

Climate Change and Adaptation Meeting the Challenge

Presentation to the Denali Commission

Dan White and Colin West

Alaska Center for Climate Assessment and Policy

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ACCAP is funded by the National Oceanic and Atmospheric Administration (NOAA) and is one of a group of Regional Integrated Sciences and Assessments (RISA) programs nation-wide.





Daniel White - Director, Institute of Northern Engineering, University of Alaska Fairbanks

John Walsh - President's Professor of Climate Change & Chief Scientist, International Arctic Research Center, University of Alaska Fairbanks

Craig Gerlach - Professor, Resilience and Adaptation Program, Department of Anthropology, University of Alaska Fairbanks

Fran Ulmer - Director, Institute of Social and Economic Research, University of Alaska Anchorage



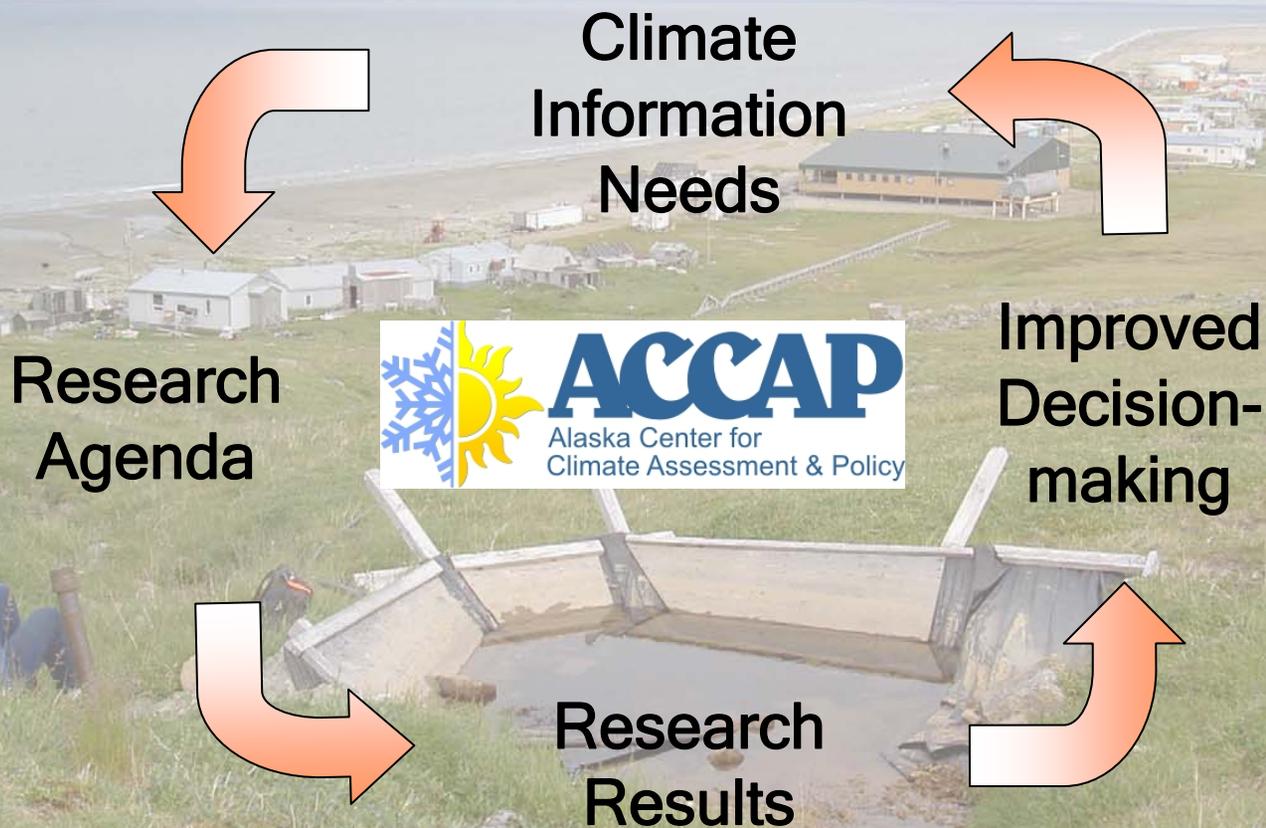


Integrating science and decision-making for adaptation to climate change in Alaska

Goals

- ❖ Create research partnerships to meet Alaska's needs for climate information
- ❖ Integrate science and policy for more informed decision-making
- ❖ Promote continuing feedback between users of climate services, or products, and scientists

Are we prepared to understand the changes, take advantage of the opportunities, and meet the challenges of a changing climate?



Preliminary ACCAP Focus

Climate impacts related to Alaska's transportation sector are our initial focus. We envision expanding activities to include wildfire, permafrost/foundations, ecosystem services and other infrastructure issues.

- ❖ Sea ice conditions affecting Alaskan coastal communities, marine ecosystems and offshore transportation (*John Walsh and Hajo Eicken, Lead*)
- ❖ Water resources and their impact on tundra travel & access to resources (*Daniel White, Lead*)
- ❖ The synergistic effects of climate change and land use in the Upper Yukon River Watershed (*Craig Gerlach, Lead*)
- ❖ Modeling the value of Alaska public infrastructure at risk to climate change (*Fran Ulmer, Lead*)

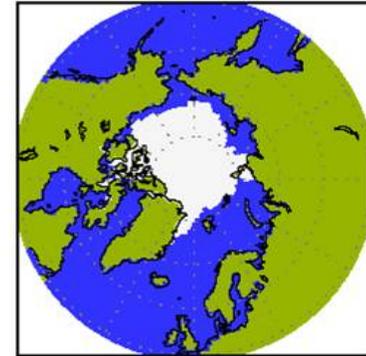
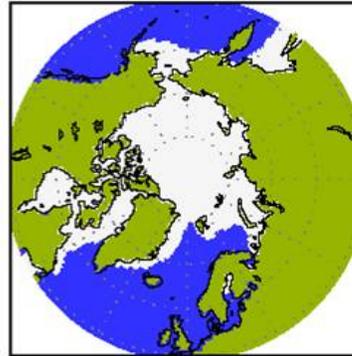
**Sea ice conditions
affecting Alaskan
coastal
communities,
marine ecosystems
and offshore
transportation**

Projected Ice Extent
(5-model median)

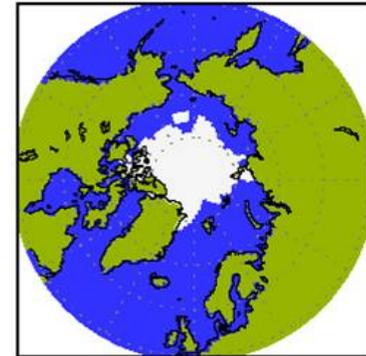
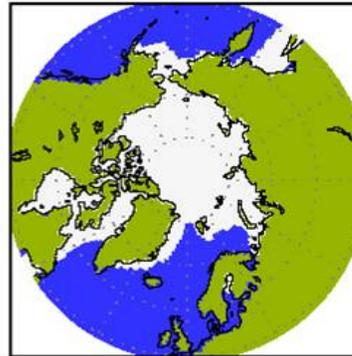
March

September

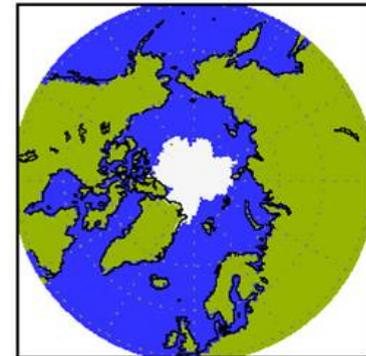
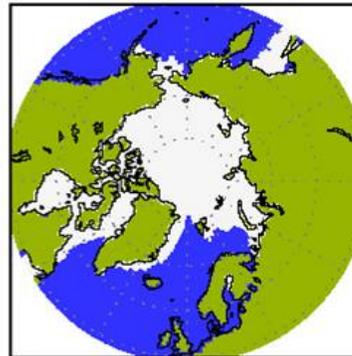
2010-2030



