

ITP 2 Overview

Deployment Location: 8/19/2004, 15:00 UTC at 77° 10.4'N, 141° 13.0'W

Last Location: 9/28/2004, 12:00 UTC at 76° 44.8' N, 137° 22.9' W

Duration: 40 days

Distance Travelled: 390 km

Number of profiles: 244 in 40 days

Other instruments: IMB

The first ITP (serial number 2) was deployed in the Beaufort Sea as part of the Beaufort Gyre Freshwater Experiment (BGFE) during the JWACS 2004 cruise on the *CCGS Louis S. St. Laurent*. The ITP and one Ice Mass Balance Buoy (IMB) were deployed on a 4 m thick multiyear ice floe in a location designed to drift through the BGFE array during the following year.

ITP 2 Deployment Operations

The day prior to the deployment of the ITP/IMB a multiyear ice floe approximately 500 m by 500 m characterized by dirty snow was spotted from the ship, the helicopter was flown onto the floe, and two test holes were bored through the ice using a 2" diameter hand auger to determine the thickness (3.8 and 4.0 m).

The following morning, the deployment operation began at 6 AM local time (CDT) with the transportation in light fog of an ice party of eight and all gear to the selected site in three helicopter flights and two slingloads. Drilling the 11" diameter hole through the ice for the installation of the ITP profiler was the most difficult part of the ITP deployment. Midway through the 4 m ice, the old hard ice became softer and more porous so that embedded seawater turned the ice shavings into slush, and the 10" diameter flutes had difficulty removing the material. To complete the drilling, the deployment tripod assembled, and the auger hung from a chainfall, so that the drilling could proceed at a controlled rate with reduced labor.

The hole was finally completely drilled by 7:30, with 50 cm of freeboard above the seawater. In the next two hours, the anchor weight and wire rope (with bottom bumper) were smoothly deployed, and then the ITP profiler was attached, and easily passed through the 11" hole, the 800 m wire rope was deployed, and the surface package attached to the tether. Subsequent communications with the underwater inductive modem through the surface package using a laptop computer confirmed that the inductive modem circuit between the profiler and surface package was operation. The surface package was situated over the hole, the tripod was removed, and a wooden platform was constructed beneath the buoy. By 10 AM local time (15:00 UTC), the ITP deployment was complete.

Simultaneously, the IMB was being installed approximately 10 meters away. One 11” diameter hole was drilled 1 m deep to encase the surface package, and three 4” diameter holes through the ice for the ice sensors. The thermistor hole was in 4 m thick ice with 20 cm of freeboard. Where the snow sensor was located, there was initially 5.5 cm of snow. At 10 AM, the operation of the IMB was verified using a Campbell keypad to check memory locations. Clean up and covering of the cables continued for next half hour, and all personnel and cargo were returned to the ship by 11 AM. Later, messages from shore laboratories confirmed that both buoys were operating properly.

ITP 2 Data Processing

The 244 profiles that were received from the ITP appear to be largely free of fouling and instrument errors and were processed according to the procedures described in the ITP Data Processing Procedures. The processing parameters for ITP2 are shown in the figures to the right. A software bug in the underwater unit resulted in instrument resets during two profiles (107 and 214) so that no information is available from those. As per design, the instrument successfully resumed operation on the subsequent profiles. Profiles 188, 208, and 209 had large segments of presumably contaminated conductivity data that were discarded. A few other conductivity spikes were removed, but the temperature data appeared to be completely uncontaminated.

ITP 2 Data Description

The ITP profiler was configured to operate with an accelerated sampling schedule of 6 one-way profiles between 10 and 750 m depth each day in order to more quickly evaluate endurance and component fatigue. In the surface package, the GPS receiver was powered every two hours to obtain locations, and buoy temperature and battery voltage status were recorded. After 40 days of reliable operation and data telemetry, data from this first prototype ITP stopped being received; one possible explanation for its premature demise is that the supporting ice floe fractured, and the system sank. (By design, the surface package buoyancy of this first unit was not adequate to float the tether and ballast weight; subsequent systems are equipped with sufficient buoyancy.)

