ITP25 Overview

Deployment Location: 9/22/2008, 02:00 UTC at 80° 38.5'N, 166° 46.0'W

Last Location: 7/7/2009, 23:00 UTC at 84° 6.5' N, 120° 42.9' W

Duration: 289 days

Distance Traveled: 1959 km

Number of profiles: 580 in 289 days

Other instruments: ITAC, PAWS

ITP25 was deployed on a 1.6 m icefloe in the Beaufort Gyre from the German Research Vessel *Polarstern* as part of the European Union DAMOCLES Program. On the same icefloe, an Optimare ITAC (Ice-Tethered Acoustic Profiler) with GPS mast and University of Hamburg (ZMAW) PAWS (Polar Atmospheric Weather Station) meteorological buoy were also installed. The ITP operated on a typical sampling schedule of 2 one-way profiles between 7 and 760 m depth each day.

ITP25 Deployment Operations

ITP 25 was deployed as part of the first 'Super Station' (or Ice-Based Observatory) established during the ARK-XXIII/3 expedition on the Polarstern, and consisted of the ITP, a PAWS meteorological station and ITAC acoustic current profiler buoy. Arriving near the desired deployment location on September 21, fog limited helicopter operations to a short distance away from the ship, during a few time periods of clear weather. Potential floes were surveyed using a 2" portable ice auger, but the weak and thin ice made finding a suitable floe difficult. Eventually, the ship docked alongside a relatively level 1.5-1.7 m thick ice floe and sites were selected within 300 m of the edge. The actual deployment operation began early the next morning when the weather was fortunately clear enough to transport gear by helicopter.

After some difficulties with the 10" ice augers, the ITP was successfully installed about 100-150 m from the ice-floe edge where the Polarstern was docked, the PAWS was located about 30 m away and the ITAC about 100m away in 2m thick ice. There were refrozen melt-ponds in several places around the deployment sites. Despite the difficulties on finding the location, foggy weather conditions and operating some of the equipment, all of the buoys worked well on deployment, with many thanks given to the support from the ship's crew and volunteers from other scientific groups on-board who assisted the deployments.

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

ITP25 Data Processing

The 580 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 25 are shown in the figures to the right. Buoy drift speeds were almost always less than 30 cm/s throughout the entire time series so the profiler covered the full extent of every profile.

The CTD data required little editing for biofouling or similar glitches. One complete profile (438) was eliminated due to unrealistic conductivity (C), while only two profiles had significant portions removed for similar reasons. Single point C spikes were removed from roughly 15 profiles. Based on these edits, ITP25 had a 99.5% good data return.

Thermohaline staircases were present throughout most of the time series, enabling CTD lag corrections (the variance criterion for their detection dropped briefly below the 0.0004 threshold for profiles 275 through 310). All of the lags were in the typical range found for previous systems. During manual editing, a small set of lags (order 20) were modified to remove small "spikes" at the base of T/S steps (T lag), or to adjust a slight salinity tilt (S reducing with depth within a step, leading to slight density inversions; adjust thermal lag).

Potential conductivity was mostly constant and close to unity. The record included four spikes, which were investigated by inter-comparison of S, T, and density profiles as well as TS diagrams within a group of neighboring profiles. In one instance (profile 438) the conductivity adjustment was reset to neighboring values: as mentioned above, 438 had been significantly edited, and the remaining profile was "short", i.e., had little overlap with our historical conductivity fields. This might have "fooled" the calibration routines. In all other cases, the determined conductivity adjustment was confirmed.

