ITP29 Overview

Deployment Location: 8/31/2008, 02:00 UTC at 79° 30.0'N, 177° 18.3'W

Last Location: 8/26/2011, 23:09 UTC at 58° 24.5' N, 50°50.9' W

Duration: 1091 days

Distance Traveled: 13,321 km

Number of profiles: 1489 in 745 days

Other instruments: none

ITP 29 was deployed on a 2.1 m icefloe in the Transpolar Drift from the Russian Research Vessel *Akademik Federov*. The ITP included a dissolved oxygen sensor and operated on a standard sampling schedule of 2 one-way profiles between 7 and 760 m depth each day.

ITP29 Deployment Operations

The first ITP deployed from the *Akademik Federov* in 2008, ITP 29 was deployed remotely using the ship's contracted helicopter from St. Petersburg. Prior to the first flight, a meeting was held by the chief scientist with the deployment team and flight team to ensure that everyone understood the desired ice floe requirements and planned operations for the ITP installation. The flight team were well seasoned veterans of the Arctic and knowledgeable about choosing the proper ice conditions. Soon afterwards, the MI-8 helicopter was loaded with everything needed for the deployment and final preparations were made for the flight.

Flight time was roughly one hour to the first potential floe spotted from the air. The helicopter landed and the ice drilled and found to be only 1.8 meters thick. Looking for a floe greater than 2 m thick, it was decided to continue the search. The second landing of the helicopter found a floe that was 2.8 meters thick at the landing spot -- a perfect find amongst first year ice which typically measured less than 1.5 meters.

After unloading the deployment team and apparatus, the helicopter departed to conduct other business. The deployment took roughly three hours to complete and communications between the profiling instrument and the surface package tested well. The deployment gear was repacked and the helicopter was called, and the team snacked on tea, cheese and salami while they waited for their ride back to the ship.

ITP29 Data Processing

The 1489 profiles that were transmitted from ITP 29 were processed according to the procedures described in the ITP Updated Data Processing Procedures. The processing parameters for ITP

29 are shown in the figures to the right. 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. Aside from a few minor glitches, major biofouling was concentrated around two events: one soon after launch (starting with profile 7), the second towards the end of the record (starting around prof 1336). The first event was very short, while the second, related to the ITP drifting into waters shallower than 750m, was more spread out. Both were associated with major calibration changes as well.

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. The combination of Alpha = 0.11 and Tao = 4.5 worked well in most cases. A few instances of the thermistor lag corrections ("tlag" in the code) as well as the conductivity - temperature time offsets ("cshift") were modified to better adjust sharp spikes at the top/bottom of stair cases.

For most of the record, the conductivity adjustment ("rat") remained fairly flat and close to unity. In fact, from profiles 40 through 1200, this ITP record was remarkably clean. However, there were two periods with large calibration adjustments, presumably triggered by conductivity cell contaminations. The second, longer event was clearly related to the ITP drifting in and out of shallow (<750m) waters near the northern coast of Greenland. After repeated iterations, a significant number of conductivity and oxygen profiles were edited out. For the very last profiles, even temperature showed large up/down hysteresis and was removed. The first event soon after deployment triggered an even larger calibration adjustment. Some conductivity and oxygen profiles right around the largest calibration changes could not be aligned to realistic shapes; it seems likely that the contamination was so severe that calibration changes occurred even within the profile, which our single-factor calibration adjustment can not handle. However, some tens of profiles following the calibration spike still had increased conductivity calibration numbers, yet their data looked very reasonable, suggesting that our calibration mechanism worked well there.

