

## ITP 55 Overview

**Deployment Location:** 8/8/2011, 22:00 UTC at 76° 5.1'N, 138° 16.9'W

**Last Location:** 1/13/2013, 22:00 UTC at 71° 44.3' N, 177° 50.4' E

**Duration:** 524 days

**Distance Traveled:** 5508 km

**Number of profiles:** 547 in 274 days

**Other instruments:** IMB 2011-K, Uptempo

ITP 55 was deployed on a 3.13 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*. On the same icefloe, a US Army Cold Regions Research and Engineering Laboratory (CRREL) Seasonal Ice Mass Balance Buoy (IMB 2011-K) and an Uptempo buoy were also installed. The ITP is operating on a typical sampling schedule of 2 one-way profiles between 7 and 760 m depth each day.

## ITP55 Deployment Operations

The last of the four ITP systems to be deployed during JOIS 2011 was ITP 55, and it would not be easy. Complicating floe selection, the ice conditions were deteriorating as the cruise was heading out of the multiyear pack ice into marginal ice, and a thick fog limited helicopter operations within close proximity to the ship. However, a floe was found that was over 3 m thick near the center, tapering to 1.6 m at the edges which was sufficient for deploying the 3 buoys composing this particular Ice-Based Observatory (IBO).

While deployment of the ITP proceeded, other scientists surveyed the ponded floe. A prototype profiler with current probe was originally to be deployed as ITP 55, but difficulties during bench tests onboard the ship prohibited its use. Fortunately, ITP 42 had been recovered earlier during the cruise (see ITP 42 Recovery Operations) and that profiler tested well except for a bad battery pack, so would be used instead with the new battery pack from the prototype profiler. The recovered surface package was renumbered and prepared with new batteries, as well.

The deployment proceeded in usual fashion until the first inductive modem test with the profiler suspended on the wire revealed a problem. After a significant amount of troubleshooting on the ice it was determined that the problem resided with the inductive modem in the surface package. Rather than abort the deployment, it was decided to swap in the new surface package electronics that had been originally prepared for ITP 55 (which was composed largely of parts retrieved from recovered ITPs 24 and 4). While one member of the team returned to the ship and made the changeover, the other members proceeded to deploy the SIMB and Uptempo buoys.

When the new surface package arrived, the inductive modem test was a success, and the remainder of the deployment proceeded as expected. Despite all of the difficulties, the Frankenstein refurbished ITP deployment with IBO was accomplished in 4 hours – only 1.5 hours longer than expected.

## ITP55 Data Processing

Of the 547 profiles that were transmitted from the ITP, only the first 251 actually profiled the water column (when the mooring anchor began dragging bottom), and these 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. Before the mooring ran aground, buoy drift speeds did not prevent the profiler from covering nearly the full vertical extent of all but a few profiles that it communicated to the surface package.

Thermohaline staircases were well defined initially and used to generate initial estimates for CTD lag corrections. However, the conductivity steps soon became smeared, both the temperature and conductivity lags drifted, and fixed lags had to be applied after profile 50.

## ITP55 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.

The buoy drifted initially southward then headed generally west from 75 to 74°N latitudes. After 4 months, on December 12, 2011, the tether anchor contacted the shallow Chukchi shelf bathymetry near 74°N, 161.5°W, and the profiler ceased profiling but continued to communicate. At first the instrument hovered around 360 m depth, then gradually rose to hover between 35 and 15 m depth, until it ceased communicating with the surface package on May 8, 2012, at a location just northeast of Wrangel Island. The surface package continued to transmit status and GPS for another 8 months while it skirted generally westward just north of the Wrangel Island shoreline.

The profiler was no longer communicating with the surface package, and the unit finally ceased transmitting altogether nearly 5 months later on October 4, 2012. Almost one year later, in September 2013, the buoy was discovered washed ashore on western Ireland.

