ITP 51 Overview

Deployment Location: 9/17/2011, 5:00 UTC at 81° 28.9’ N, 103° 10.3’ E

Last Location: 1/11/2013, 11:00 UTC at 79° 12.2’ N, 2° 13.4’ E

Duration: 482 days

Distance Traveled: 5157 km

Number of profiles: 76 in 38 days

Other instruments: Ice beacon

ITP 51 was deployed on a 2 m thick ice floe in the Transpolar Drift during the ARK-XXVI/3 cruise (TransArc) on the *R/V Polarstern* as a contribution to the Hybrid Arctic/Antarctic Float Observation System (HAFOS). 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.

ITP51 Deployment Operations

ITP 51 was the fourth and final ITP deployed from the *Polarstern* on the 2011 TransArc expedition and the last of the year. Weather conditions were good, so that the helicopter could be used to transport equipment to the ice, while the *Polarstern* maintained position against the floe and put the gangplank over the side. The ice thickness at the ITP deployment site was about 2 m, on a high point between well frozen, light blue melt ponds, and surrounded by ridges on all sides. There was a gentle slope of about 1 m / 20 m distance parallel to the closest ridge, which was about 20 to 30 m away (the other ridges were quite far off). The entire deployment operation took around 3 hours from the time that the first loads were delivered by the helicopter, until the last loads were hauled back onboard using the ship’s crane.

ITP51 Data Processing

The 76 profiles that were transmitted from the ITP 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.

Thermohaline staircases were available in the upper portion of the profiles (100-250dbar) to generate initial estimates for CTD lag corrections. Thermal lag estimates were relatively large, particular for the second half of the record, suggesting possible sensor or pump issues. They were manually increased further manually to reduce hysteresis between up- and down profiles. The deeper portions were relatively noisy. This could again relate to sensor issues, but may at least in part be due to variability near the shelf break being different from the typical deep ITP data in the central gyre.

During the second profile, the oxygen calibration "dorat" jumped from 1 to about 1.2, but subsequent profiles retained a realistic shape. A second jump to much larger jump occurred at profile 33 and lasted through profile 43, after which it precipitously back to near 1.2. Dorat values of close to 5 were unrealistic, as was the shape of these profiles, and they were edited out. The remainder of the record started with increased up/down O2 differences, and the worst offenders were also edited out.

ITP51 Data Description

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

After deployment, the buoy first headed slightly south and west, then turned and meandered eastward toward Severnaya Zemlya (North Land). Unfortunately, the system approached too close to the continental shelf on October 24, dragged the mooring, and contact with the profiler was lost the following day.

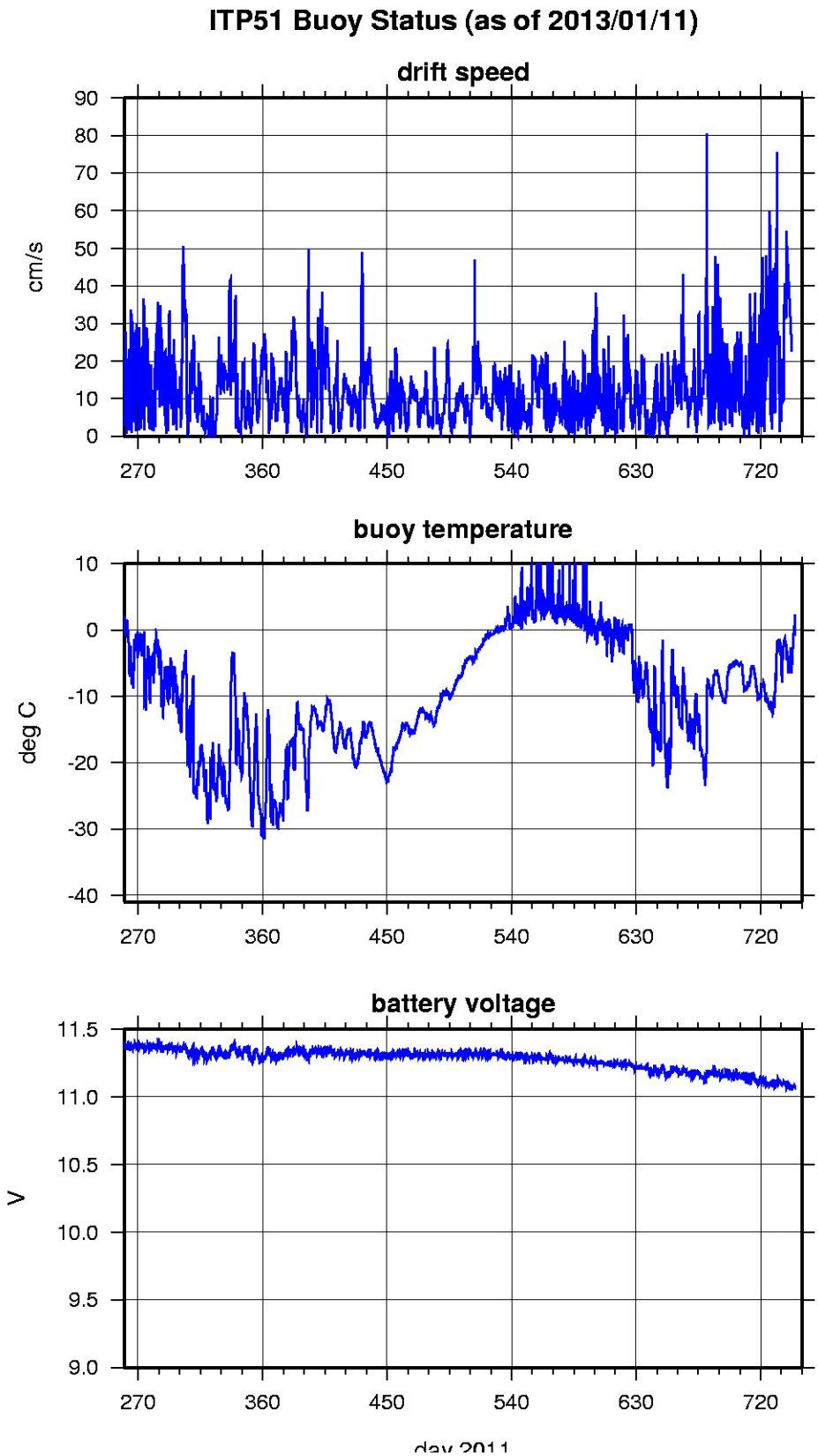
The surface package continued to broadcast locations for another 14.5 months as it drifted over deep water across the Transpolar Drift northwards to more than 88 °N, then turned and proceeded through Fram Strait. The last location from ITP51 was obtained on January 11, 2013, and 2 days later the last transmission from the surface package was received.