ITP29 Data Description

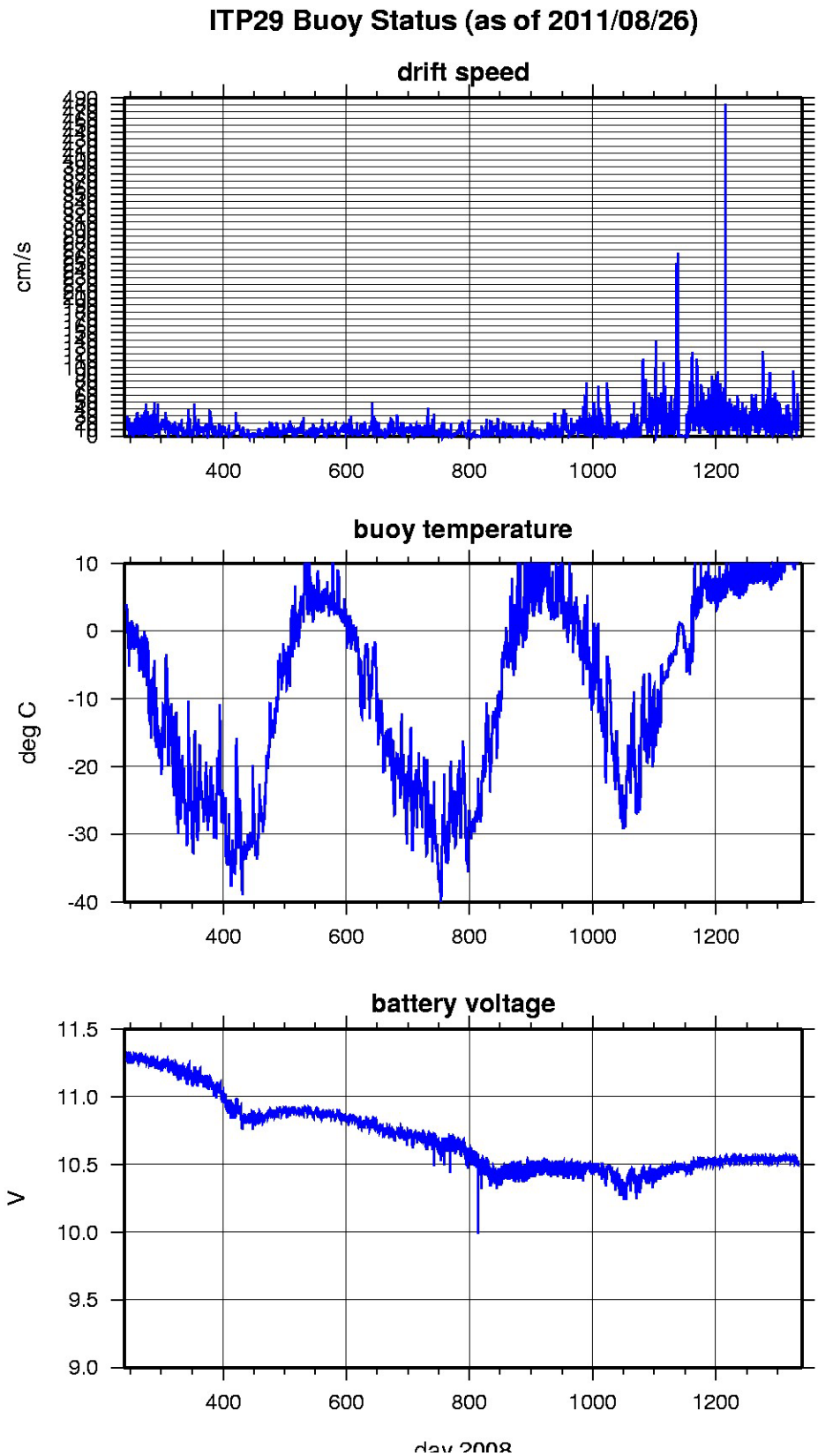
The ITP profiler operated on a standard sampling schedule of 2 one-way profiles between 7 and 750 m depth each day. In the surface package, the GPS receiver was powered hourly to obtain locations, and buoy temperature and battery voltage status were recorded. After 745 days of reliable operation and data telemetry while the system drifted across the Arctic Ocean with the Transpolar Driftstream current, the ITP profiler stopped communicating with the surface package when the mooring system presumably dragged in shallow bathymetry off of the northeast corner of Greenland. The surface package continued drifting with the East Greenland current to the Labrador Sea for nearly another year acquiring GPS locations and status data before transmissions ceased.

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

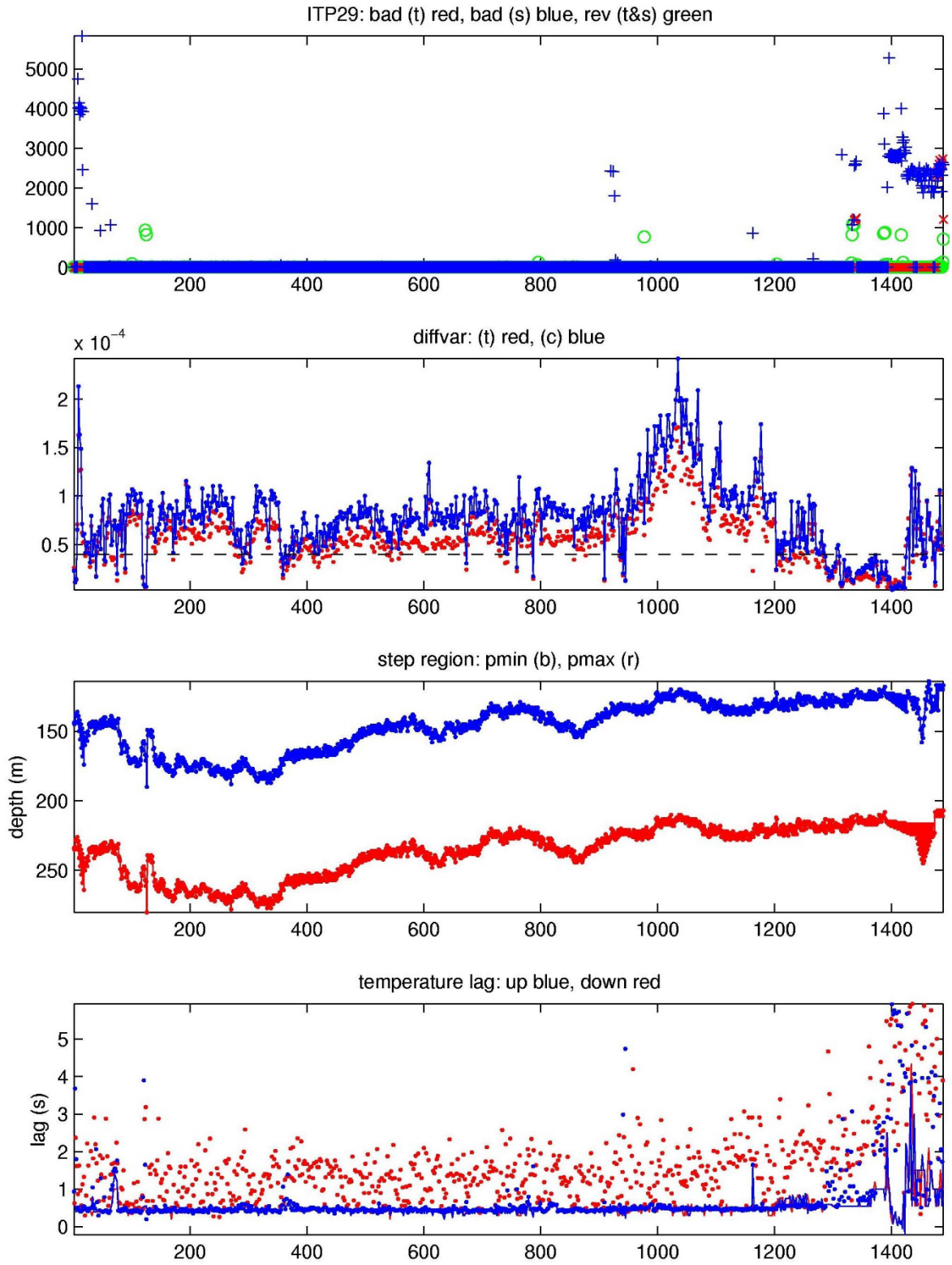
Level II hourly buoy location data in ASCII format: itp29rawlocs.dat