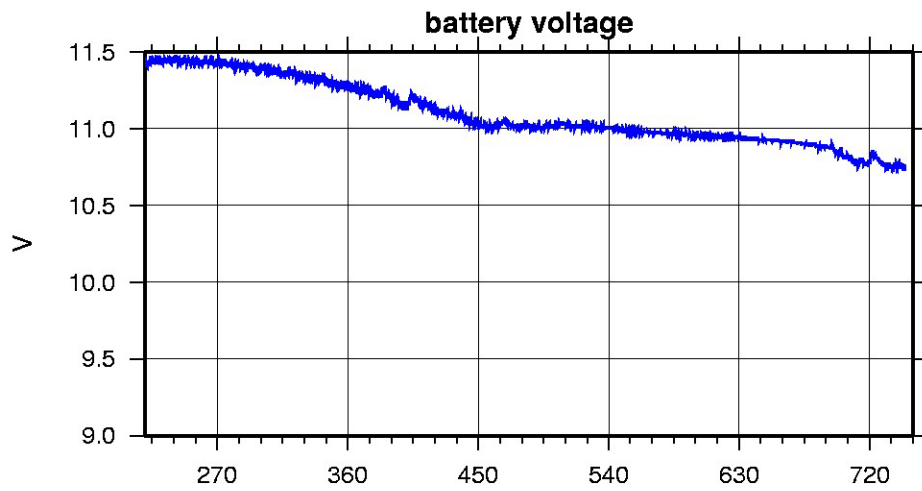
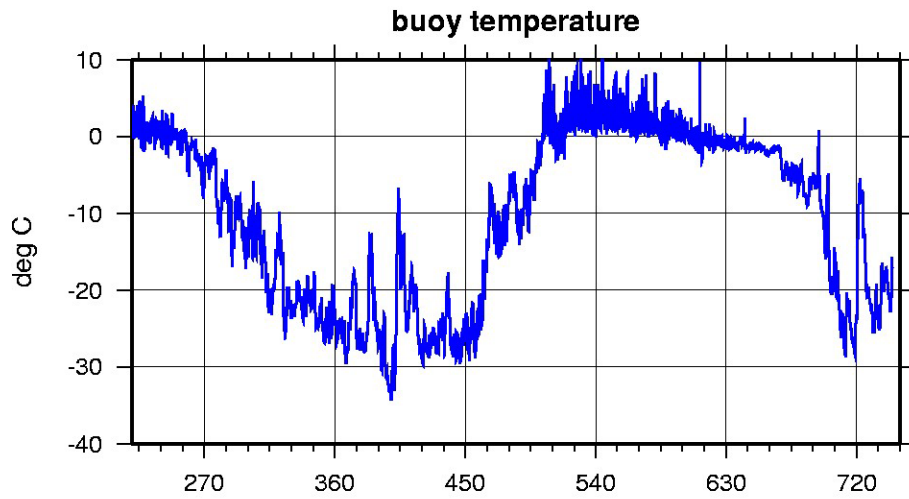
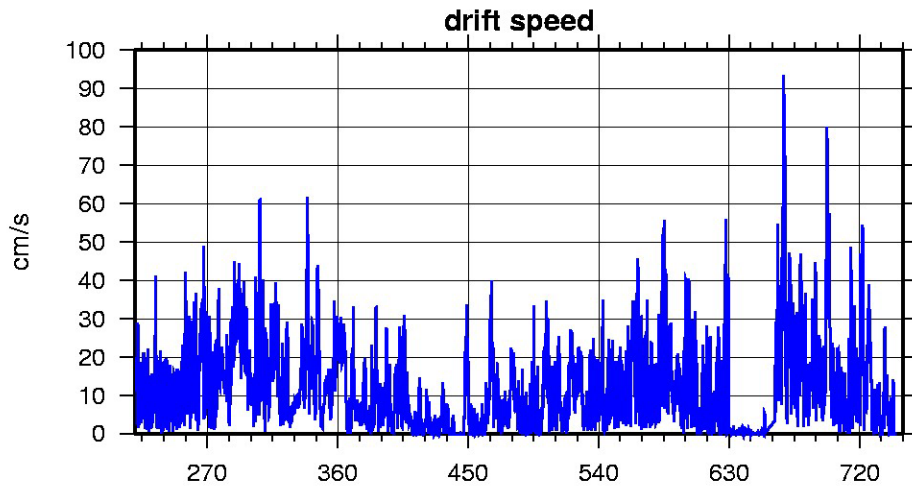
The plots below are of the final, calibrated, edited data (as opposed to the raw data presented on the active instrument pages).

Level II hourly buoy location data in ASCII format: `itp55rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp55cormat.tar.Z` or `itp55cormat.zip`

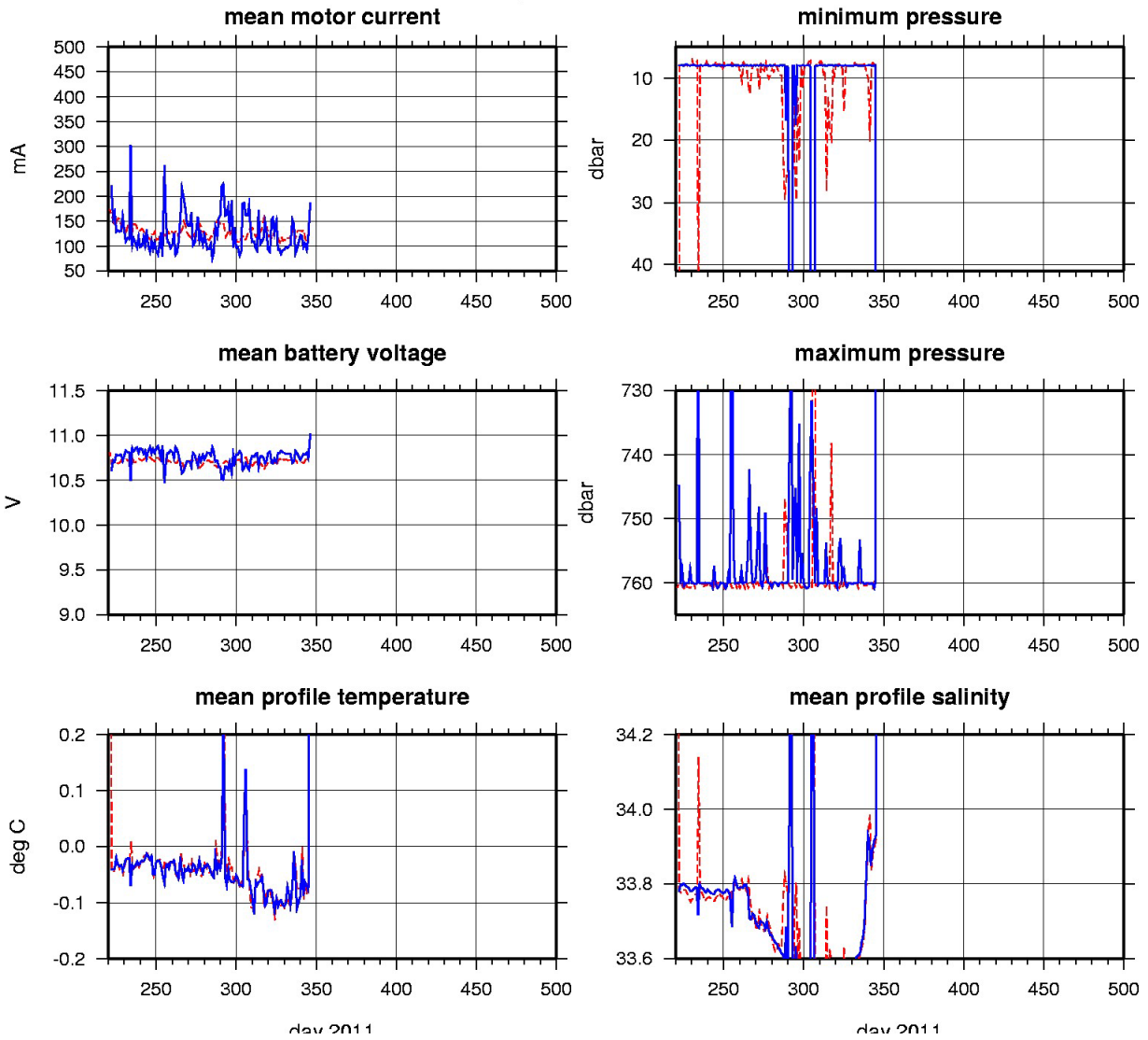
Level III 1-db bin-averaged processed profile data in MATLAB format: itp55final.mat  
Level III 1-db bin-averaged processed profile data in ASCII  
format: itp55final.tar.Z or itp55final.zip