ITP25 Data Description

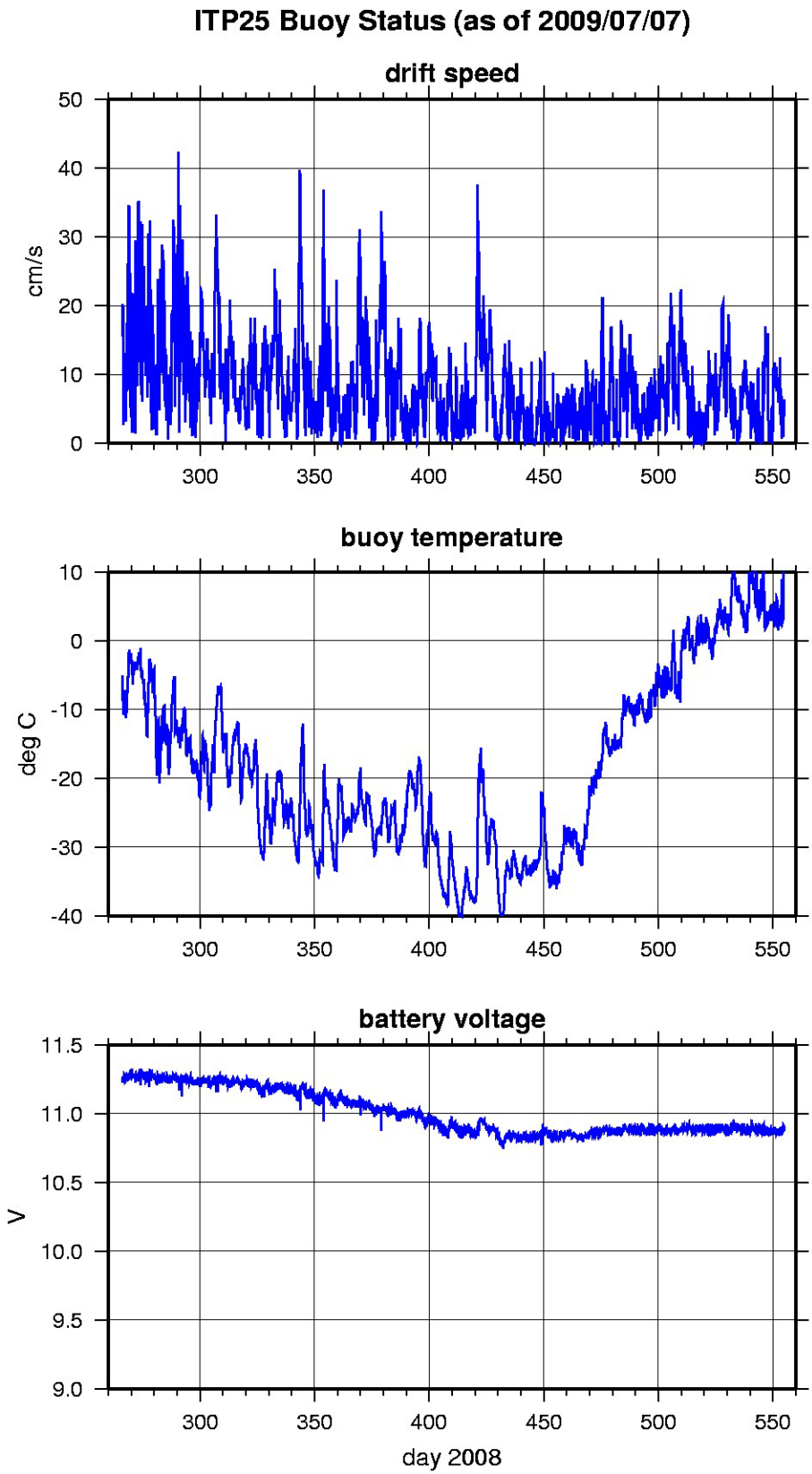
The ITP profiler was configured to operate with a standard sampling schedule of 2 one-way profiles between 7 and 750 m depth each day. In the surface package, the GPS receiver was powered hourly to obtain locations, and buoy temperature and battery voltage status were recorded. After 289 days of reliable operation and data telemetry while gradually drifting from the Makarov Basin across toward the Canadian Archipelago, ITP 25 suddenly ceased transmitting data. Often loss of communications with the profiler, followed by loss of GPS locations precede disappearance of an ITP presumably encased in a ridge. These symptoms were not present in this case, so the reason for the abrupt failure is not known.

