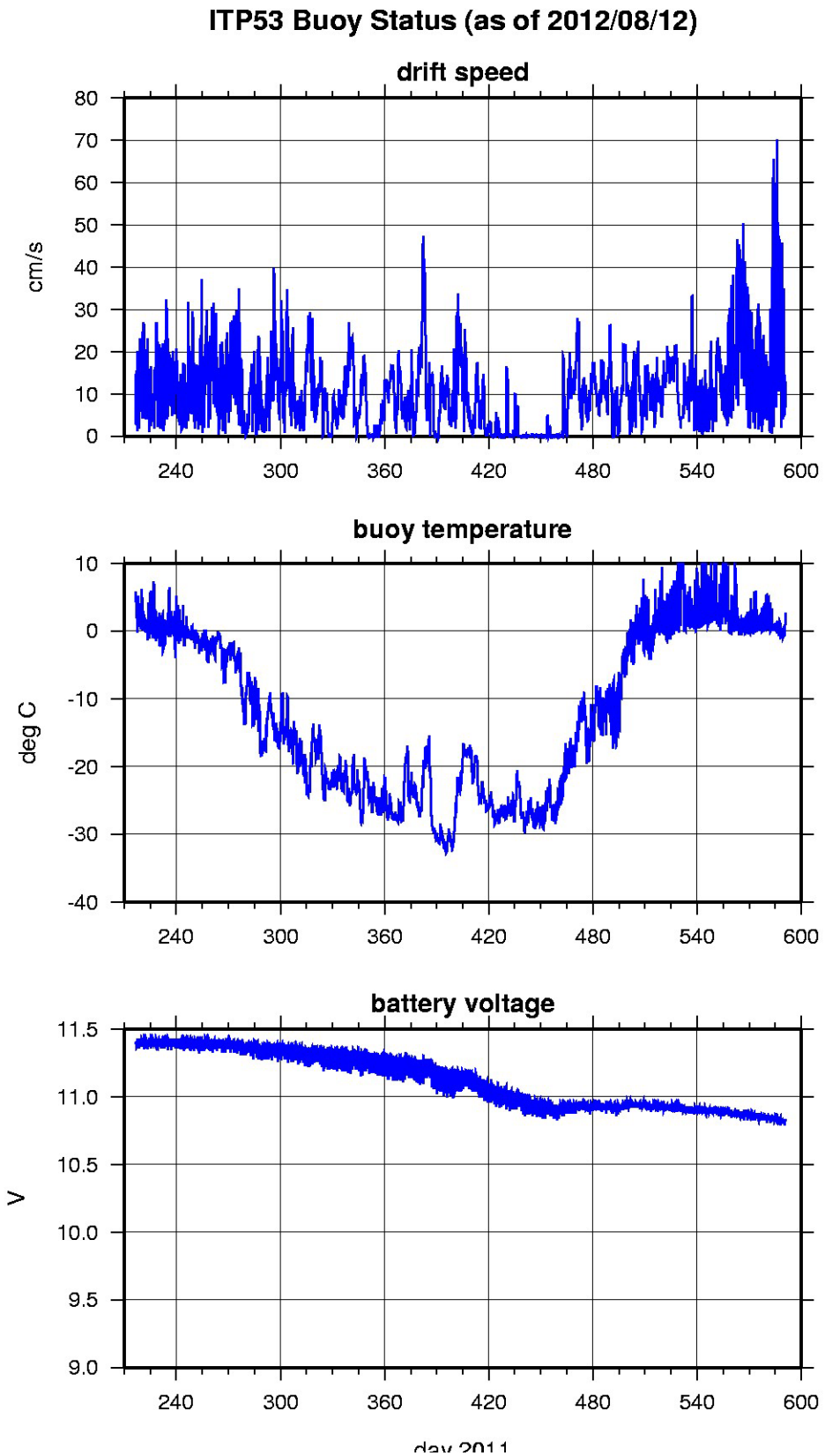
The buoy drifted generally southeastward with the Beaufort Gyre circulation for the first 3 months, then migrated generally southward along the 140°W meridian from 77 to 74°N latitude over the next 3 months. Subsequently, the system turned west and managed to maintain the mooring system despite drifting over the Northwind Ridge, then turned back east along 76°N. In July 2012, drift speeds accelerated, peaking at 70 cm/s in early August and shortly thereafter the surface package abruptly ceased transmitting on August 12th. The profiler had continued to transfer data to the surface package until the last buoy transmission.