# ITP55 Buoy Status (as of 2013/01/13)

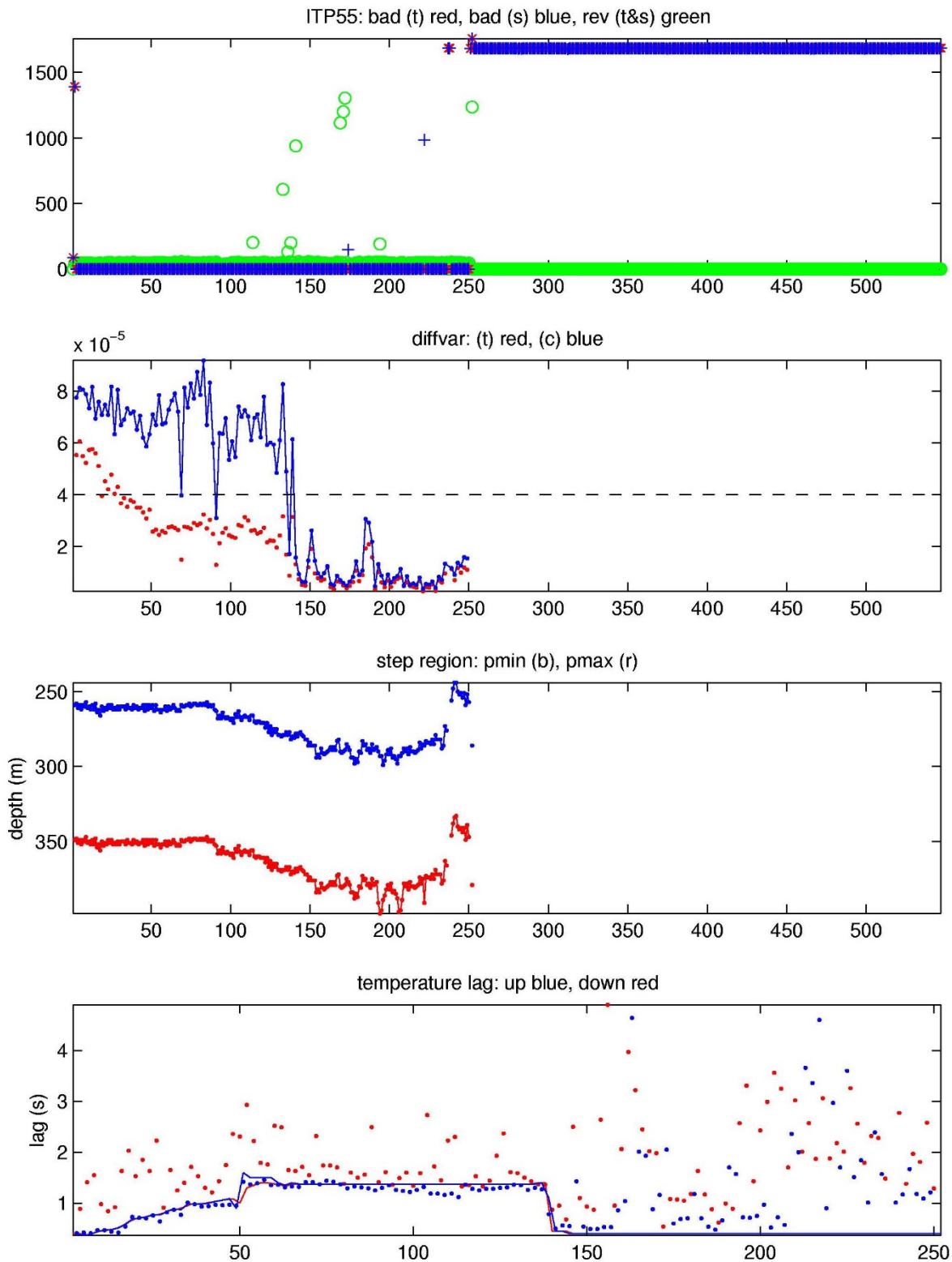


### ITP55 Profiler Status (up to profile 547)