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

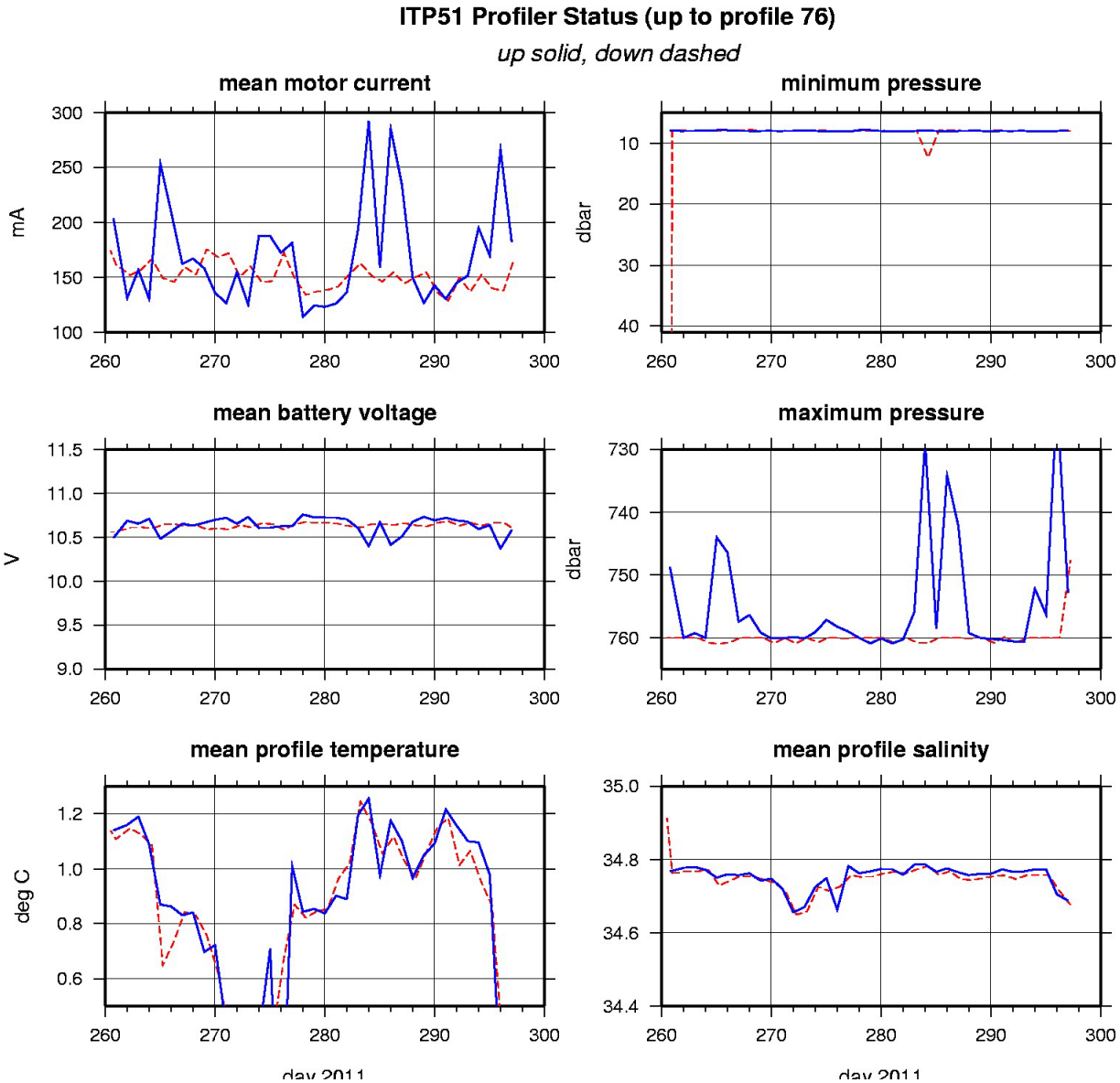
Level II hourly buoy location data in ASCII format: itp51rawlocs.dat

Level III 1-Hz processed profile data in MATLAB format: itp51cormat.tar.Z and itp51cormat.zip