2040-2060

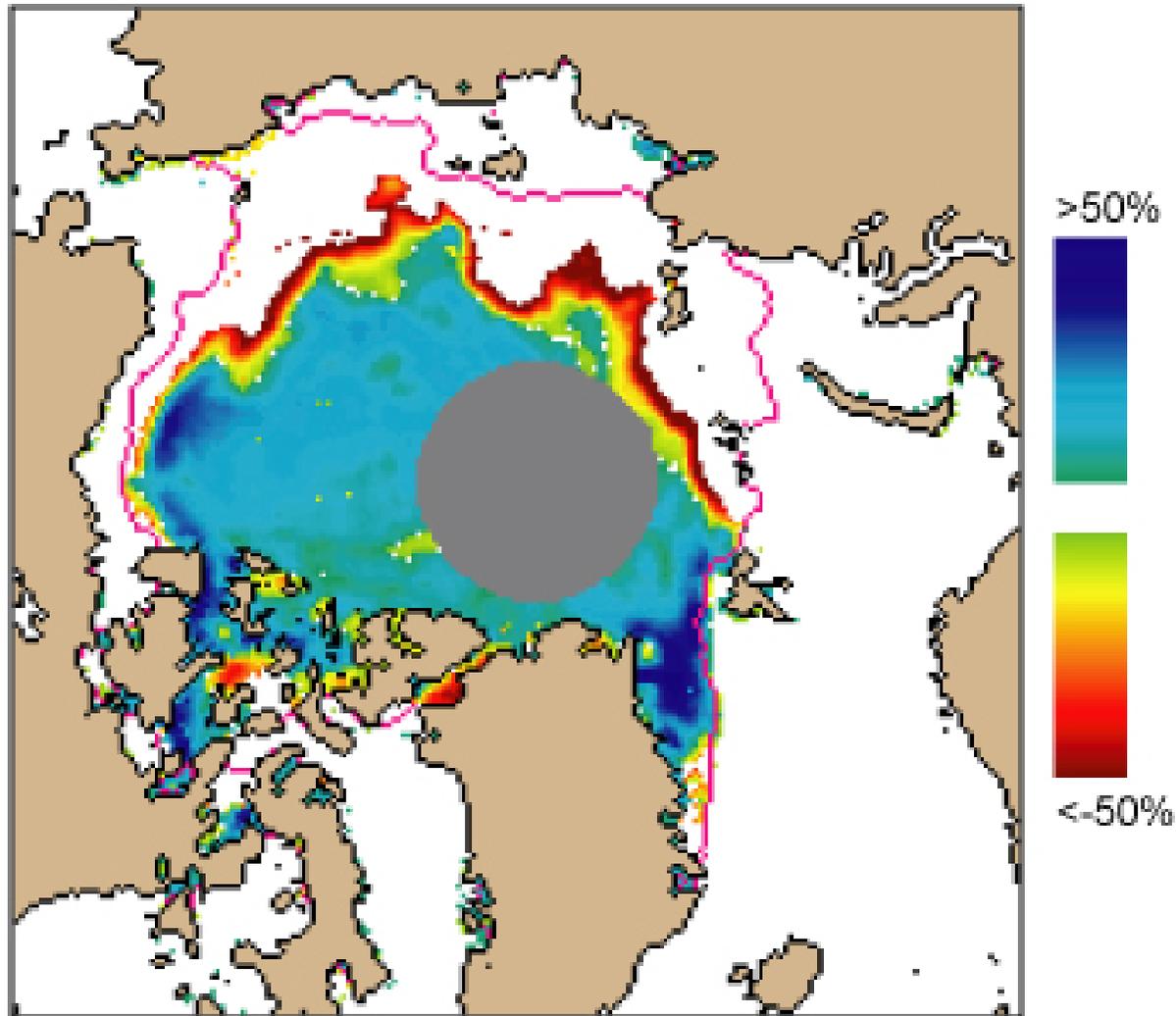


2070-2090



2005: Another record-low sea ice year

5-Day Mean: September 2005 Minimum Concentration Anomaly

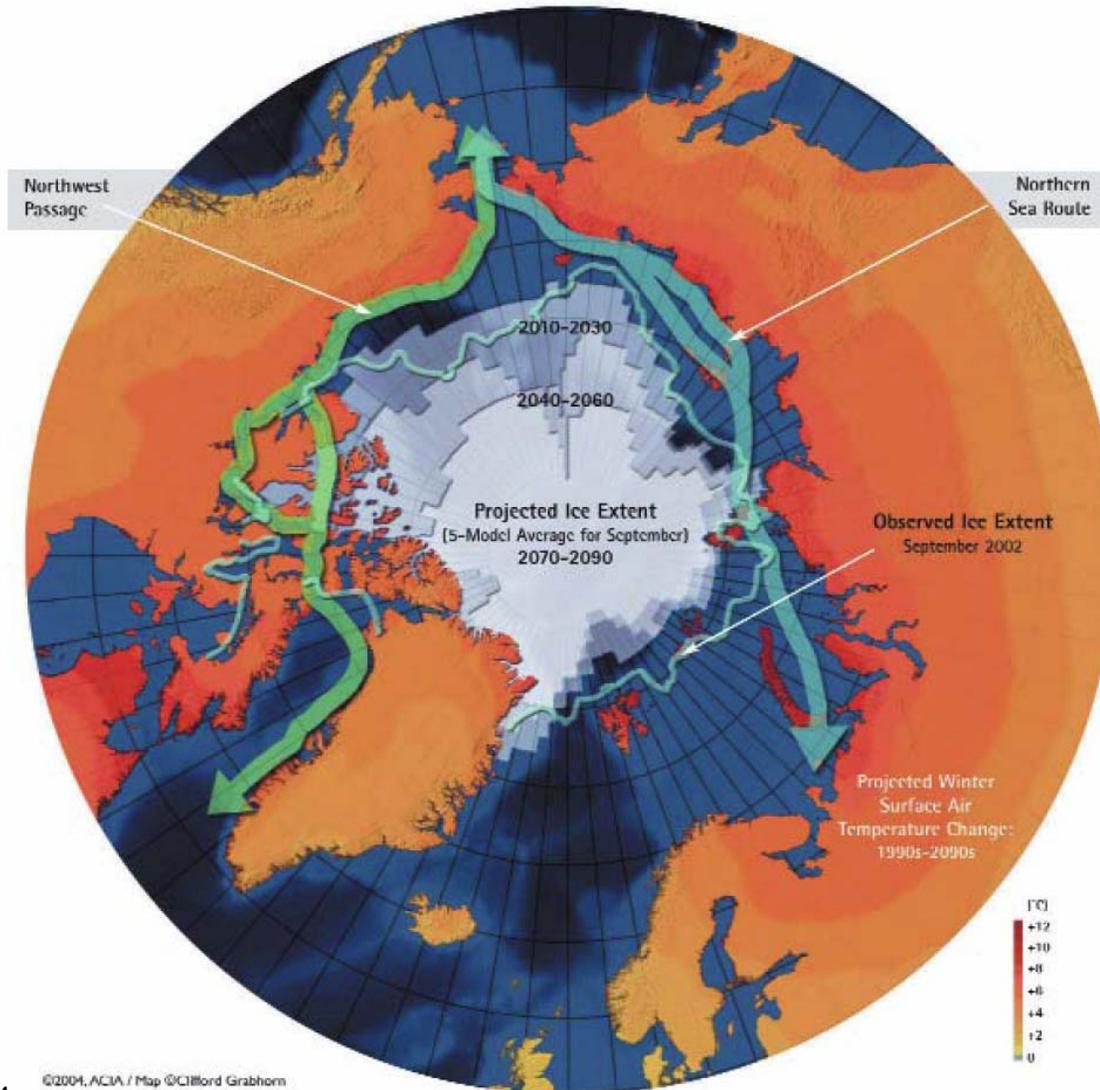


1979-2000 Mean Minimum Sea Ice Edge

National Snow and Ice Data Center, 2005

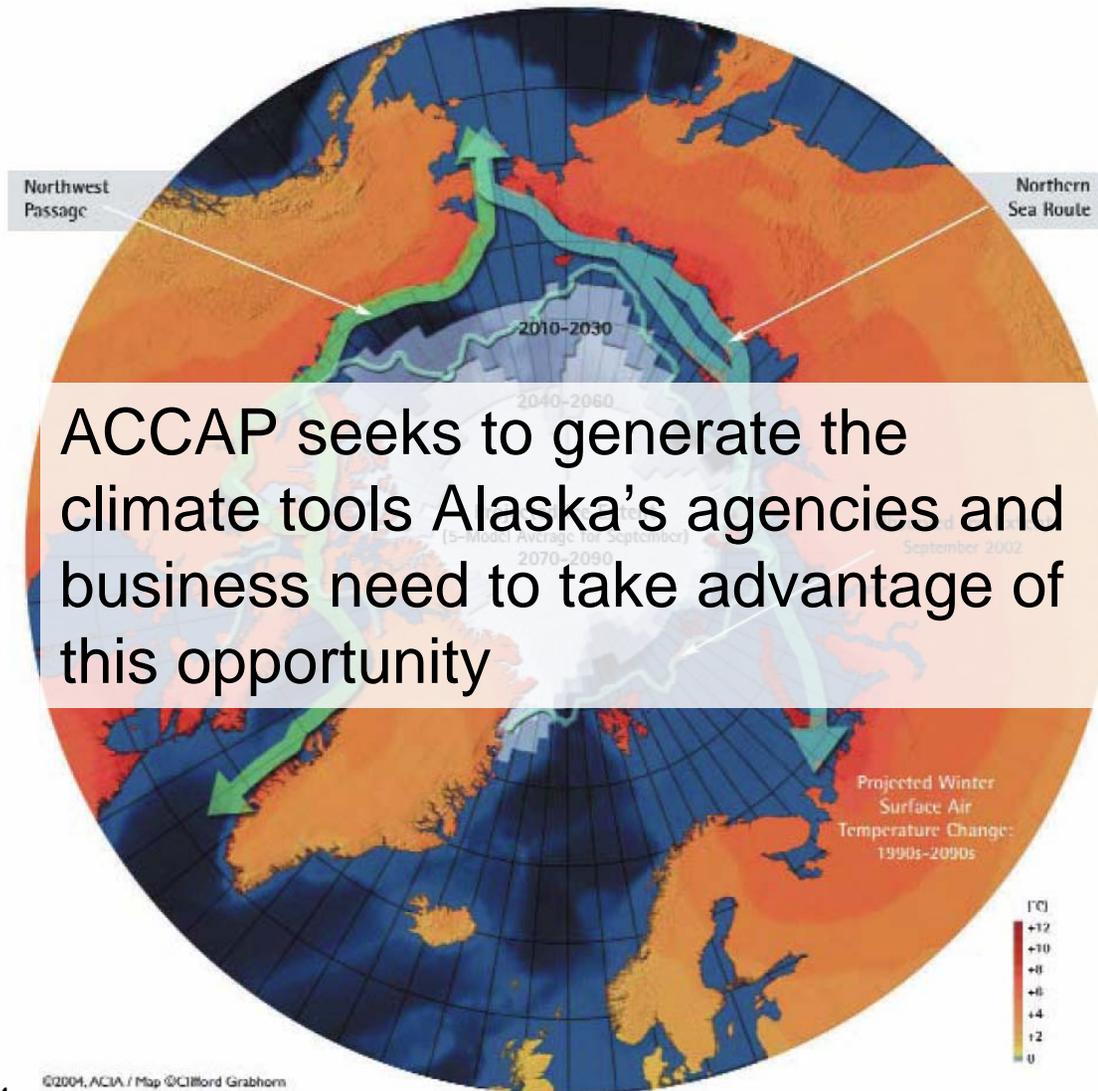
Alaska is the gateway. Are we prepared?

“Reduced sea ice is very likely to increase marine transport and access to resources.”