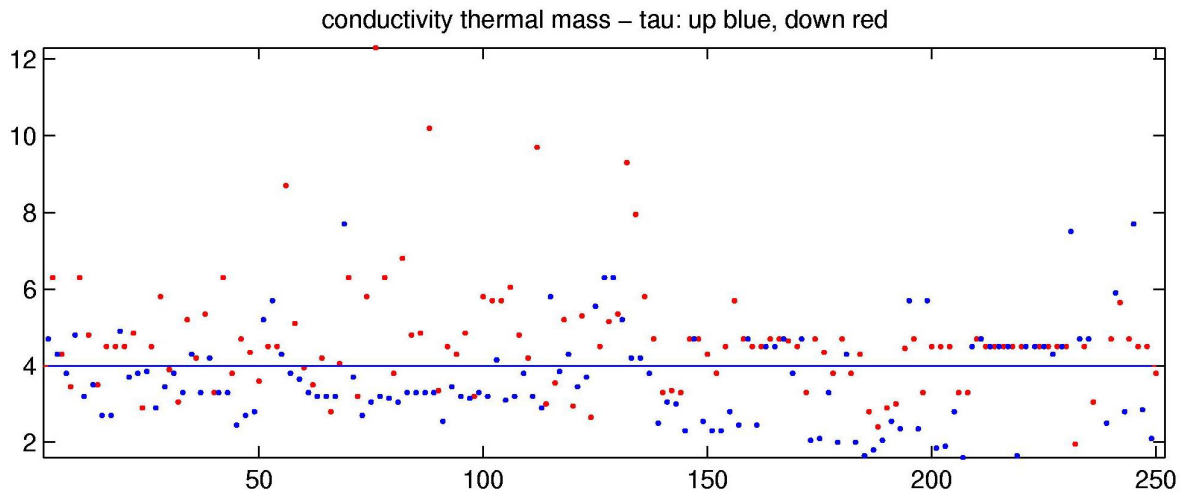
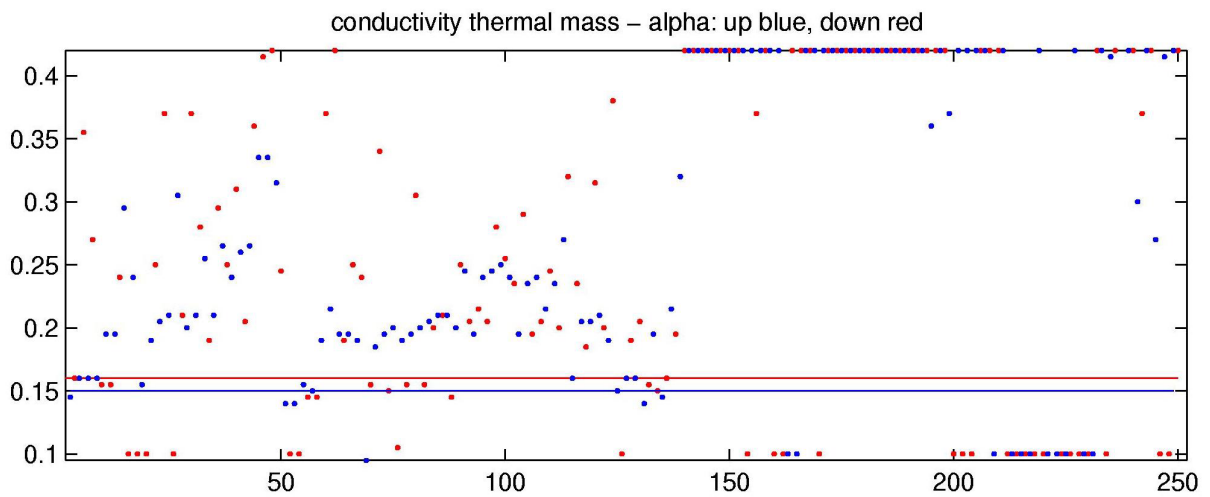
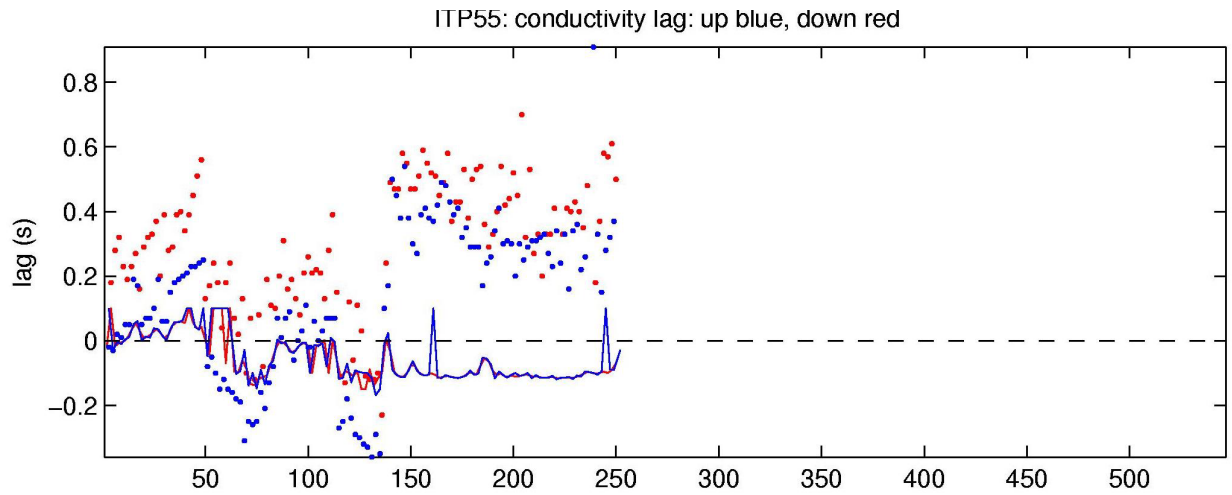
*up solid, down dashed*