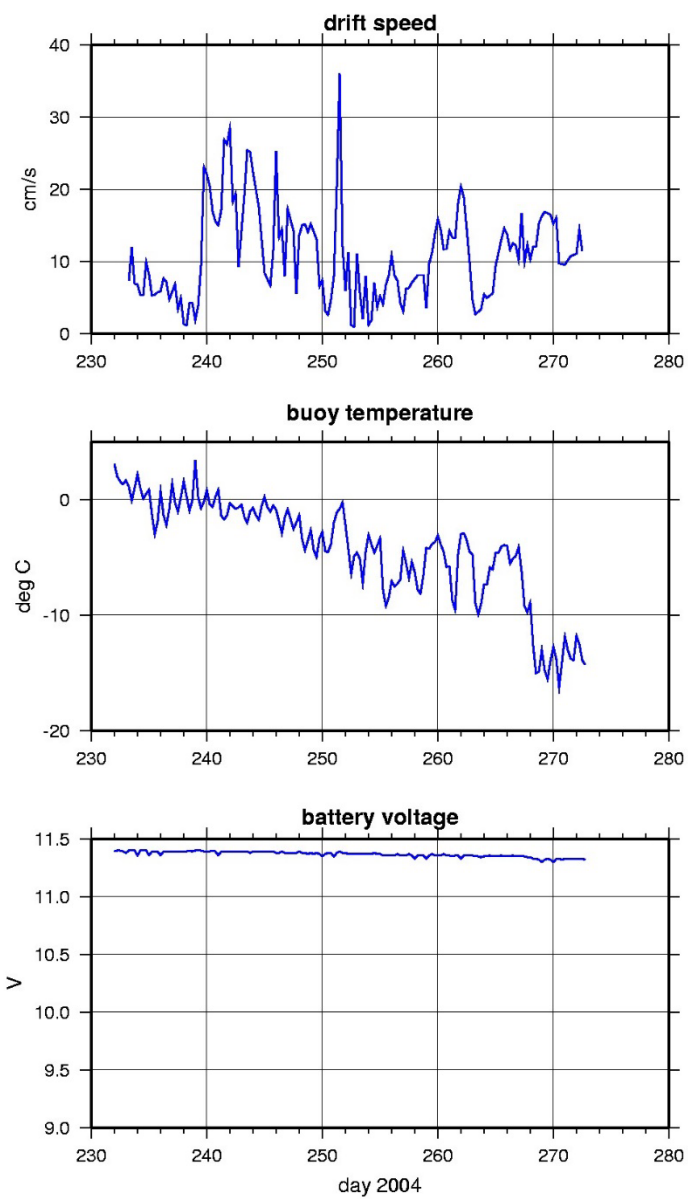
Level II bi-hourly buoy location data in ASCII format: `itp2rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp2cormat.tar.Z` and `itp2cormat.zip`

Level III 1-db bin-averaged processed profile data in MATLAB format: `itp2final.mat`

Level III 1-db bin-averaged processed profile data in ASCII format: `itp2final.tar.Z`
or `itp2final.zip`