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Water resources and their impact on tundra travel & access to resources



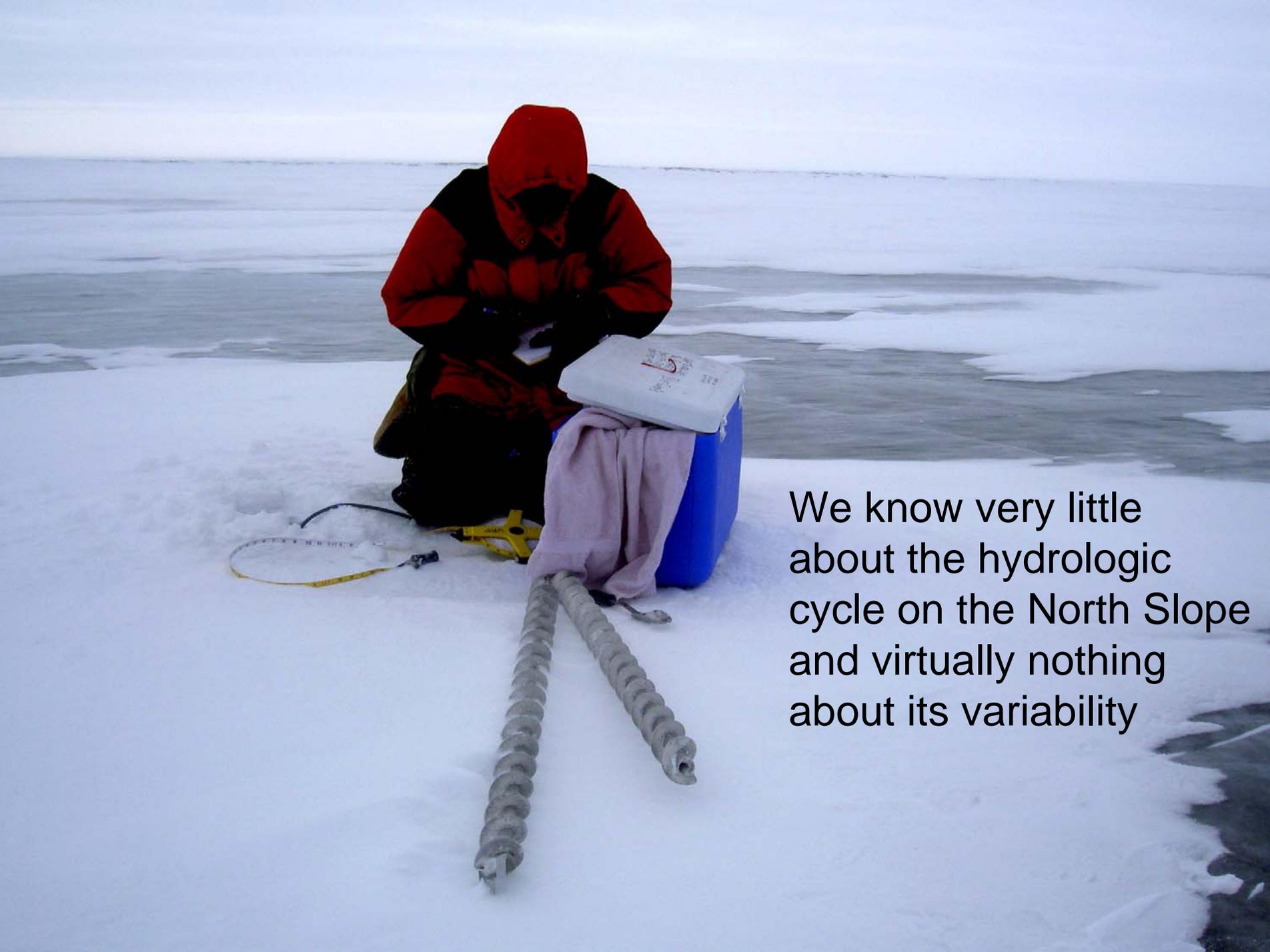
**Snow birds
flooding
sea ice**



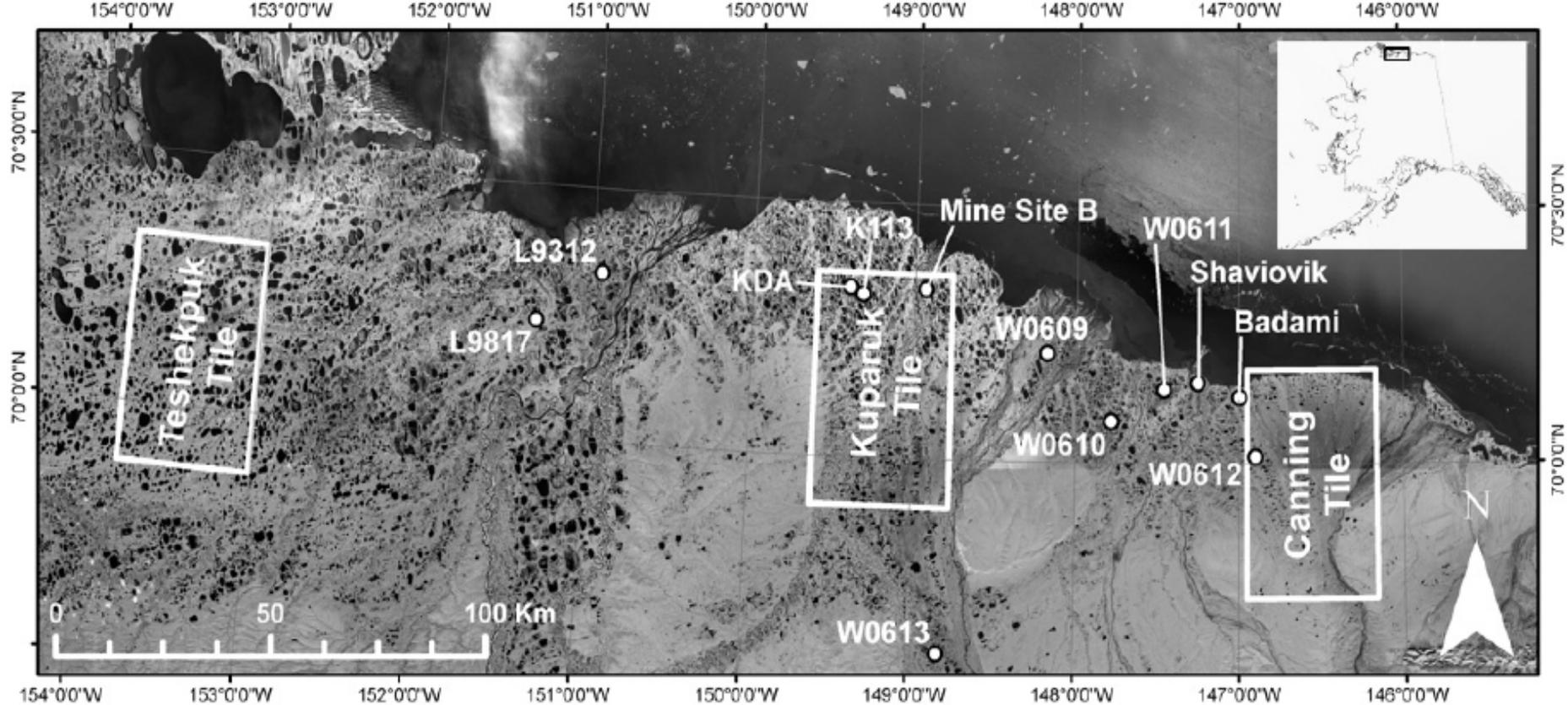
Photos courtesy of AIC

Ice roads are critical for oil and gas exploration activities. Gravel roads are no substitute. Compared to gravel roads, ice roads are cheap, fast, effective and require no remediation.