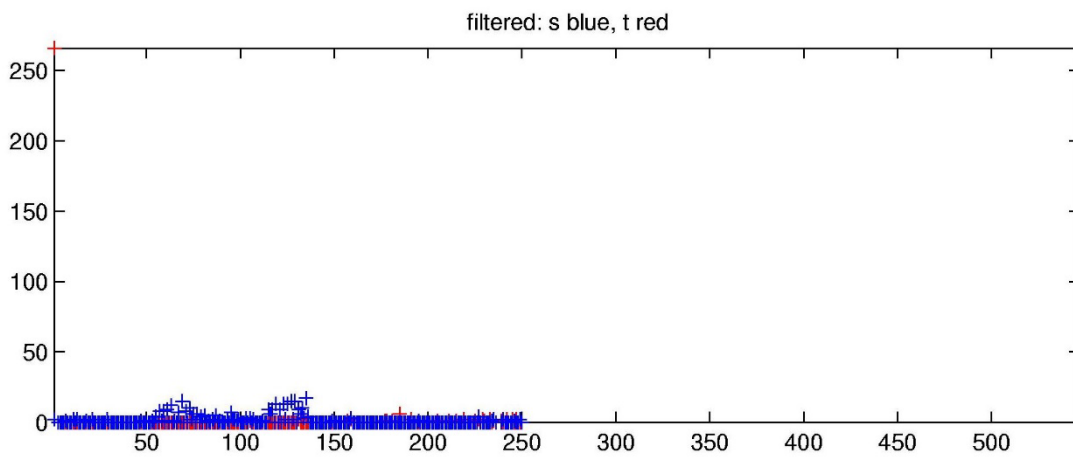
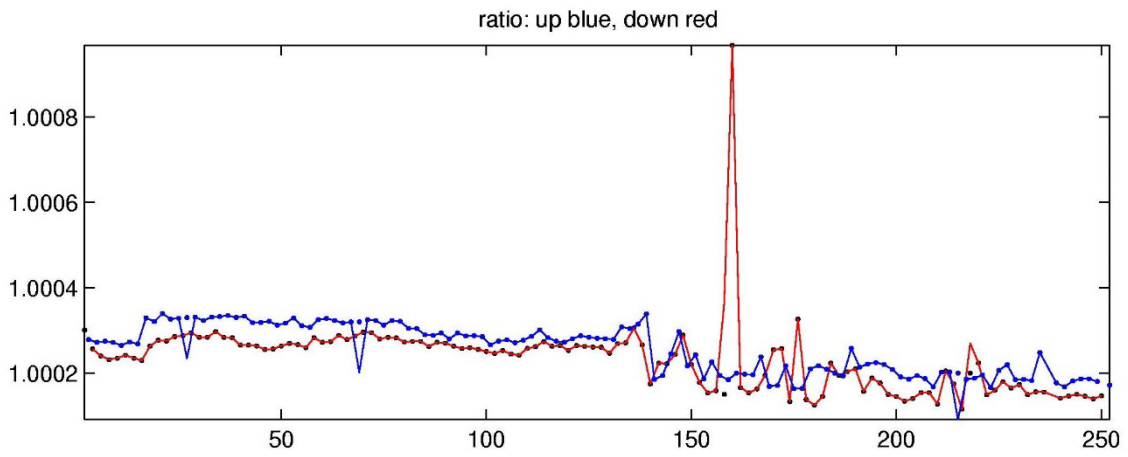
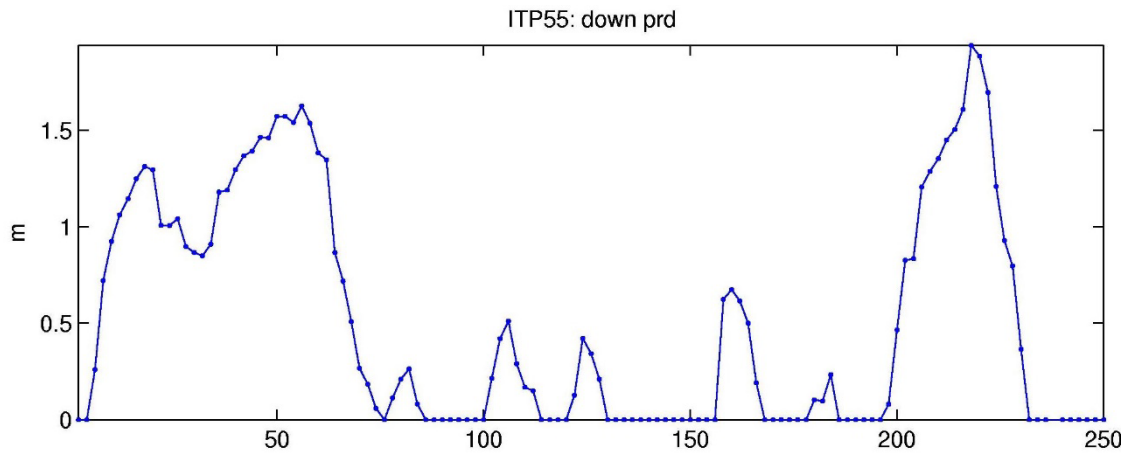
ITP profiler engineering data.