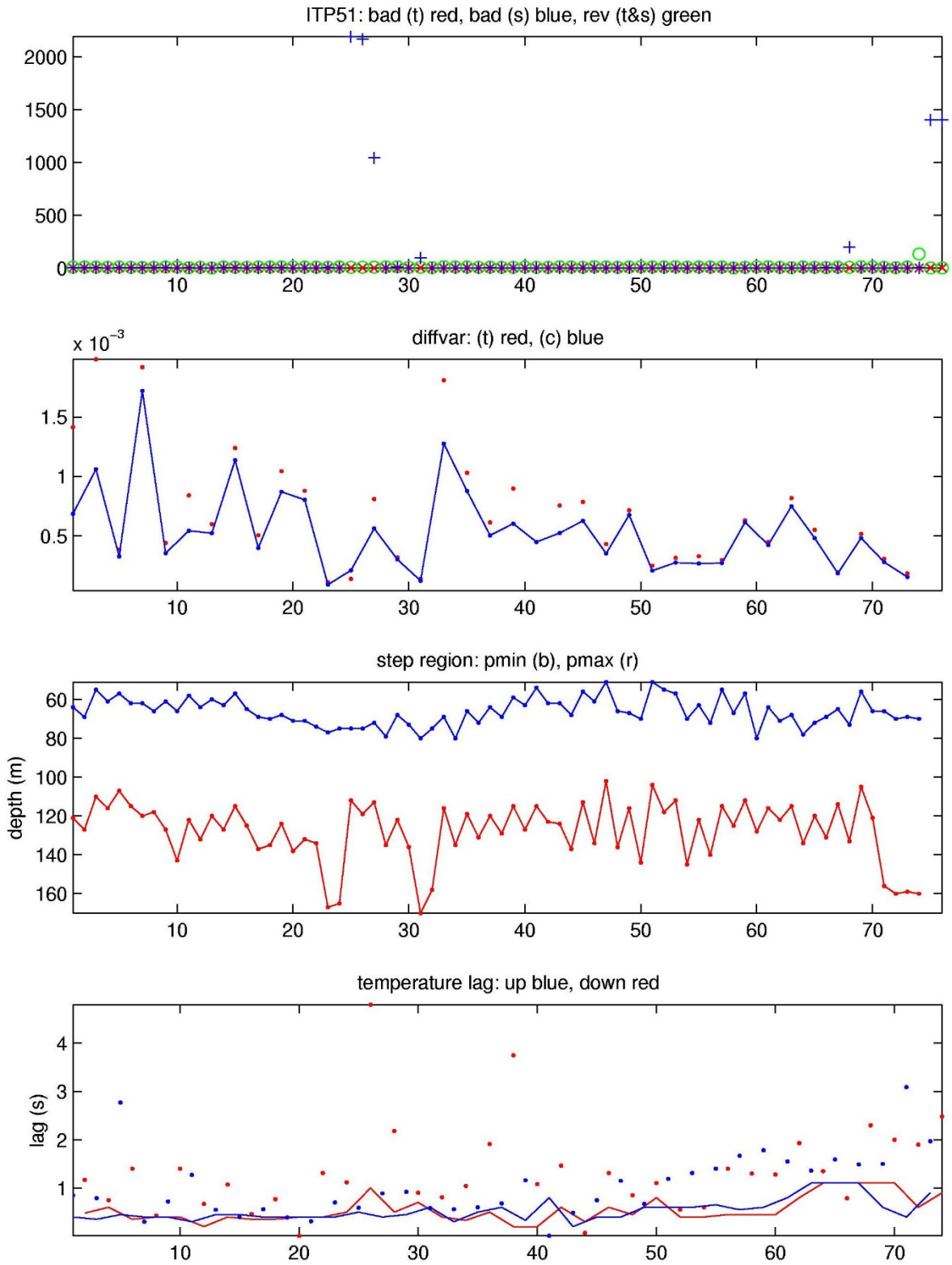
Level III 1-db bin-averaged processed profile data in MATLAB format: itp51final.mat
Level III 1-db bin-averaged processed profile data in ASCII
format: itp51final.tar.Z and itp51final.zip



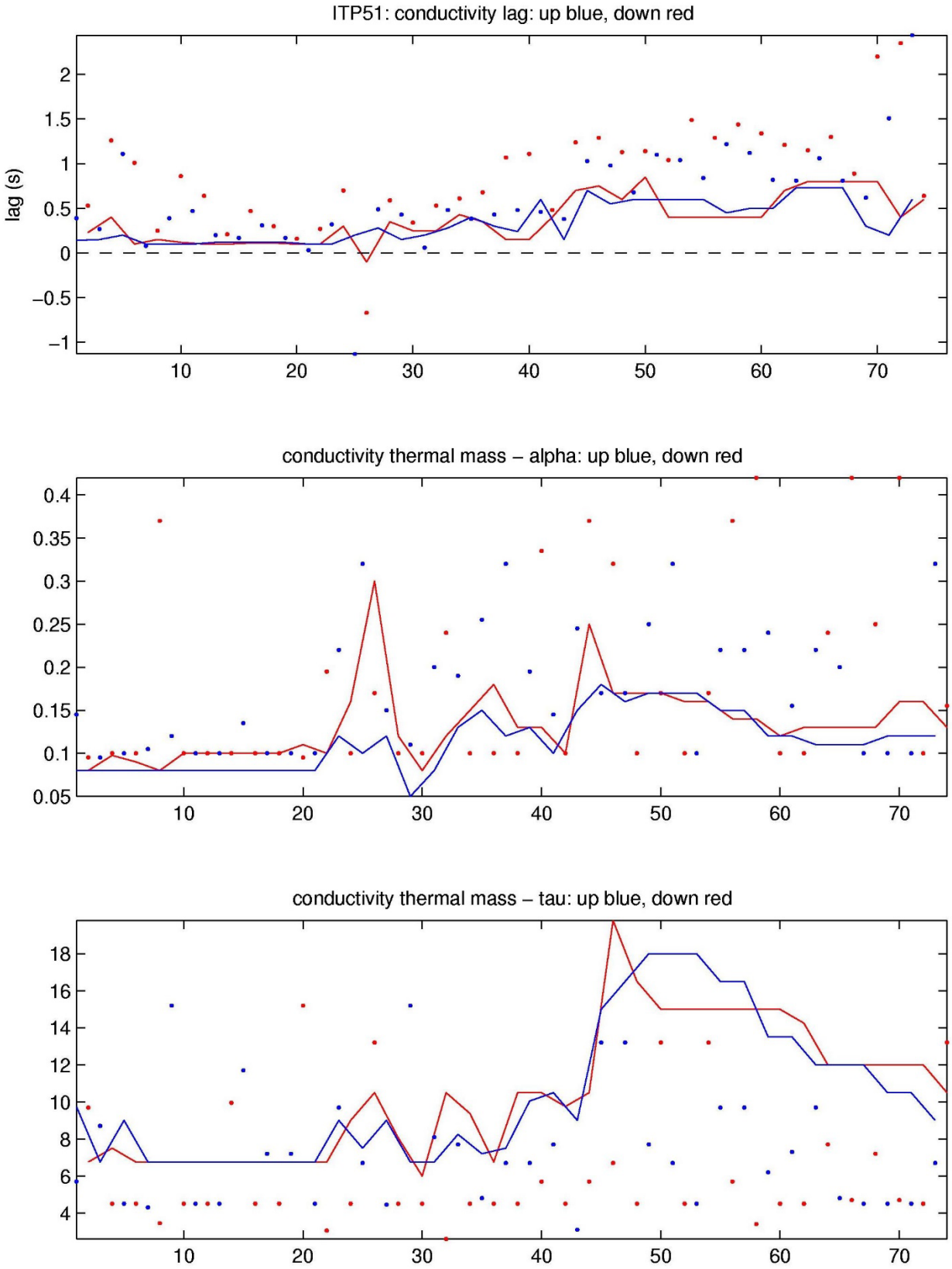
ITP Surface Buoy Status.



