

# ITP11 Overview

**Deployment Location:** 9/9/2007, 11:00 UTC at  $83^{\circ} 17.7'N$ ,  $127^{\circ} 37.9'W$ >

**Last Location:** 10/22/2009, 15:00 UTC at  $74^{\circ} 35.4' N$ ,  $161^{\circ} 34.3' W$

**Duration:** 774 days

**Distance Travelled:** 4810 km

**Number of profiles:** 1690 in 776 days

**Other instruments:** IMB 2007-J

ITP11 was deployed on a 2.8 m thick icefloe from the Russian icebreaker *Akademik Federov* as part of the European Union DAMOCLES Program. On the same icefloe, a US Army Cold Regions Research and Engineering Laboratory (CRREL) Ice Mass Balance Buoy (IMB 2007-J) was also installed. The ITP operated on a typical sampling schedule of 2 one-way profiles between 7 and 760 m depth each day. An attempt was being made in September 2009 to find and recover the ITP (as the profiler was nearing the end of its battery life) when the top float disappeared (presumably beneath the decaying ice rubble). Days later it reappeared and sent updated locations for a brief period, but by then it was too far away to be recovered.

## ITP 11 Deployment Operations

The first Ice-Based Observatory deployed from the Russian research vessel *Akademik Federov* during the International Polar Year (IPY) consisted of ITP 11 and an IMB. This ice floe was selected from the vessel, and the deployment operation occurred with the *Federov* and escort nuclear icebreaker "Rossiya" nearby. The gear and personnel were carried over the side onto the ice in cargo slings and pallets and hauled or walked across the ice where the buoys were installed.

## ITP 11 Data Processing

The 1690 profile attempts that were transmitted from the ITP were processed according to the procedures described in the ITP Data Processing Procedures. The processing parameters (described in ITP Data Processing Procedures) for ITP 11 are shown in the figures to the right. Thermohaline staircases were not prominent in the time series, but sufficient to sometimes compute lags which did not seem to vary (where steps were present) throughout. A step shift in conductivity occurred between profiles 407-429. Numerous profiles between 1060 and 1270 have odd T-S shapes above and through the Atlantic Water layer but are stable in density. These profiles have some characteristics that differ from typical fouled sensor data and could portray horizontal seawater intrusions, so were not removed. The mooring likely dragged on the Chukchi shelf between profile 1638 and 1650, and the profiler recovered somewhat afterwards obtaining partial profiles (in higher drift speeds) up to profile 1686, when the battery rapidly

exhausted. Due to the software overflow bug, ITP 11 experienced 68 resets with complete loss of data for these profiles, and typically incomplete vertical coverage for the next subsequent profiles.

## ITP 11 Data Description

In the surface package, the GPS receiver obtained locations, buoy temperature and battery voltage status every hour, while the package circled the perimeter of the Beaufort Gyre from the northwest around to the southwest for over two years. The ITP profiler was configured with a standard battery to operate on a standard sampling schedule of 2 one-way profiles each day, with an expected battery lifetime of about 1500 profiles. However, the ITP attempted 1690 profiles, most (91%) which were nearly full profiles (with exceptions from of the software reset problem, obstruction with the bottom, and near the end due to excessive drift speeds).

The plots below are of the final, calibrated, edited data.