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.



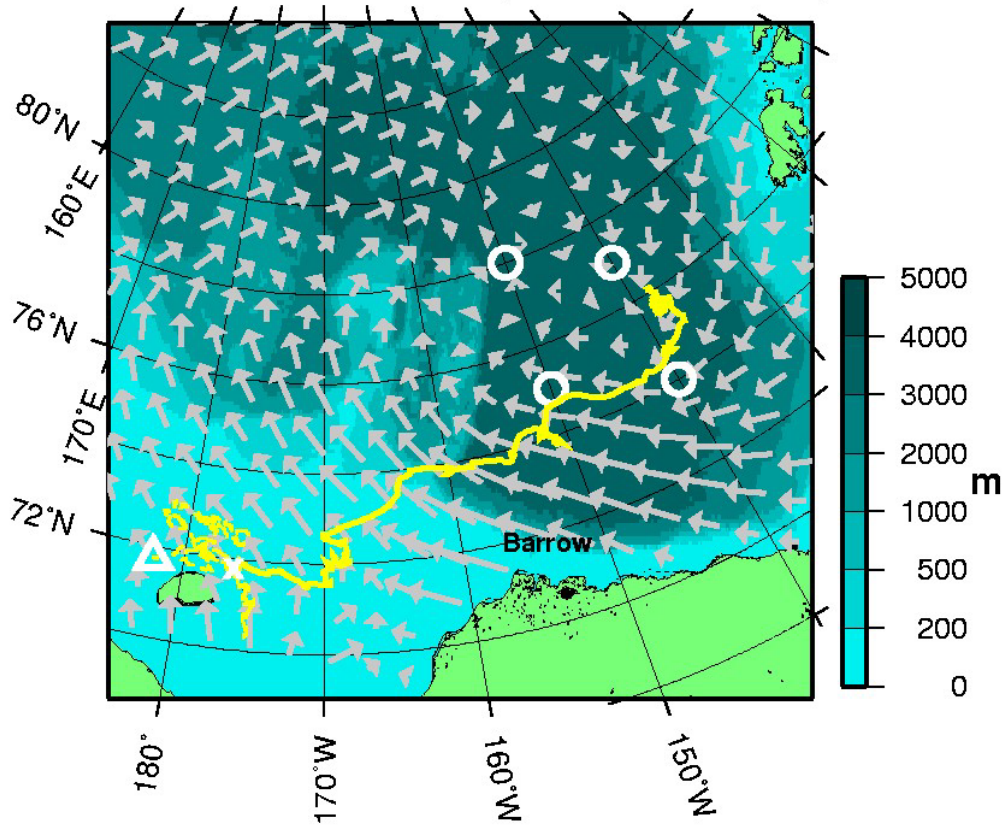
Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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