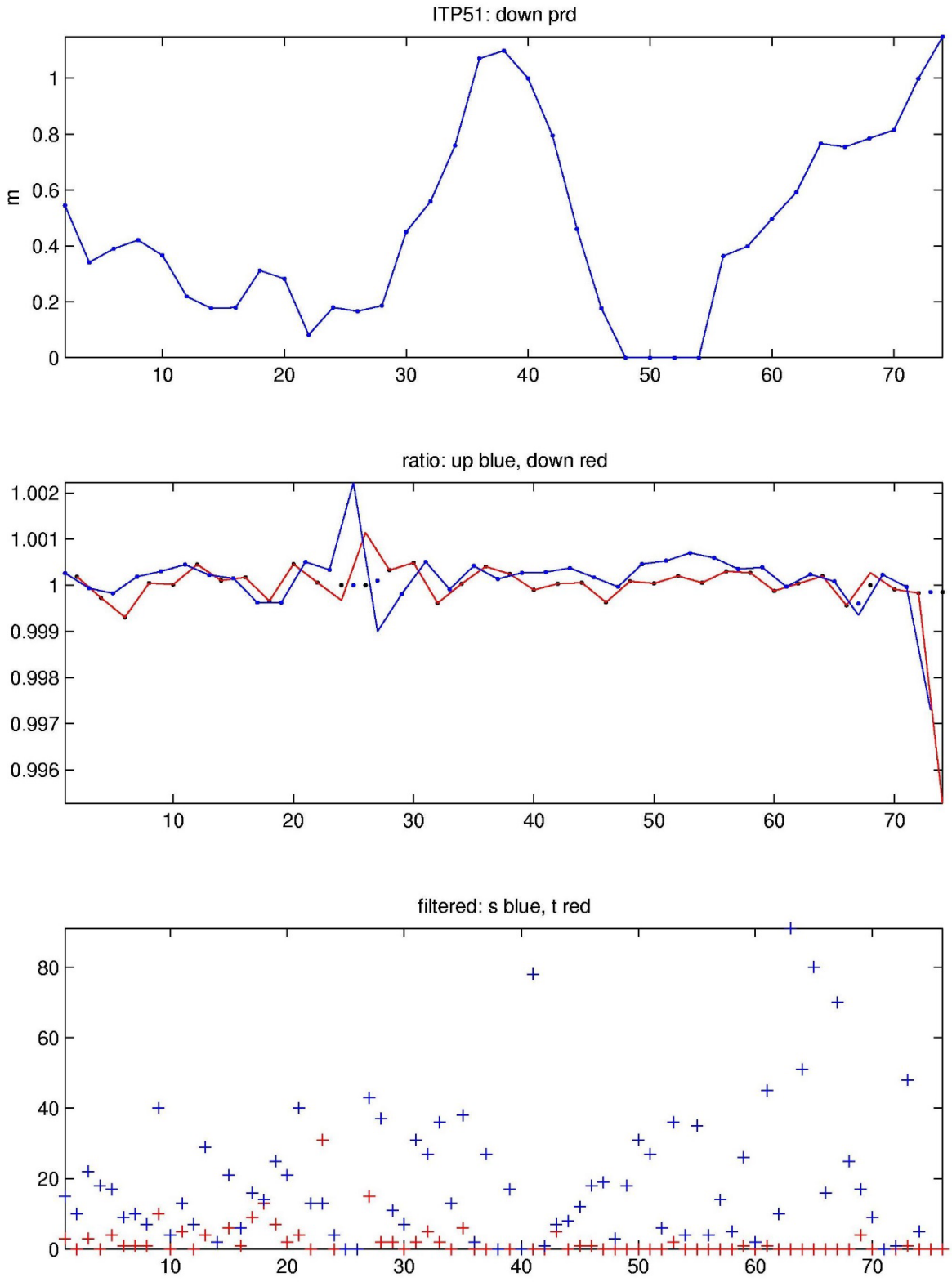
ITP profiler engineering data.