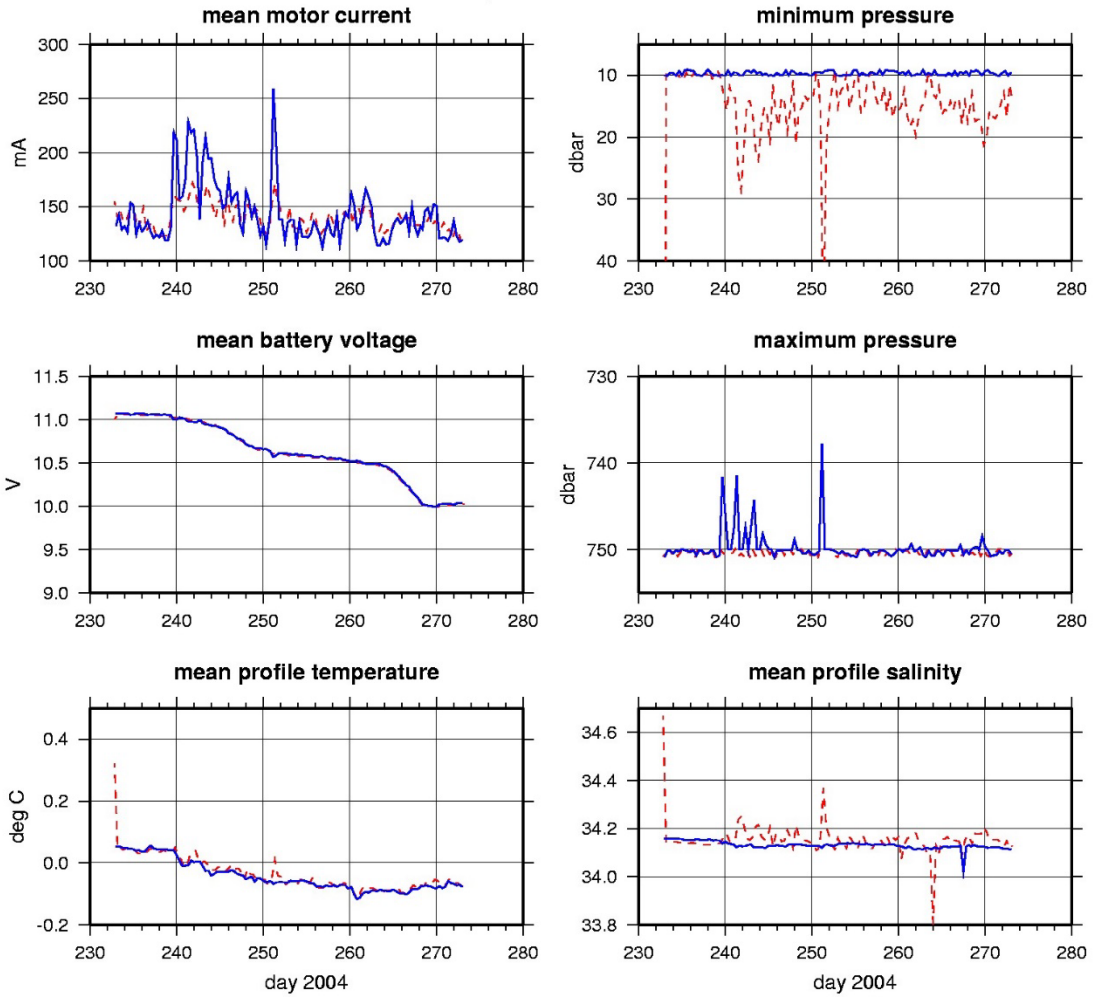
ITP2 Buoy Status (as of 2004/09/28)