Level III 1-Hz processed profile data in MATLAB format: itp29cormat.tar.Z or itp29cormat.zip

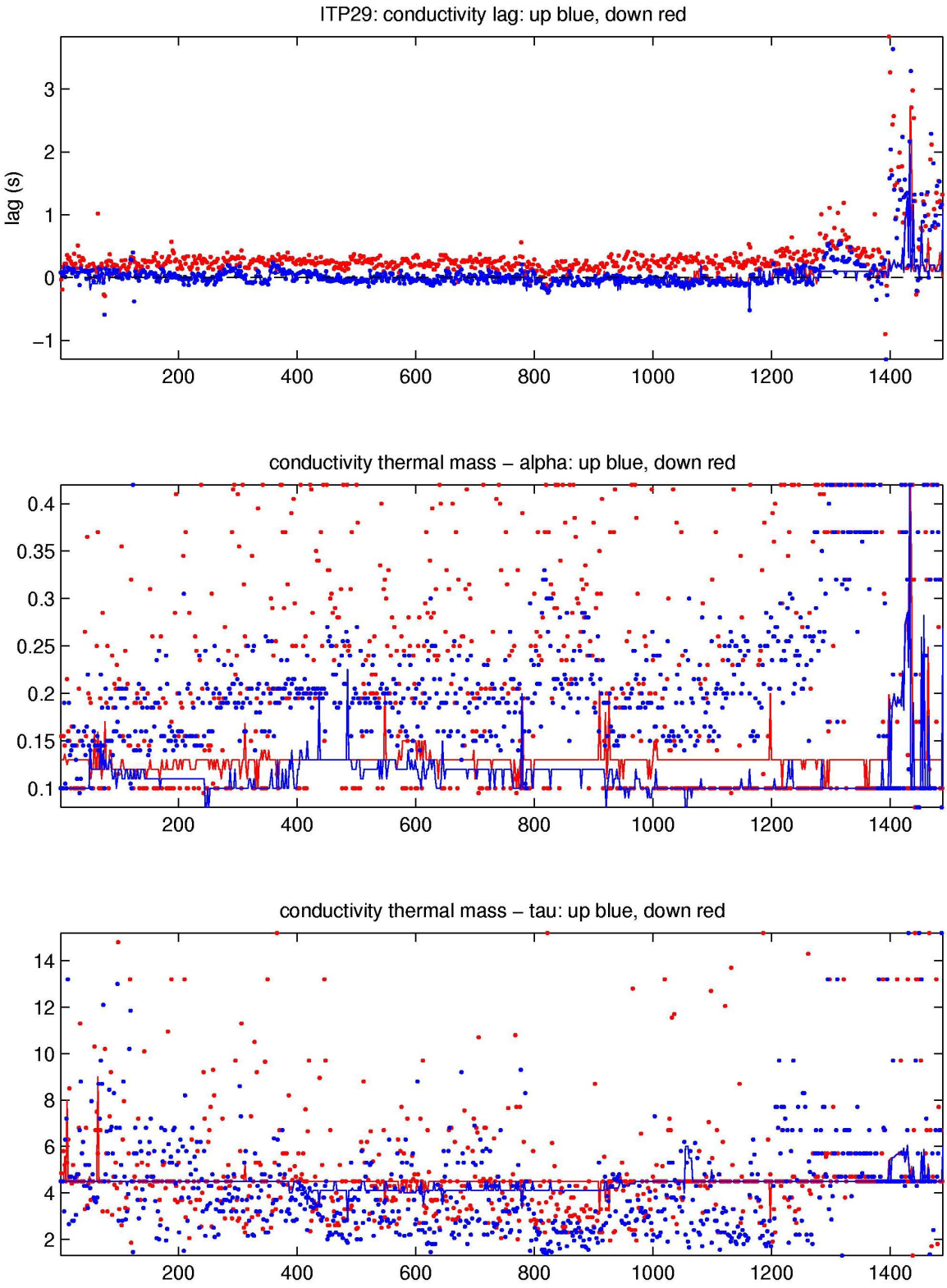
Level III 1-db bin-averaged processed profile data in MATLAB format: itp29final.mat
Level III 1-db bin-averaged processed profile data in ASCII
format: itp29final.tar.Z or itp29final.zip



