

# 2013 NABOS CRUISE BLOG

By Lindsey Bartholomew

**September 23, 2013**

Our ninth NABOS cruise is over, the ship is in Kirkenes for disembarkation and downloading all gear. Thanks to all participants for their key role in this successful cruise! Thanks to numerous others whose participation in the cruise preparation led to safe, smooth, and effective operations at sea!



Photo by Ioana Colfescu.

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**September 17, 2013**

Today, our team aboard of Akademik Fedorov successfully deployed our ninth deep-water mooring. It is an impressive achievement considering that the mooring deployments were complemented by the deployment of five ITPs, one O-buoy, three O-tempo buoys, one IMB buoy and numerous meteorological buoys. In addition to these deployments, the scientific team aboard the ship conducted extensive CTD measurements and water sampling for unique chemical program. Glider observations provided exciting data from the St. Anna Trough region. The ship is finishing our planned section along 90E and the last planned section will be crossing St. Anna Trough.

Summer School aboard the ship is close to its end. The students are finishing their research projects. In several days they will have a final session where their results will be reported, discussed and evaluated.

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Photos courtesy of Lindsay Bartholomew.

### **September 15, 2013: Polar Bear - Swimming!**

Post from Lindsay Bartholomew (visit her blog at [Lindsay in the Arctic](#)):

Yesterday we had another moment of mass hysteria. Many of us were quietly working, as usual, in the common room where we have lectures and presentations. Something in Russian came over the intercom system, and one of the Russians in the room shouted: "polar bear!?" Everyone put down their laptops, and ran - I mean SPRINTED - out of the room, through the dining hall, and out to the deck, with no thought of coats.

We have been seeing icebergs the last couple days, but not the big flat ice floes, so no one had been expecting to see a bear. And we went outside, it still looked as if there could not possibly be a bear. There was no ice! But looking in the water, there was a big, adorable, furry white head swimming nearby. He swam back and forth, seemingly curious about the ship, and then swam toward the back of the ship. And of course we all followed toward the stern as well. Everyone was smiling and happy, but there was also a look of fear and a little sadness on many people's faces. Where was the ice? In what direction could he swim to get back to the ice? Rationally, we know that polar bears are classified as marine mammals and are capable of swimming for a day or more at a time. But that extent still seems extreme. So we all want to think that he was out for a swim and will happily swim back to ice that is just beyond the horizon. Look how amazing and beautiful he is!

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### **September 15, 2013: Moorings - Outrageously Awesome**

Post from Lindsay Bartholomew (visit her blog at [Lindsay in the Arctic](#)):

The Sun helped us recently celebrate the second-to-last mooring of our expedition. Lots of us went outside to enjoy a little bit of sunshine along with the amazing sight of lowering instruments down 2,700meters (more than 1.5miles) into the ocean. Here's more about this outrageously awesome piece of science and engineering. [Figure 1 below] shows the diagram of this ddM9 mooring. This diagram has been well-used, as you can see from the notes scribbled all over it (most of which are serial numbers of the components). This mooring was deployed in a location where the ocean floor has a pretty steep slope, and a couple things were adjusted to the whole structure to account for this. A heavier-than-usual anchor was lowered down as the base of the mooring (it's about 850kg in water), and an extra "buoyancy support" element (the square yellow component in the diagram) will help raise the mooring out of the water when another expedition returns to retrieve it.

The two yellow cylinders in the diagram, between the anchor and the extra buoyancy support, are the "release assembly." You can see the bottom of these two cylinders are joined by a "v" shaped link and ring. When another expedition returns to retrieve the mooring, they will "speak" to the release assembly with an acoustic signal, and one of those releases (the other is there as a back-up) will detach. The anchor will remain at the bottom, but the rest of the mooring cable and instruments will be lifted up out of the water, aided by the buoyancy components.

