

# ITP19 Overview

**Deployment Location:** 4/7/2008, 16:00 UTC at 88° 27.1'N, 16° 57.7'E

**Last Location:** 11/22/2008, 23:00 UTC at 78°2.4' N, 2° 33.4' W

**Duration:** 230 days

**Distance Traveled:** 2385 km

**Number of profiles:** 912 in 228 days

**Other instruments:** IMB 2008-E, AOFB 15, Weatherex & webcam

ITP 19 was deployed on a 1.9 m thick icefloe in the Transpolar Drift from the Russian ice camp Barneo in collaboration with the North Pole Environmental Observatory (NPEO) . On the same icefloe, a Naval Postgraduate School Arctic Ocean Flux Buoy (AOFB 15), a US Army Cold Regions Research and Engineering Laboratory (CRREL) Ice Mass Balance Buoy (IMB 2008-E) and NOAA/PMEL Weatherex station with webcam were deployed. The ITP operated on a fast-sampling schedule of 4 one-way profiles between 7 and 760 m depth each day, started in the Basin, stalled at 83° N, and reached Fram Strait only 7 months after deployment.

## ITP19 Deployment Operations

We and our gear arrived at the Russian ice camp on April 5 after a 2.5 hour flight on the Antonov from Spitsbergen. At first we can find no one that can speak to us in English, and have no tent arrangements, but with a little help from a friendly Russian scientist that we know, we are taken care of.

Next morning, we survey the surrounding ice with a 2-inch auger to determine thicknesses and pick out a 1.9 m floe just behind camp, several hundred paces away. All the ice in the area is first year ice that formed since the previous summer in the large polynya in the eastern Arctic and drifted to the present location. It is very homogenous, so there really is no choice, but to take the largest, closest floe available.

The IMB is installed on this day, the ITP on the next and AOFB on the day after while the Weatherex buoy (with webcam) is assembled and tested nearby. The air temperature is around -27 C, so in order to keep the underwater instruments warm on the ice before being deployed, we use a tiny 2-man tent on the ice that is heated electrically with a generator. Though the ice is relatively thin, the auger blades had a difficult time cutting through the hard ice, so the hole making proceeded slowly in the cold. AOFB operations are verified on laptop, although the Iridium telephone takes several attempts to connect due to the cold.

On the following day the buoy array was surveyed and diagrammed, and a few days later we were on the southbound Antonov flight. The Barneo ice camp was occupied until the end of April, and then evacuated, so that only the buoy cluster remained.

## ITP19 Data Processing

The 912 profiles that were recovered from the ITP were processed according to the procedures described in the ITP Updated Data Processing Procedures. The processing parameters for ITP 19 are shown in the figures to the right. Sensor lags were typical for the first 474 profiles (237 days) but became very large (more than 5 seconds). **Mega-lag corrections were applied to compensate for the extreme fouling or pump failure at reduced quality and with residual up/down deviations beginning with profile 528.** Profiles 748 to 758, 774 to 776 and those from 793 and above were beyond meaningful lag correction and were eliminated from the final product. A broken profiler spring (discovered when the system was recovered) and excessive drift speeds through and after Fram Strait hindered the profiler from climbing the wire against the drag in several profiles after 800.

## ITP19 Data Description

The ITP profiler was configured to operate with an accelerated sampling schedule of 4 one-way profiles between 7 and 760 m depth each day, as it was expected to reach Fram Strait in less than a year. In the surface package, the GPS receiver was powered hourly to obtain locations, and buoy temperature and battery voltage status were recorded.

The drift of the ITP was fortuitous as it managed to skirt shallow bathymetry and speed through Fram Strait with the 790 m mooring tether intact. During the first 4 months the profiler sampled through the Amundsen and Nansen Basins and encountered the entering Atlantic water looping around the Yermak Plateau, when the CTD pump on the profiler malfunctioned or fouled so caused extreme sensor lags. While these are corrected in the dataset, the accuracy of the results is reduced beginning in August, and completely corrupted profiles during the transit through Fram Strait beginning in October are removed. Just after the last profile attempts were received a month later, the ITP surface package stopped communicating.