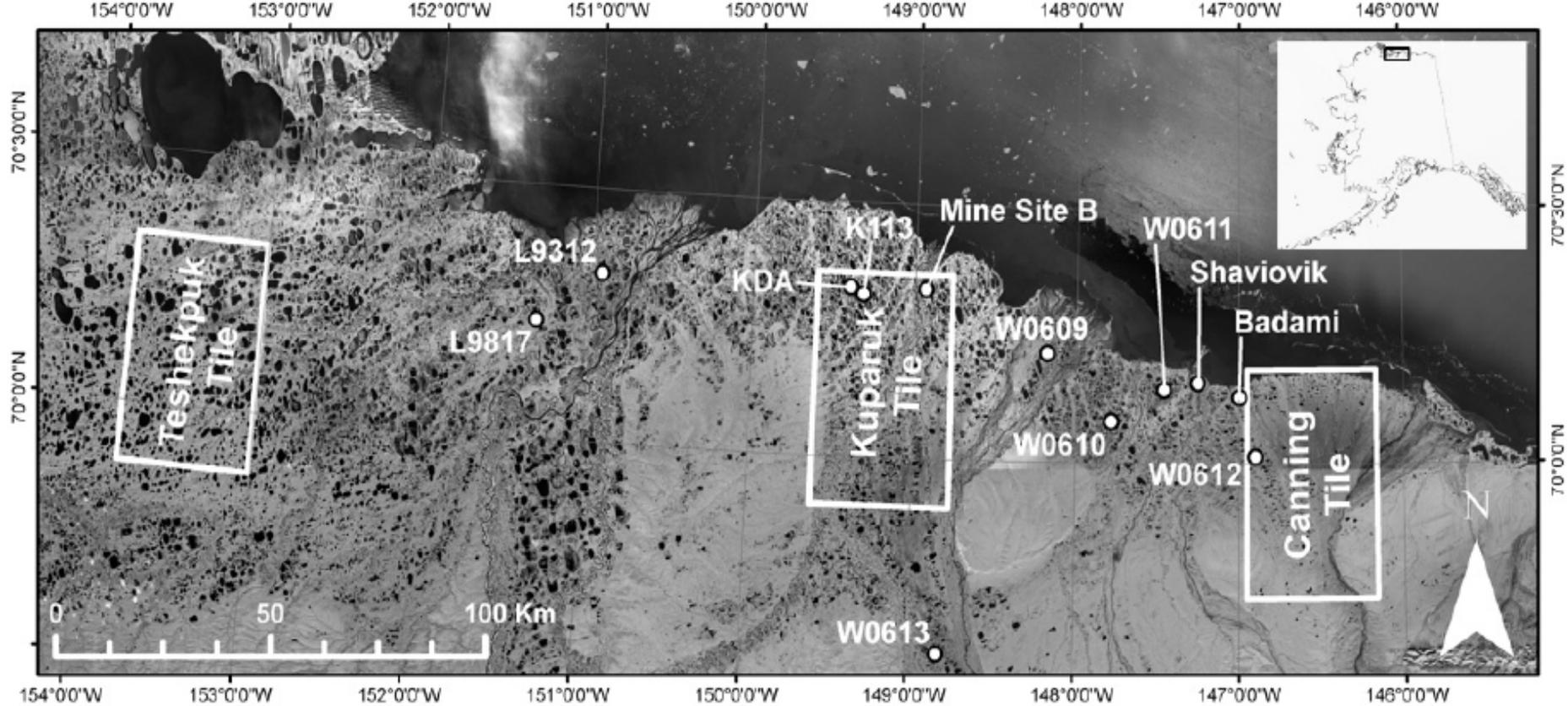


We know very little about the hydrologic cycle on the North Slope and virtually nothing about its variability

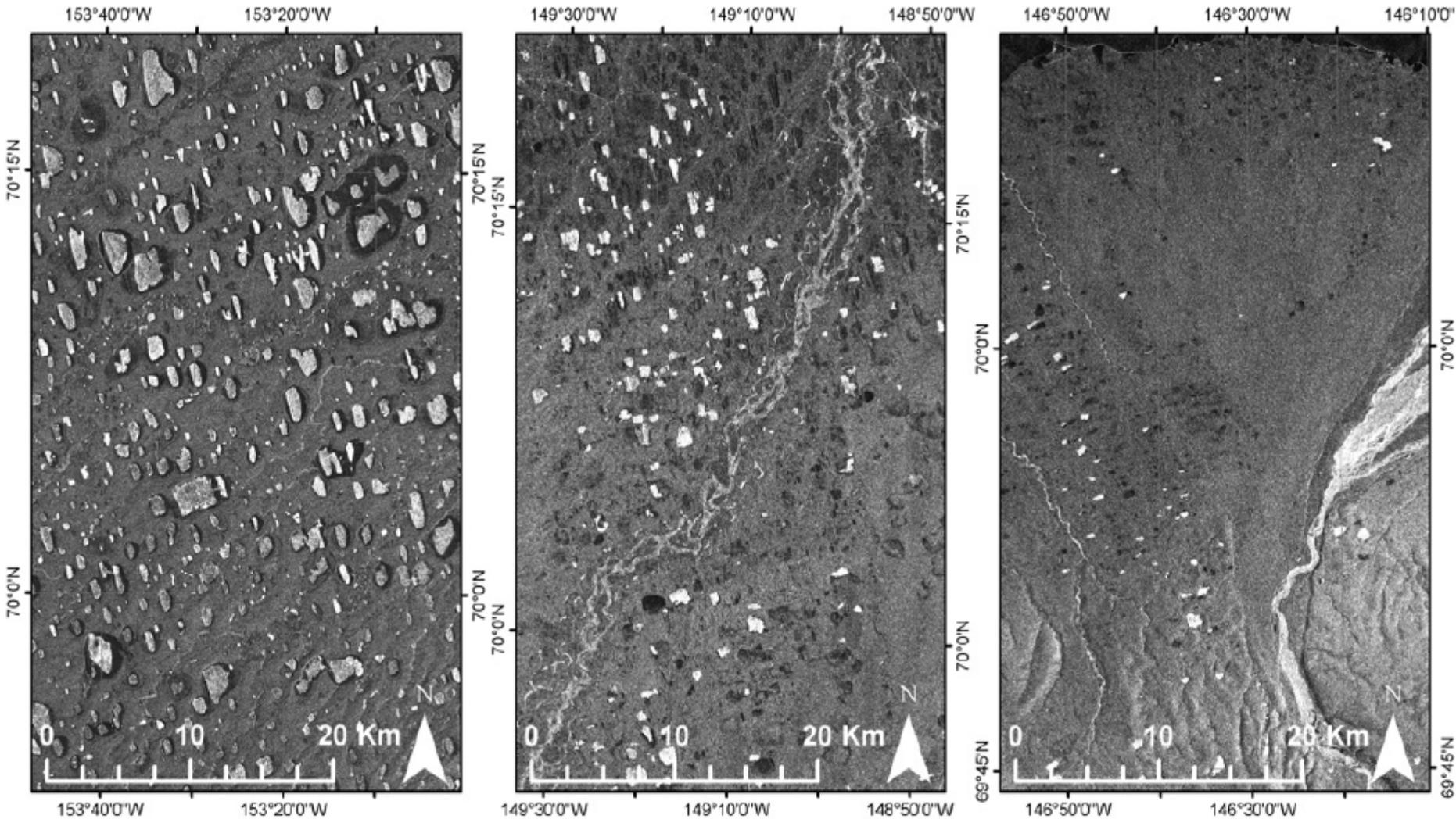


A project was funded by DOE in 2003 to, better understand the North Slope hydrologic cycle, and develop strategies for effective and efficient water management (partners include: DOE, ADNR, ADOT&PF, BLM, MMS, Nature Conservancy, Northern Alaska Environmental Center, ConocoPhillips Alaska, British Petroleum).