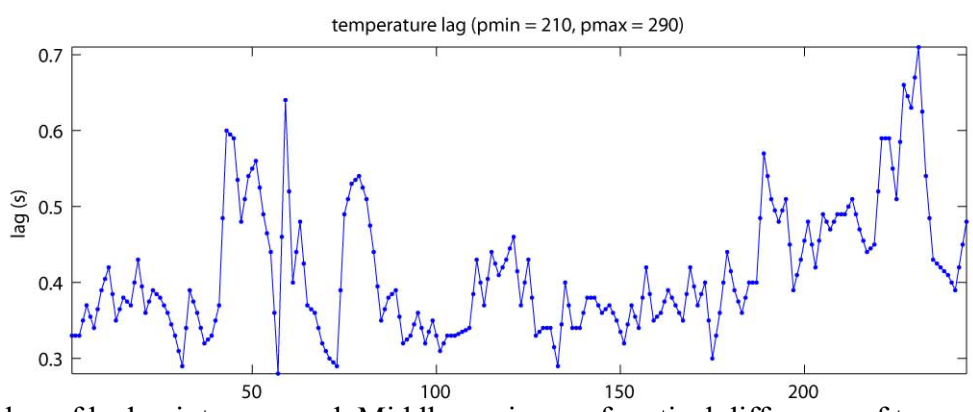
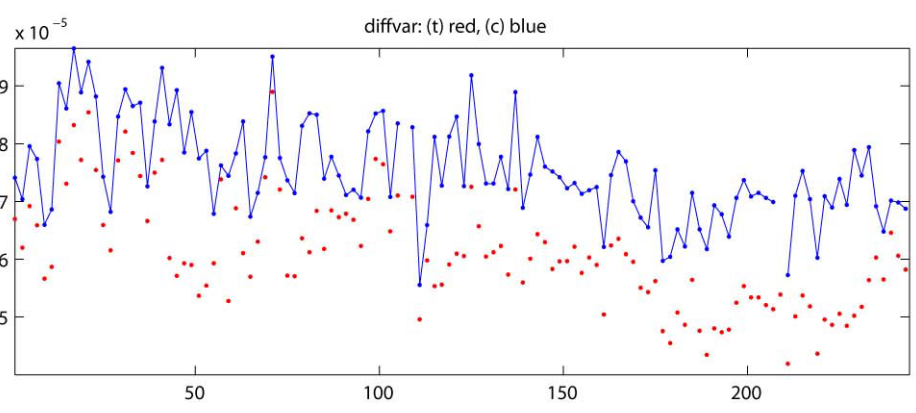
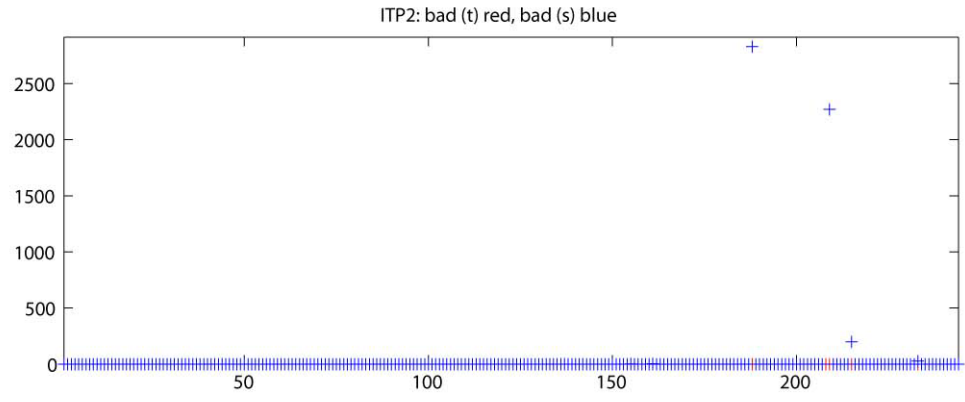
ITP surface buoy status.

ITP2 Profiler Status (up to profile 244)