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

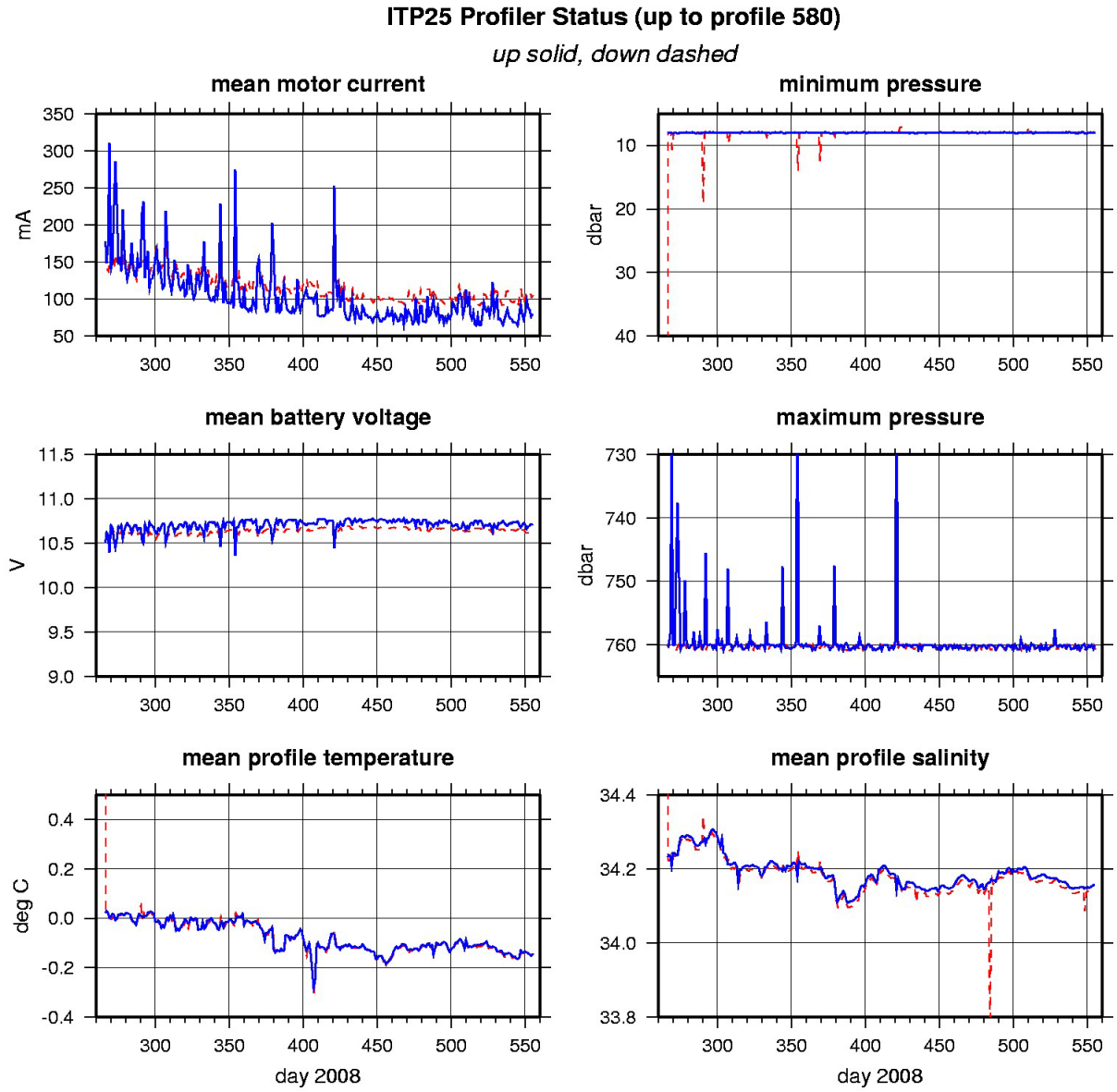
Level II hourly buoy location data in ASCII format: itp25rawlocs.dat

Level III 1-Hz processed profile data in MATLAB format: itp25cormat.tar.Z or itp25cormat.zip