There are five different CTD (conductivity, temperature, depth) instruments on the mooring, at various depths, which will take these ongoing measurements of the water. There are also two "upward-looking" ADCPs (Acoustic Doppler Current Profiler), at roughly 450meters deep and 50meters deep, each of which will measure water currents between their location and the surface. The instruments in the diagram just below the largest yellow buoyancy sphere (the ISUS and ODO) will be taking measurements of nitrates and dissolved oxygen in the water, which will help scientists trace water masses throughout the Arctic. (We have put these instruments on three moorings at three different locations, all of which will take ongoing measurements until they are retrieved during a future expedition - and we have also been taking measurements of oxygen and nitrates throughout this expedition, every time we do a CTD cast). There is also an upward-looking sonar near the top of the mooring, which measures ice-depth at the surface.

Just knowing our position when we deploy this mooring (82°N latitude, 97°E longitude) is not enough to locate it to retrieve it in the future. The ocean is huge (not to mention the fact that the area is sometimes ice-covered). Near the top of the mooring, still almost 50meters down, the location transponder will be able to send and receive signal from a ship, allowing the future expedition to more precisely locate and retrieve the mooring. Can you see why I described above the whole mooring process as "outrageously awesome?"

ULS at 56m  
with line lengths shown  
with stretch 0.5%  
could be at 43m

ULS sensor depth 56 to 43 metres

CAT 45118  
ULS # S114-8

Launch line

CAT Location transponder clamped within ULS frame

2 x shackle

2 x 17 inch glass spheres

Chain 1 metre 1/2" long link

Shackle Link Shackle

Chain 1.5 metre 3/8" std. link

2 x shackle

SBE 37 clamped to ADCP 300

SBE 37  
ADCP 300 #

Shackle Link Shackle

Lebus

6280

2 x shackle

Buoyancy 37 inch steel

Short Recovery line  
19mm 3 strand  
polypropylene line attached to

kevlar line  
59.5m



1.5m

Chain 1/2" long link 1 metre

1m

ISUS and SBE 37

10533 1255  
TOWING  
Buoy on deck

Shackle Link Shackle

114.5m

69m spacing

Shackle Link Shackle

115.5m

40m spacing

Shackle Link Shackle

185m

SBE 37 clamped to line

6284

kevlar line 312.5 + 20m

225m

Hawboldt

19033 ADCP

Wind on  
wind on  
wind on

200  
995  
995  
46m

Shackle Link Shackle

450m

ADCP 75kHz

ADCP #

Shackle Link Shackle

452m

2 x 17 inch glass spheres  
attached at ADCP frame

Spacing 148m

3049

Shackle Link Shackle

600m

SBE 37 clamped to line

Hawboldt

mark 200m  
at 52 m on deploy

2246m required  
for 2700m

995 + 995 + 200 + 46m

Add here for deeper

4x 17" additional  
lebus 46m

REL 43486  
REL 43488

1m

2 x Shackle

2698m

Dual Edgetech release assembly

Dual release chain and links

Release ring

Shackle

1m Chain 1/2" long link to anchor

chain wrap thru  
anchor eye and  
shackle

Shackle

2700m

Anchor Railway wheels

2700m design

DEPLOYMENT DETAIL MODIFIED ver.3 M9

Mooring ## Revised A FEDEROV 2013

Figure 1: M9 Mooring



Photo 1: The anchor and the release assembly about to be lowered in the water.



Photo 2: The mooring apparatus, about to be raised up to deploy the mooring instruments.



*Photo 3: Some of the instruments for the mooring; from bottom to top in the picture, you can see the location transponder (orange spheres), the ISUS instrument for measuring nitrates (black cylinder), and the ADCP (the 4 orange disks on the white cylinder).*

## September 14, 2013: Waking Up to Glaciers

Post from a scientist, Marika Marnela:



Photos courtesy of Lindsay Bartholomew.