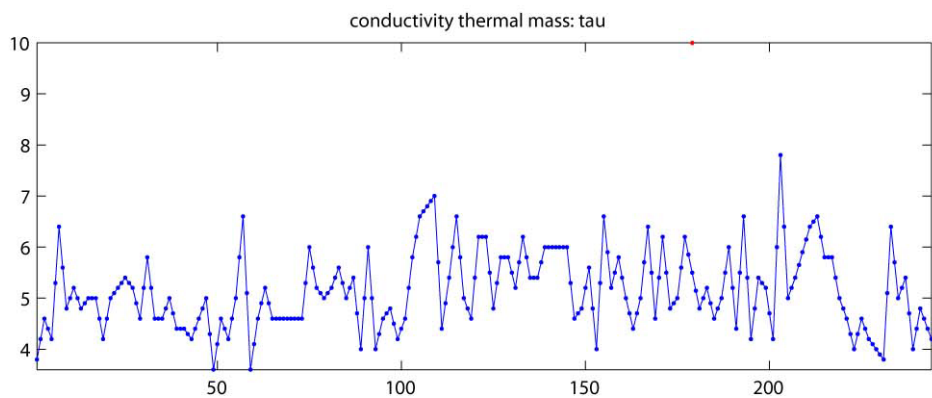
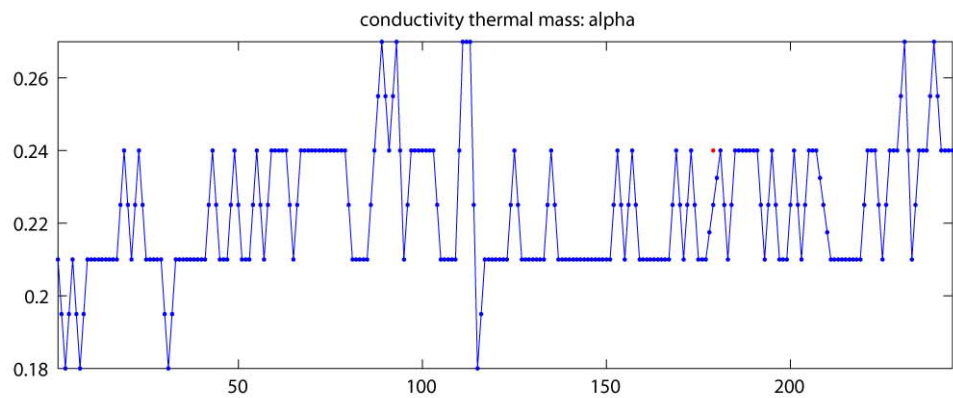
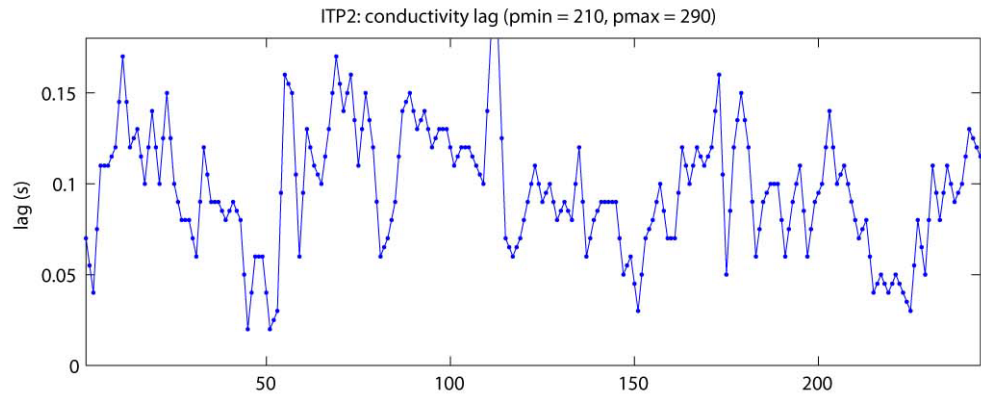
up solid, down dashed