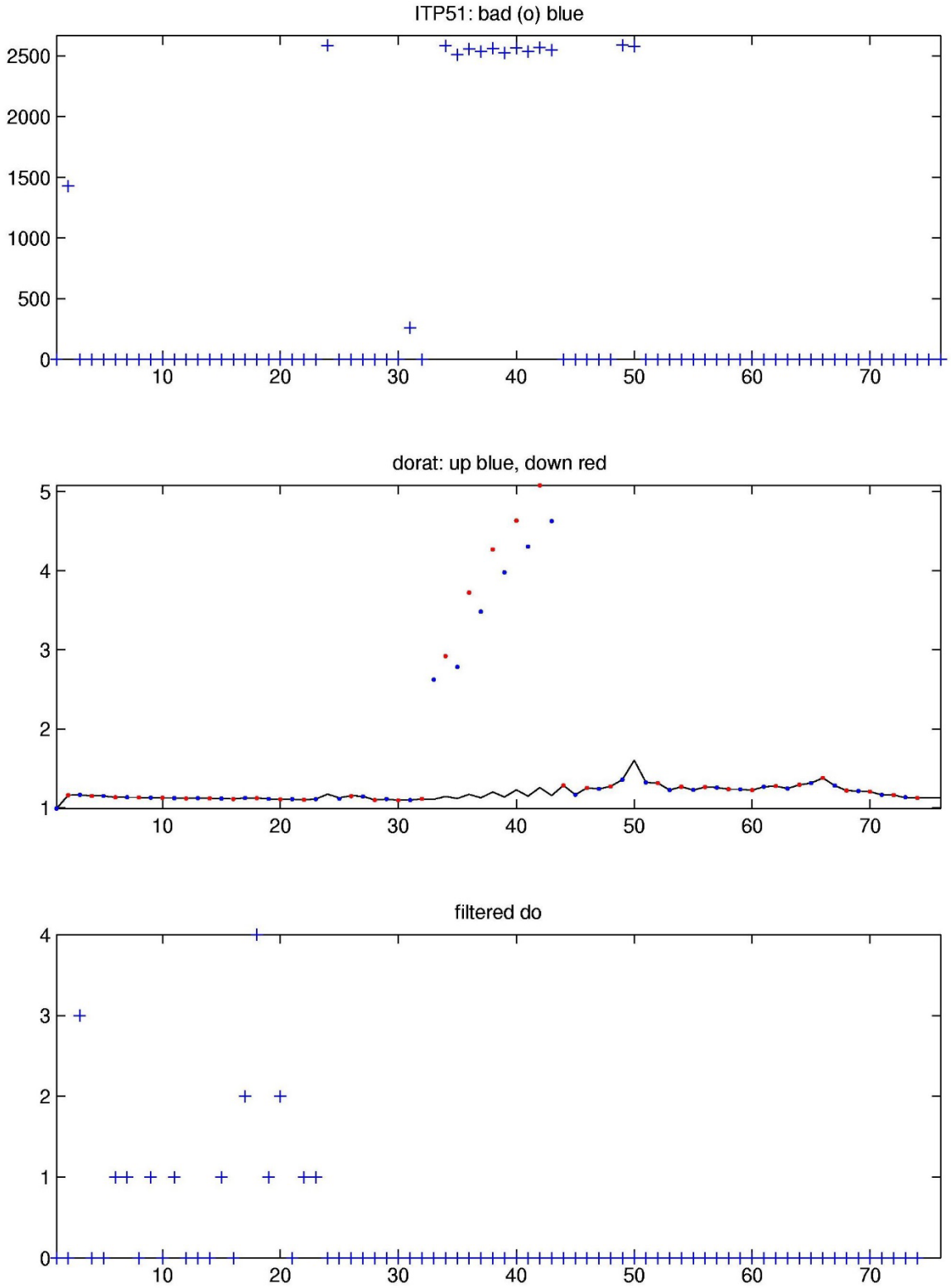
Top: number of bad points removed, Middle: variance of verticle difference of temperature and salinity in step region for up-going profiles, Bottom: temperature lag.



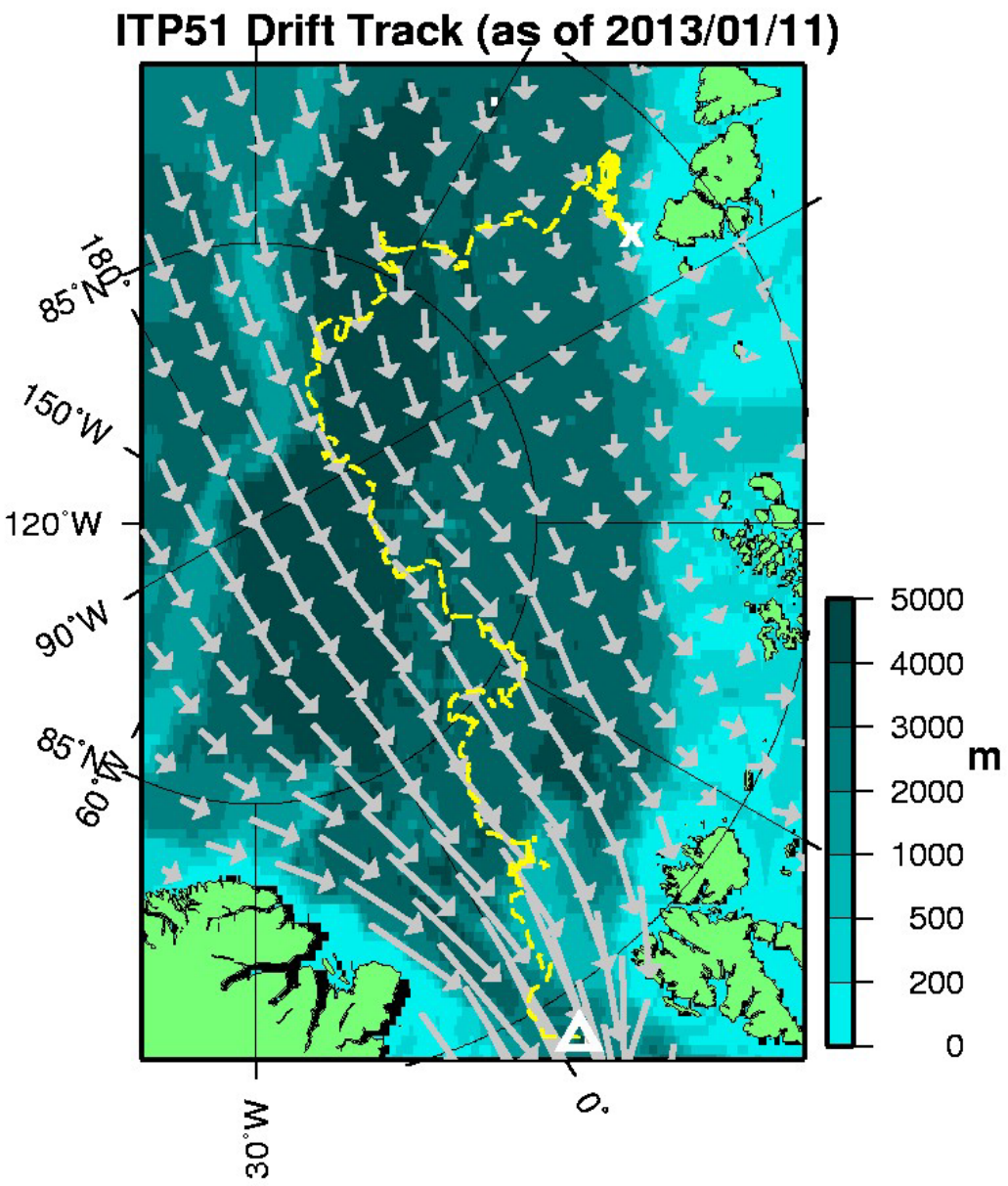
Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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