At about 4am the other morning the ship started to slow down for a CTD station (salinity, temperature and depth measurements of the water column). We were stopping east of the Severnaya Zemlya islands for what was the last station of a section across the slope and along the shelf near the islands. A quick glimpse through the window resulted in an even quicker decision to put on clothes and rush to the deck, quietly so as not to wake up anyone sleeping in their cabins. But what waited outside was too amazing not to be shared: Icebergs, bergy bits, growlers, all around us. Even a glimpse of the islands. And sunshine! The quiet and calm of the morning combined with being still half asleep created an almost magical experience.

Glacier ice, or "ice of land origin", as it is formally known in ice identification nomenclature, floating in the ocean is classified into different categories depending on its size and shape. The more time the glacial ice remains in the ocean and is moved about by wind and waves, or pushed into other pieces, the more it cracks, crumbles, rots, or becomes smooth. There are names for many different forms and features of the ice. The smallest ones are called growlers (because that's the sound they can make when colliding with a ship and also because sometimes they are just beneath the surface and go unseen until making contact); somewhat larger pieces are called bergy bits; and in order to be classified as an iceberg, glacier ice needs to stand more than 5 meters above sea-level and be at least 15m long. We have seen tabular, wedged and irregular bergs, and bergy bits that came in so many shapes, but that also might have to be classified as irregular.

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### September 13, 2013

According to Vladimir Ivanov, Chief Scientist, "Akademik Fedorov" will finish the CTD section off Cape Arkticheskiy (Severnaya Zemlya Archipelago) by tomorrow morning. The plan for tomorrow also includes deployment of our eighth mooring at ~2700m depth. After that they will sail towards the next planned section at 90E. This section includes extensive CTD observations and deployment of the last (5th) ITP buoy at the northern tip (~85N) of the section and deployment of our ninth mooring at ~2700m. The weather forecast looks promising: after several days of storm weather, the expedition will enjoy calm seas with a nice perspective for several next days.

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### September 10, 2013



Photos courtesy of Lindsay Bartholomew.

As I'm writing, we are at 80°N latitude, 107°E longitude, with air temperatures of -1°C, and water temperatures of 0°C (and windy). Before I even left my cabin, I was looking out the porthole - seeing the waves and whitecaps, noticing how the level of the water seemed to go up and down as the ship swayed side to side, and

holding onto the wall to I didn't lose balance. And... WHOOSH! Water splashed up across the window. I can tell you, that makes you appreciate the power of the ocean. Then when we all arrived at the first lecture of the day (and after duct taping the projector to the table), we got some warnings: go back to your cabin and secure anything that could fall... don't wear flip-flops on the ship... don't walk with an open laptop ... close/open doors using the handles only (i.e. don't wrap your fingers around the door itself)... and, don't go outside. We are also not able to do any CTD (conductivity, temperature, depth) measurements of the ocean in these conditions, because the water is too rocky to be able to securely lower an instrument into the water on a cable. We're on our way north again, and I think we're all looking forward to the bumpy rumbling, but relatively stable, movement through the ice again!

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Photos courtesy of Lindsay Bartholomew.

### **September 9, 2013**

So far, seven moorings were successfully deployed during the cruise. Six of them form a mooring section crossing the Laptev Sea slope from 250m through 3900m along approximately 125E longitude. Moorings were deployed for two years and will provide information about changes of water temperature, salinity, currents, ice drift speed and thickness, sea-level changes and some chemical parameters. Two more moorings will be deployed off Severnaya Zemlya at ~2700m depth. See the photos to the right capturing the moments of mooring deployments.

Currently the ship is moving westward with CTD stations along her way. The weather is rough and ice floes do not protect the ship from seas very well.

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Left-side photos by Marie Kapsch. Others courtesy of Lindsay Bartholomew.

### September 3, 2013

Today, the ship was moving in very compact ice (see pictures). A solid thick ice floe required for buoy deployments has been found and the science crew successfully deployed a cluster of buoys including a massive O-buoy providing measurements of chemical components of sea water, an ITP buoy measuring temperature and salinity in the the upper (>800m) ocean, an O-tempo buoy providing the temperature profile just below the ice, and a meteo buoy. So far, two ITP, one O-buoy, two O-tempo and five meteo buoys have been deployed.