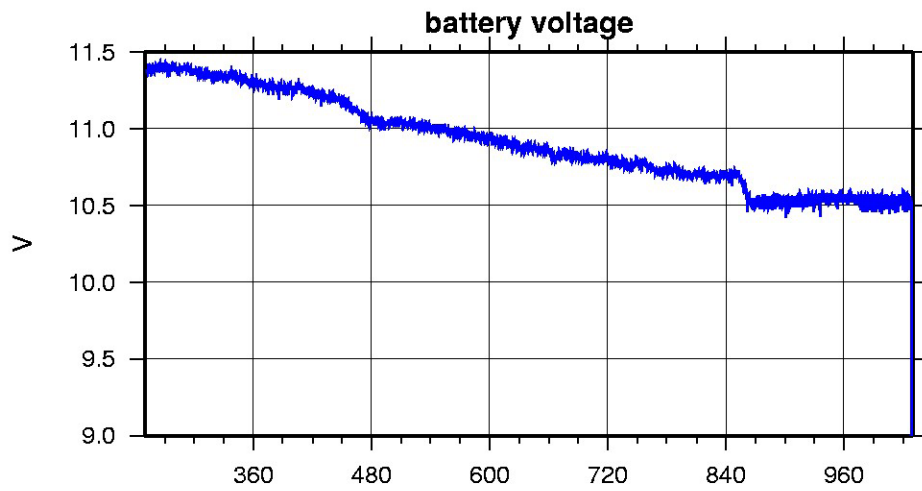
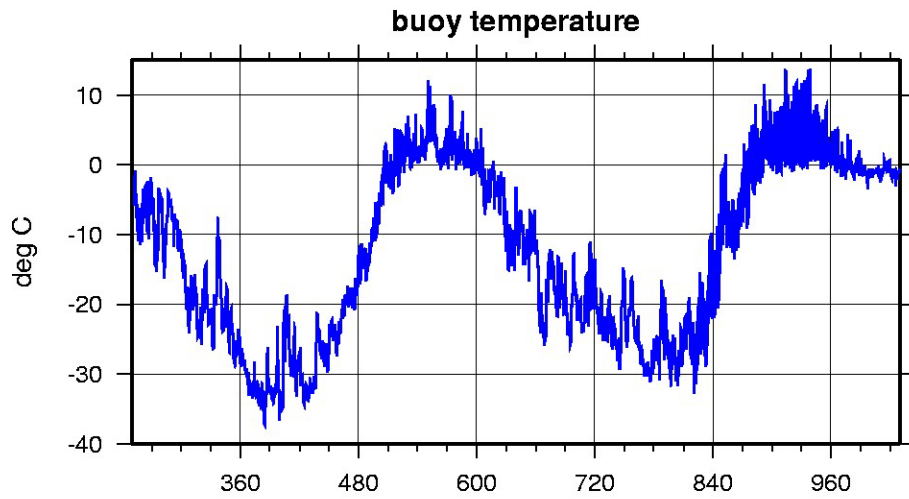
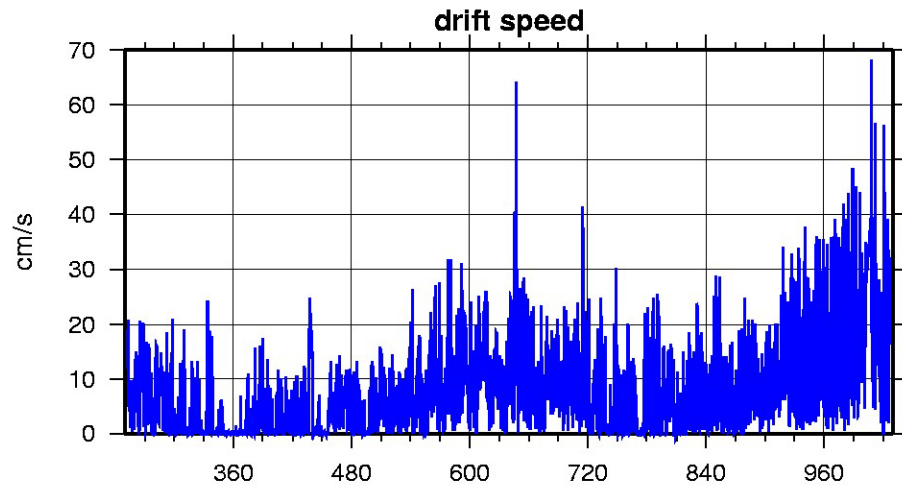
Level II hourly buoy location data in ASCII format: `itp11rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp11cormat.tar.Z` or `itp11cormat.zip`

Level III 1-db bin-averaged processed profile data in MATLAB format: `itp11final.mat`

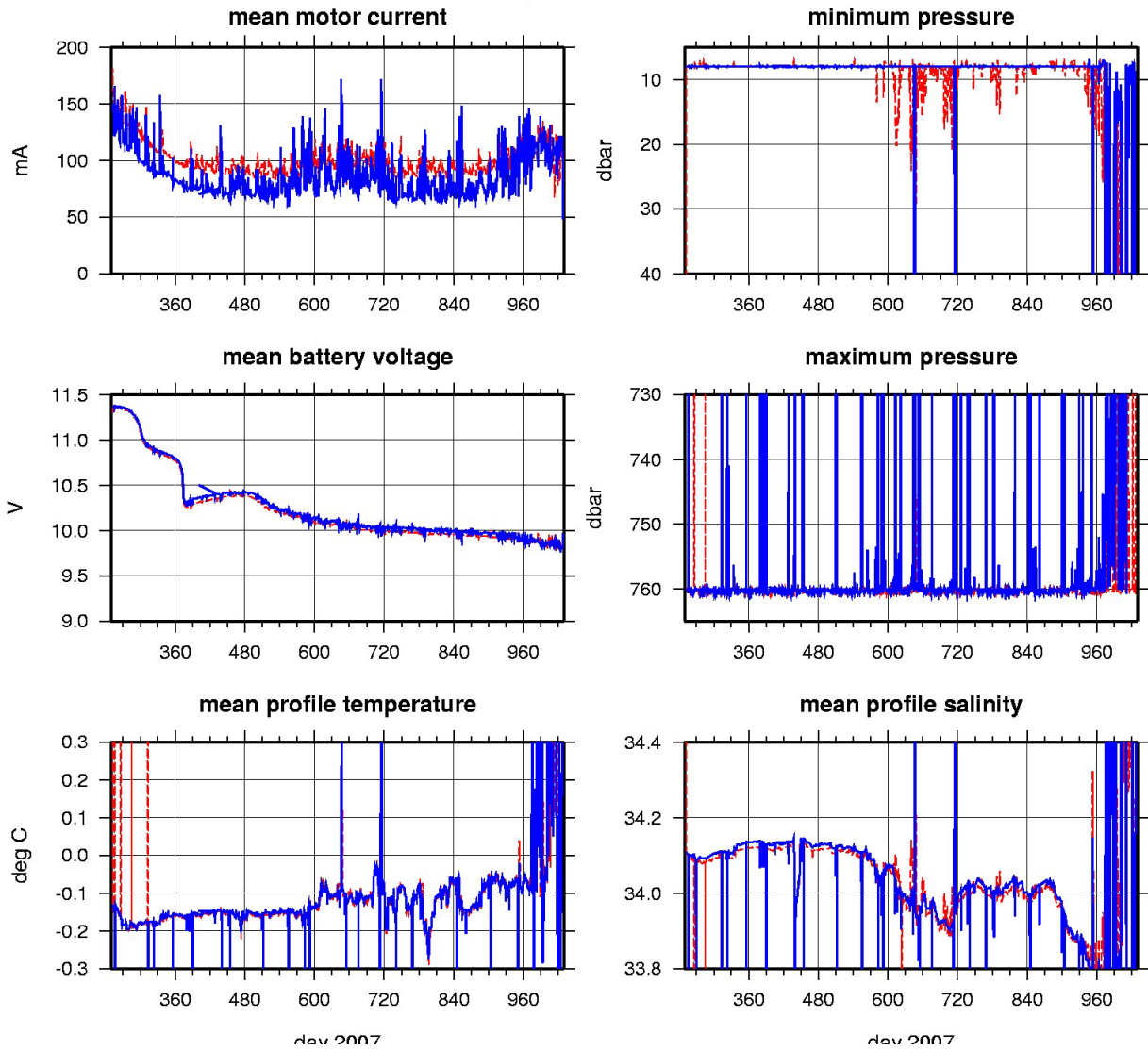
Level III 1-db bin-averaged processed profile data in ASCII format: `itp11final.tar.Z`  
or `itp11final.zip`