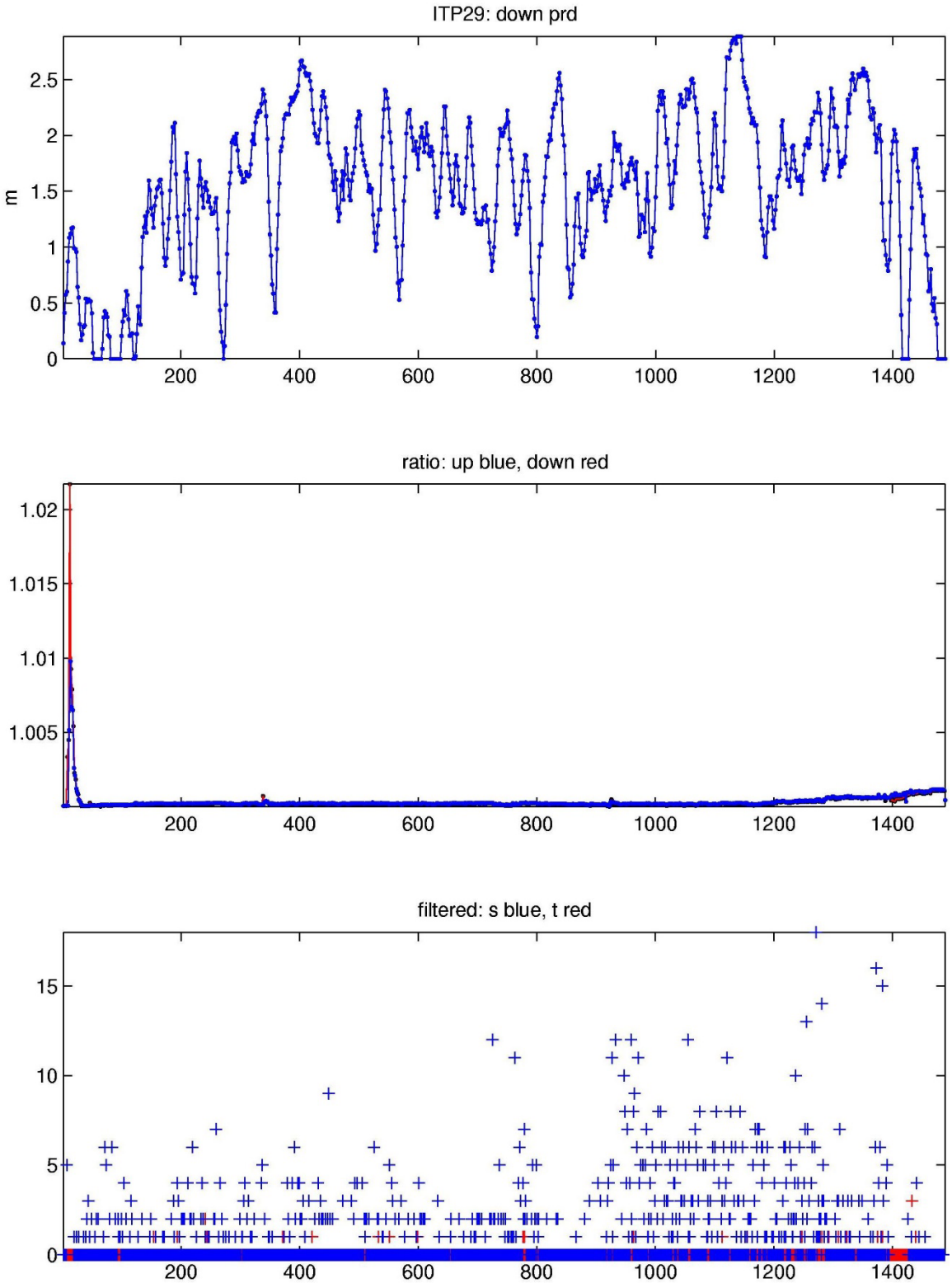
ITP surface buoy status.