**ITP55 Drift Track (as of 2013/01/13)**

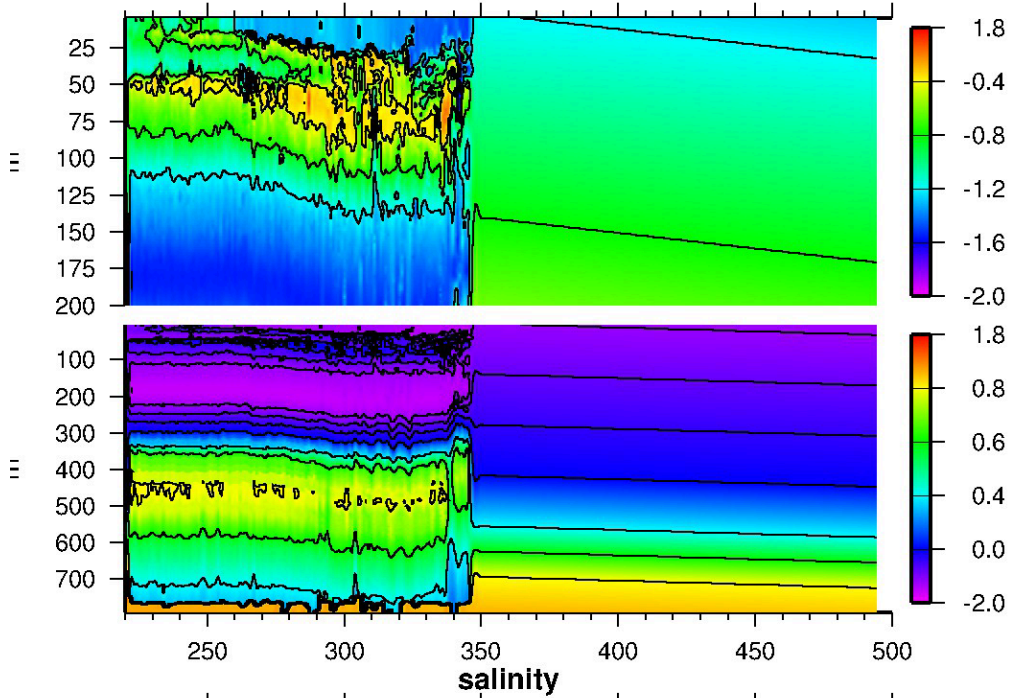


**ITP drift (yellow line), last profile (cross), and last location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).**

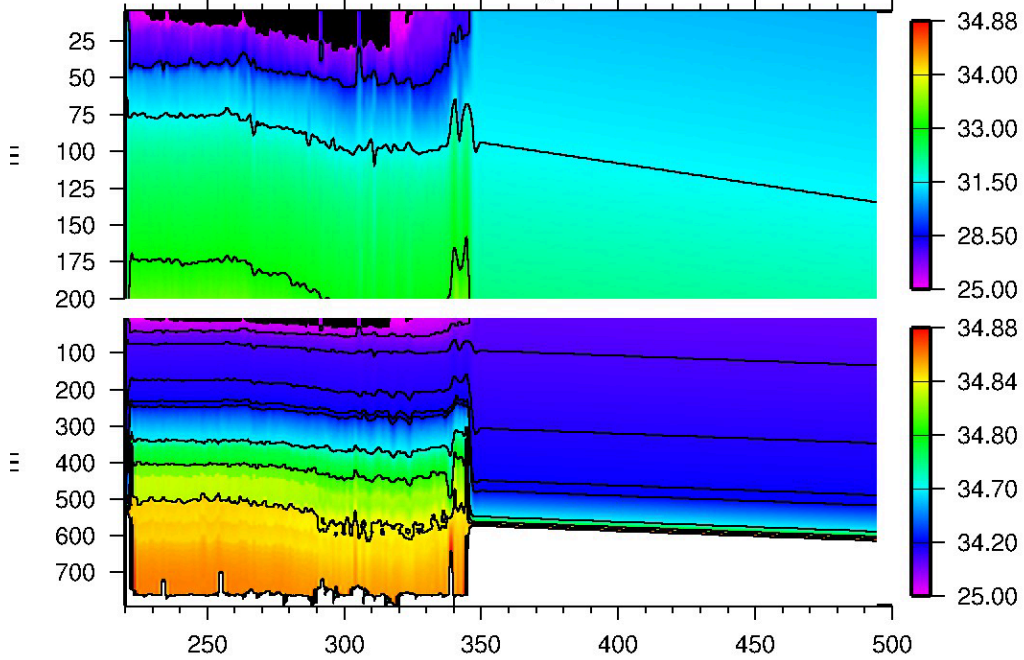
Plot of buoy locations.