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

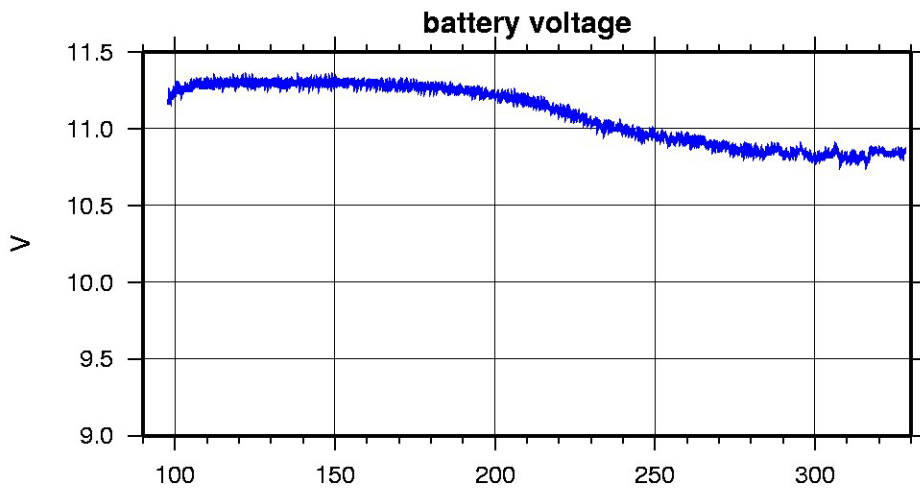
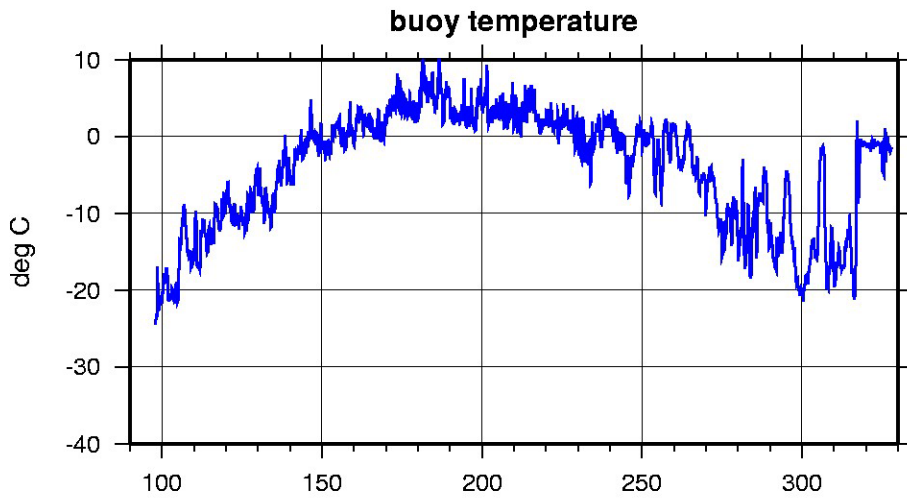
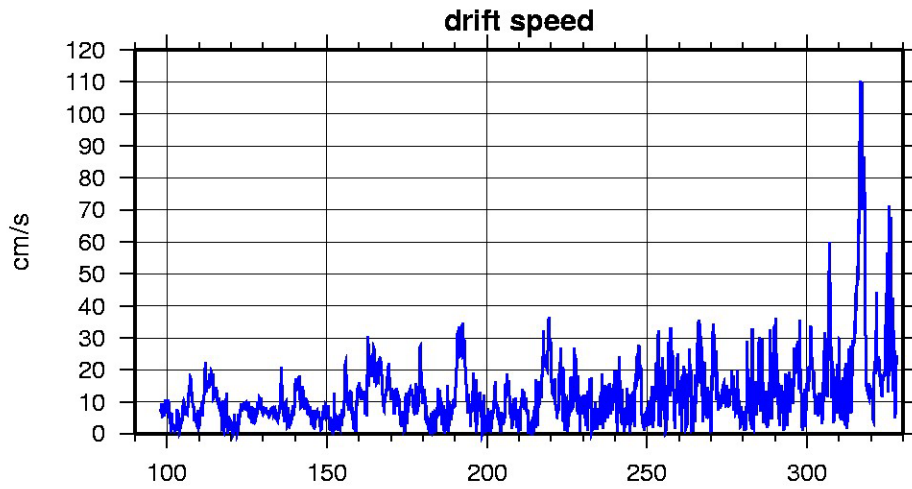
Level II hourly buoy location data in ASCII format: `itp19rawlocs.dat`

Level III 1-Hz processed profile data in MATLAB format: `itp19cormat.tar.Z` or `itp19cormat.zip`

Level III 1-db bin-averaged processed profile data in MATLAB format: `itp19final.mat`

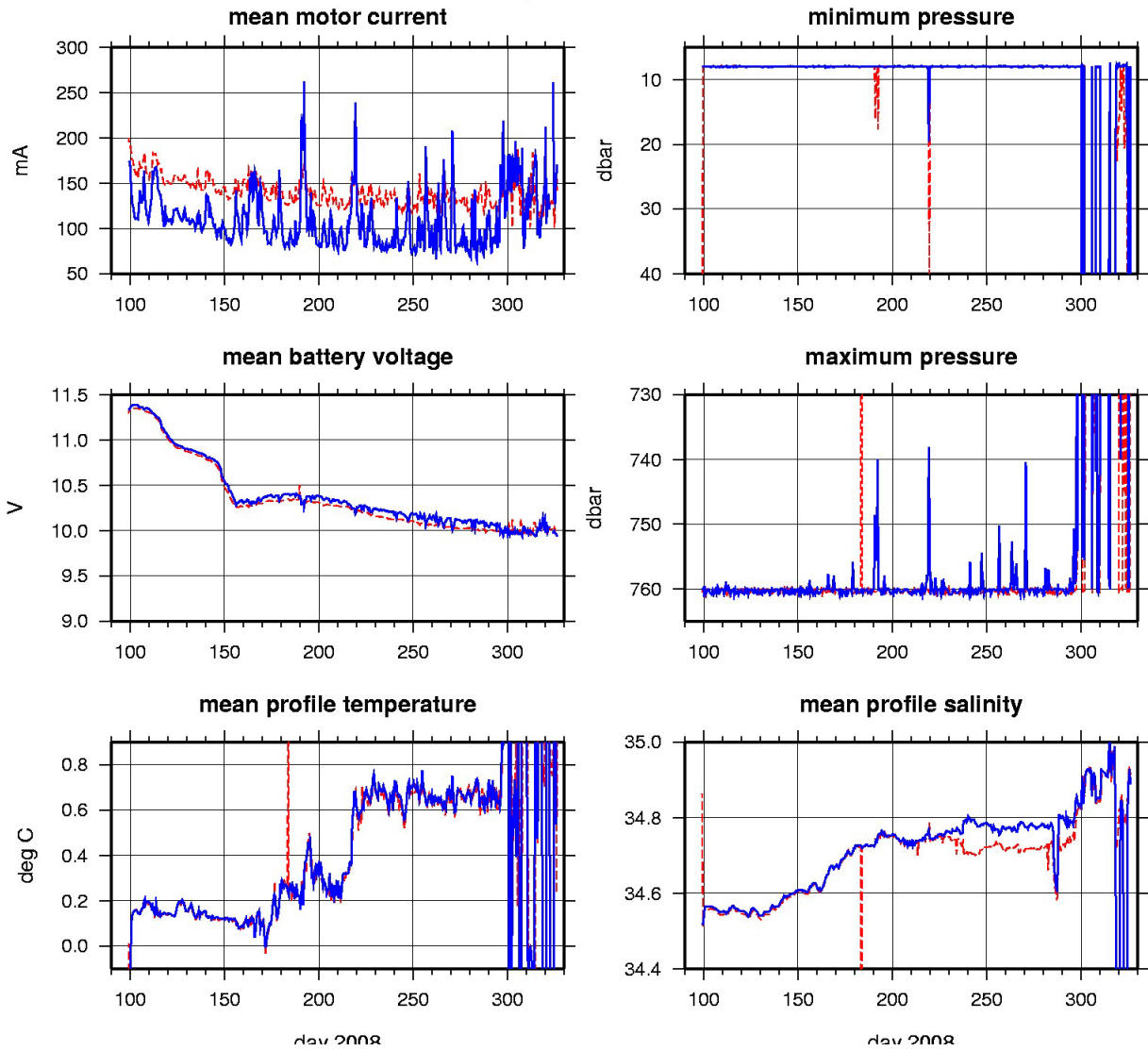
Level III 1-db bin-averaged processed profile data in ASCII format: `itp19final.tar.Z`  
or `itp19final.zip`