# ITP11 Buoy Status (as of 2009/10/22)



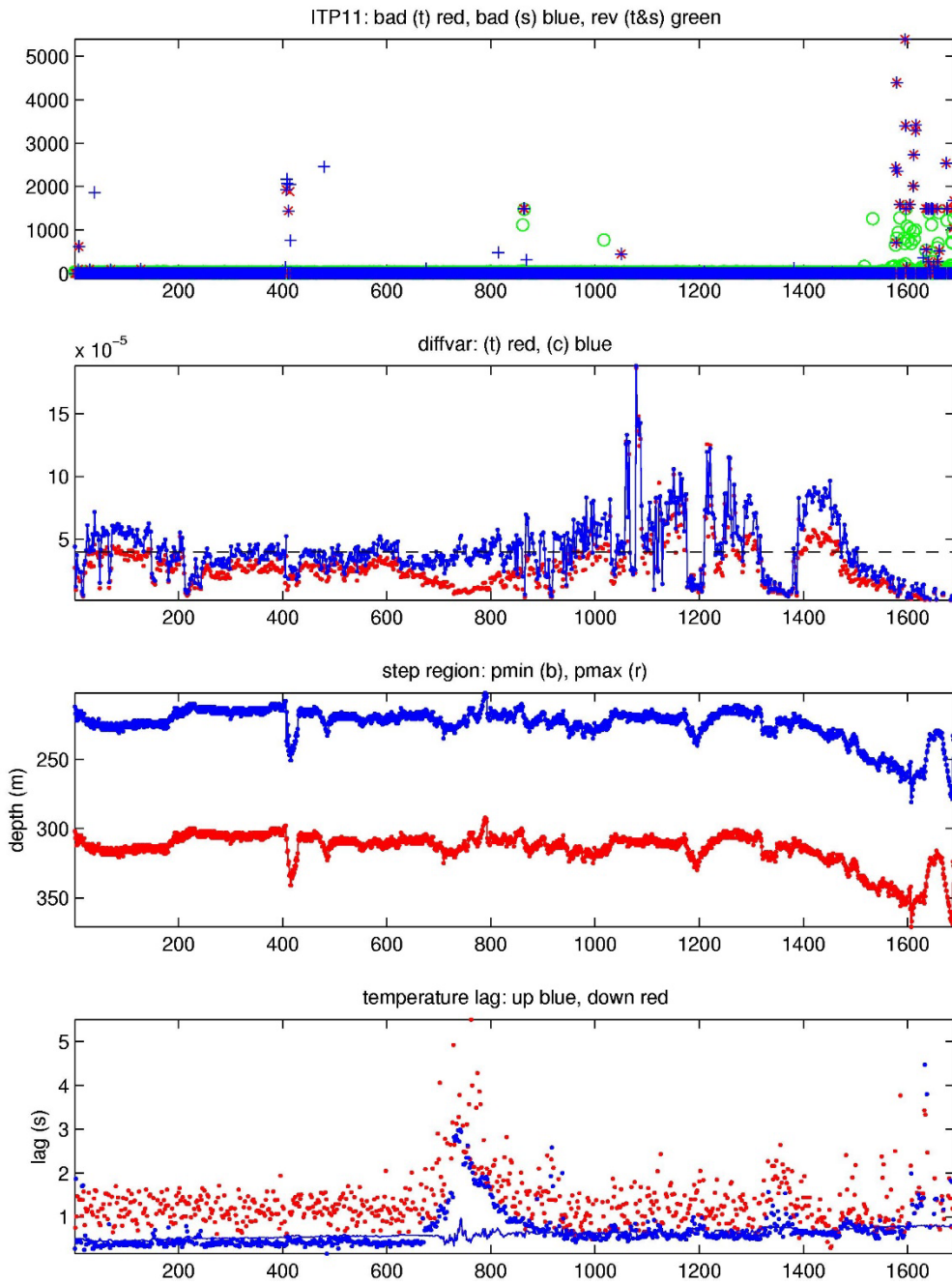
# ITP11 Profiler Status (up to profile 1690)