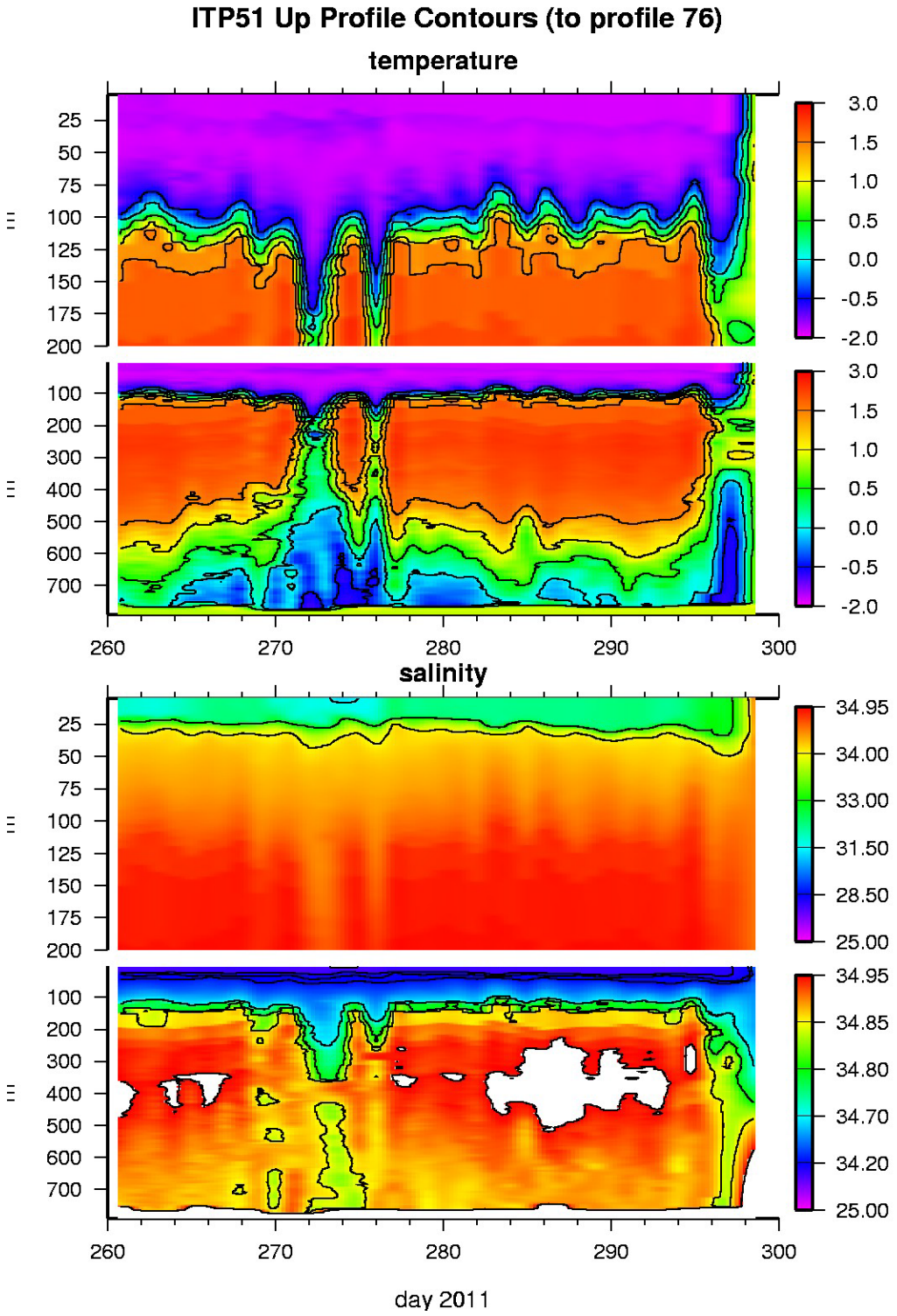


Top: number of bad dissolved oxygen points removed, Middle: dissolved oxygen ratio adjustment, Bottom: number of filtered spikes.