# ITP19 Buoy Status (as of 2008/11/22)

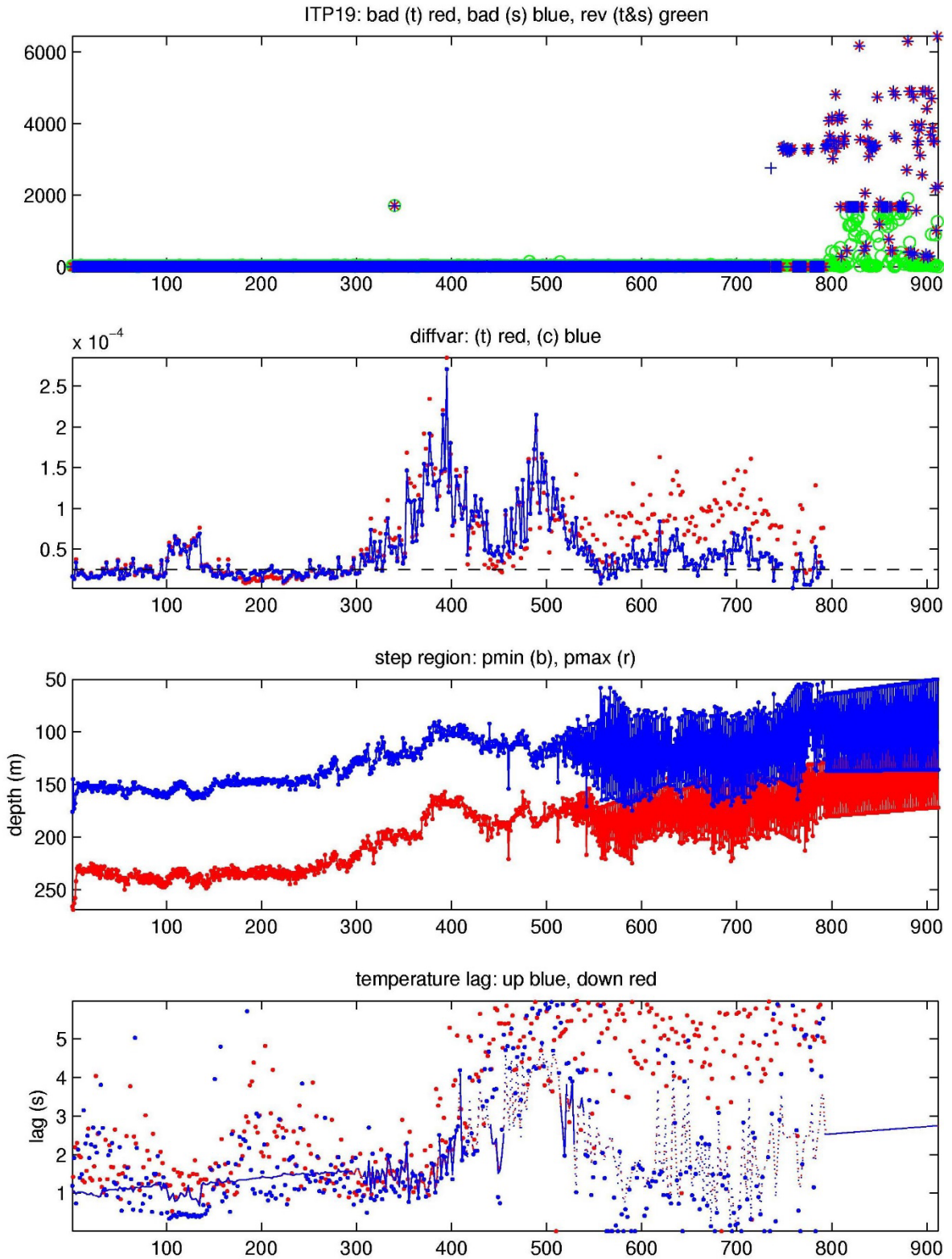


### ITP19 Profiler Status (up to profile 912)

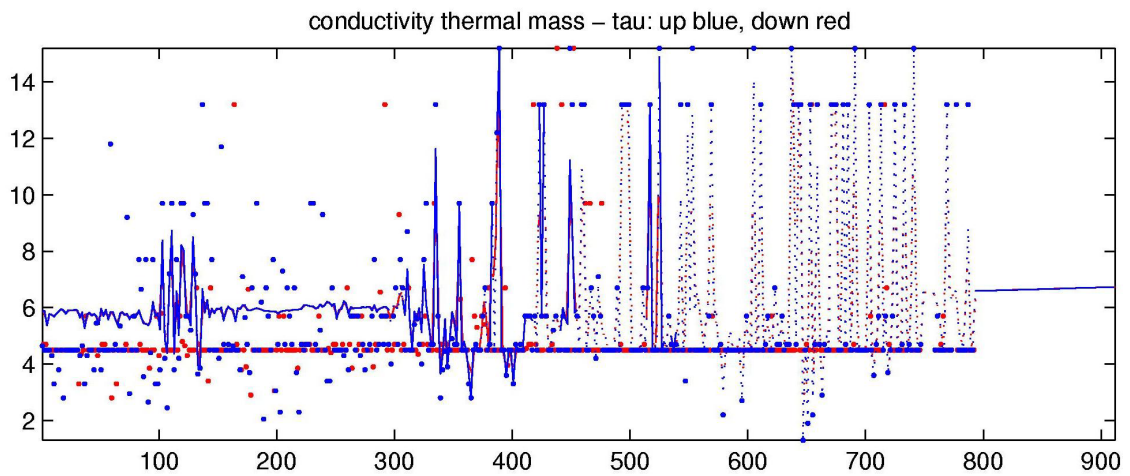
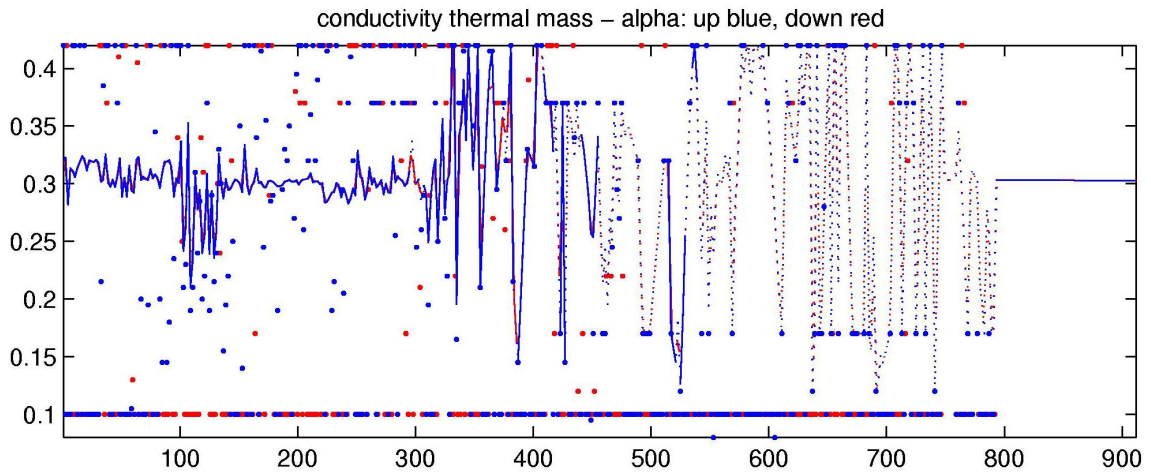
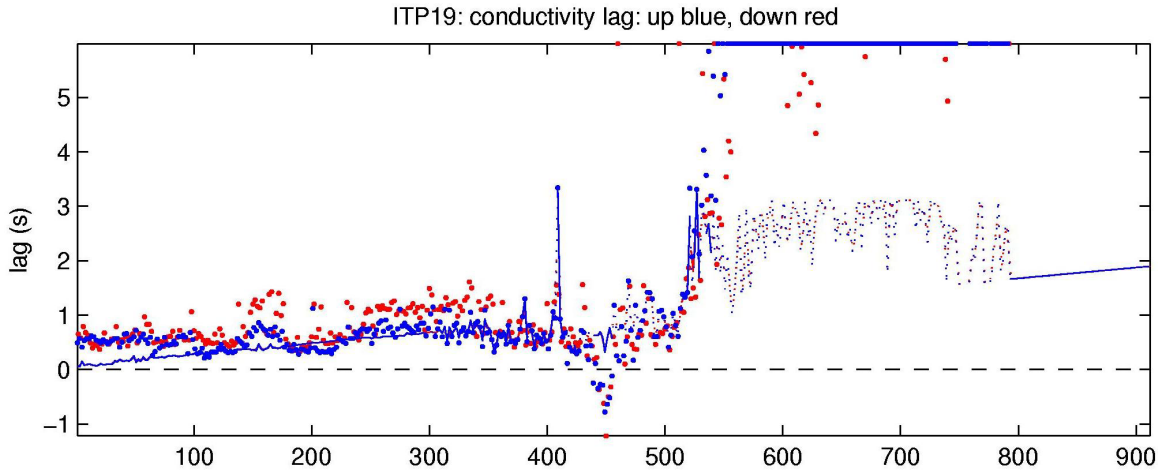
*up solid, down dashed*