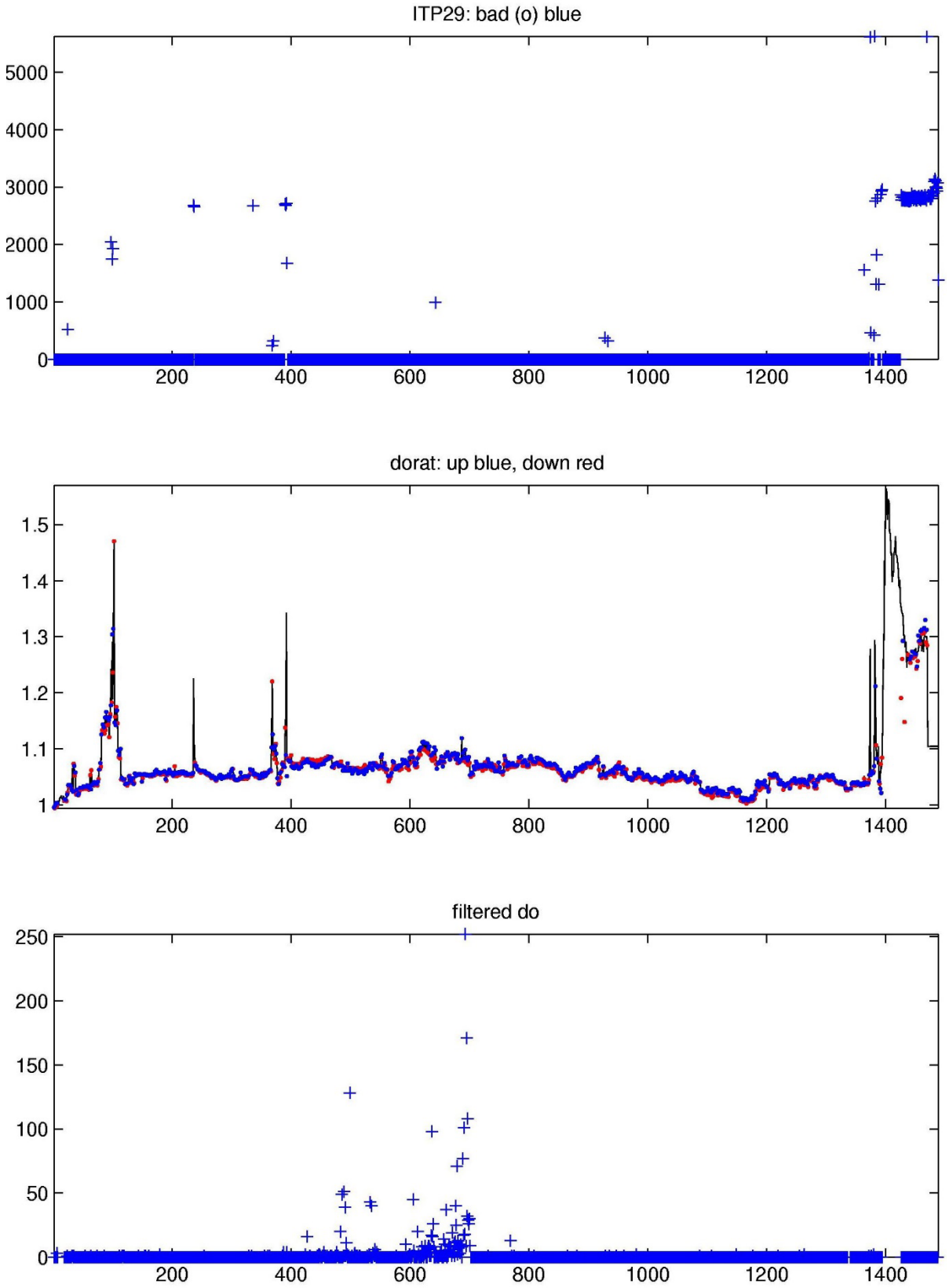
Number of bad points removed (top); variance of vertical difference of temperature and salinity in step region for up-going profiles; depth of staircase layer; temperature lag (bottom).



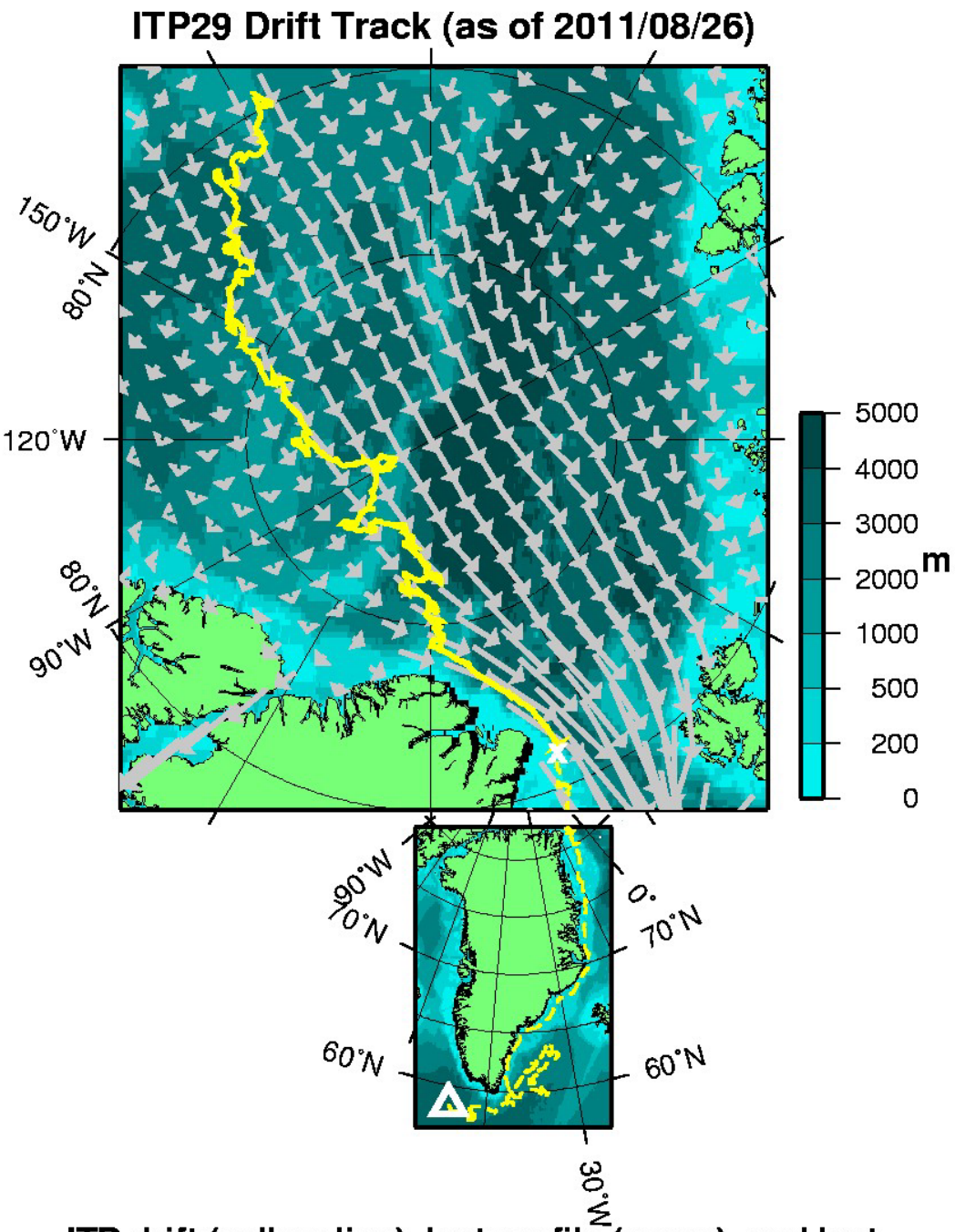
Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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