Water resources are much more than an ice road issue...facilities, fisheries, bridges and other infrastructure, wildlife



Originally funded by DOE, ADOT&PF and ADNOR funded an expansion of this project east to the Canning River and South to the Kuparuk River Foothills. MMS, DOE, and BLM also facilitated the expansion of weather stations North and South, respectively.



Bright spots are lakes with water under the ice in March, 2005
 Possible new areas for exploration may be water poor

This is an ongoing project with many partners
ACCAP can help by focusing effort on climate tools needed
to better plan for North Slope activities?

Photo courtesy of Bryan Collver

3. 14. 2001

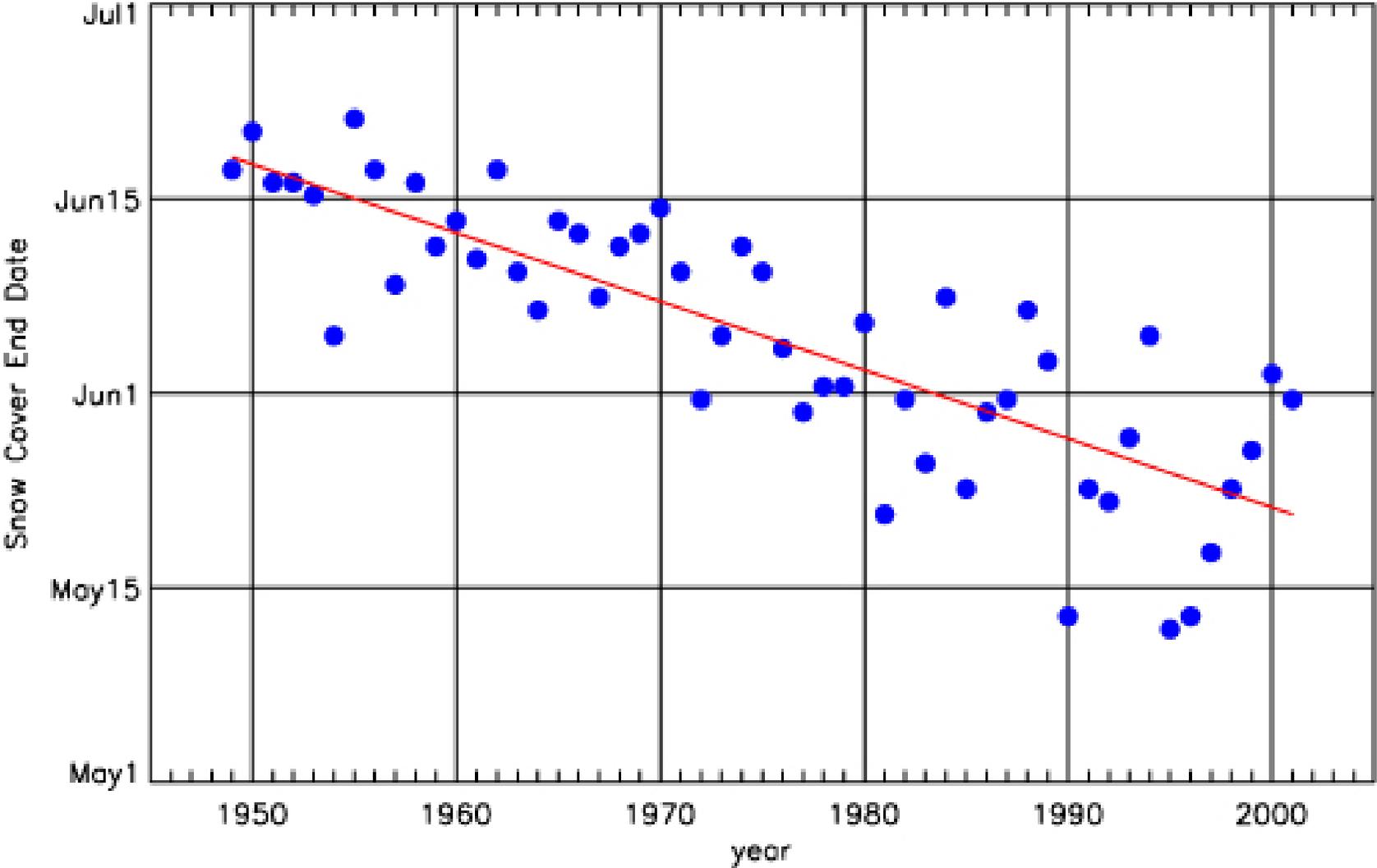


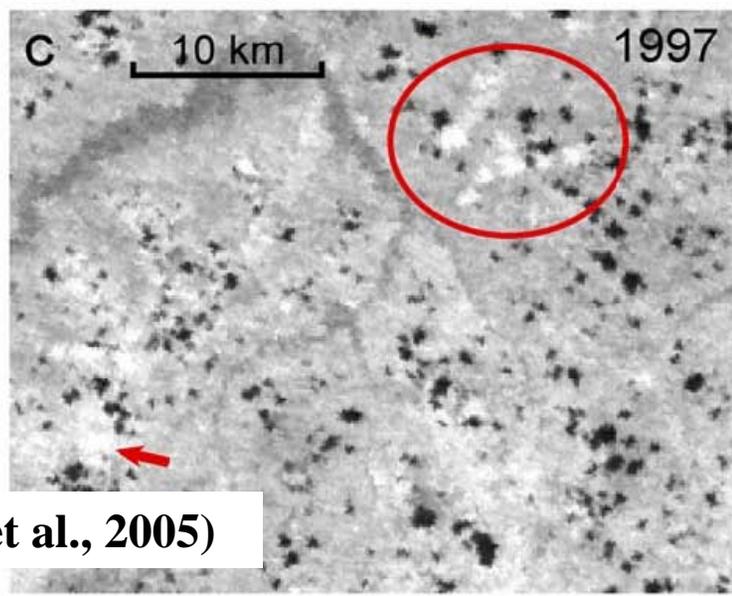
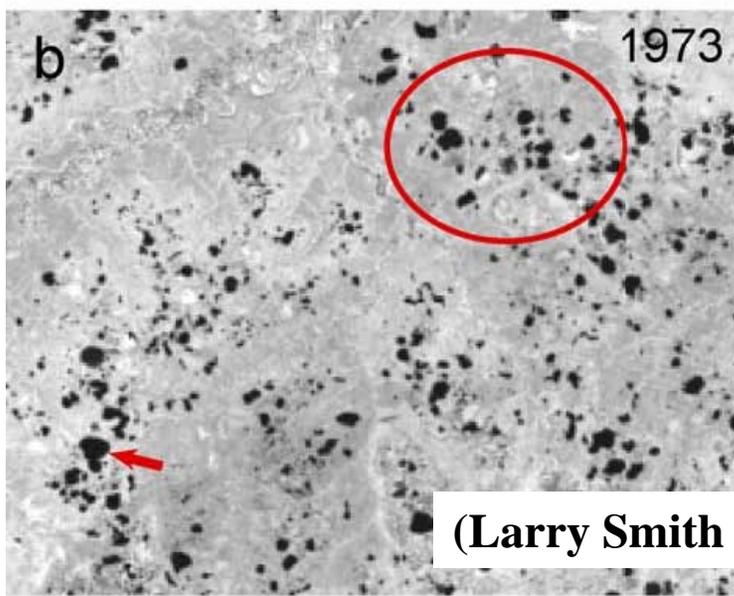
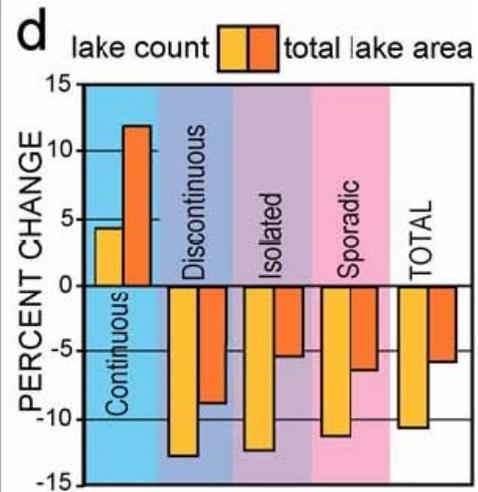
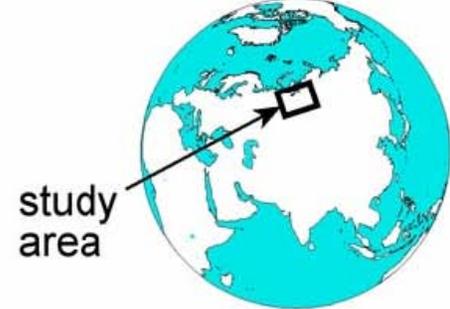
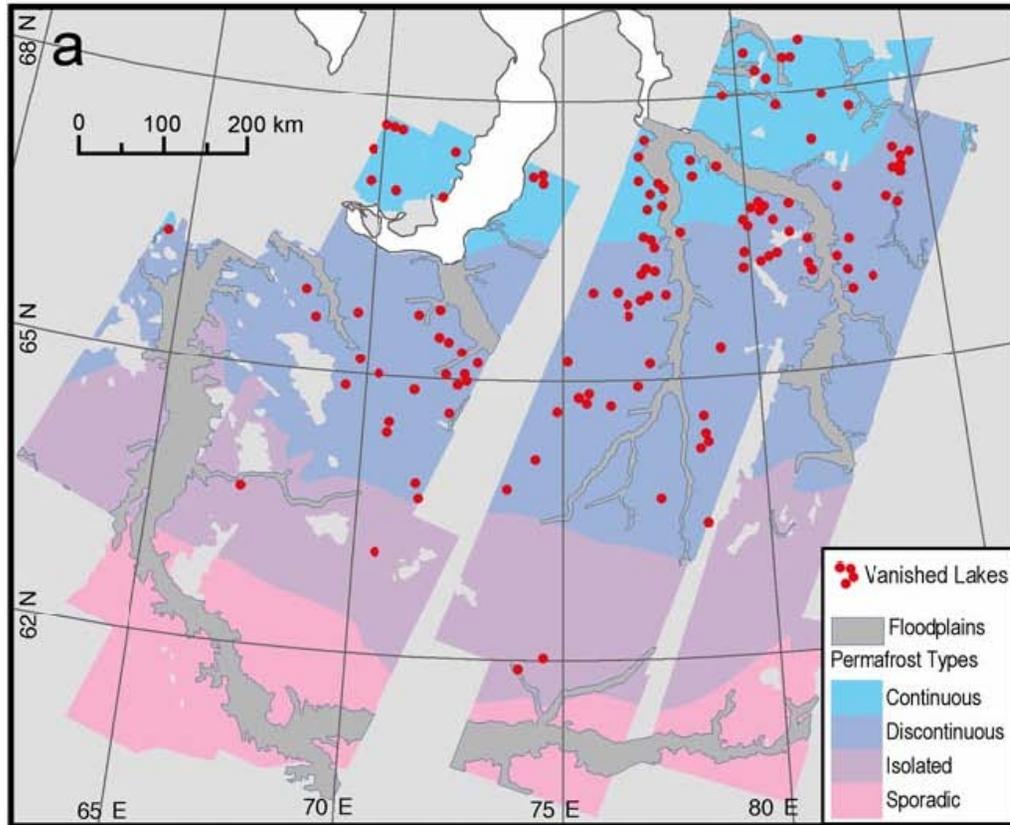
The synergistic effects of climate change and land use