*up solid, down dashed*

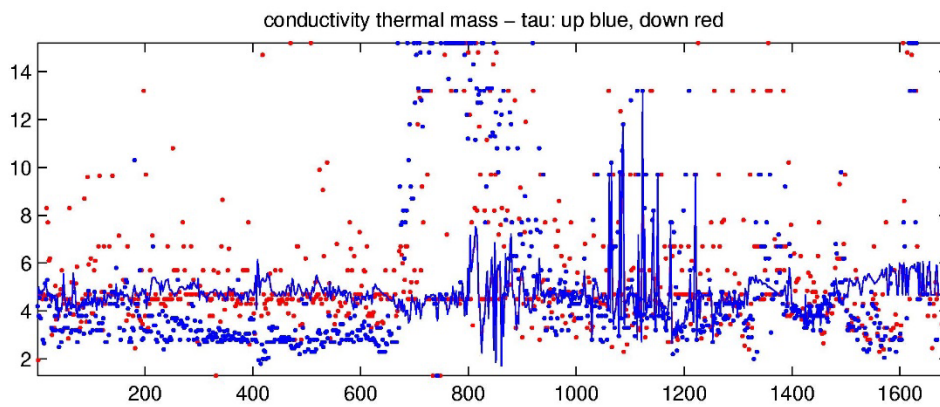
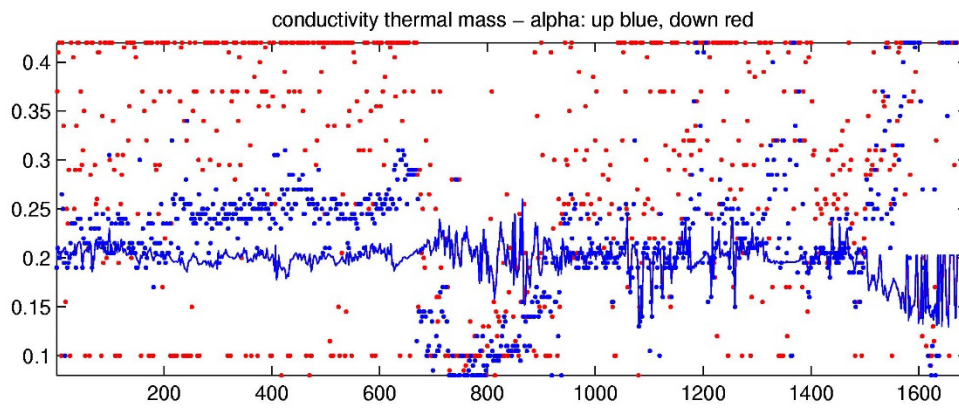
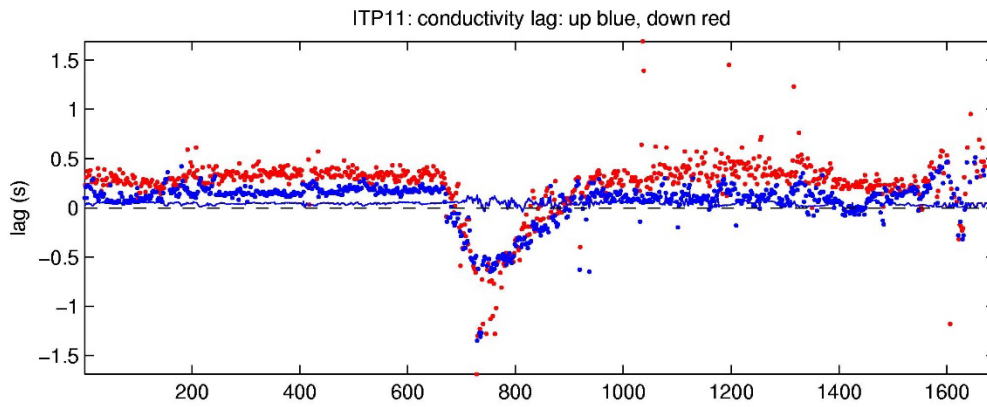