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

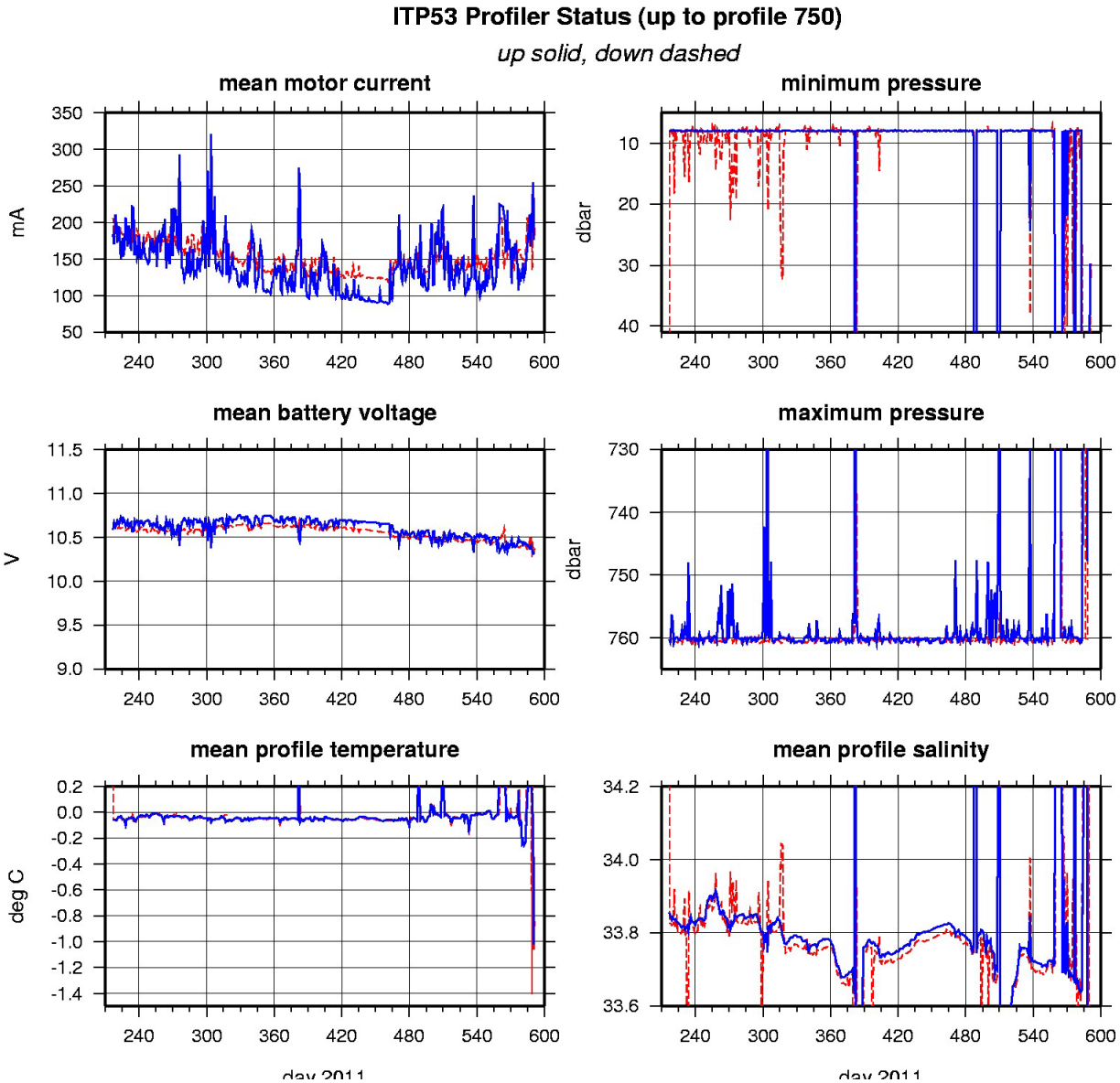
evel II hourly buoy location data in ASCII format: itp53rawlocs.dat

Level III 1-Hz processed profile data in MATLAB format: itp53cormat.tar.Z or itp53cormat.zip