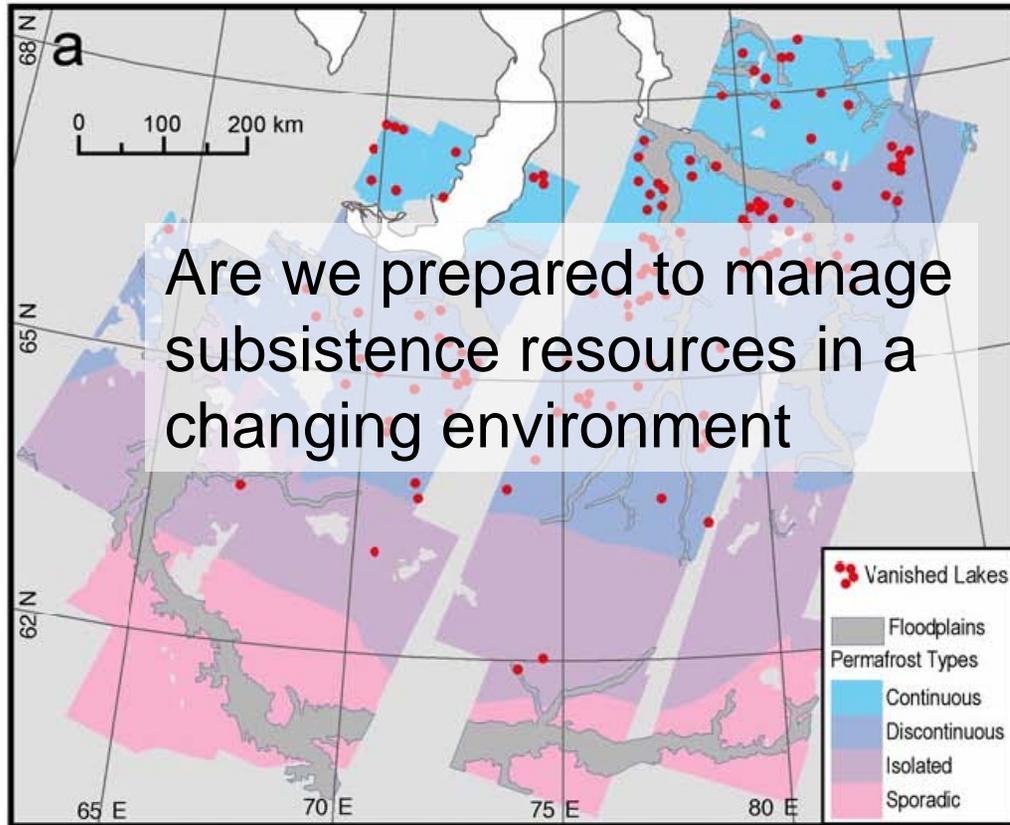
Late snow, low snow, or early melt reduces access to resources reached over snow and ice

Stone, R.S., E.G. Dutton, J.M. Harris, and D. Longnecker (2002), Earlier spring snowmelt in northern Alaska as an indicator of climate change, *Journal of Geophysical Research*, 107 (D10) 10.1029/2000JD000286

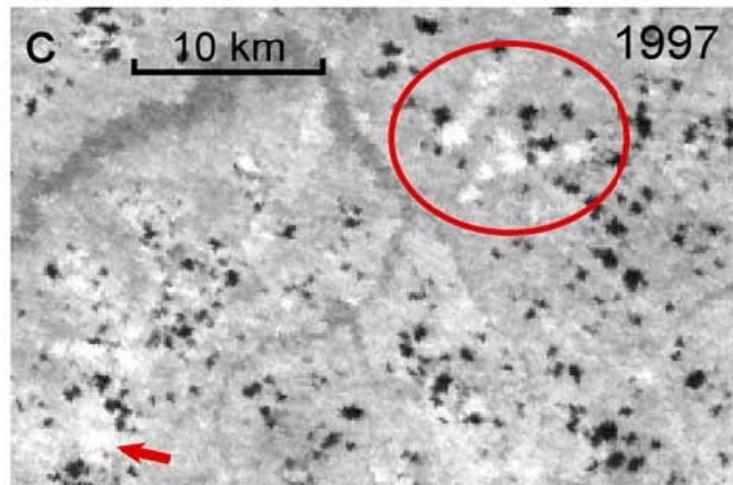
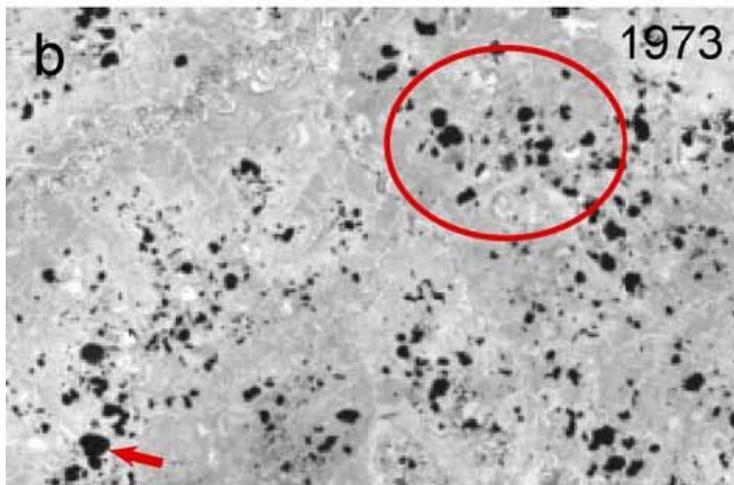
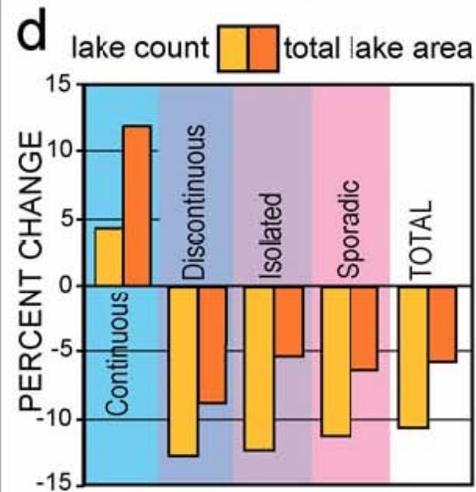
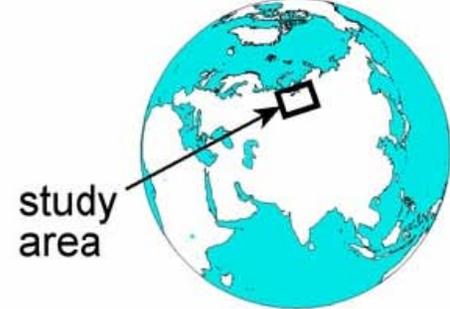