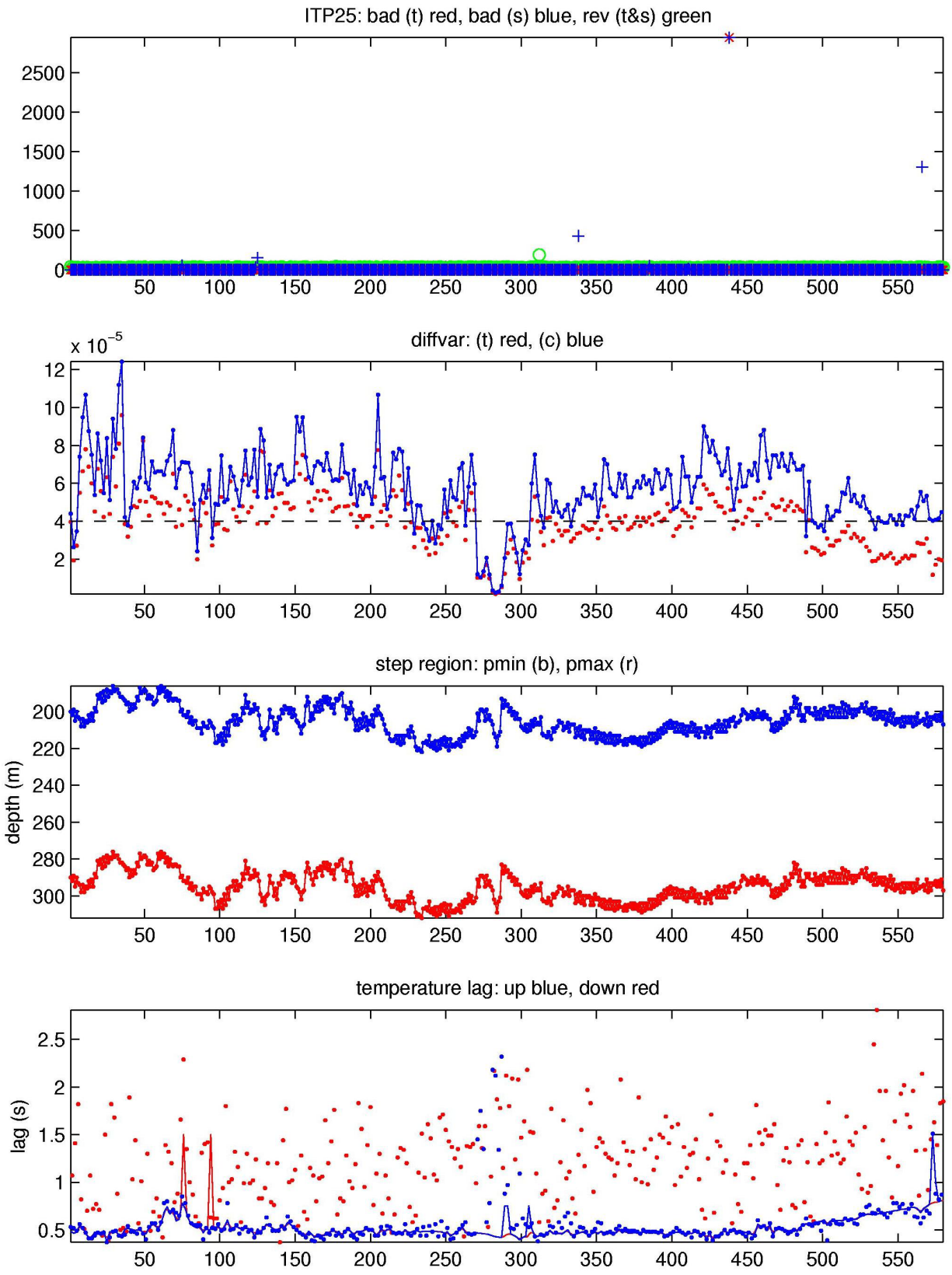
Level III 1-db bin-averaged processed profile data in MATLAB format: itp25final.mat
Level III 1-db bin-averaged processed profile data in ASCII format: itp25final.tar.Z
or itp25final.zip