ITP profiler engineering data

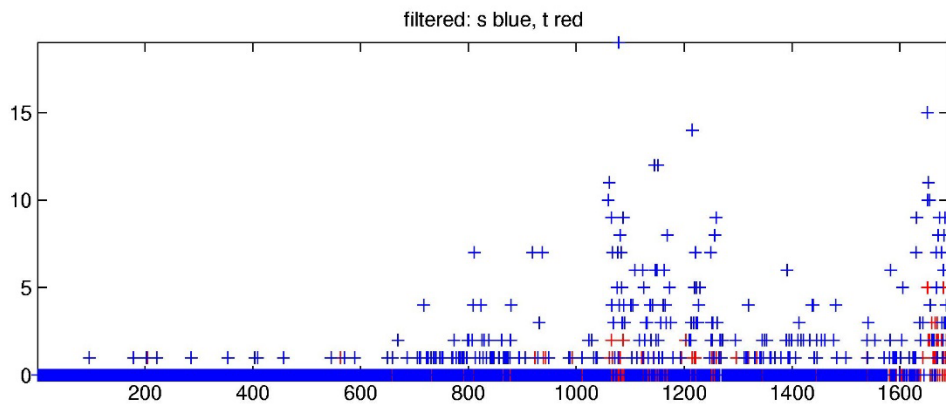
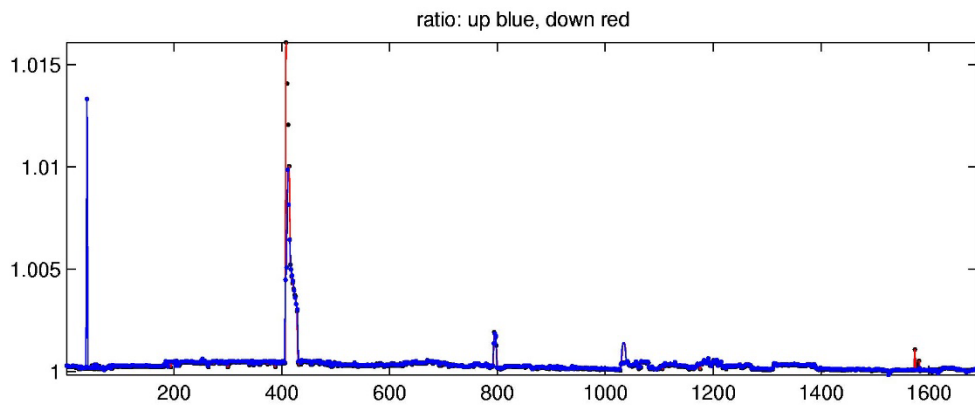
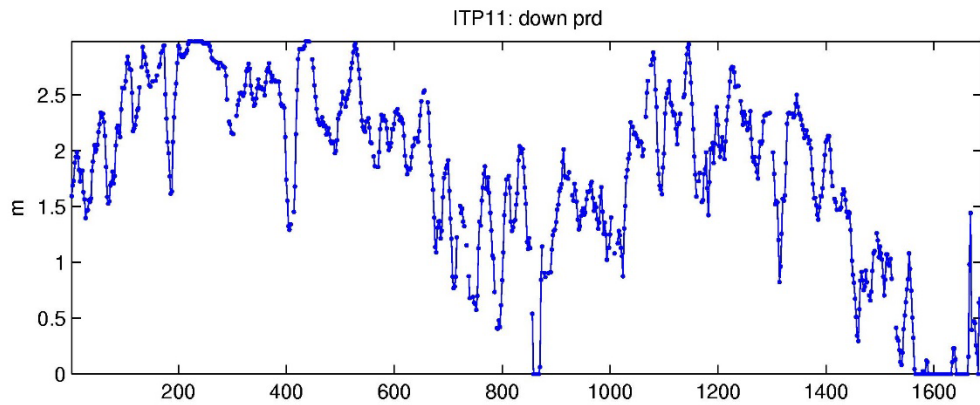




Number of bad points removed (top); variance of vertical difference of temperature and salinity in step region for up-going profiles; depth of staircase layer; temperature lag (bottom).