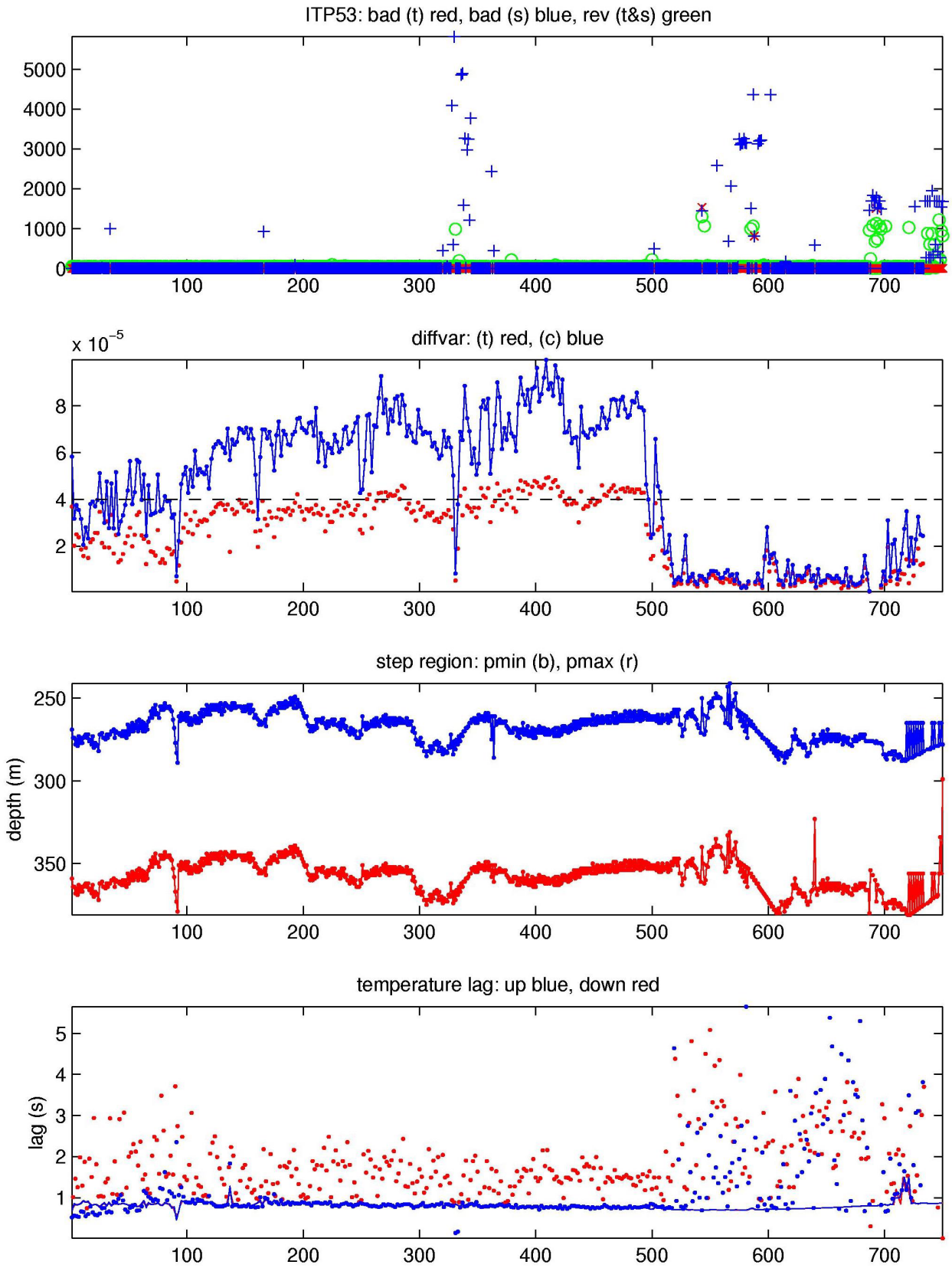
Level III 1-db bin-averaged processed profile data in MATLAB format: itp53final.mat
Level III 1-db bin-averaged processed profile data in ASCII
format: itp53final.tar.Z or itp53final.zip