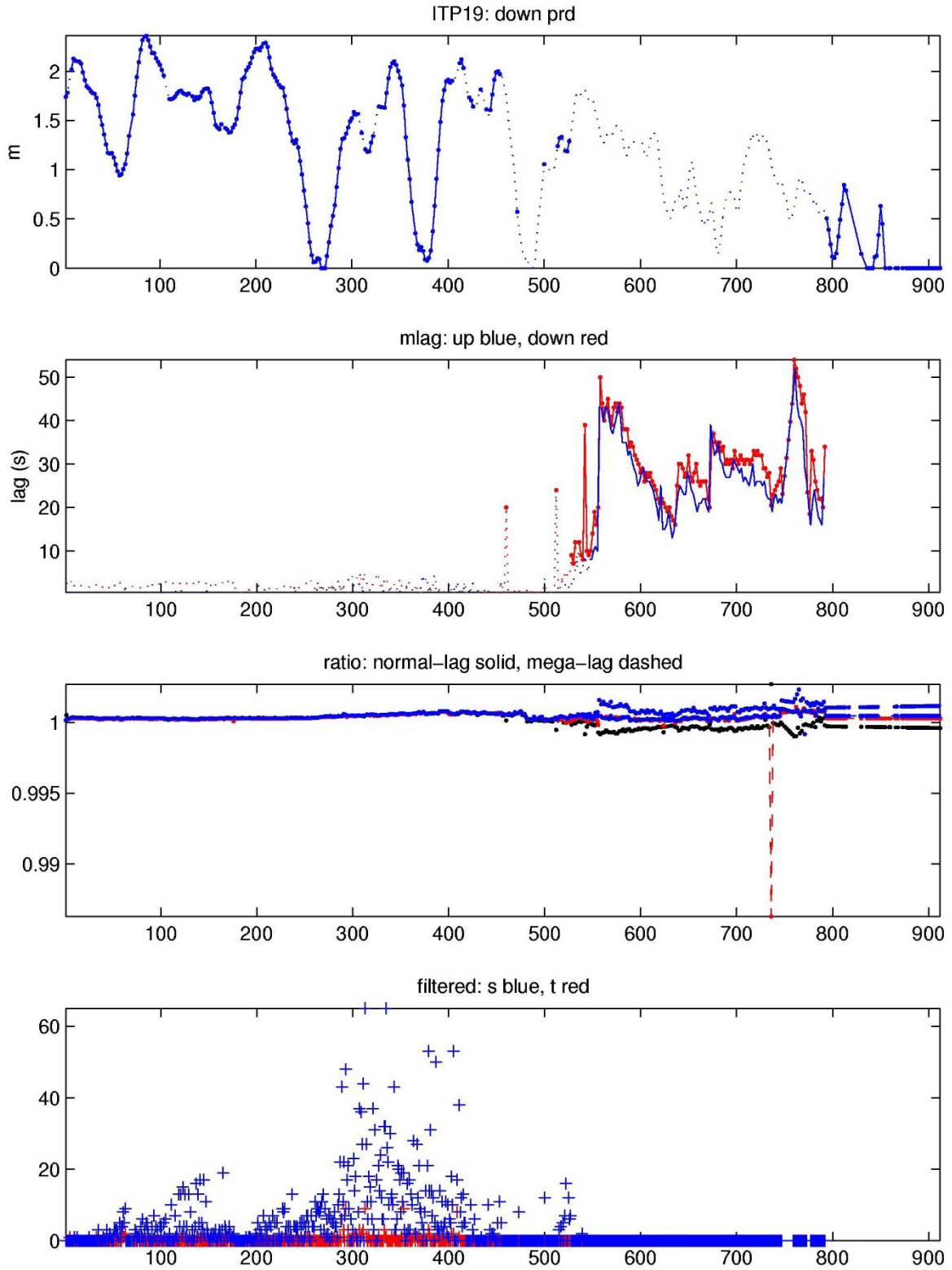
ITP profiler engineering data.



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.

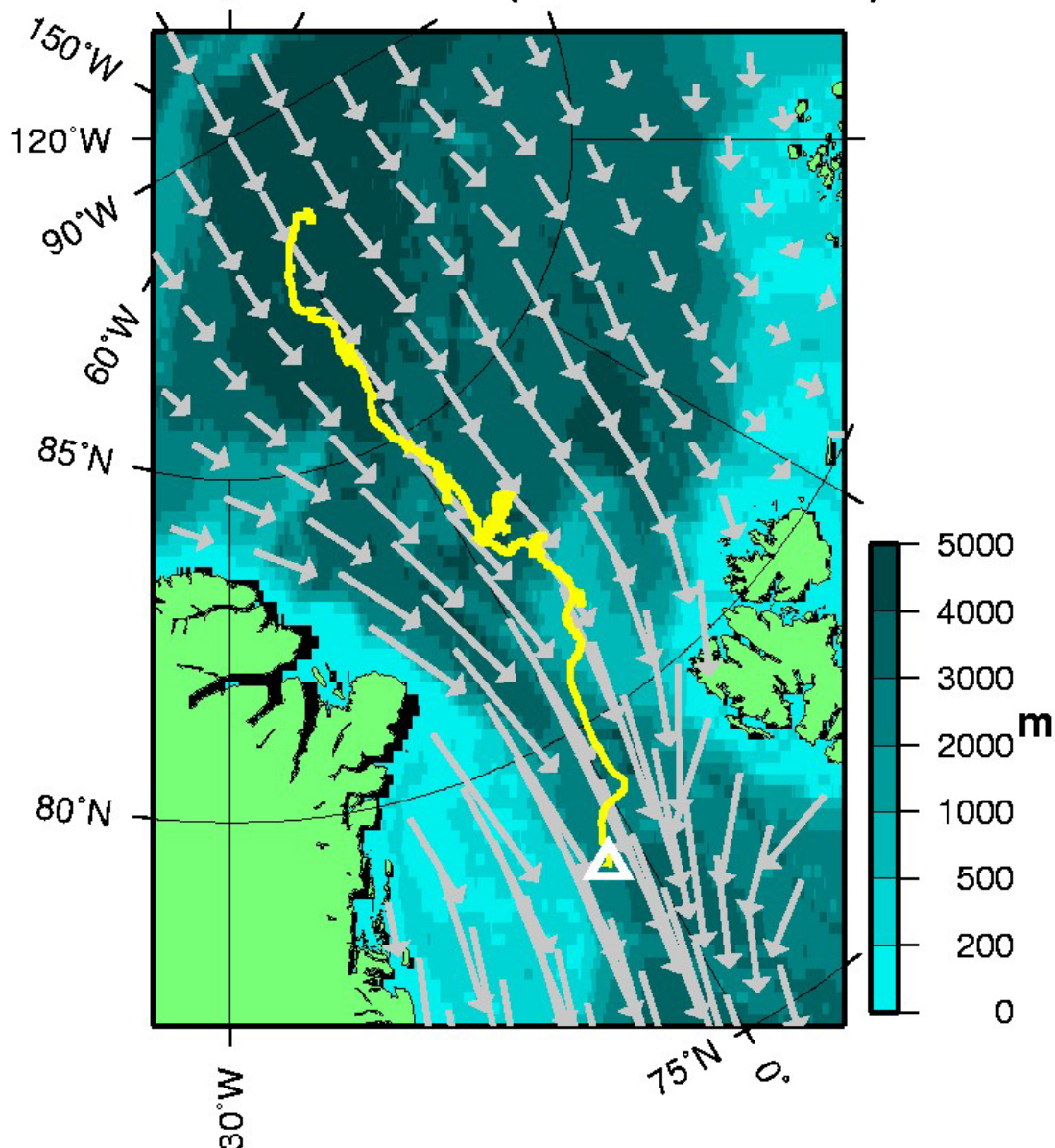


Top: conductivity lag, Middle: conductivity thermal mass amplitude correction, Bottom: conductivity thermal mass lag correction