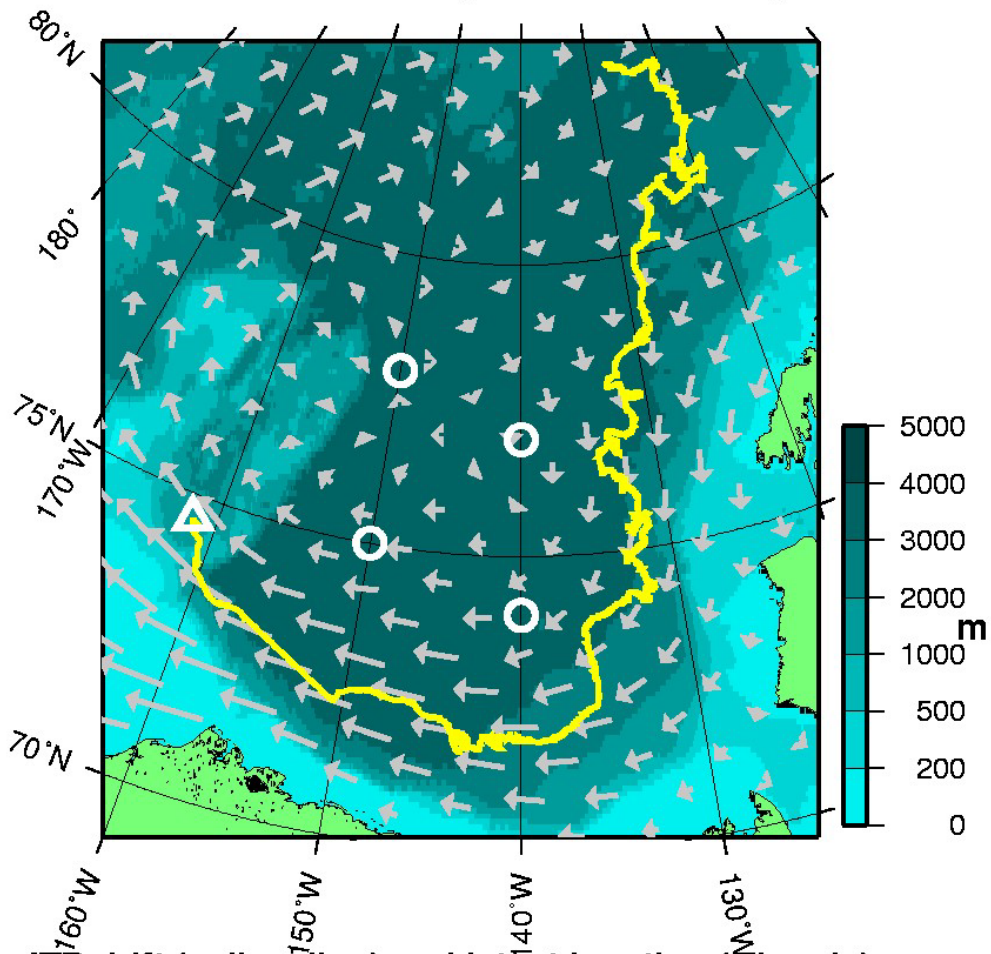


Top: conductivity lag. Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction.



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

### ITP11 Drift Track (as of 2009/10/22)



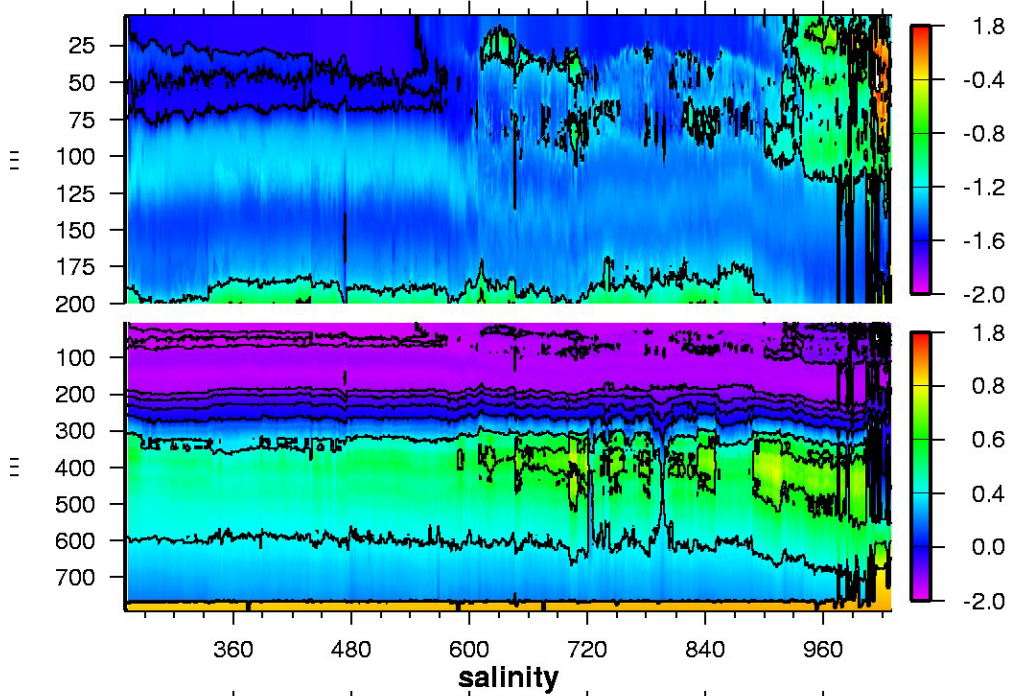
ITP drift (yellow line) and latest location (triangle),  
BGOS moorings (white circles) and annual ice drift from  
IABP (grey vectors) on IBCAO bathymetry (shading).

Plot of buoy locations.