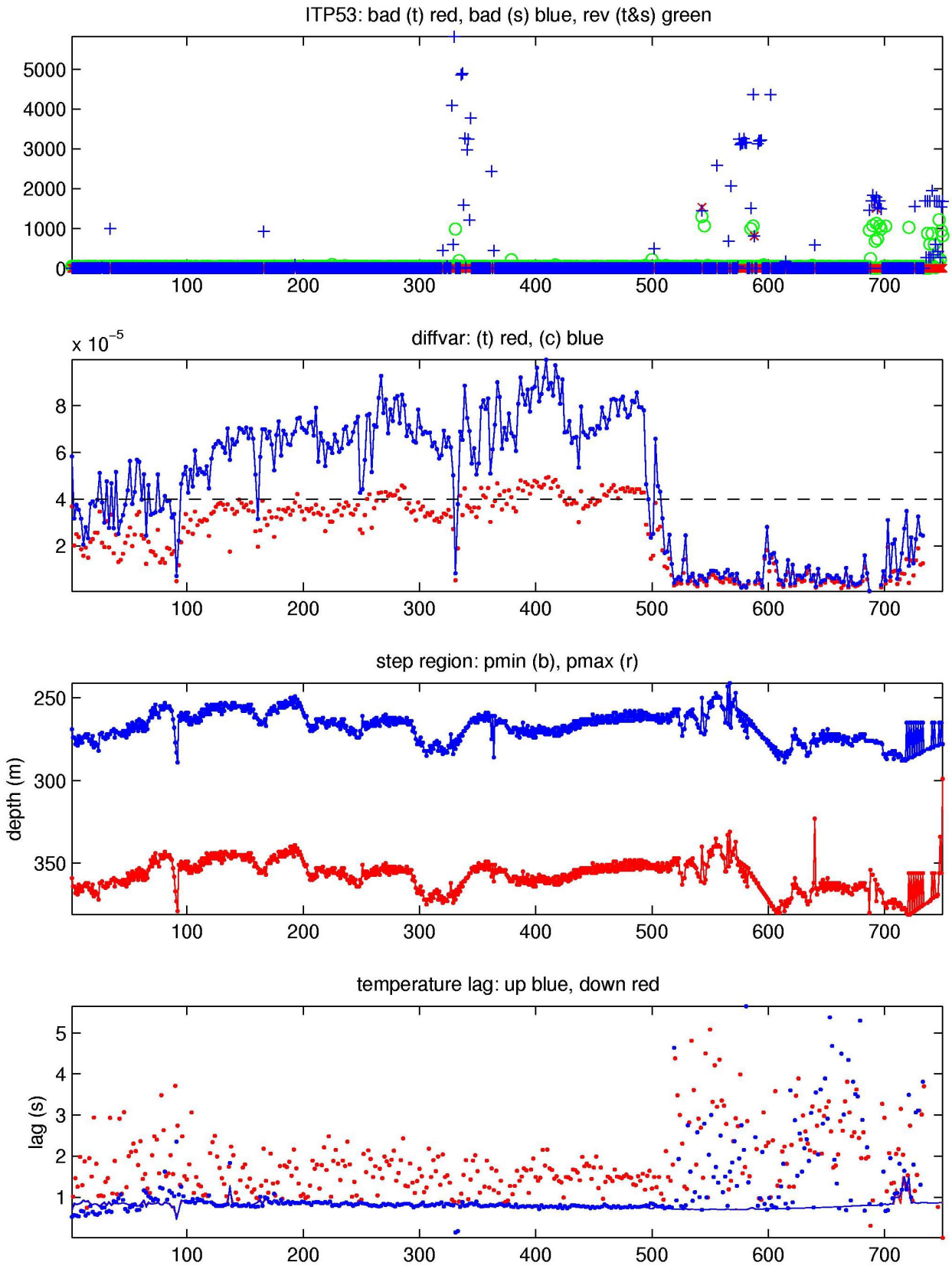
ITP Surface Buoy Status.