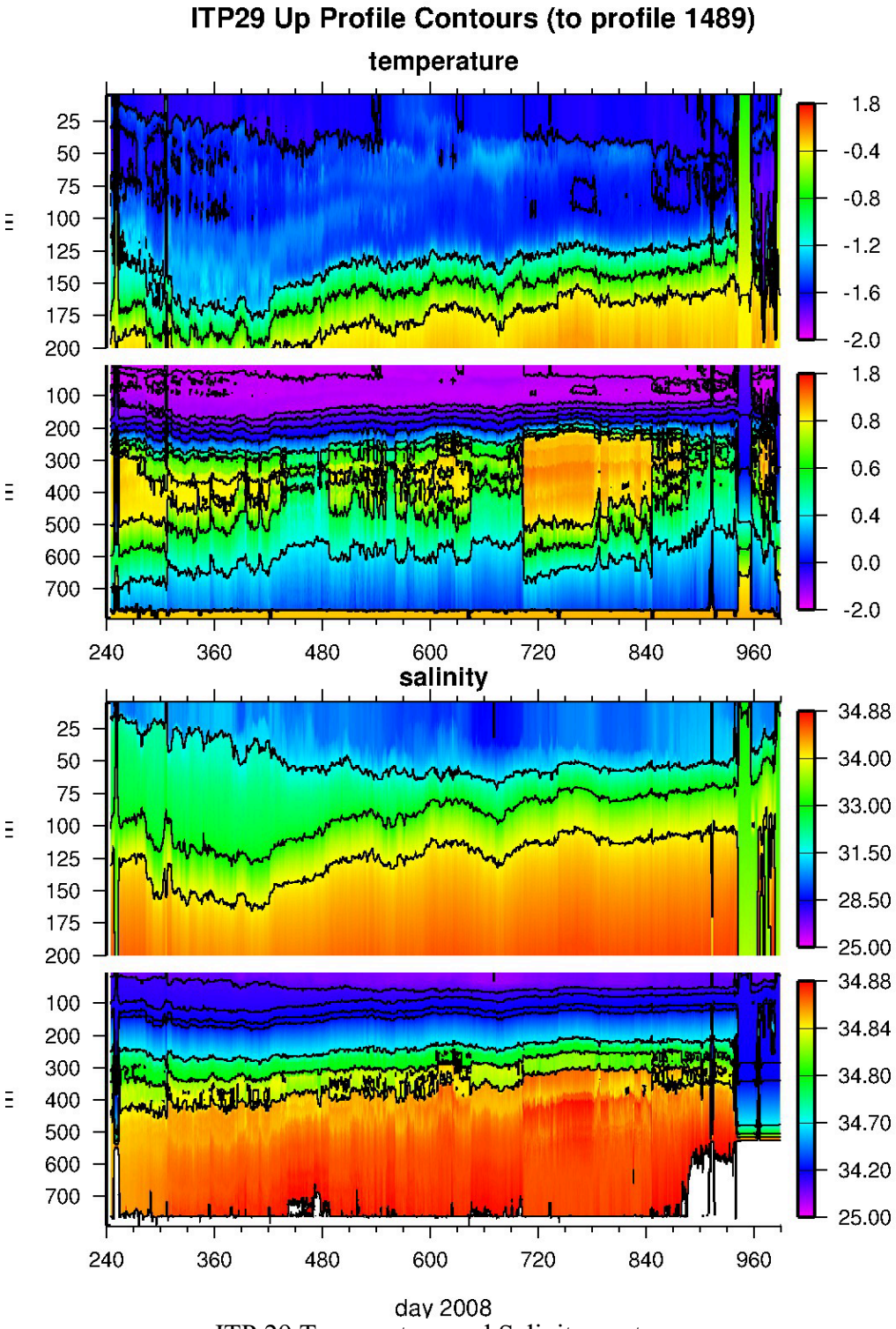


Top: number of bad dissolved oxygen points removed, Middle: dissolved oxygen ratio adjustment, Bottom: Number of filtered spikes.