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Photo courtesy of Lindsay Bartholomew.

### **September 3, 2013: Polar bears!**

Post from Lindsay Bartholomew (visit her blog at [Lindsay in the Arctic](#)):

Let me paint you another picture for this one. It was almost 2am "ship time" (mid-day local time), and everyone is out on the deck because the Sun is out (which has been rare). Everyone's fingers are about to freeze off, but no one wants to leave the view of jagged piles and smooth panes of solid white ice under a clear blue sky. It's like a combination of a National Geographic centerfold, the ice planet of Hoth from Star Wars, and some fairytale land. And of course, everyone is hoping to spot polar bears, the "holy grail" of Arctic animal sightings. As the ship slowly cracks its way through ice, we see footprints headed in the same direction as the ship. We try to keep the tracks in sight, and then someone says "I think I see two dots..." Everyone's binoculars and cameras point in that direction, and then the dots start to move. As we get closer, there are two polar bears. (Insert here sounds of happiness and excitement from everyone.) The bears are still a ways off, but we can tell they're curious about the big red noisy thing passing by them. They stare and investigate for a minute, and then meander off to blend into the white.

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### **August 30, 2013**

Update from Vladimir Ivanov, Chief Scientist:

They successfully deployed the first ITP buoy at 80° 50N and 132° 38E. Ice conditions changed dramatically by strong southern winds which made ice compact not allowing the ship to move along ~144E section. The decision was made to move to south and continue work from the southern (not northern) end of the section. They plan to deploy our fifth mooring M3 at 144E tomorrow. All cruise participants are safe and sound.

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### **August 29, 2013**

Despite terrible weather (30m/s winds plus rain) the science team successfully deployed two deep-water (3300m and 3900m) moorings. Deployments went smoothly: it took only 4.5 hrs for technicians to deploy the

deepest mooring, for example. The plan for the next day includes deployment of ITP (see the [Technology](#) web page for details).

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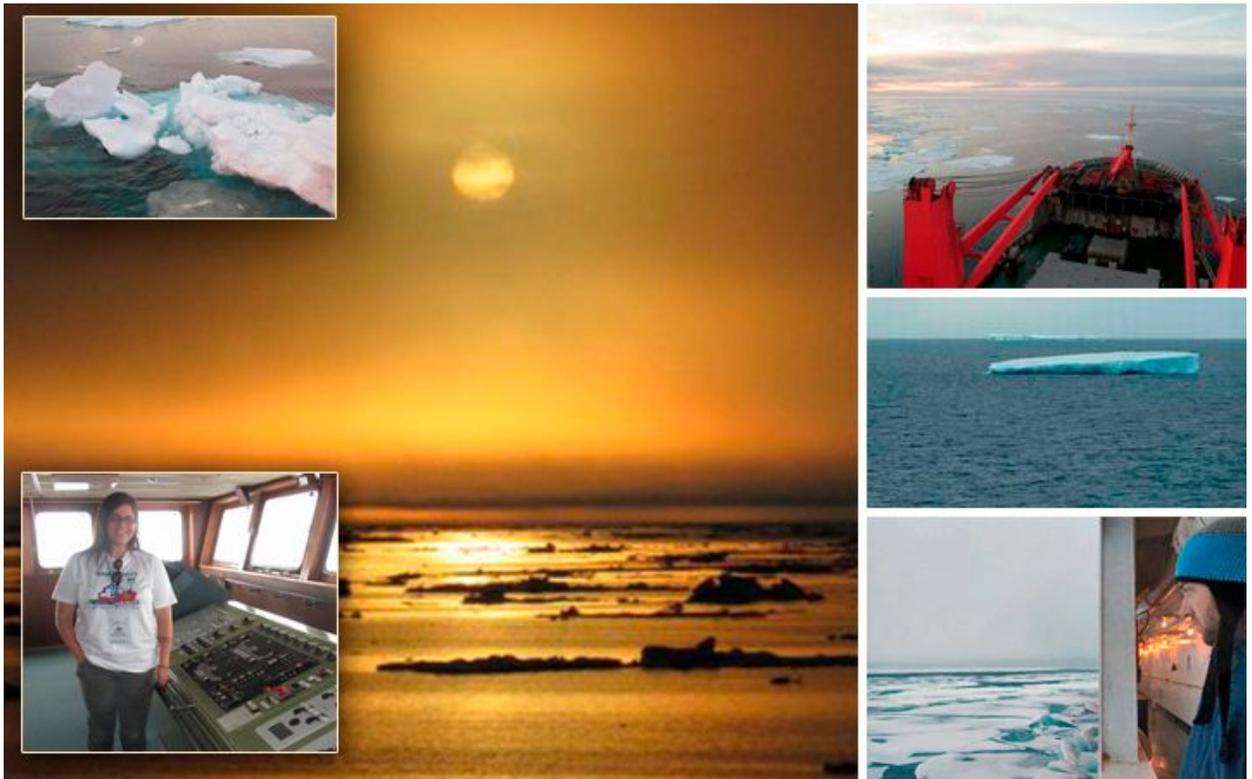
Photos courtesy of Lindsay Bartholomew.