(Larry Smith et al., 2005)



Are we prepared to manage subsistence resources in a changing environment



(Larry Smith et al., 2005)



Modeling the value of Alaska public infrastructure at risk to climate change





Photo: Dan White



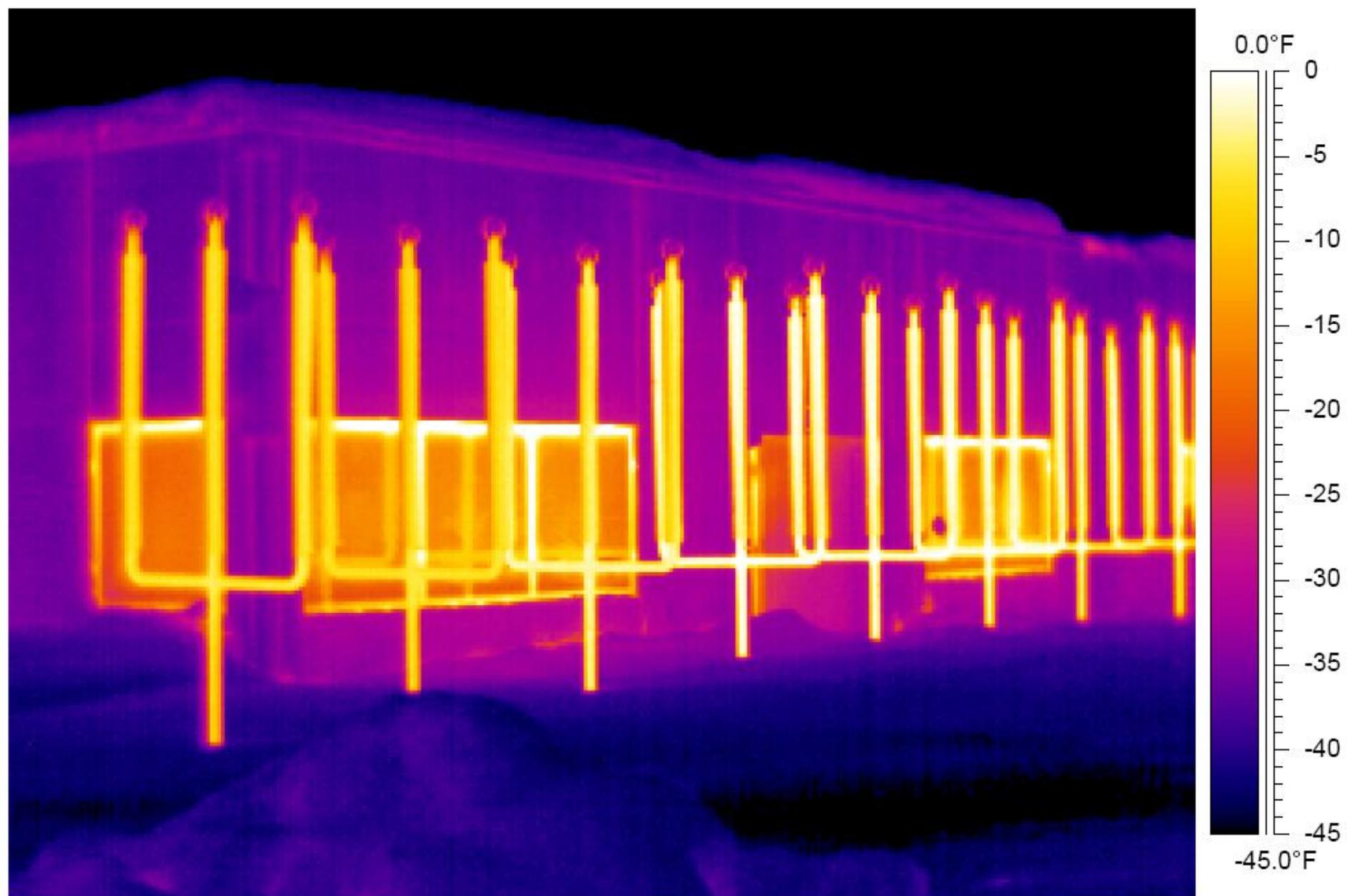
Permafrost damage is normally due to soil warming created by the structure.

We can build in ways to protect permafrost from the heat of structures.

Ultimately, however, nearly all structures built on permafrost rely on the ground to remain frozen.



Thermosyphons keep the ground frozen. They take advantage of the fact that in winter, the outside air is a great sink for heat.



Thermosyphons extract heat from the ground in winter

An aerial photograph of a large industrial facility, likely an oil or gas processing plant, situated in a vast, flat, wetland landscape. The facility consists of numerous green-roofed buildings, a large white hangar, and various pipes and structures. The surrounding area is a mix of brown and green, with several large, shallow water bodies or ponds. The sky is overcast with grey clouds.

Measures designed to protect permafrost are expensive, and put engineers and owners [Alaska] in the business of “refrigerating” the ground in a warming climate