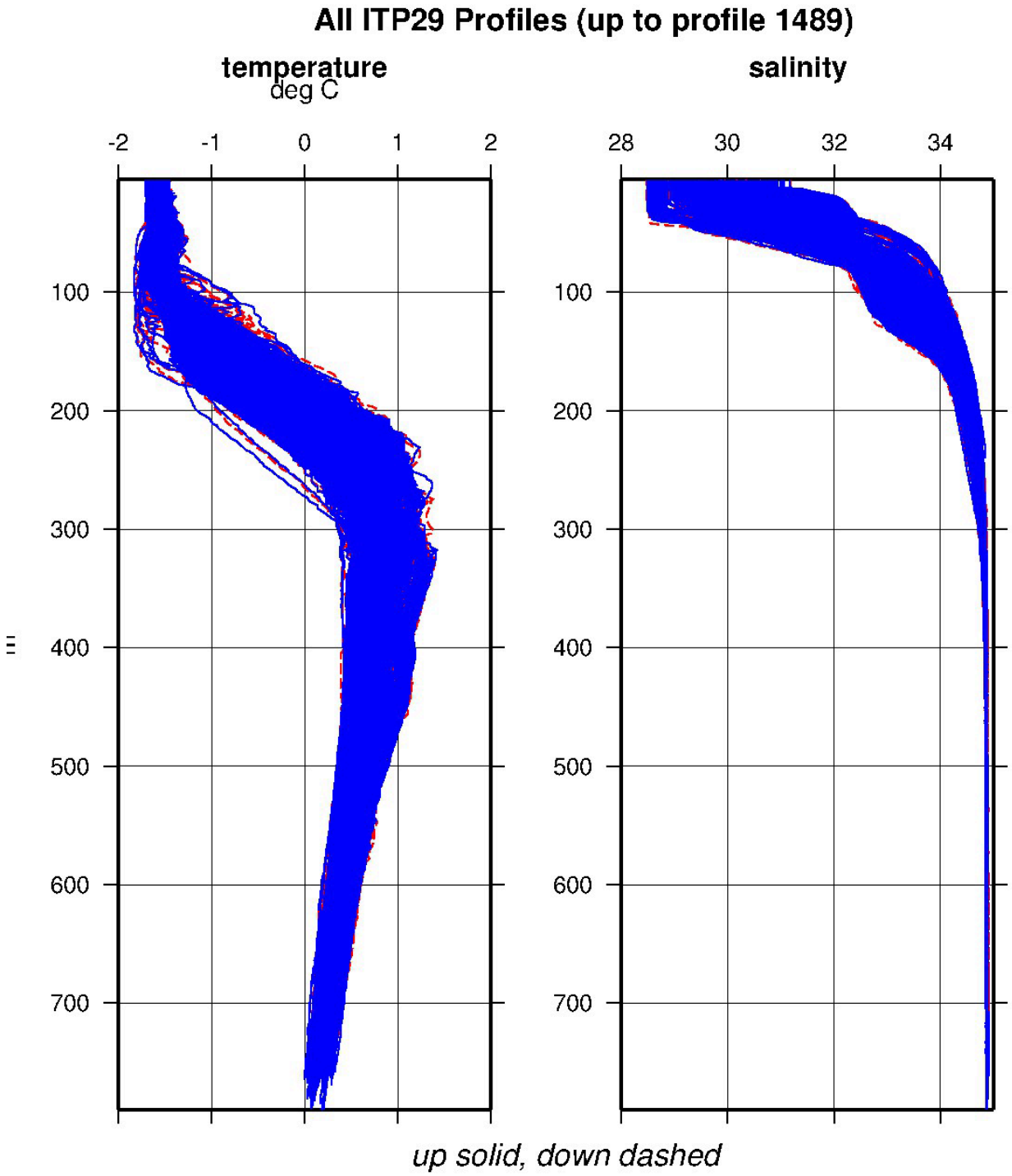


ITP drift (yellow line), last profile (cross), and last location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).

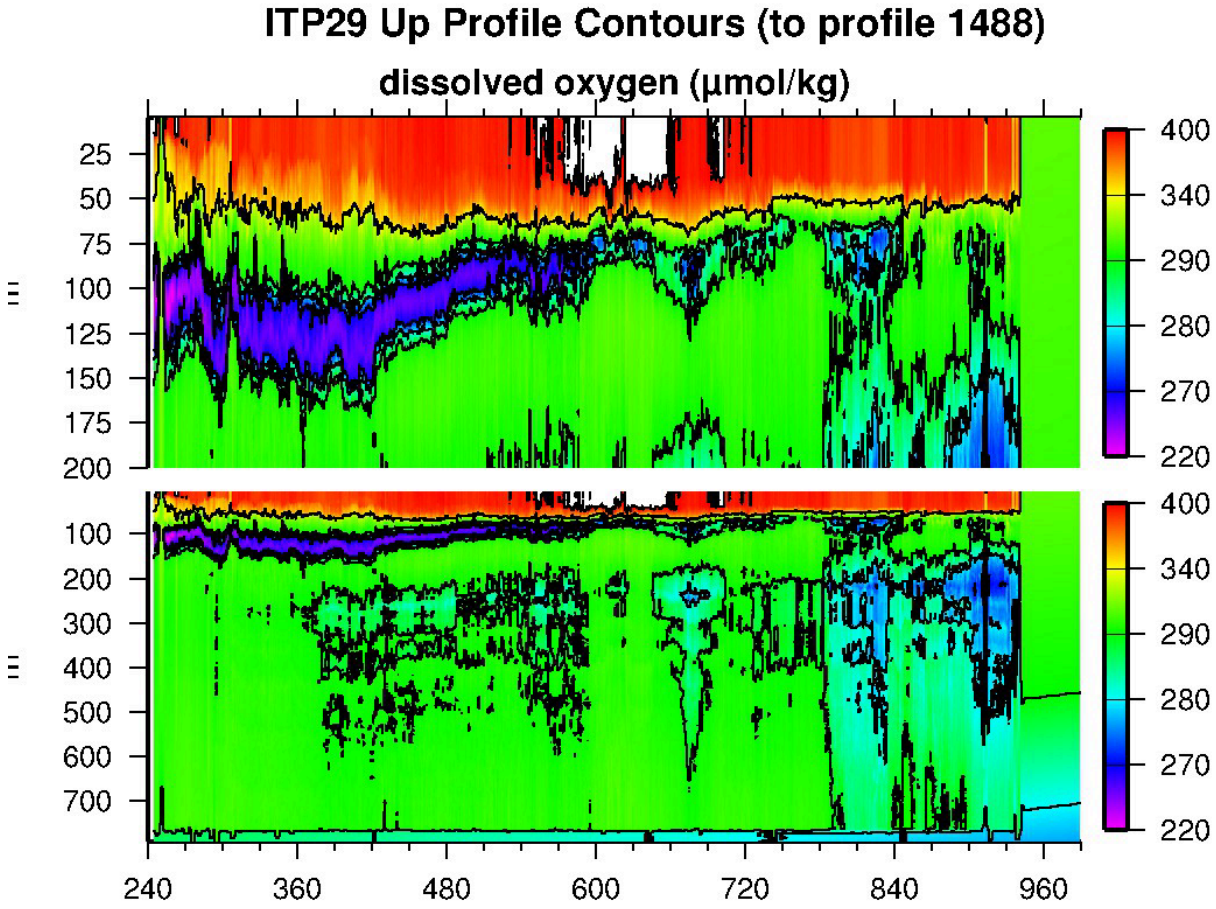
Plot of buoy locations.