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

### ITP19 Drift Track (as of 2008/11/22)



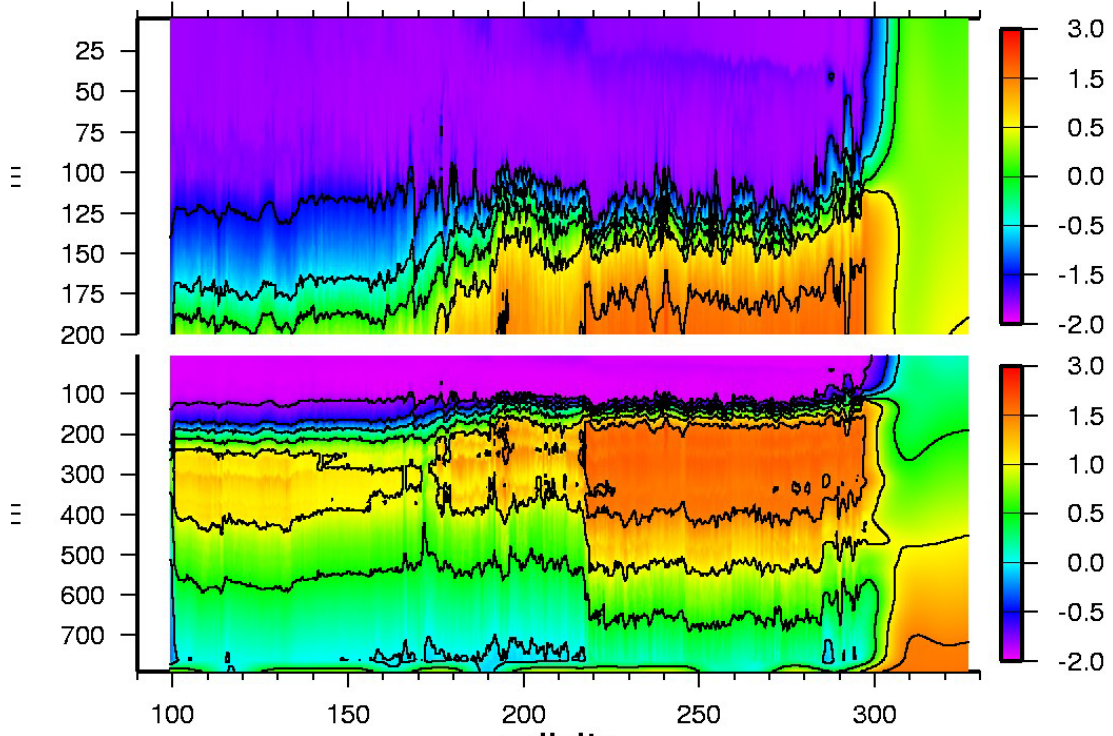
**ITP drift (yellow line) and latest location (triangle), and annual ice drift from IABP (grey vectors) on IBCAO bathymetry (shading).**

Plot of buoy locations.