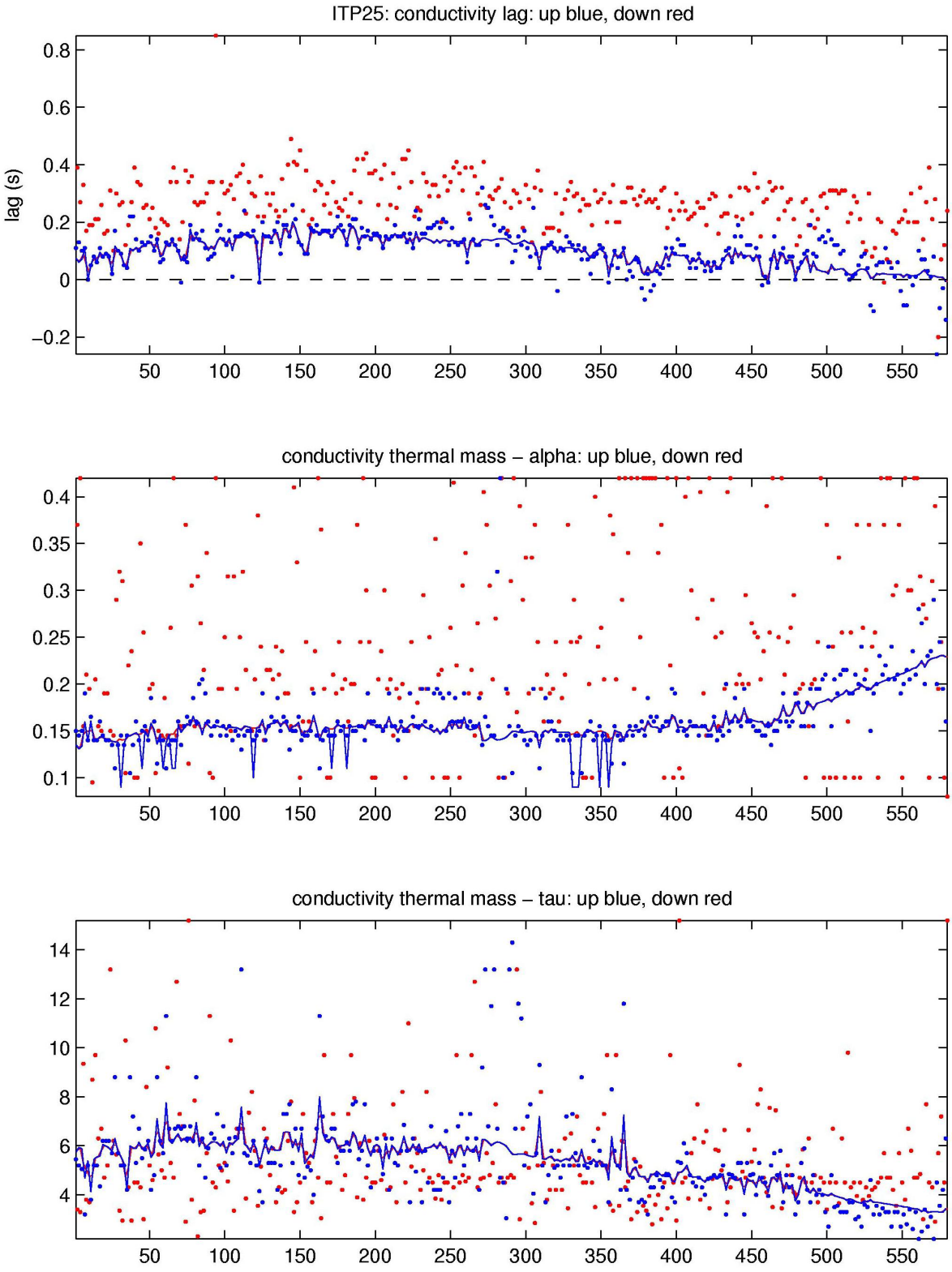
ITP Surface Buoy Status



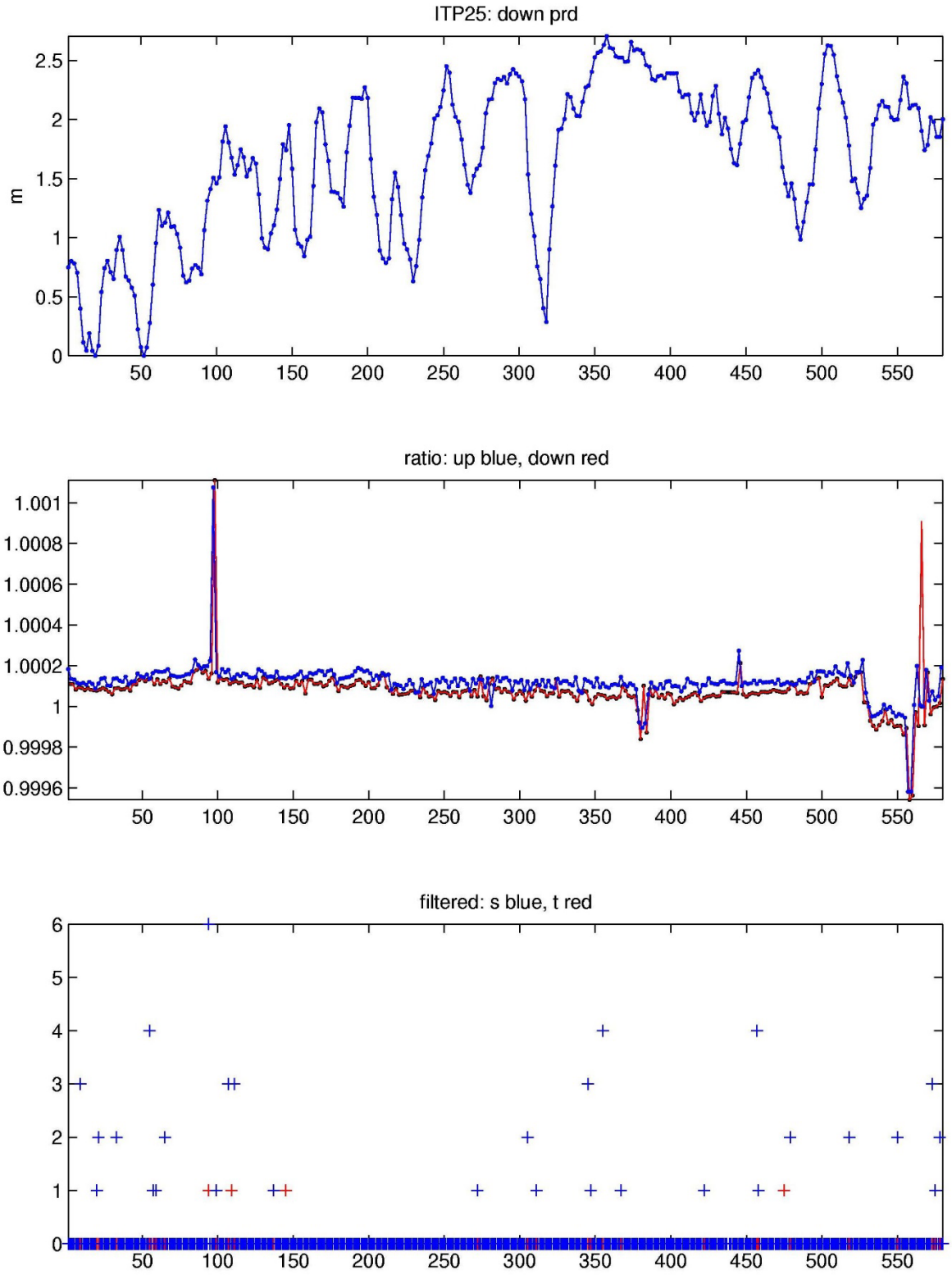
ITP profiler engineering data.