### ITP55 Up Profile Contours (to profile 547)

temperature



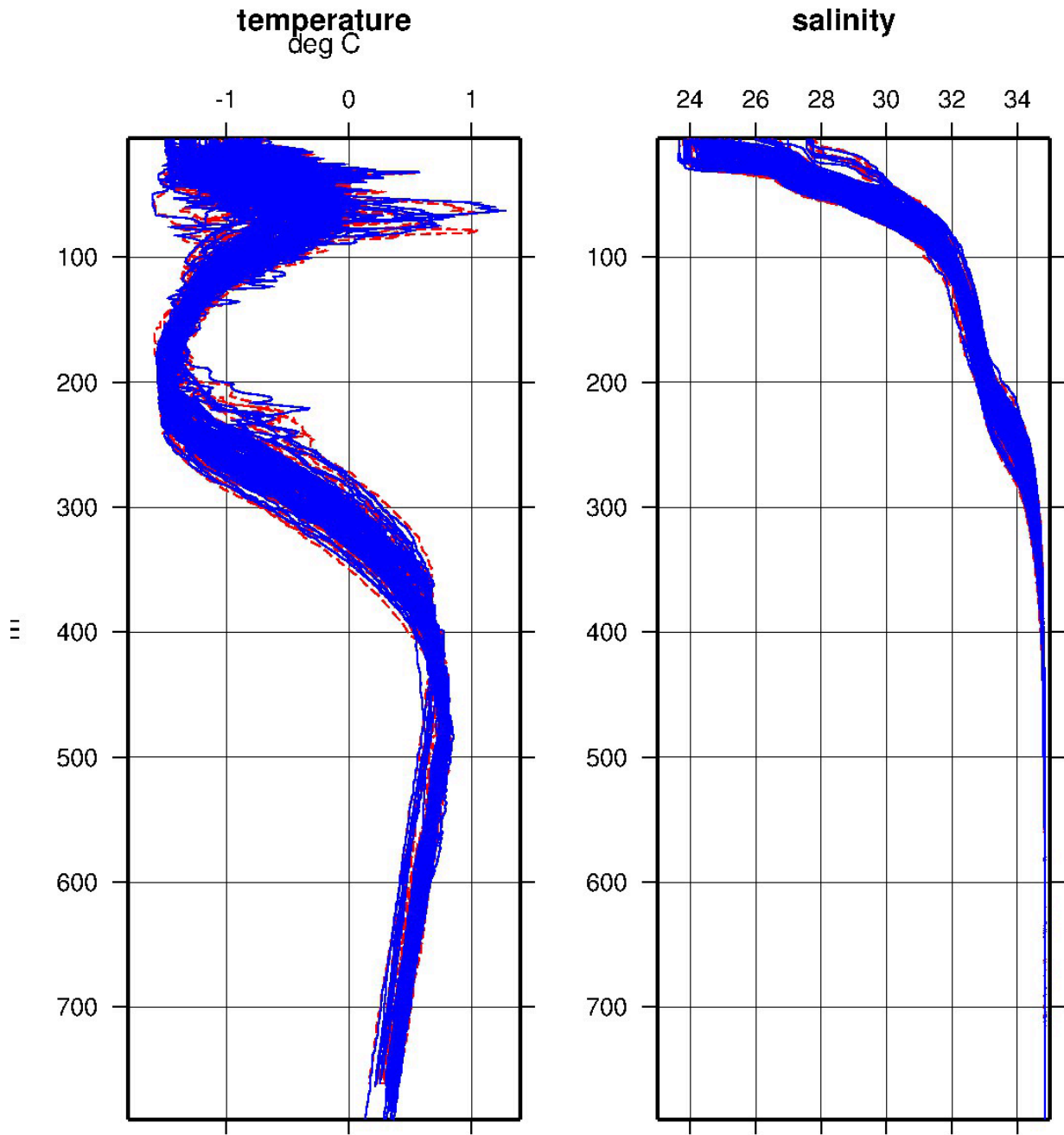
salinity



day 2011

ITP55 temperature and salinity contours

# All ITP55 Profiles (up to profile 547)



*up solid, down dashed*

Composite plot of ITP temperature and salinity contours.



Shortly after installation, the foam flotation collar of newly deployed ITP 55 still shows the marks from its previous deployments as ITPs 4 and 24. (Mary-Louise Timmermans)



The reconnaissance team on the ice is barely visible from the ship through the fog. (Mary-Louise Timmermans)

**BGOS/JOIS 2011 Ice Based Observatory 3**

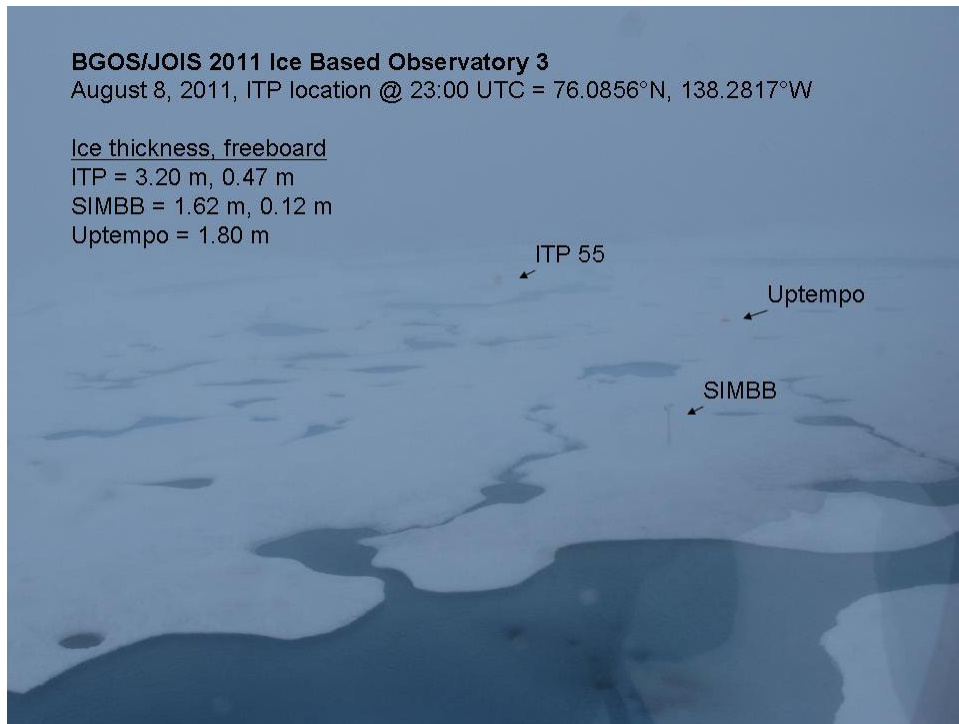
August 8, 2011, ITP location @ 23:00 UTC = 76.0856°N, 138.2817°W

Ice thickness, freeboard

ITP = 3.20 m, 0.47 m

SIMBB = 1.62 m, 0.12 m

Uptempo = 1.80 m



Barely visible through the fog, the distribution, ice thickness and freeboard measurements at the buoy sites of the last IBO deployed during JOIS 2011 are shown. (Rick Krishfield)