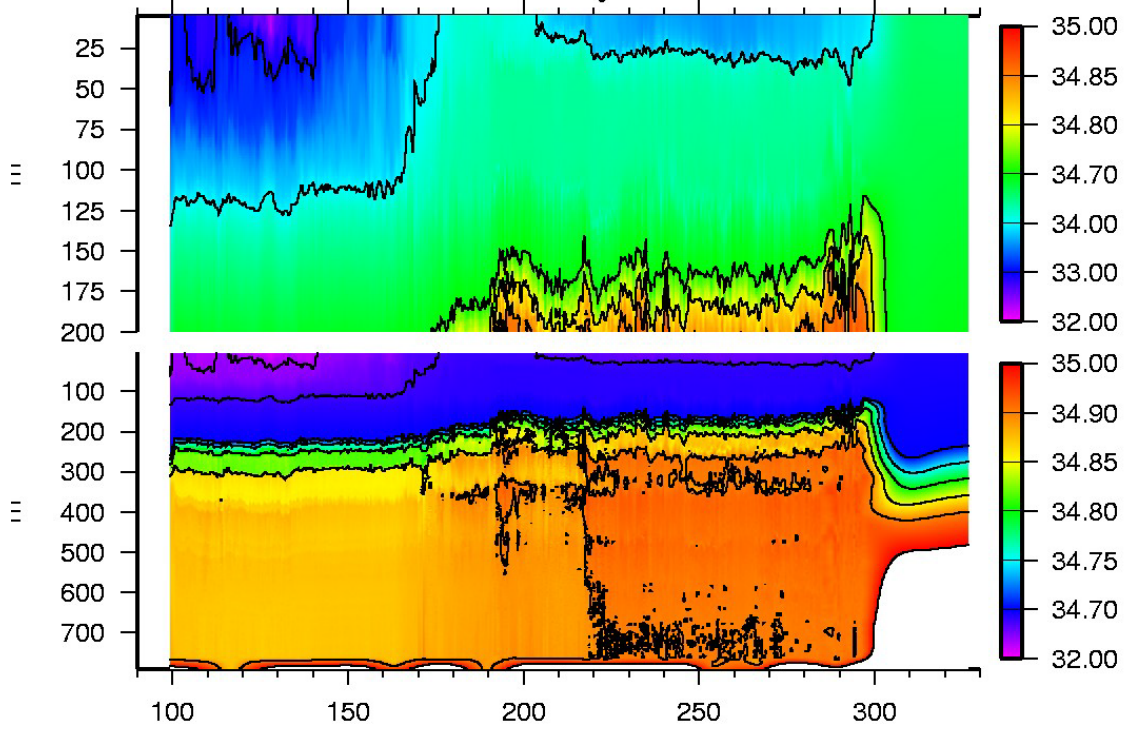


# ITP19 Up Profile Contours (to profile 911)

## temperature



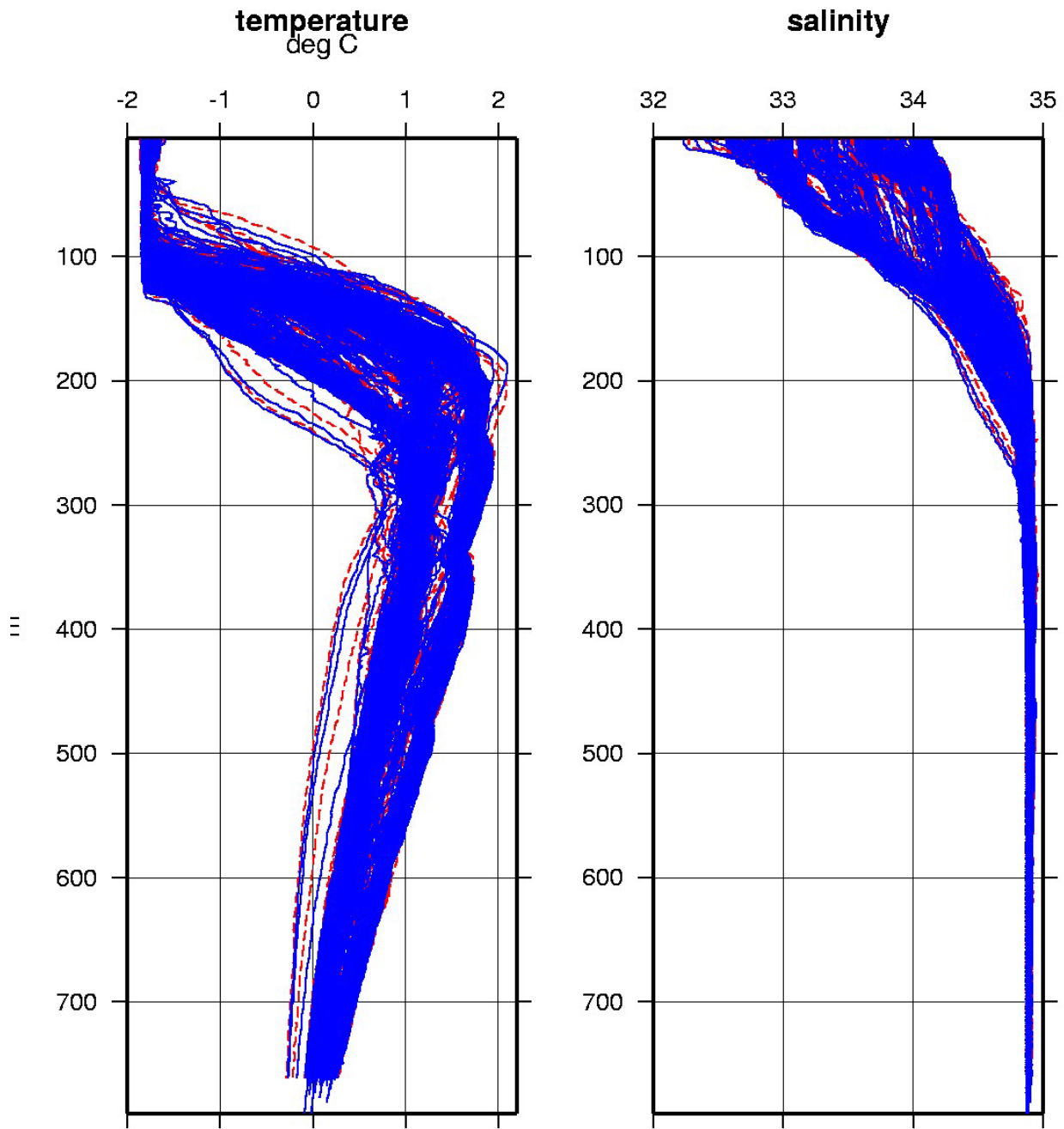
## salinity



day 2008

ITP19 temperature and salinity contours

# All ITP19 Profiles (up to profile 911)



*up solid, down dashed*