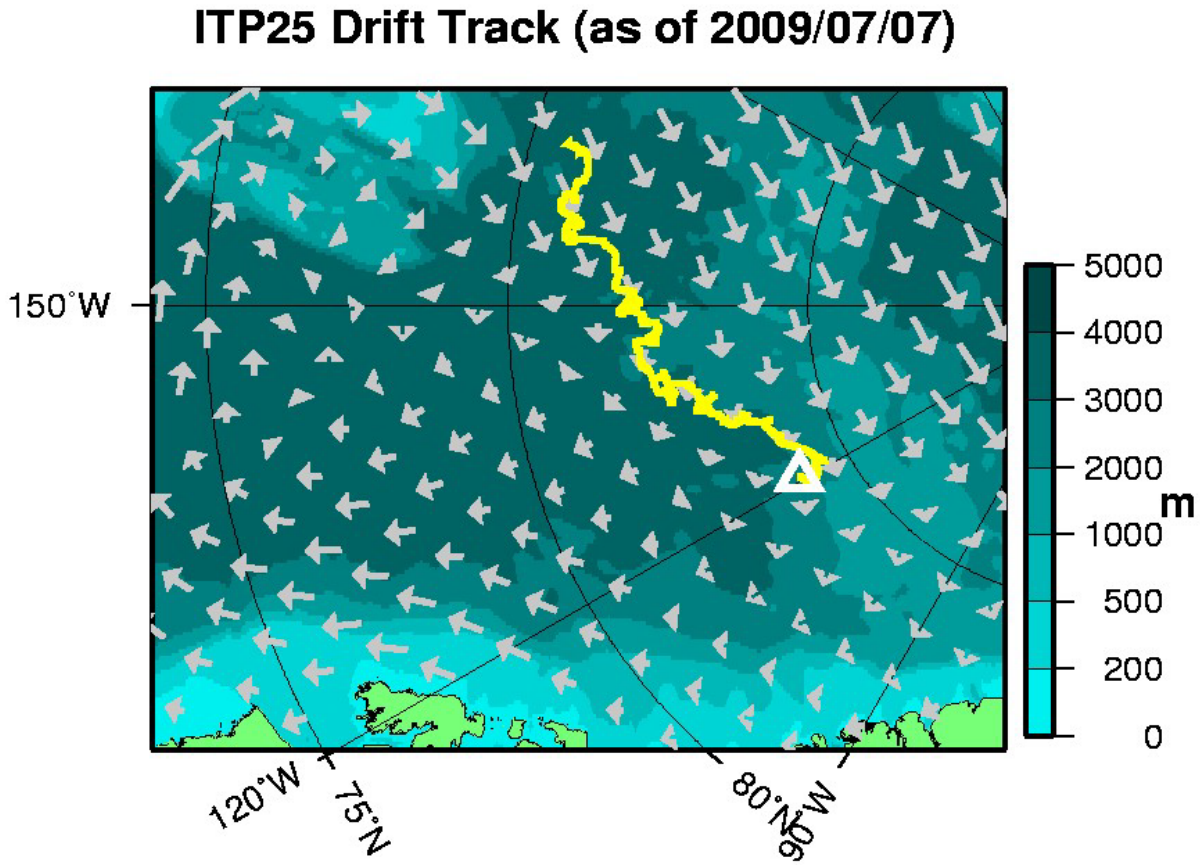
Top: number of bad points removed, Middle: variance of verticle difference of temperature and salinity in step region for up-going profiles, Bottom: temperature lag.



