POLAR RESOURCES




13 Jun 04 Newsletter: Going with the Flow, Record Melt at Swiss Camp, TRECing in Russia, Alaska, and the Bering Sea

Going with the Flow

Many researchers steer clear of scientific investigations involving harsh climates and remote locations. Add to that huge icebergs, extensive ice cover, frequent fog, strong tidal currents, and instrument interference due to the proximity to magnetic north, and most would think it is madness to work in such dangerous locales. But such conditions don't phase Kelly Falkner one bit. A professor in the College of Oceanic Atmospheric Sciences at Oregon State University, Falkner is leading a logistically challenging study of freshwater flow through the Nares Straight in the Canadian Archipelago to contribute to the U.S. Global Change Program.

The Arctic Ocean stores approximately 100,000 km^3 of freshwater in both liquid and frozen form, which is roughly equivalent to the volume of 8.2 Lake Superiors. About a fifteenth of this freshwater—roughly the volume of 1.35 Lake Michigans—flows out of the Arctic annually into the more southern seas. The mixing of freshwater from the Arctic with more saline, and hence more dense, oceans may seem trivial, but this process greatly impacts the circulation of ocean waters within the immediate vicinity and globally. These circulating waters, in turn, affect global climate depending on their salinity, temperature, and capacity to uptake carbon dioxide from the atmosphere.

An ADCP being deployed from the aft working deck of the USCGC Healy.

Freshwater leaving the Arctic has only a few routes by which to escape, one of which is through the Canadian Archipelago just west of Northern Greenland, funneling directly into the North Atlantic Ocean. Freshwater flux through this region has been studied very little, because doing so is often quite hazardous and logistically very tricky. Undaunted and with the logistics support of the US Coast Guard and VECO Polar Resources, Falkner has formed a U.S.-Canadian-Japanese collaborative and plans to collect data from this region over five years to determine the scale and effects freshwater flow in this area and the factors that contribute to this process.

Participants in the 2003 CATS cruise.

In July 2003, Falker and her research associates boarded the *USCGS Healy* to begin their studies. Cutting through thick sheets of ice, the crew reached the Kennedy Channel where they positioned an array of 6 moorings that spans the 40-km stretch of water. The moorings are composed of several different instruments—acoustic Doppler current profilers; sensors that measure conductivity, temperature, and pressure; and ice sonars. Sitting on the ocean floor, the moorings measure and store various factors including the speed of water currents at different depths, the movement of ice sheets, and the thickness of the ice. The moorings will be recovered and redeployed in 2005 and then finally collected in 2007. Falkner is already preparing for next year's mooring collection, as she recently embarked on a reconnaissance flight to Greenland to scout out safe sites for aircraft landings.

Data collected by the mooring arrays will be combined with other measurements that will contribute to freshwater flow understanding. Satellites will be used to map the changes in ice cover over time. Meteorological stations will measure wind velocity and pressure so that these effects can be factored into freshwater flow measurements. By analyzing the chemical composition of growing shell layers of mollusks in the region that reflects the chemistry of the water, variations in the water can be determined on the order of decades to centuries. Tracing other signature chemicals will enable the researchers to determine where the freshwater flowing through the Nares Straight originated.

The information obtained by Falkner and her colleagues will not only discern freshwater flow through the Canadian Archipelago, it will also be used to improve global freshwater flow models that predict ocean current circulation and hence contribute to our understanding of global climate processes.

- Kara Nyberg, PhD

Many thanks to Kelly Falkner for providing information and photos. For more information about this research, check out the following link:
http://newark.cms.udel.edu/~cats/

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UPCOMING GREENLAND EVENTS

ANG Flight Period
21 - 26 June

Greenland Holiday
(Solstice)
21 June

Greenland
Who's in the field?

Ed Stockard loads a pallet on the new Danish Air Force C-130 J model

Kangerlussuaq & Remote Field

Koni Steffen's team of 4 completed their Swiss Camp work early, and with a Twin Otter finishing up work for Ken Jezek's NASA team preparations were made for an early pull-out on Monday. As luck would have it, the weather turned for the worse that morning after 3 weeks of perfectly clear days. The Steffen team was forced to wait until Thursday for the slow-moving weather system to clear for a pull-out. The team reports an excellent field season at Swiss Camp. They removed automatic weather stations from two sites due to a large amount of melt in recent years. The team also reported a record melt of *1.8 meters* at Swiss Camp – a location noted for being in the equilibrium zone on the ice sheet where accumulation consistently equals annual melting. For more information about Steffen's research visit http://cires.colorado.edu/steffen/

On Monday VPR greeted the Danish Air Force C-130 as it arrived in Kangerlussuaq. VPR's Ed Stockard brought over our forklift to assist with the offload of 2 pallets and a loose load box. In exchange, the crew took a pallet of gear to Thule for us that would have cost $6,000 to ship commercially. Now there's international cooperation for you!