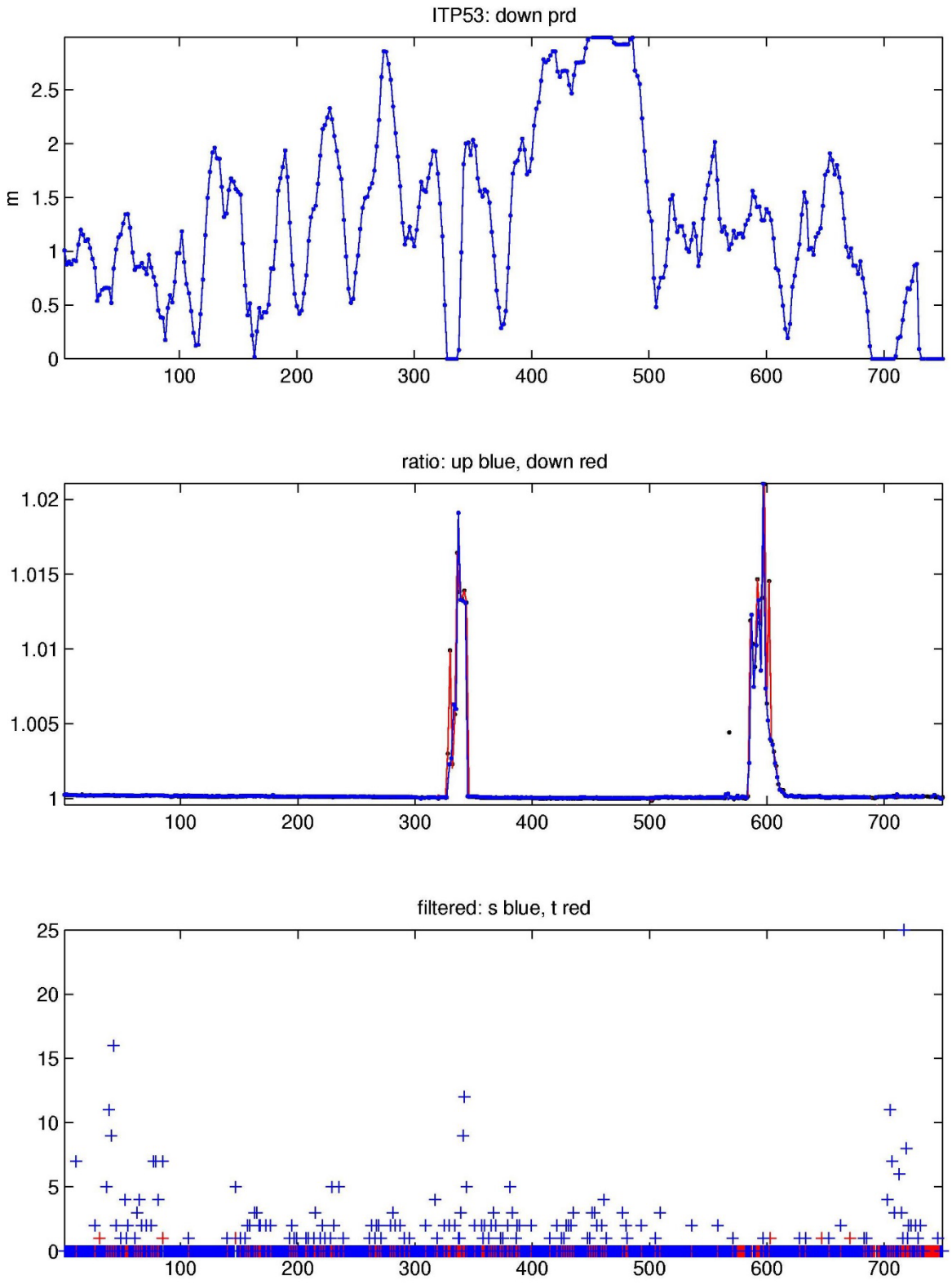
ITP profiler engineering data.



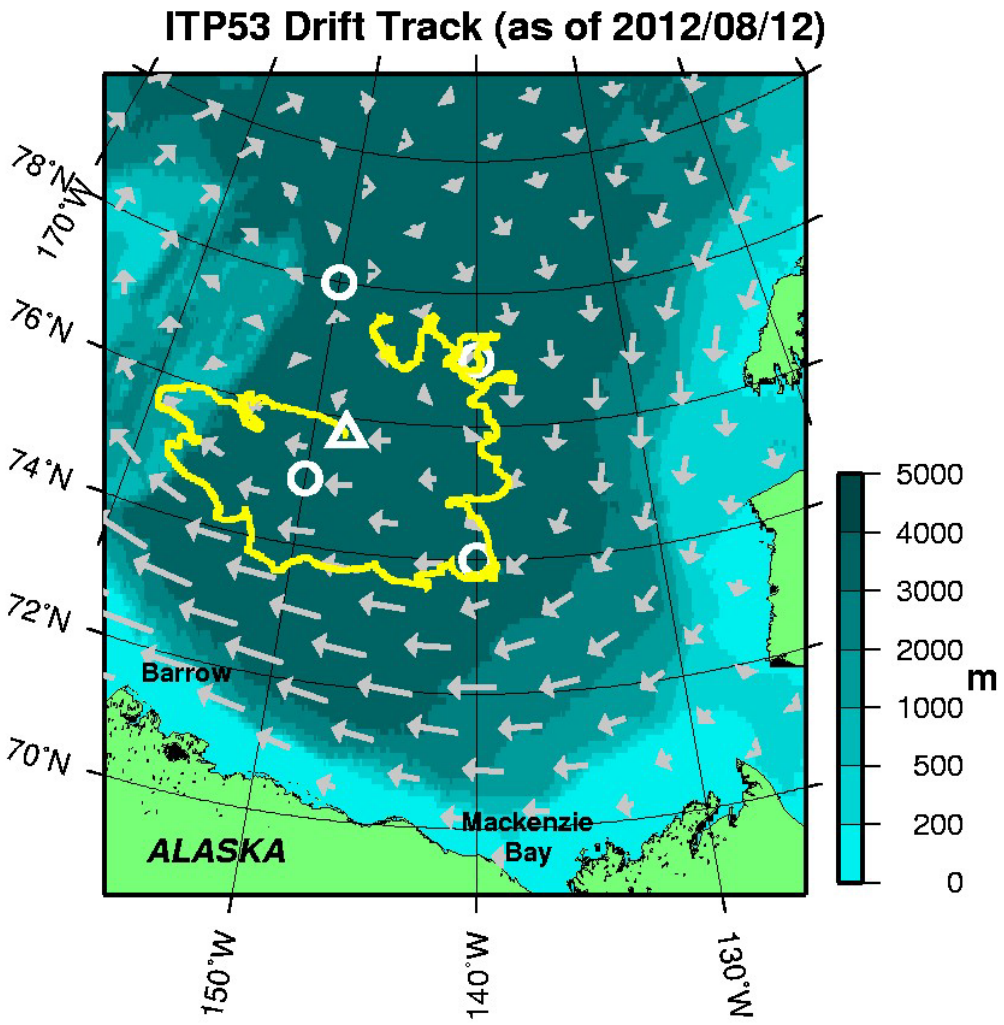
Top: number of bad points removed, Middle: variance of verticle difference of temperature and salinity in step region for up-going profiles, Bottom: temperature lag.