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

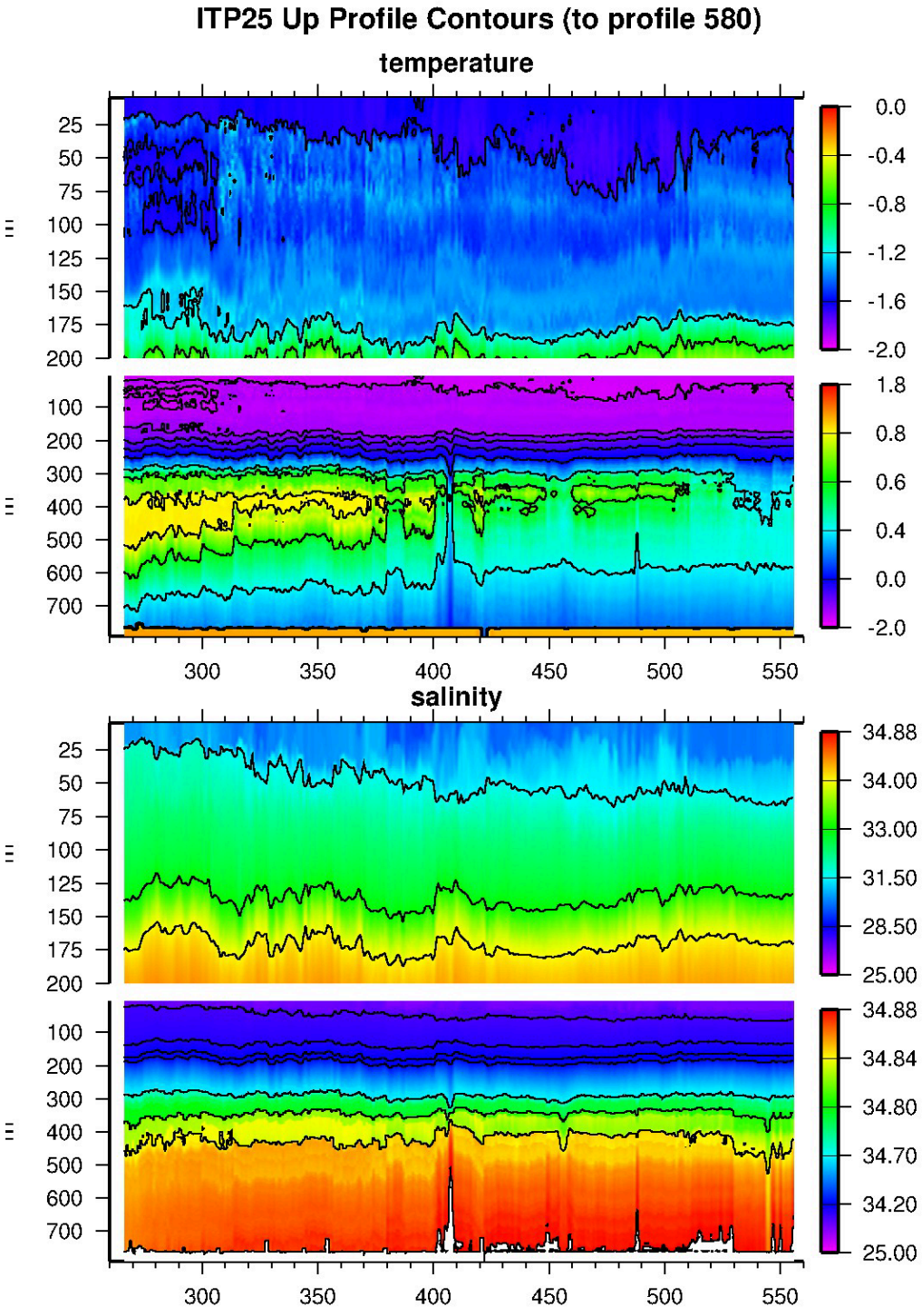


Top: down pressure deviation correction, Middle: salinity ratio adjustment, Bottom: Number of filtered spikes.