Future researchers (or skidoo-ers?) – local kids visit the Kangerlussuaq warehouse

Summit

Gregg Lamorey and Bob Hawley finished logging the GRIP borehole on Monday for their Borehole Optical Stratigraphy (BOS) project, while the ICDS drillers finished drilling seven holes on Wednesday for the same project.

Unfortunately the weather did not cooperate for Saskia Bourgeois from ETH Zürich, who needs clear skies for her instruments (for more visit: http://www.rereth.ethz.ch/umnw/atmosphys/ohmura/pj.06.html).

Liz Morris gave a talk about the Cryosat traverse and her borehole research, which uses a neutron probe to determine snow density (see http://www.esa.int/export/esaLP/cryosat.html.

Summit Station got busy towards the end of the week preparing for Monday's flight. Camp staff did quite a bit of digging due to drifting after several windy days.

Raven

The Raven crew hosted Koni Steffen's team this week. They passed through to service and download data from their AWS. The Twin Otter was there and away within 3 hours, leaving behind an inter-flight week resupply.

In preparation for the upcoming flight period, the Raven crew spent 50 hours grooming the runway. In addition, the melt has started so they backfilled both Weatherports.

Check out this product press release with a Greenland science tie in by Xantrex, the manufacturer of Camp Raven's Inverter/Charge controller http://www.solaraccess.com/news/story?storyid=6883

Bill and Kurt Burnham of the Peregrine Fund with a female gyrfalcon. They are banding, measuring and taking blood samples of the birds for genetic information. Visit http://www.peregrinefund.org for more.

Weather

Kangerlussuaq's week started with a big change in the weather. An occluded stationary front moved into western Greenland causing cooler temps, 3 days of rain in Kangerlussuaq, and snow at higher elevations such as Raven, where the pressure plummeted, bringing 4 days of above freezing temps, flat light and WET heavy snow. A midnight sun put on an amazing display of an elongated sun pillar one evening. The front also brought an end to the warm and pleasant weather this week at Summit, which had several overcast days and winds that reached more than 20 knots mid-week. Morning temperatures averaged –17C.

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UPCOMING ALASKA EVENTS

Learn to Return Course
Toolik Field Station, AK
21 - 25 June

Alaska
Who's in the field?

Yu Ping Chin from Ohio State University started work at Toolik Field Station. He is collaborating with Diane McKnight from the University of Colorado to study the effects of Persistent Organic Pollutants (POPs) on surface waters in the Arctic.

Larry Hinzman and a team of researchers are in Nome, working both on local meteorological towers continuing fieldwork for their collaborative study on the intersection between climate change water resources and humans in the Arctic, featured in last week's newsletter (http://www.vecopolar.com/Files/PDFs/Newsletter06_06_04.pdf).

Darrell Kaufman, collaborators and field team members are in Anchorage this week, conducting reconnaissance flying in the Wrangell and Chugach Mountains, and preparing to head to Dillingham. Their focus is Holocene climate variability in southern Alaska lakes over a 1500km transect at approximately 60 degrees north.

Tom Piwowarski, Toolik carpenter, will deliver gear to Valdez for Dr. Tad Pfeffer, who will arrive on 6/14 to begin work on his study of Columbia Glacier's calving mechanisms. Read more about the group's work at the glacier at: http://tintin.colorado.edu/group/columbia/ColumbiaIntro.htm

Looking Ahead

- ✓ The helicopter will commute to Toolik to begin the summer flying season. Joining the helo at Toolik will be Naomi Whitty and Tracy Sheeley, the Toolik helicopter coordinator. Naomi will stay for a few days to train Tracy and then drive back to Fairbanks with the remaining construction crew.
- ✓ Fritz Nelson and team begin their field season studying the depth of permafrost thawing in northern Alaska.

The land of the midnight sun. Toolik photo taken at 12:45am facing due north. Courtesy of Scott McComb

TREC Updates

- ✓ Amy Clapp posted her last journal entry from the field (http://www.arcus.org/TREC/phpbb/viewforum.php?f=5). Amy just returned from 3 weeks at Russia's Lena River Delta with a team of researchers led by Max Holmes.
- ✓ Patty Cie is on day 30 of a 40-day cruise on the Healy.
- ✓ Laurie Carr, Karen Bejin and Scott McComb are participating in research projects around Toolik Field Station.

To follow all of the TREC adventures please go to http://www.arcus.org/TREC/index.html (and click on Explore).

Max and Amy use an iridium phone to check email in a Moscow park while a statue of Lenin watches over the scene.