Composite plot of ITP temperature and salinity contours.



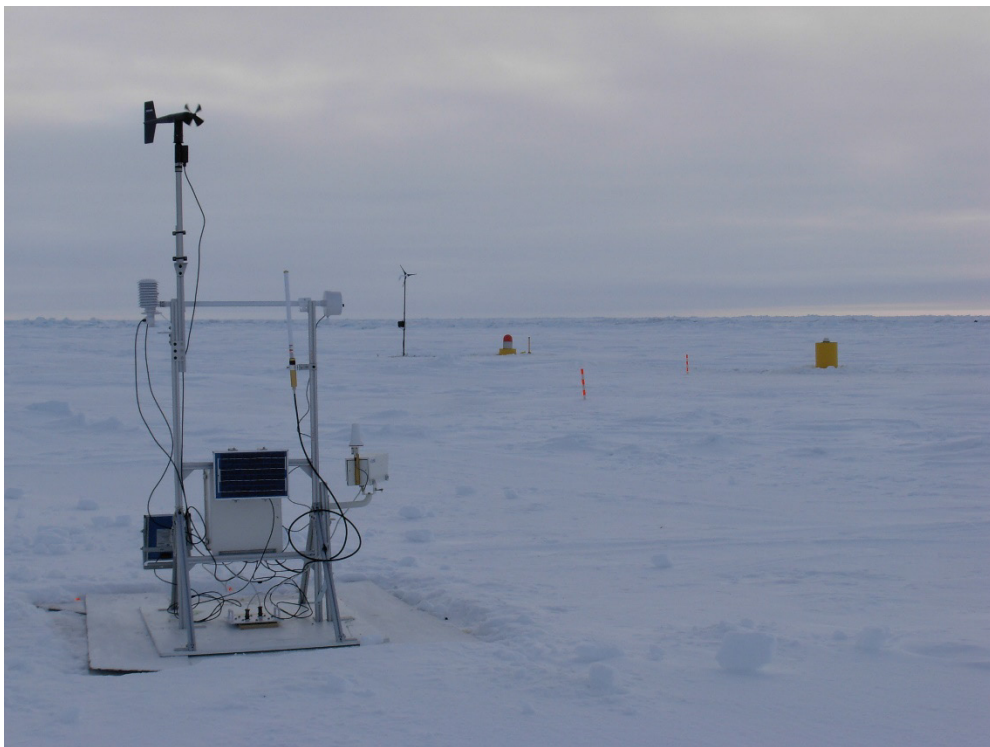
The entrance to ice camp Barneo is indicated by the ice sculpture on approach from the runway.  
(Photo by Rick Krishfield)