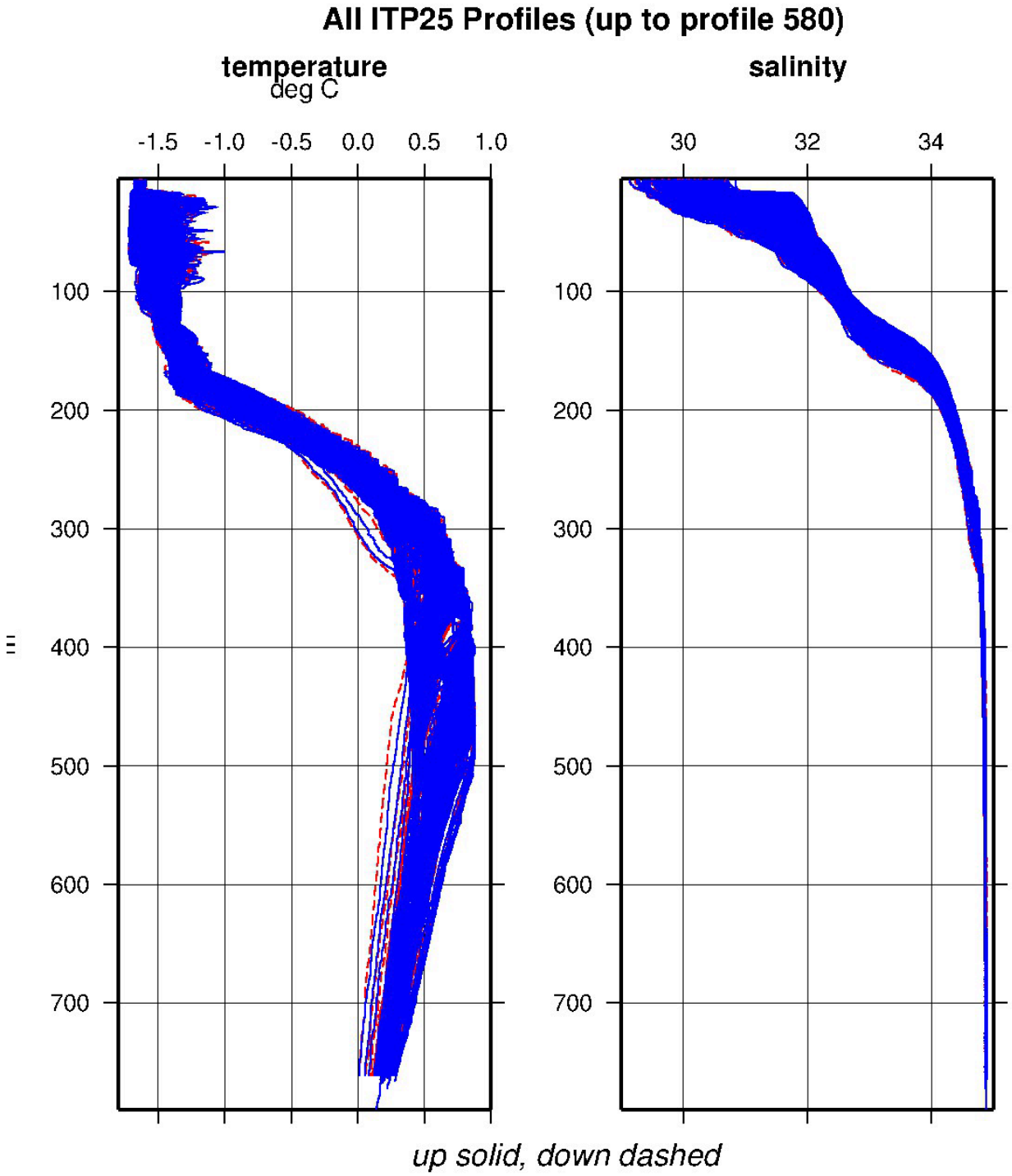


ITP drift (yellow line) and latest location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).

Plot of buoy locations.



ITP25 temperature and salinity contours.



Composite plot of ITP temperature and salinity contours.

ITP25 surface package (with supplemental conical foam flotation) after deployment, with the Polarstern in the background. (Photo by Ben Rabe)

Packing up the deployment apparatus shortly after deployment of the IBO. The antenna to the left is from the ITAC. (Photo by Takashi Kikuchi)