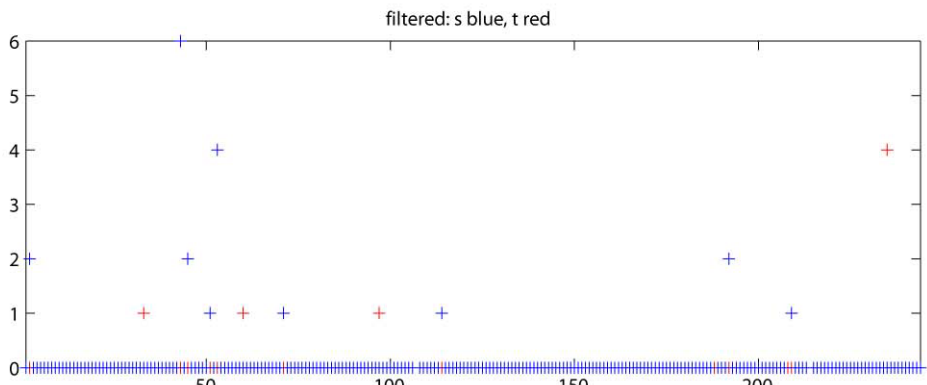
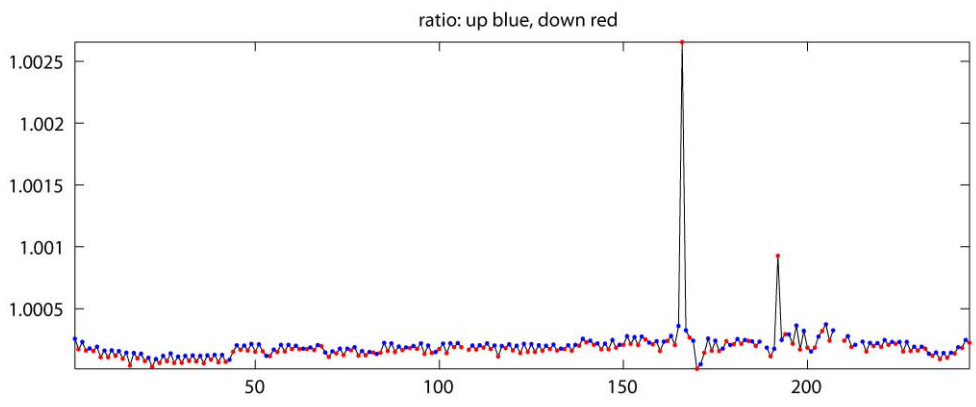
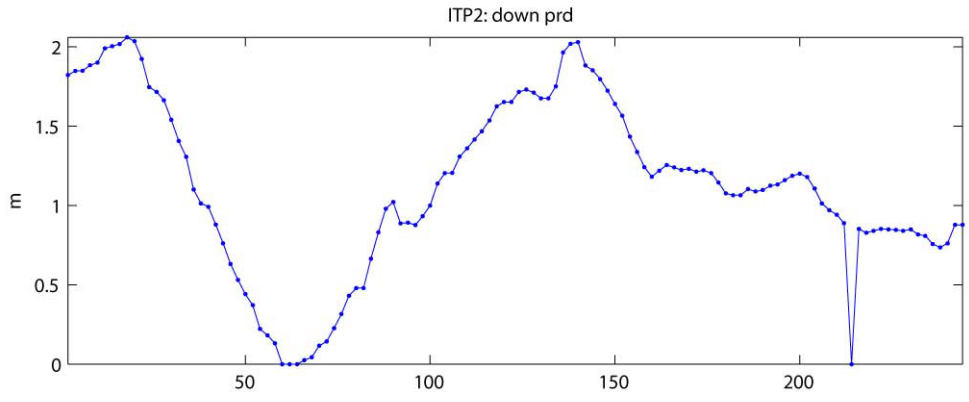
ITP profiler engineering data.



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.

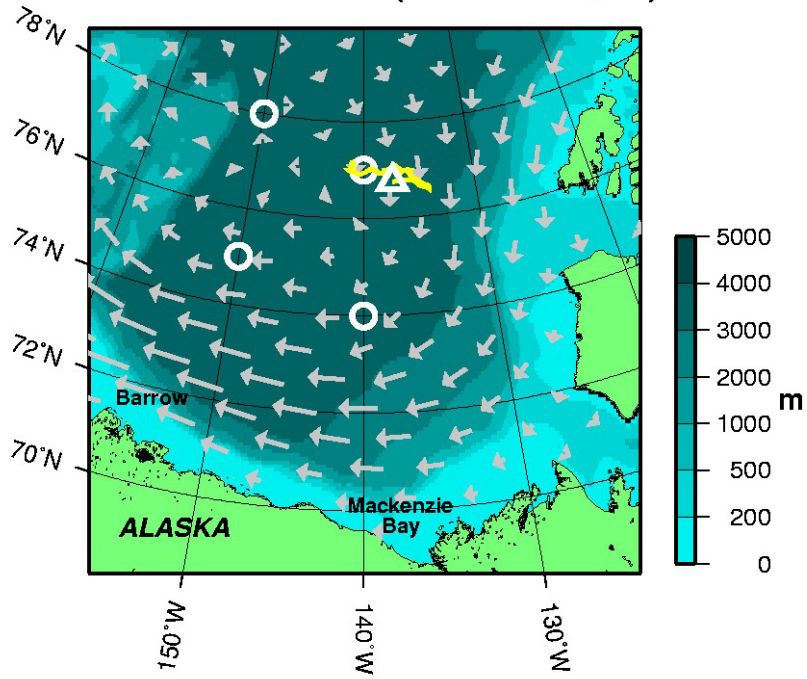


Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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