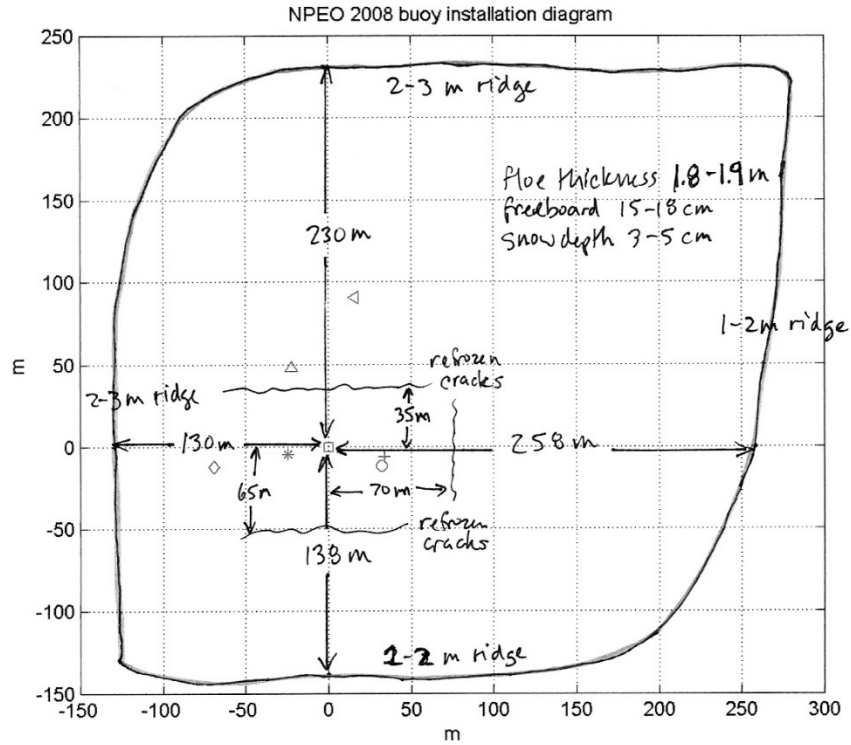
The vast amount of ice surrounding the camp was 1.8-1.9 m thick. This area was selected several hundred meters away from the tents of Barneo in the distance. (Photo by Rick Krishfield)



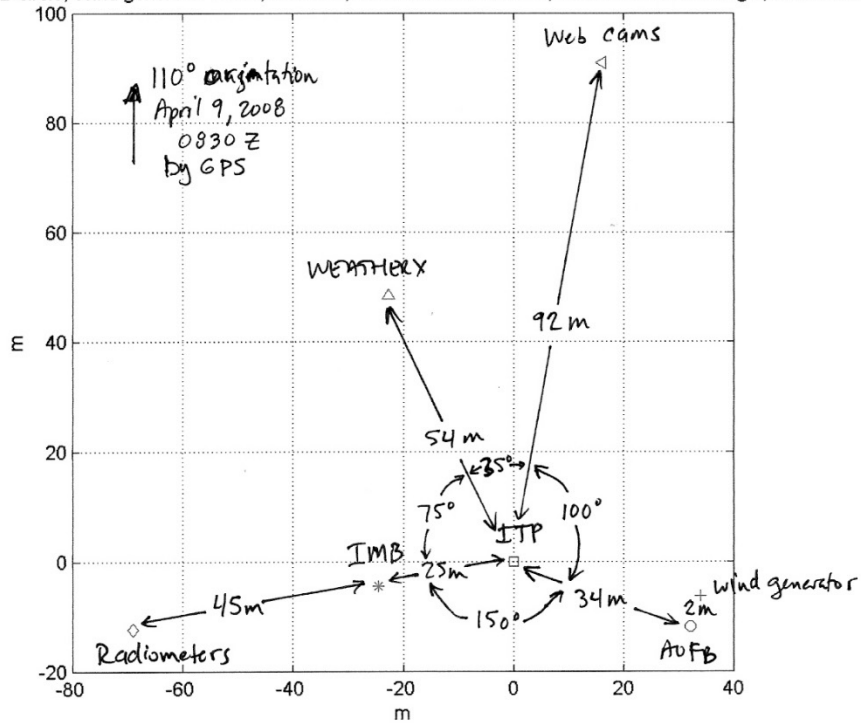
ITP 19 surface package is positioned on a pallet after deployment with the IMB in the background. (Photo by Rick Krishfield)



Weatherex station, AOFB, ice stakes, and ITP 19 in position on the first day after deployment. (Photo by Rick Krishfield)



ITP square, AOFB circle, Wind generator cross, IMB star, Radiometers diamond, Weather station triangle, Cameras left trian



Map of the rough dimensions of the ice floe containing the buoy cluster (top), and distances and bearings from ITP (bottom). (Rick Krishfield)



NOAA North Pole webcam with ITP 18 and IMB in view on July 1, 2008. While the ice is rapidly melting on the surface, the web cam turned so the ITP can just be seen past the weather station mixed in amongst the many melt ponds.