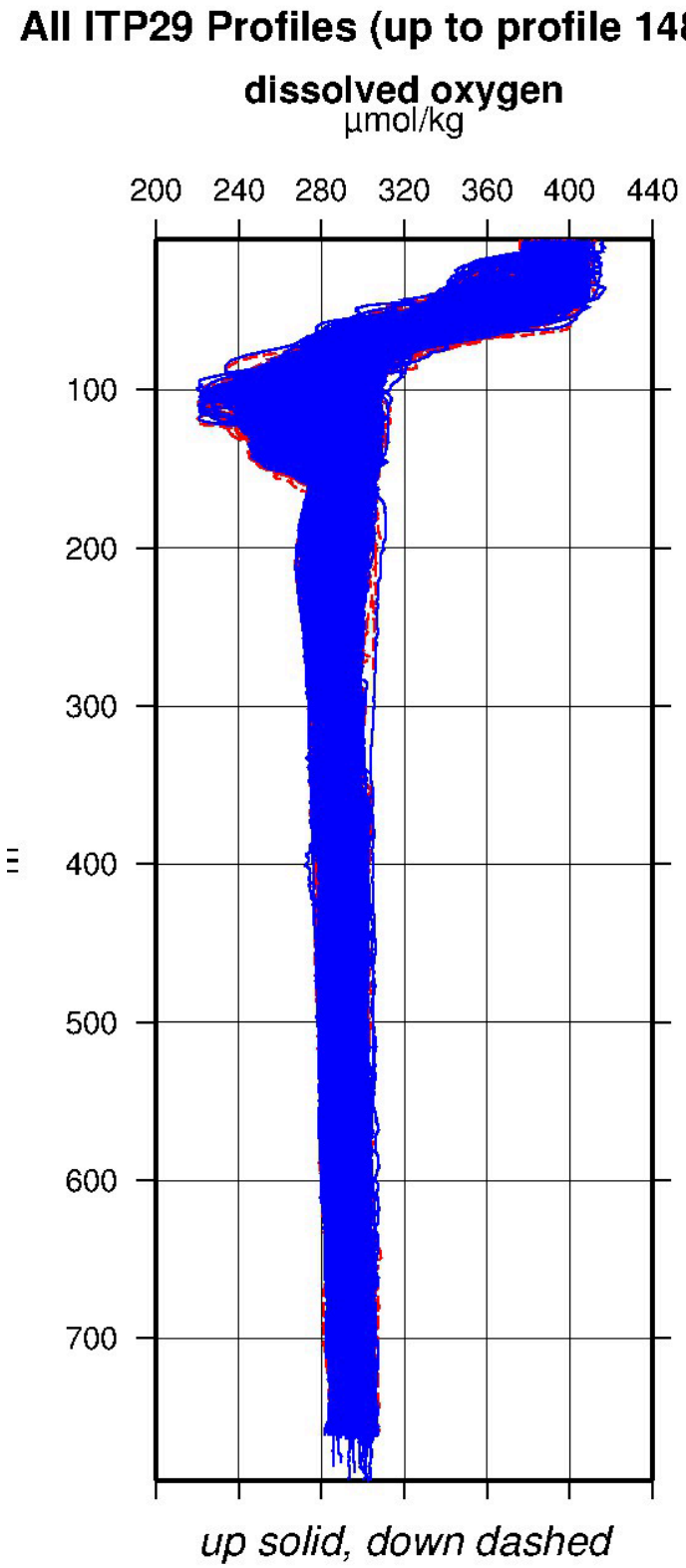
ITP 29 Temperature and Salinity contours.



Composite plot of ITP temperature and salinity profiles.



ITP29 dissolved oxygen contours



Composite plot of dissolved oxygen profiles

At least several days prior to any deployment operation, it is important to prepare the surface packages to verify positioning and transmission functionality. The buoys are removed from the shipping boxes, the batteries connected, electronics sealed in the aluminum pressure tube, and finally lashed upright with a clear view of satellites. Scientists back at WHOI receive the status updates from the ITP surface packages and provide confirmation to the field team that each buoy is able to successfully obtain GPS locations and transmit via Iridium satellite telephone. (Kris Newhall)