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

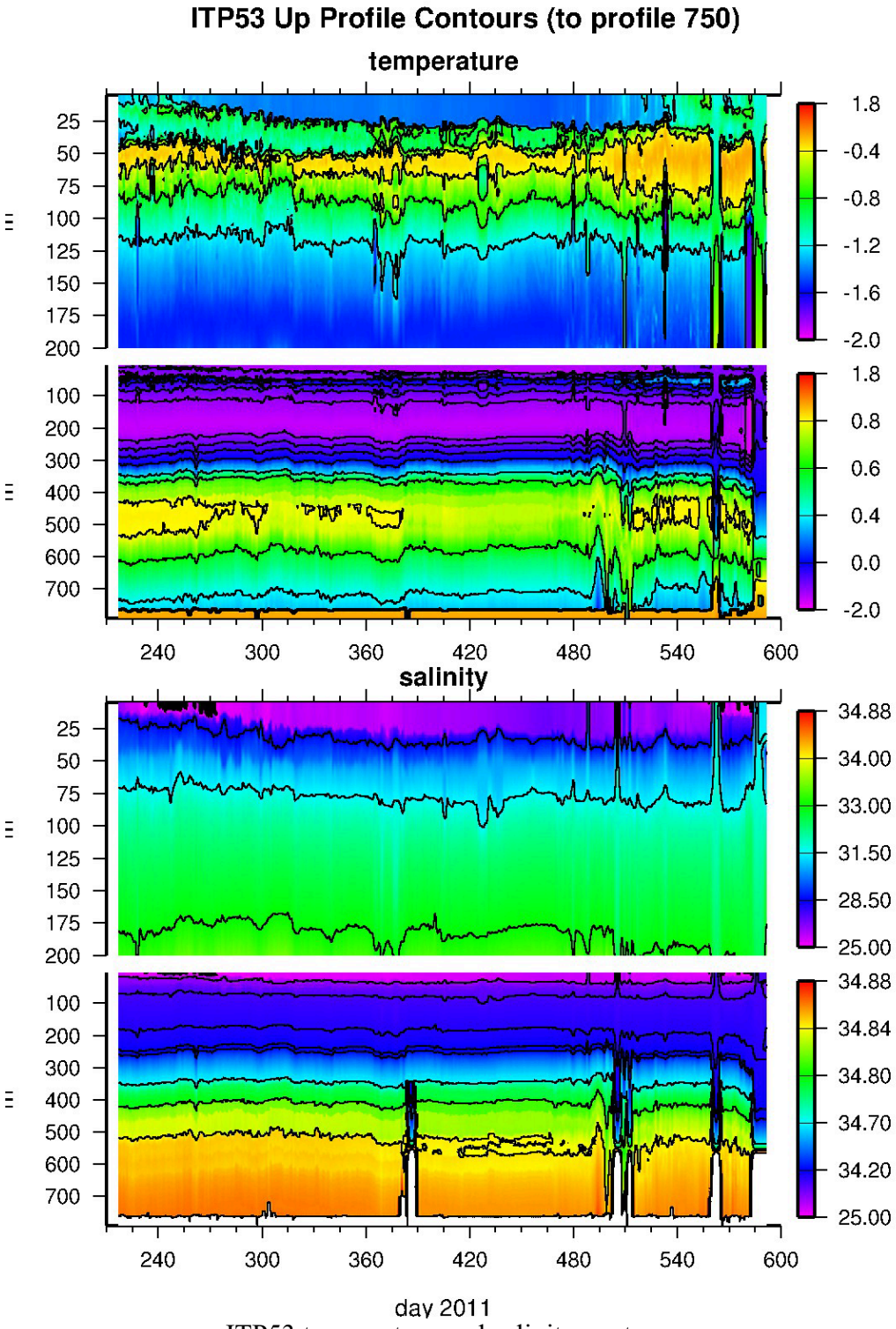


Top: down pressure deviation correction, Middle: salinity ratio adjustment, Bottom: Number of filtered spikes.