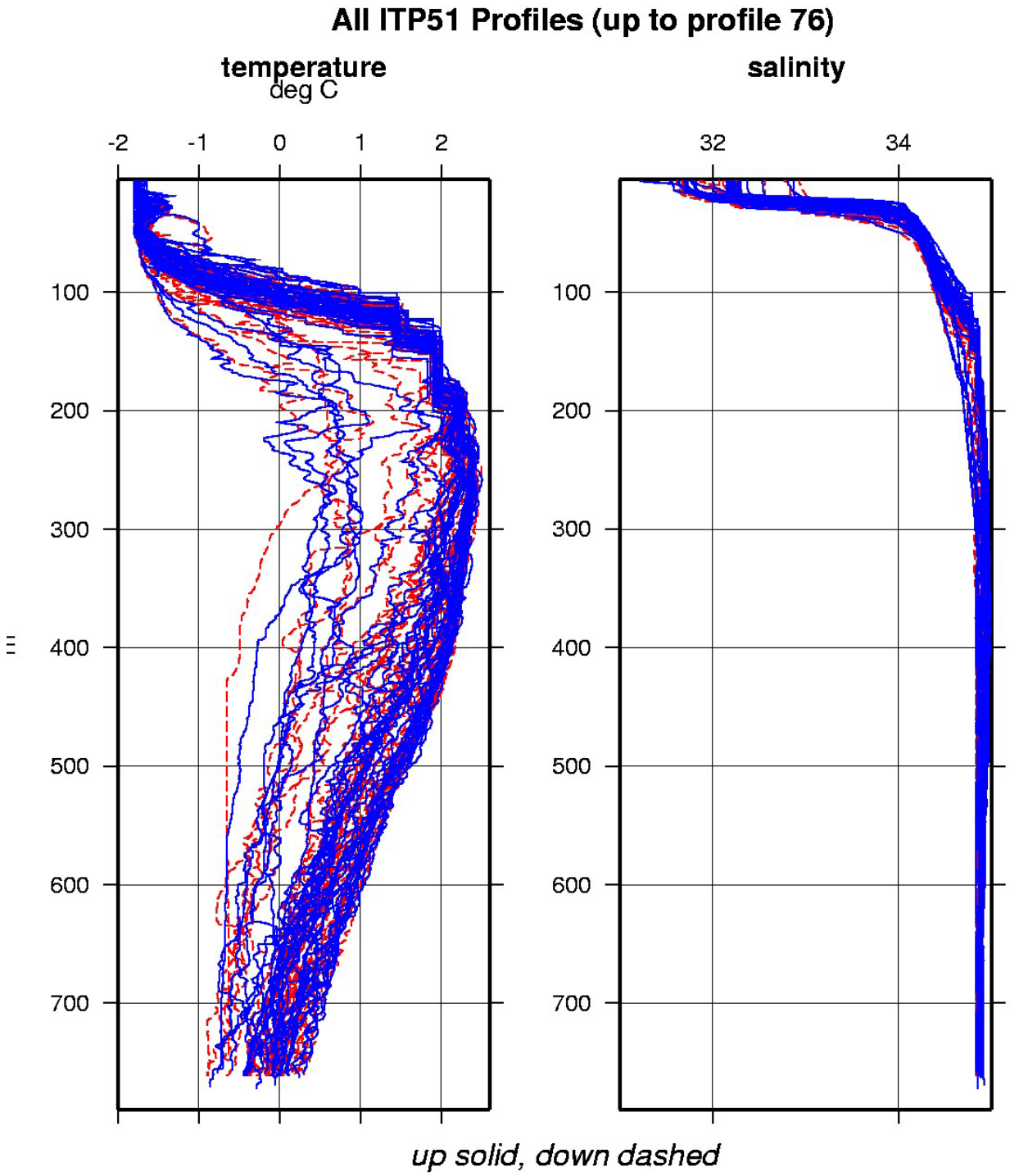


ITP drift (yellow line), last profile (cross), and last location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).

