ATLAS Field Report: Snow, Weather & Shrubs: Winter Pathways of Change in the Arctic (M. Sturm, J. Holmgren, G. Liston, P. Olsson, C. Racine)

Narrative: Under cold blue skies, six of us flew into Ivotuk on March 20th. The group consisted of Matthew Sturm, Jon Holmgren, Glen Liston, Chuck Racine, Ken Tape, and Andy Monaghan, the last named from Larry Hinzman and Doug Kane's group at UAF. We worked for 4 days at Ivotuk measuring snow conditions on our established lines. Temperatures got down to -38C, cold enough to make it hard to get propane to flow for the stove, but everyone stayed warm enough to get the work done. Andy checked the meteorological towers at Ivotuk and did the prep work for the stream flow monitoring that will be done at Ivotuk this spring. Jon used our FM-CW radar to measure continuous snow depths on our lines, and achieved a long sought-after success by integrating the radar returns with differentially-corrected GPS positioning. Chuck got a first-hand chance to see the snow cover on the plants and shrubs he has so carefully measured in the summer.

On March 24th, we packed up 4 snowmobiles and 6 sleds, including our FM-CW radar sled, 15 days of food, 100 gallons of fuel, a tent, tools and our snow pit kits, and then departed for Barrow 350 kilometers to the north. Andy and Chuck remained at Ivotuk awaiting a break in the weather to fly home. Fifteen miles north of Ivotuk we stopped at Kucher Creek, one of our long-term sites. The weather was cold and snowy. Unusually soft and deep snow had made the trip from Ivotuk difficult with our heavy sleds, and our gas consumption had been twice the rate we expected, far too high. It was clear that if we wanted to make the traverse to Barrow, we would have to make some hard decisions. That night we culled everything that wasn't essential, and sadly, decided the radar and its heavy sled with batteries would have to be left at Ivotuk. The next morning, Jon and I returned to Ivotuk to drop off the excess equipment and radar sled. We were happy to see that Chuck and Andy had flown out the previous night. After dropping off our loads, we motored back at our Kucher Creek camp, arriving by noon due to a well-broken trail. Glen and Ken had made the snow measurements at Kucher Creek, so we quickly broke camp and headed north toward the Colville River.

For the next 10 days, we were in a world of solitude and snow. We would travel 10 km, stop and make a series of snow measurements, then travel again, repeating the stop-and-go travel until the day was done. At night we would try to find a tent site out of the wind in a gully or creek. Our route took us down Kucher Creek to the Colville River, across the Colville and Awuna Rivers, then along the ridges north of the Colville to the Toparoruk River and finally to Oumalik. At Oumalik we turned northwest for the long run into Atqasuk over the flat tundra and lake country of the Arctic Coastal Plain. We had a few cold and sunny days, but mostly it was gray, cold and windy. We traced the same layers in the snow from Ivotuk to the coastal plain, but the increasing effects of the wind, and the decreasing amount of winter snowfall were easy to see. The trip got bumpier as the snow got shallower and more wind-blown, but the gas mileage went up too, a good thing since the next "gas station" was Atqasuk. We followed the Usuktuk River until it neared the Meade River, then crossed over for final run into Atqasuk. Snow thoroughly mixed with sand in the river valley attested to the

power of the wind in this part of the Arctic. We were used to white drifts of snow, not drifts marbled brown and white. We began to see animal tracks and finally some caribou as we neared Atqasuk, but otherwise, had pasted through almost 150 miles of country devoid of visible life, with virtually no signs of humans.

We arrived in Atqasuk just as school was letting out for the weekend. We had arranged to work with the 6th, 7th and 8th graders but it appeared we might be too late. However, we found Mr. Ryzylo and quickly set up an impromptu evening session at his house where we met the kids. They come from a world of where snow machines, sleds, and travel are the norm, so it was easy for us to establish rapport. It was decided that we would all go out the next day and the kids would help us make our snow measurements. About 10 kids showed up (not bad considering that there are only 80 kids in K through 12 at Atqasuk) and we traveled about a mile to our site near Walt Oechel's tower. The kids worked with us. We looked at the different types of snow and had them use all of our gadgets to make measurements. The kids really liked the small snow machine (a Citation) Ken had ridden all the way from Ivotuk; it was closer to their size than the big machines their parents owned, and easier for them to steer. They wanted us to leave it in Atqasuk.

We left Atqasuk on April 2; we had allotted 3 days to make the 90 km run up to Barrow, but a snow-machine highway (complete with roadside trash, wrecked sleds and vehicles) exists between Atqasuk and Barrow in the winter, so the trip only took 10 hours. We arrived in Barrow and spent the next 5 days doing measurements in and around Barrow. We also visited the Barrow Middle School where we taught Mr. Culbertson's 7th and 8th grade classes about snow density and the different types of snow. We tested different density snow by dropping eggs onto the snow from a step ladder. In turn, the kids taught us the Inupiat names for several types of snow.

Science: The purpose of the long traverse to Barrow was to test the hypothesis that there are regional patterns of snow characteristics, like depth and density, on the Arctic Slope, and that these patterns take the form of broad east-west bands controlled by the topography. We also wanted to test whether the patterns of snow distribution we had observed in our Kuparuk Basin traverses (1994-1997) could be applied further to the west. Preliminary examination of the data we collected on the Ivotuk-Barrow line suggest that the Kuparuk patterns are repeated in remarkable detail in the west, and that these patterns are indeed controlled by the interaction of storms with the regional geography. This is good news because it means that extrapolation of our snow results across the entire Arctic Slope is possible.

Thanks: Many people helped make the work possible. Special thanks to VECO and BASC (in particular Kristin Scott and Dave Ramey) for helping with our logistics. Thanks also to our pilots, Randy and Jay. Finally, thanks to my wife Betsy, who served as message center, expediter, and safety lookout on this and all other long traverses .

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