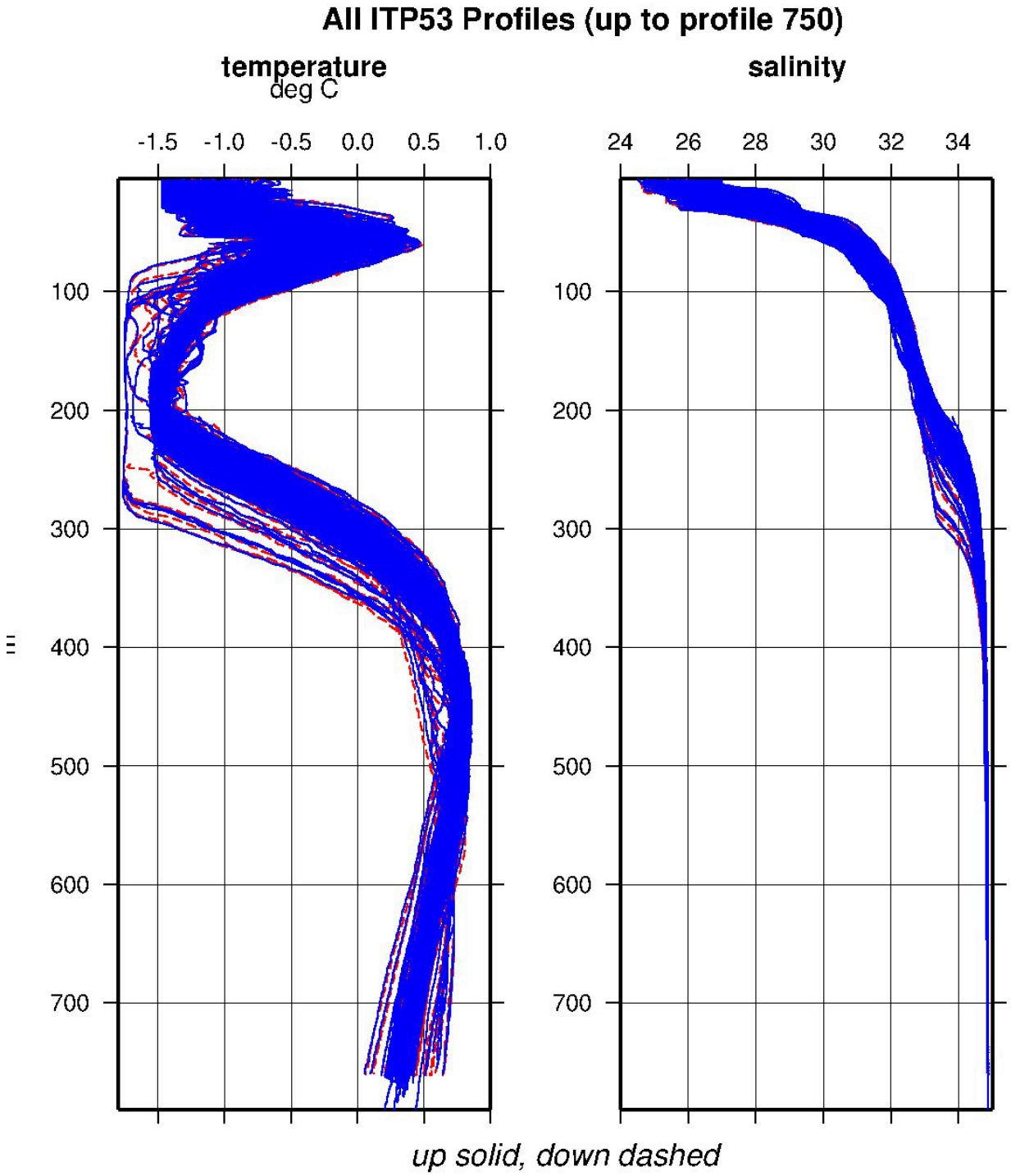


ITP drift (yellow line) and latest location (triangle), BGOS moorings (white circles) and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).