Are we prepared to manage our infrastructure on a warming foundation

The Trans-Alaska Pipeline

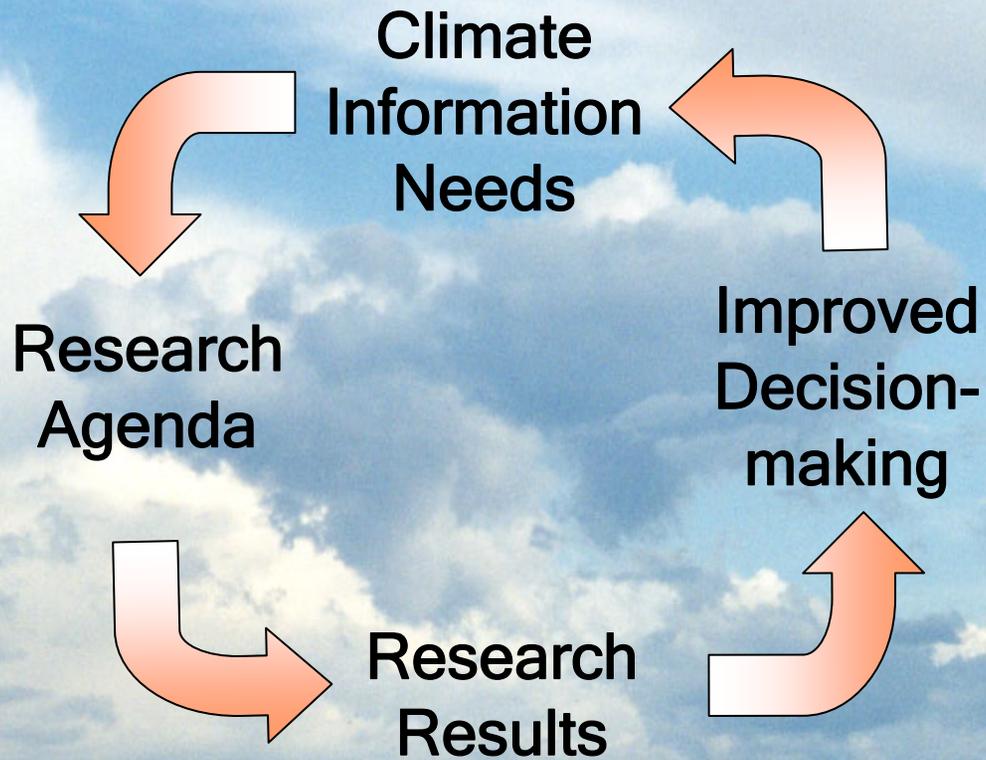


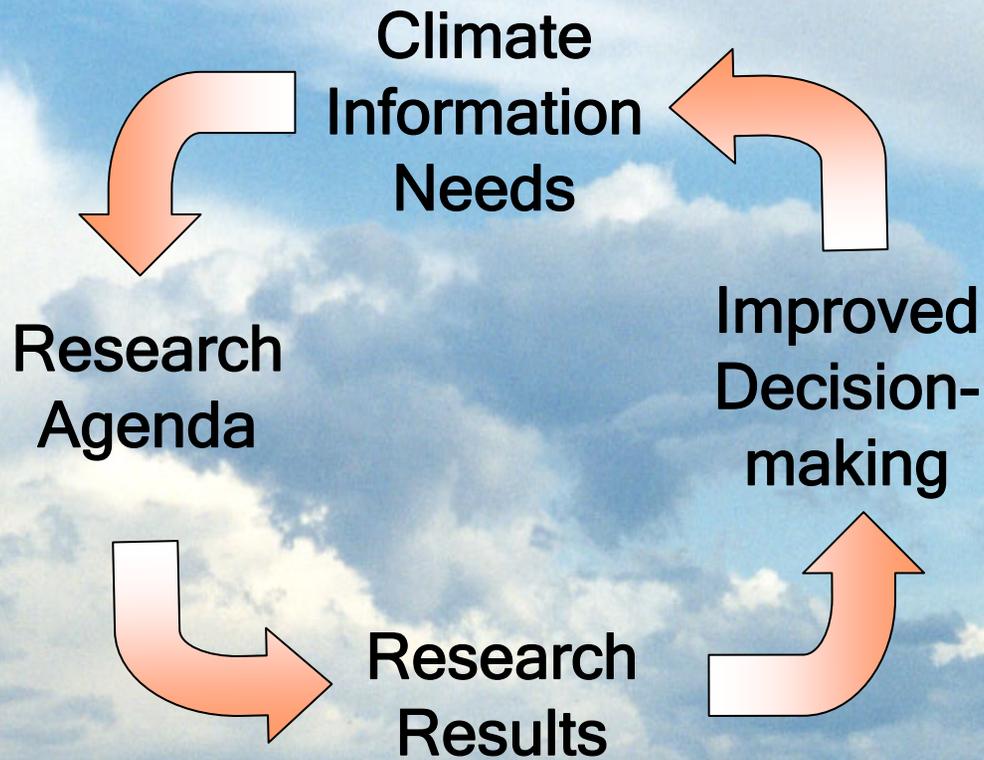
North of the Brooks Range, permafrost is cold and the foundation of the aboveground pipeline (left) does not need extra cooling to support permafrost as it does south of the Brooks range (bottom Figure)

Under a changing climate, the part of pipeline north of the Brooks Range will require installation of thermosyphons.

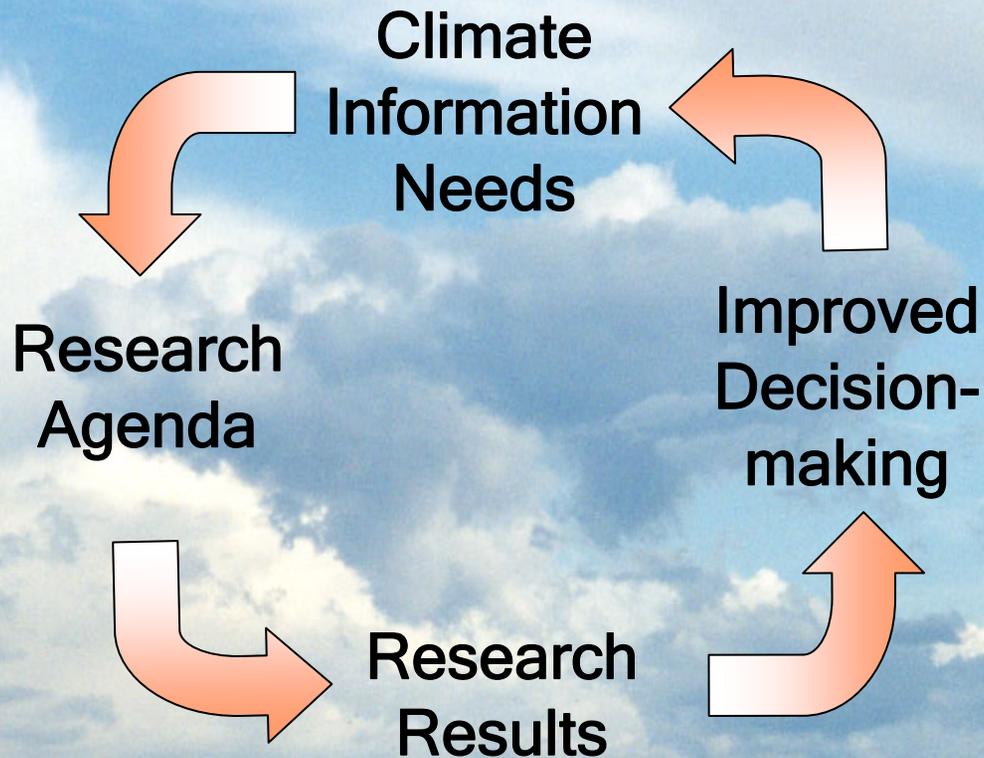
Additional measures will be needed to support the pipeline south of the Brooks Range.





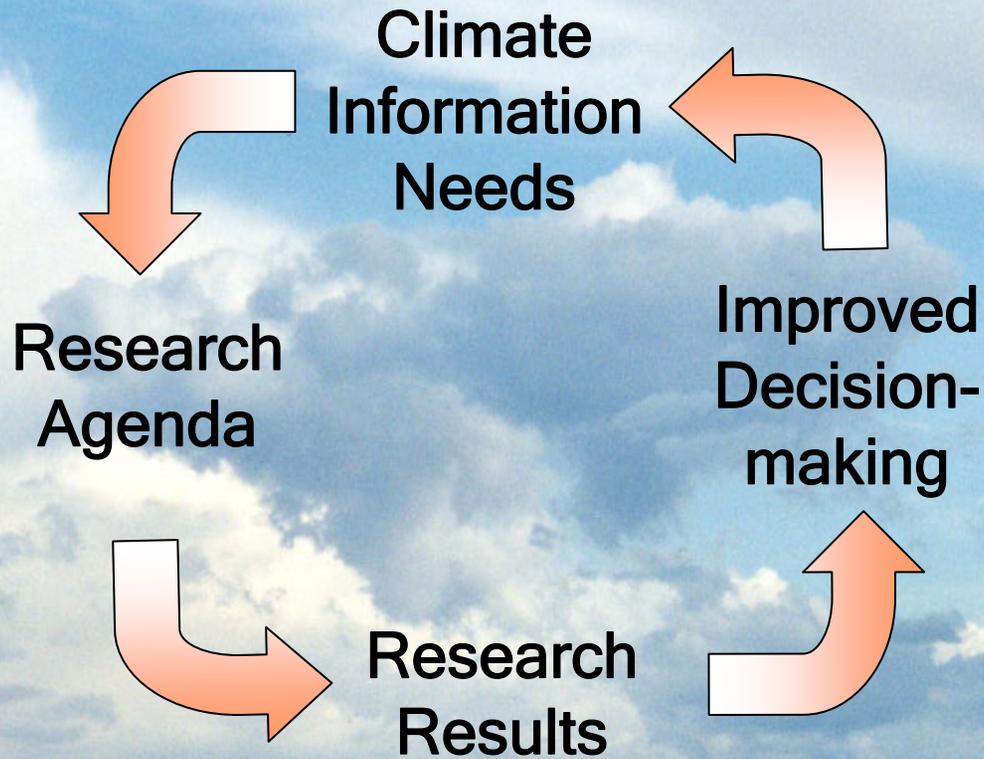


Climate services needed to build business plans, investments (ships, aircraft, buildings)



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Climate services needed to plan for state or local land use and/or development



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Climate services needed to plan for state or local land use and/or development

Climate services needed to plan for management of resources by the state, industries, or other users

ACCAP is Building Partnerships

- ❖ Scientists and engineers
- ❖ State and local planners, policy-makers and governments
- ❖ Industry
- ❖ Transportation, natural resource and land management agencies
- ❖ Alaska Native tribal governments
- ❖ Non-governmental organizations
- ❖ Alaska Native non-profit organizations
- ❖ Anyone whose decision-making is influenced by climate-related events

Partners

Partners

Partners

Partners

Partners



Climate information and products that help us prepare and adapt to a changing climate

Partners

Partners

Partners

Partners

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Climate information and products that help us prepare and adapt to a changing climate

How can you get involved?
Denali Commission is a stakeholder
– What are your big issues?

See our website, www.uaf.edu/accap

A photograph of two people standing in a snowy field. The person in the foreground is wearing a black jacket, blue jeans, and a grey knit hat, and has a large orange backpack. The person behind them is wearing a dark jacket and a dark cap. They are standing next to a long wooden fence that stretches across the field. The ground is covered in snow, and there are some wooden planks and a small wooden door in the snow in the foreground.

ACCAP Coordinator
Sarah Trainor - ACCAP Research
Scientist and Coordinator,
University of Alaska Fairbanks,
fnsft@uaf.edu, (907) 474 -7878