### **August 26, 2013**

Scientists aboard the RV *Akademik Fedorov* started their field experiments. Observations of water temperature and salinity and water sampling are made using the so-called rosette (lower right). Researchers are in preparation to deploy several buoys measuring multiple characteristics of the Arctic ocean, ice and atmosphere. Preparation of one of these buoys, O-buoy, is shown in the left photo (see description on the [Technology](#) page). Two moorings (devices anchored to the sea floor below the ice and staying in water for two years) have been successfully deployed today. Meteorologists started their observations of the state of Arctic atmosphere by launching balloons with attached sensors (upper right photo, courtesy of Lindsay Bartholomew).

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### **August 25, 2013**



Photos courtesy of Lindsay Bartholomew (pictured lower left). Visit her blog at [Lindsay in the Arctic](#).

The days when the ship was moving in ice-free waters, passing occasional icebergs, are over. The area now surrounding the ship is ~90% ice that is 60-100cm thick. However, the ice is so rotten by summer melt that it does not prevent the ship from moving from one oceanographic station to the next.

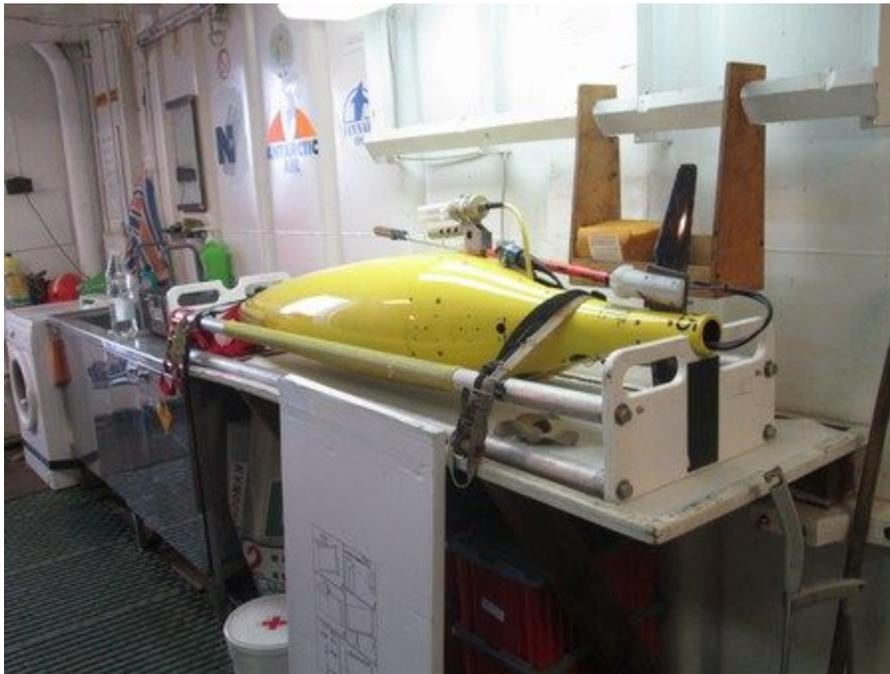
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### **August 23, 2013: Glider launched**