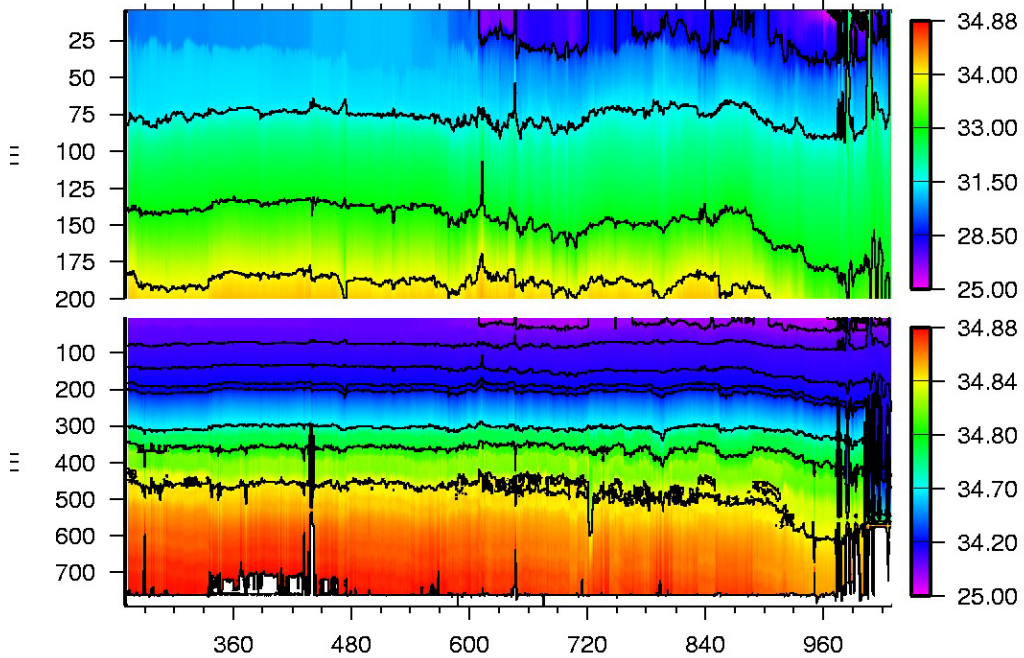


# ITP11 Up Profile Contours (to profile 1689)

temperature



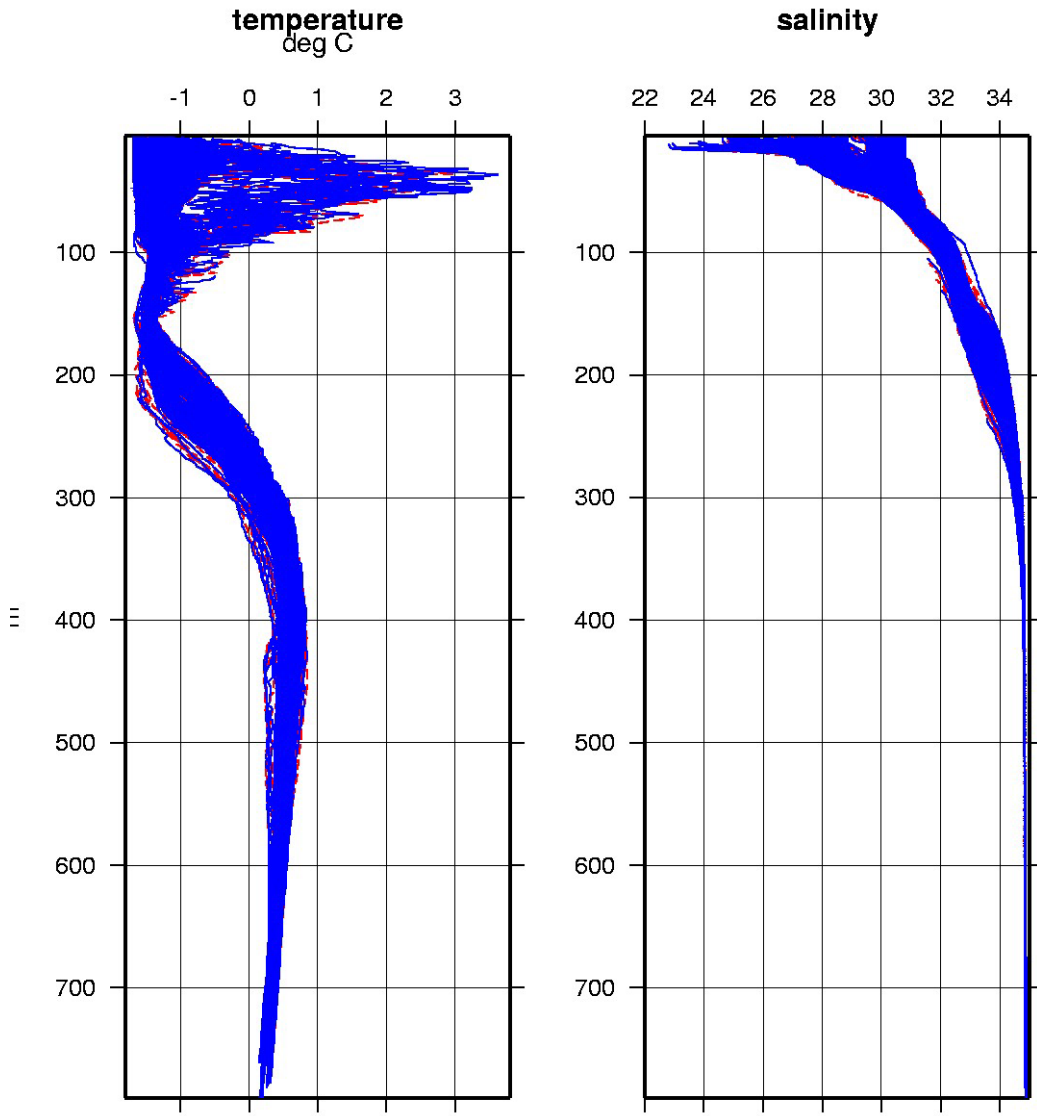
salinity



day 2007

ITP 11 temperature and salinity contours.

**All ITP11 Profiles (up to profile 1689)**



*up solid, down dashed*

Composite plot of ITP temperature and salinity profiles.