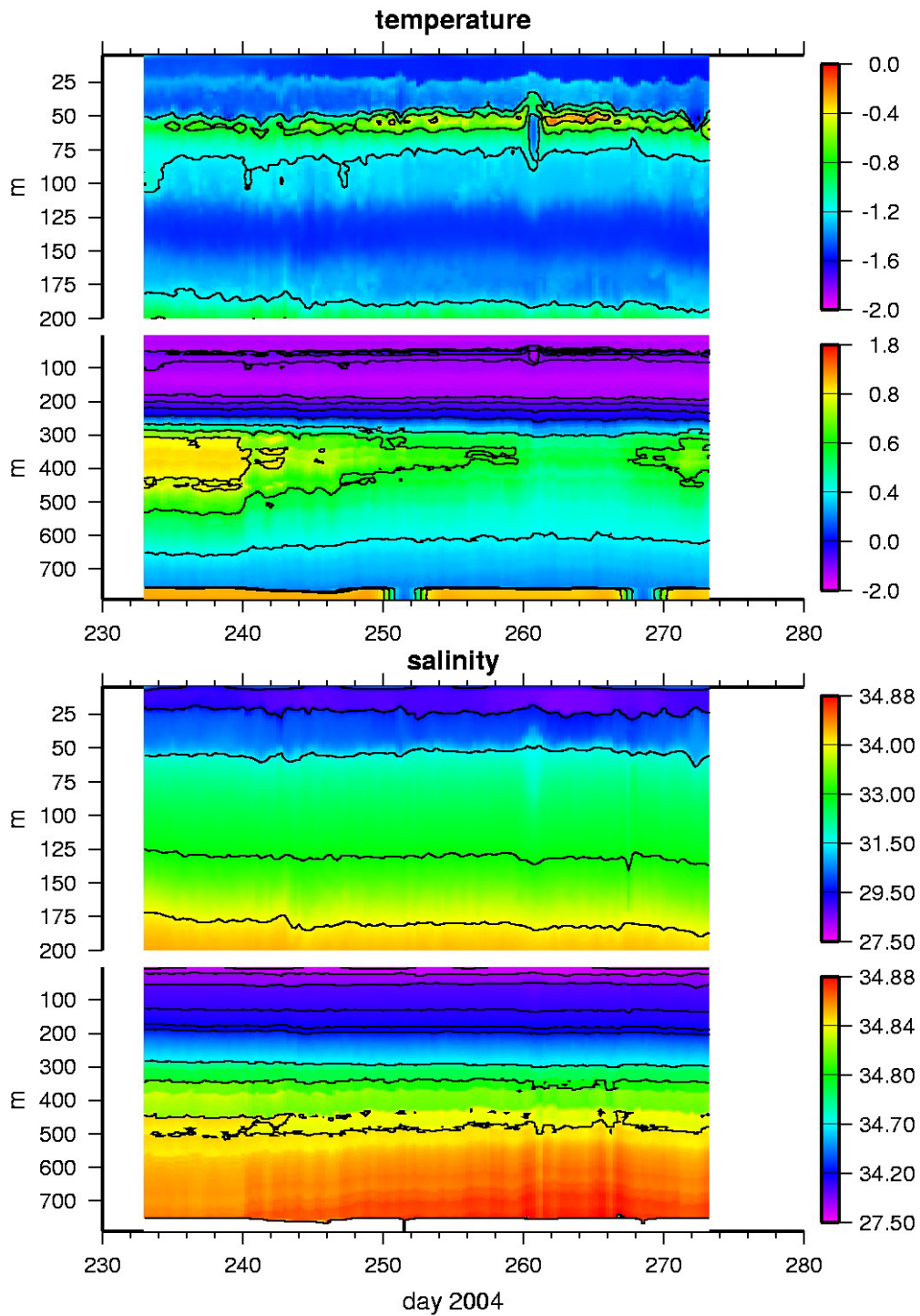
ITP2 Drift Track (as of 2004/09/28)