The first planned task for the cruise was to launch a glider, an autonomous device which can measure several important characteristics of sea water. The glider is operated remotely by commands sent via satellites from a remote place (in our case the glider is operated by Luc Rainville from the University of Washington, Seattle, who is the leader of the experiment with the glider). The instrument provided the first data from the St. Anna Trough, an important Arctic Ocean location where two branches of warm water from the North Atlantic entering the Arctic Ocean through Fram Strait and the Barents Sea meet each other.

Our correspondent aboard the ship, Lindsay Bartholomew, wrote about the launch of the glider:

In a post the day before yesterday, I wrote that we were soon getting ready to put a glider in the water. Here's how it went. It may well have been an outdoor rock concert. We got word when we should go outside, and got all dressed in layers (required, at a latitude of 81°N, air/water temperatures of 0°C, and wind seemingly about a billion miles per hour). We all stood on the helideck, leaning over the railing and watching scientists and technicians on the deck below operate the "knuckleboom" crane (a slang boat term, but you'll get it from the picture below). It slowly reached toward the glider, lifted it up and over the side, and dropped it in the water. It all happened in slow motion, but none of us even thought of getting out of the wind without seeing the whole show. This glider will "listen" to instructions from a driver at the University of Washington, periodically surfacing to get more directions and transmit data. The driver will have it meet us on our way back this way in a few weeks. Everyone should stop and be amazed about all of that for a minute.



Glider launch photo (left) by Lindsay Bartholomew. Visit her blog at [Lindsay in the Arctic](#). Other photo courtesy of Lindsay Bartholomew.

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Figure courtesy of Igor Polyakov.

### **August 21, 2013: The ninth NABOS cruise has started**

Today, at 8:15 AM Norwegian time, the RV Akademik Fedorov left port Kirkenes and our 2013 cruise started. 36 researchers and 26 Summer School members will spend 33 days at sea exploring the current state of the Arctic ocean, atmosphere, and ice. This expedition will provide important information about the historical transitions occurring in the high-latitude regions.

The timely start of the cruise is a result of the marvelous job of many people involved in the cruise's preparation. Our team of technicians led by Rob Rember made the shipment of tons of our equipment to Norway smooth and efficient. The ship crew was skillful in uploading this equipment in port Kirkenes. Special thanks to our friend Arve Henriksen and his staff from Henriksen Shipping Company located in Kirkenes who have worked with us since 2002: without their great help the project just could not happen.

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Photo courtesy of Lindsay Bartholomew.

**August 19, 2013: The NABOS cruise will start on August 20th**

The Research Vessel *Akademik Fedorov* arrived to port Kirkenes, Norway where our August-September cruise will start on August 20th. Uploading of equipment is finished, the ship is planned to sail from the port at 8:00 am AK time. All people are aboard the ship.

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Photos courtesy of Lindsay Bartholomew.

**August 15, 2013: Kirkenes is ready for the cruise**

Our summer 2013 cruise will start on August 21, 2013. Our scientific platform, RV "Akademik Fedorov," will visit port Kirkenes, Norway, on August 20th for uploading and embarkation. The team of our technicians is in Kirkenes now for preparation of our equipment for uploading, Tons of our cargo, kilometers of lines, tens of buoys and anchors fill the port (see pictures). All this equipment will be used during the cruise, with some equipment deployed in water to stay there for two years in order to provide continuous measurements of various oceanic parameters.