The first Ice-Based Observatory deployed from the Russian research vessel "Akademik Federov" in September 2007 consisted of ITP 11 and IMB on a 2.8 m thick icefloe. (Photo by John Kemp)

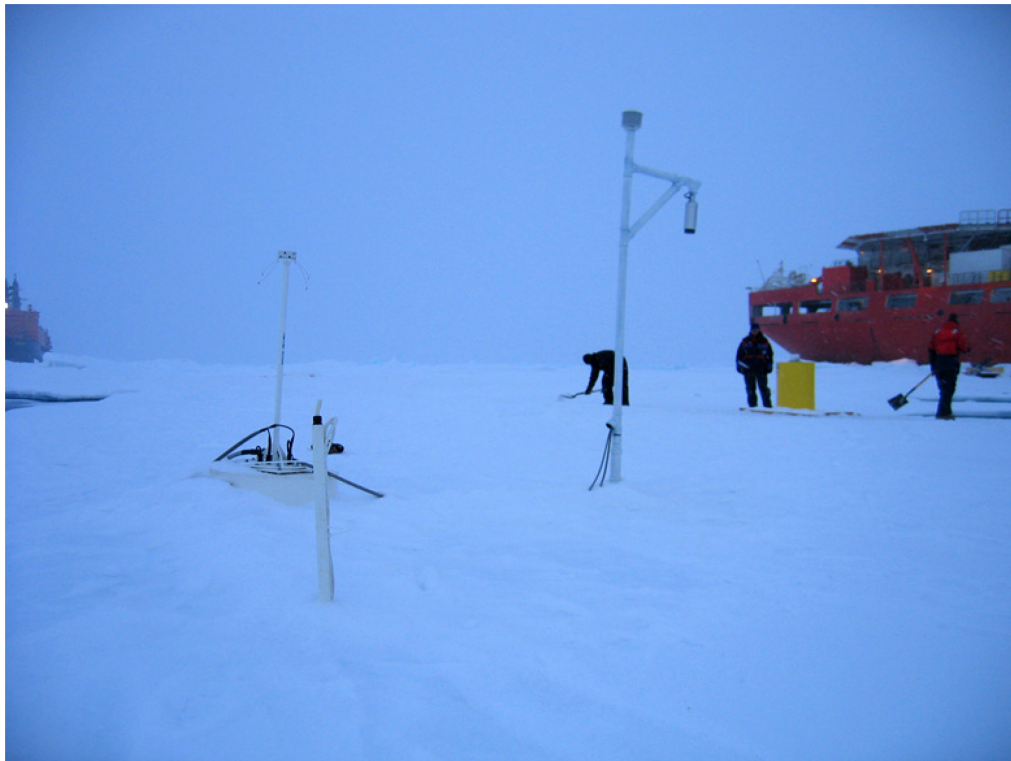


The surface float marks the selected deployment location on the ice floe selected for the ITP 11 and IMB buoy pair on a typical late summer day in the central Arctic Ocean. (Photo by John Kemp)



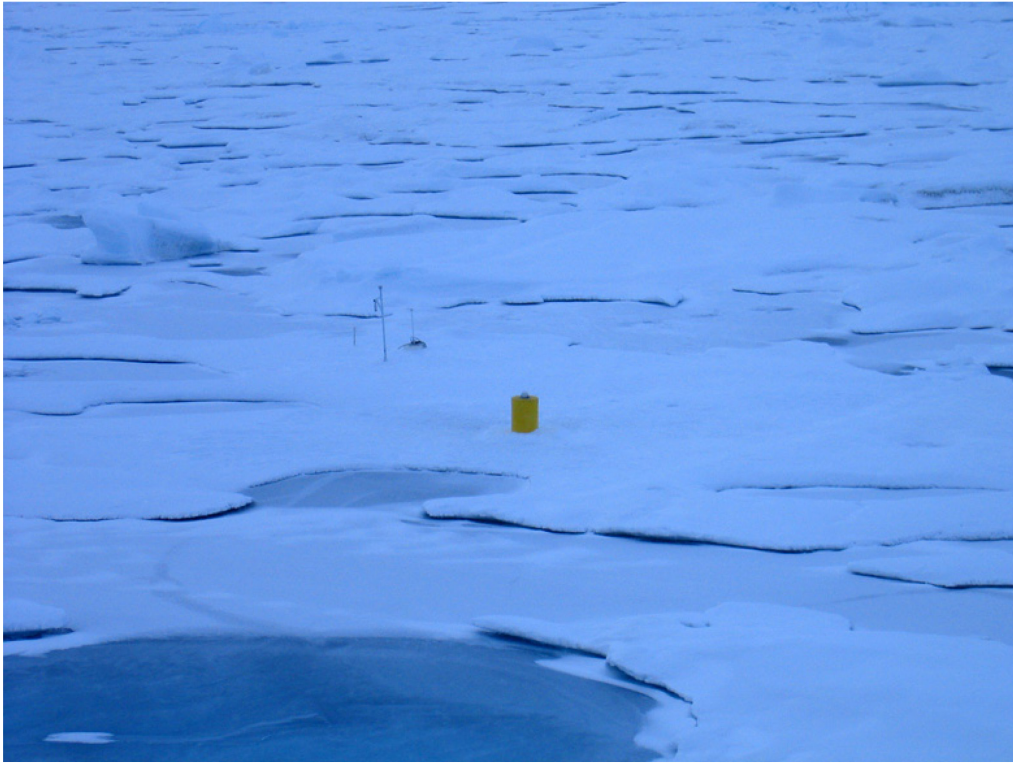


The ship's crane was used to deliver the equipment and personnel (on a slinged pallet) to the ice and hauled across the floe using a hand sled. (Photo by John Kemp)



Nearby, the IMB is installed, while snow is redistributed around the ITP site in the background in an attempt to reduce ablation of the surface package into the ice floe. (Photo by John Kemp)





A departing view of the first ITP/IMB Ice-Based Observatory installed from the Federov in IPY.  
(Photo by John Kemp)