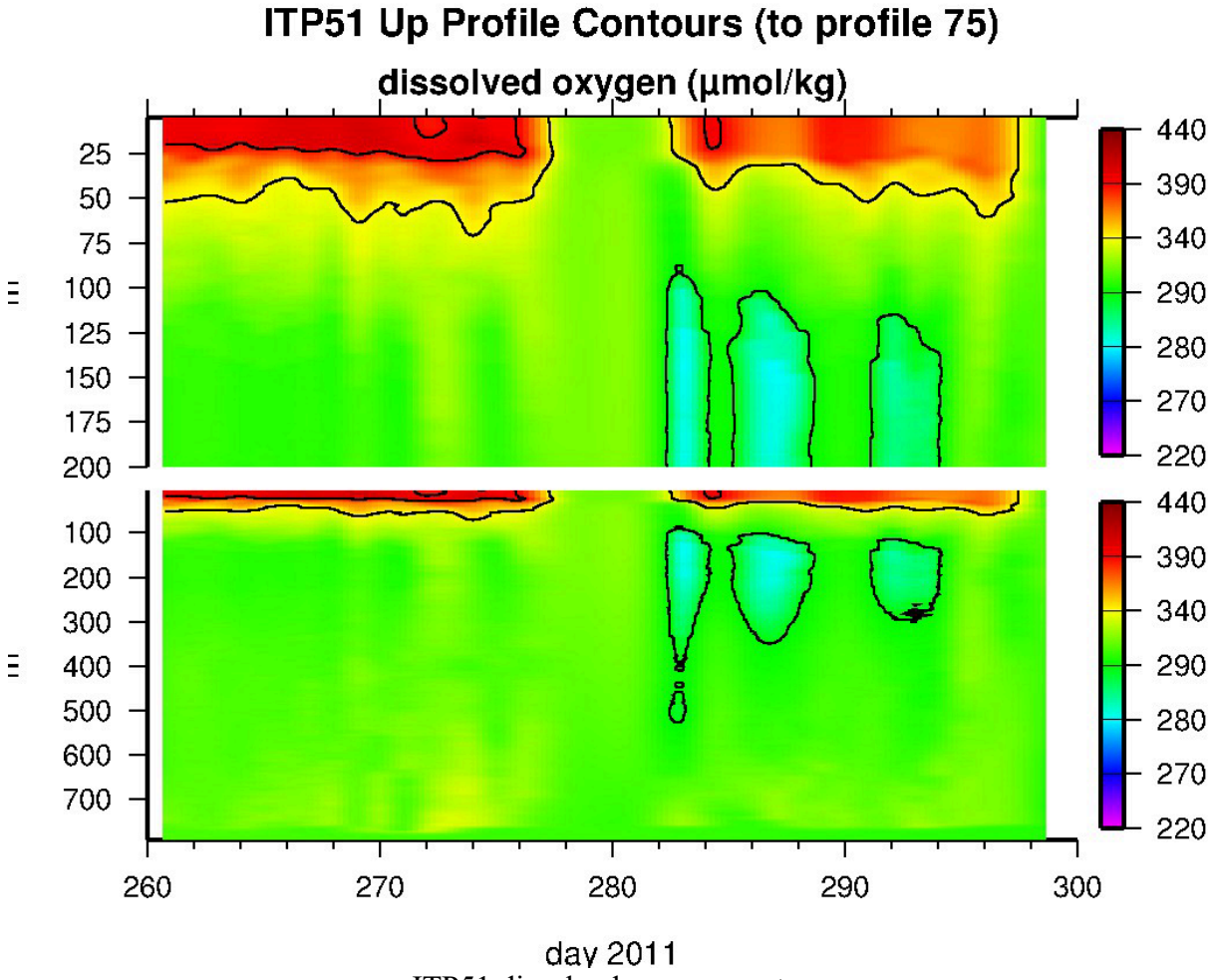
Plot of buoy locations.



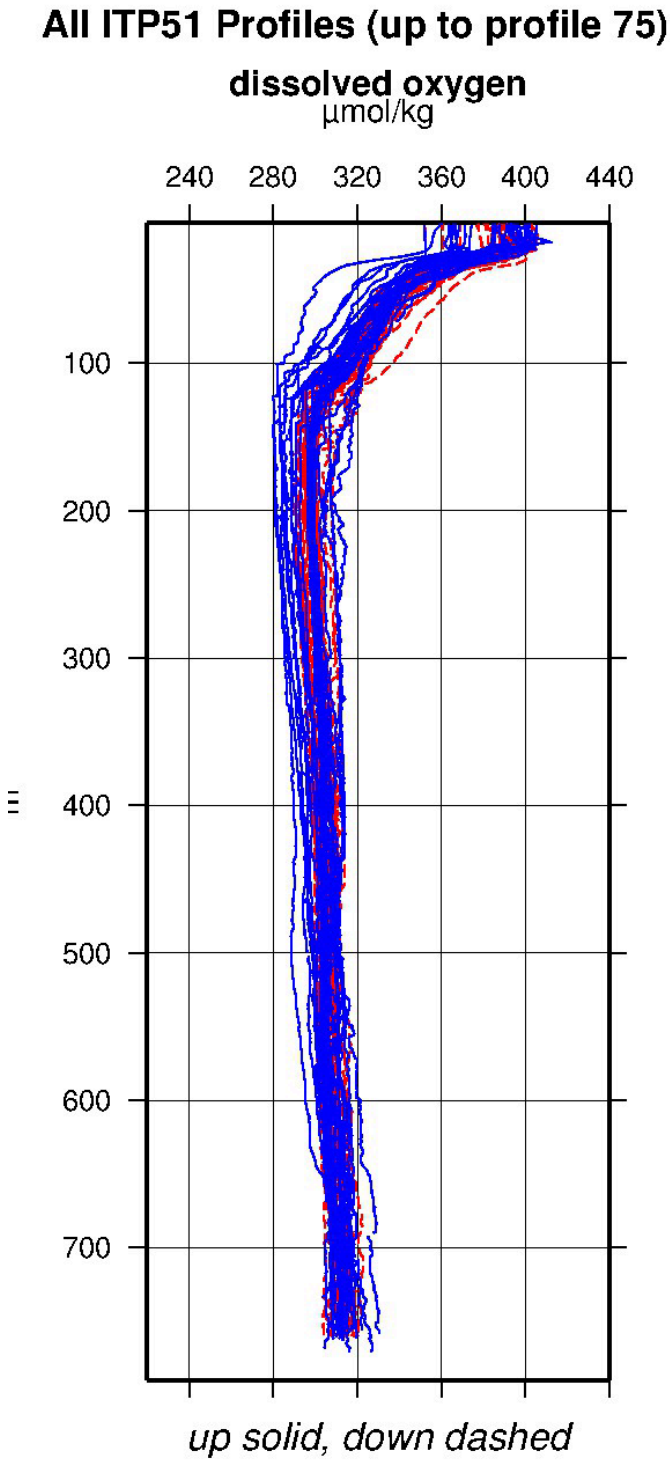
ITP51 temperature and salinity contours.



Composite plot of ITP temperature and salinity profiles.



ITP51 dissolved oxygen contours.



Composite plot of ITP dissolved oxygen profiles.

Last ITP deployed in 2011, ITP 51 surface package sits on an icefloe surrounded by frozen melt ponds in front of the Polarstern. (Ben Rabe)

The ship's helicopter delivers the deployment apparatus and the flotation collar to the ice for the installation of ITP 51.

Unspooling the tether for ITP 51 during the deployment operation.