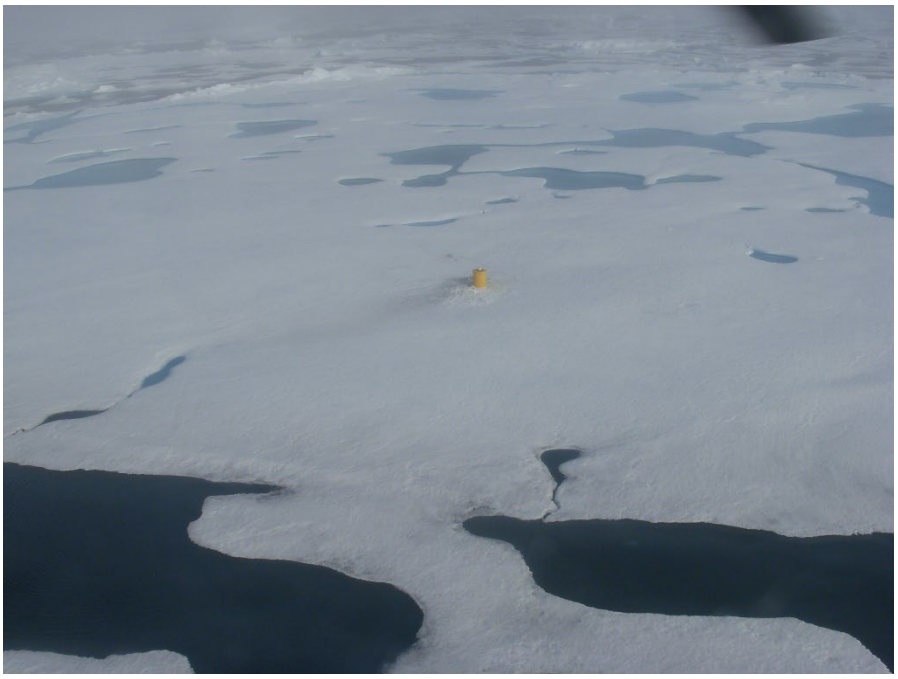
Plot of buoy locations.



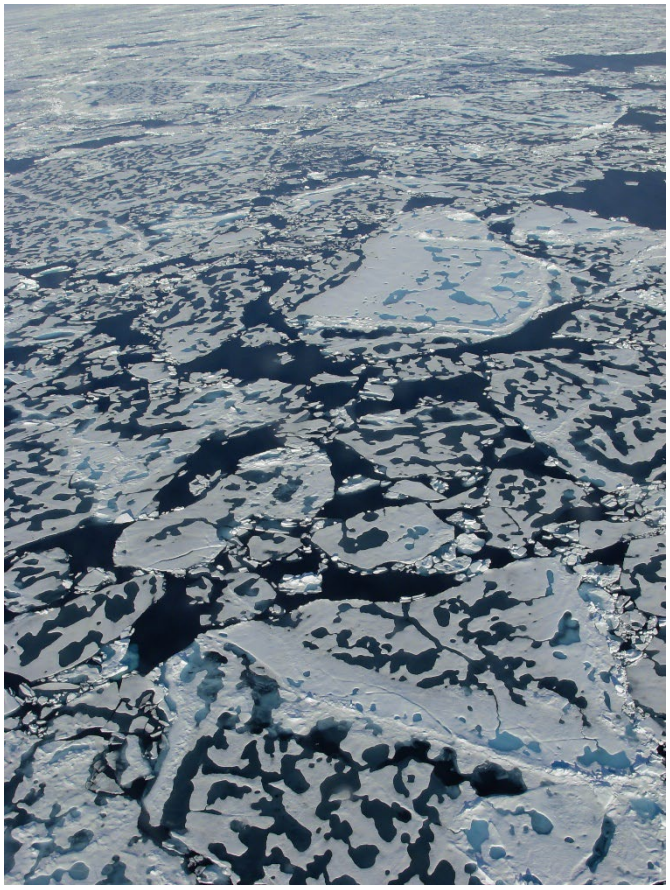
ITP53 temperature and salinity contours.



Composite plot of ITP temperature and salinity contours.



ITP 53 as deployed -- viewed from the last helicopter flight back to the ship. (Rick Krishfield)



The ice floe where ITP53 would be deployed stands out during the morning helicopter reconnaissance. (Rick Krishfield)