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

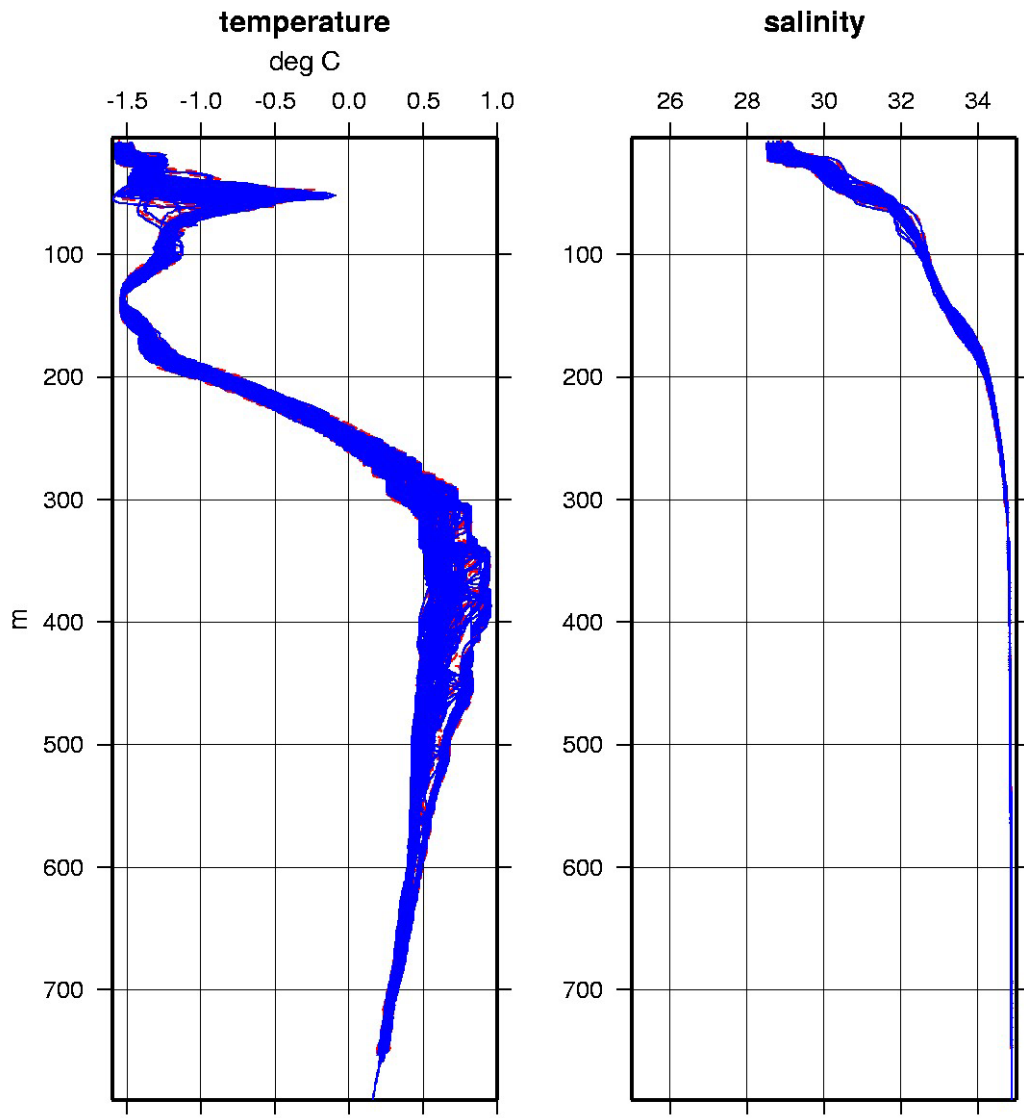
Plot of buoy locations.

ITP2 Up Profile Contours (to profile 243)



ITP 2 Temperature and Salinity contours.

All ITP2 Profiles (up to profile 243)



up solid, down dashed

Composite plot of ITP profiles.



The combination of the ITP and IMB is an example of an Ice-Based Observatory (IBO) for obtaining sustained measurements of the atmosphere-ice-ocean in all seasons as part of the Arctic Observing Network (AON). (Photo by Rick Krishfield)