



RATIC

Rapid Arctic Transitions due to Infrastructure and Climate



RATIC – T-MOSAIC

connections and opportunities

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Brief background

RATIC workshop overview



Funding



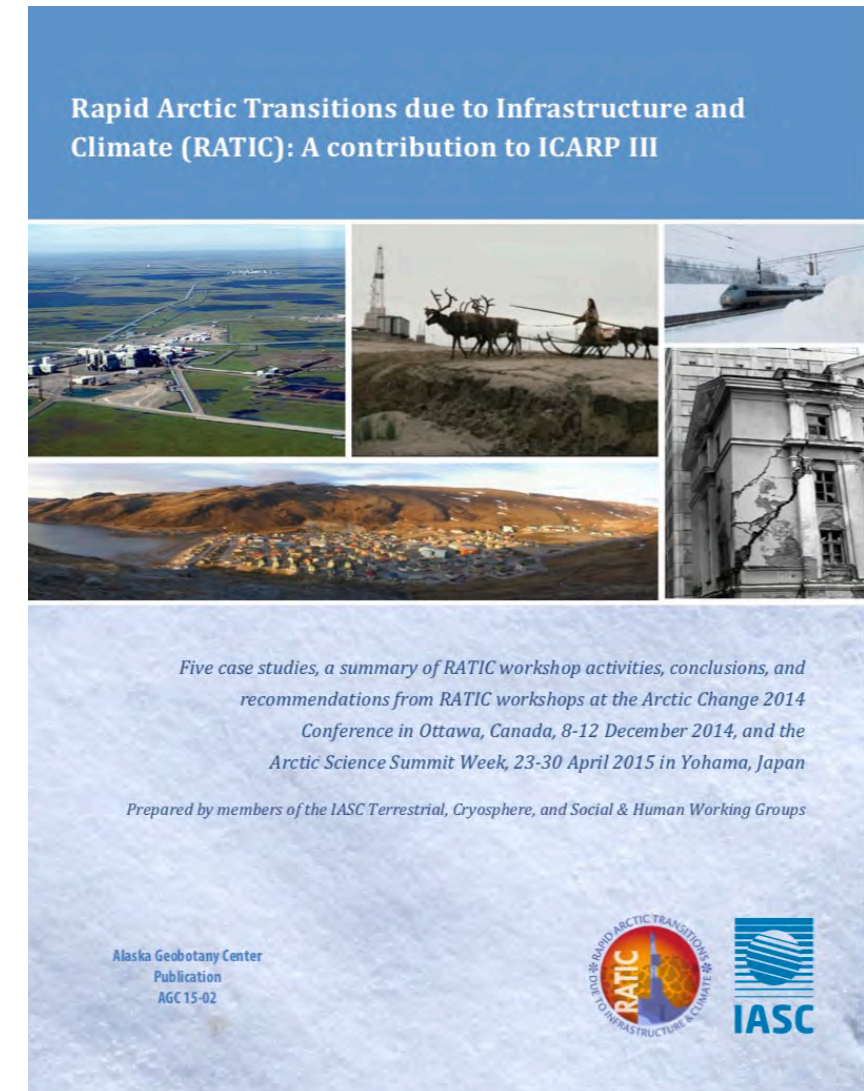


RATIC Background

- Forum for developing and sharing new ideas and methods regarding sustainable development in the face of rapid Arctic Change
- Workshops:
 - Arctic Change 2014, Ottawa, Canada
 - ICARP III, 2015 , Yohama, Japan

White paper with major messages and conclusions

<https://www.geobotany.uaf.edu/library/pubs/WalkerDAed2015-RATICWhitePaper-ICARPIII.pdf>





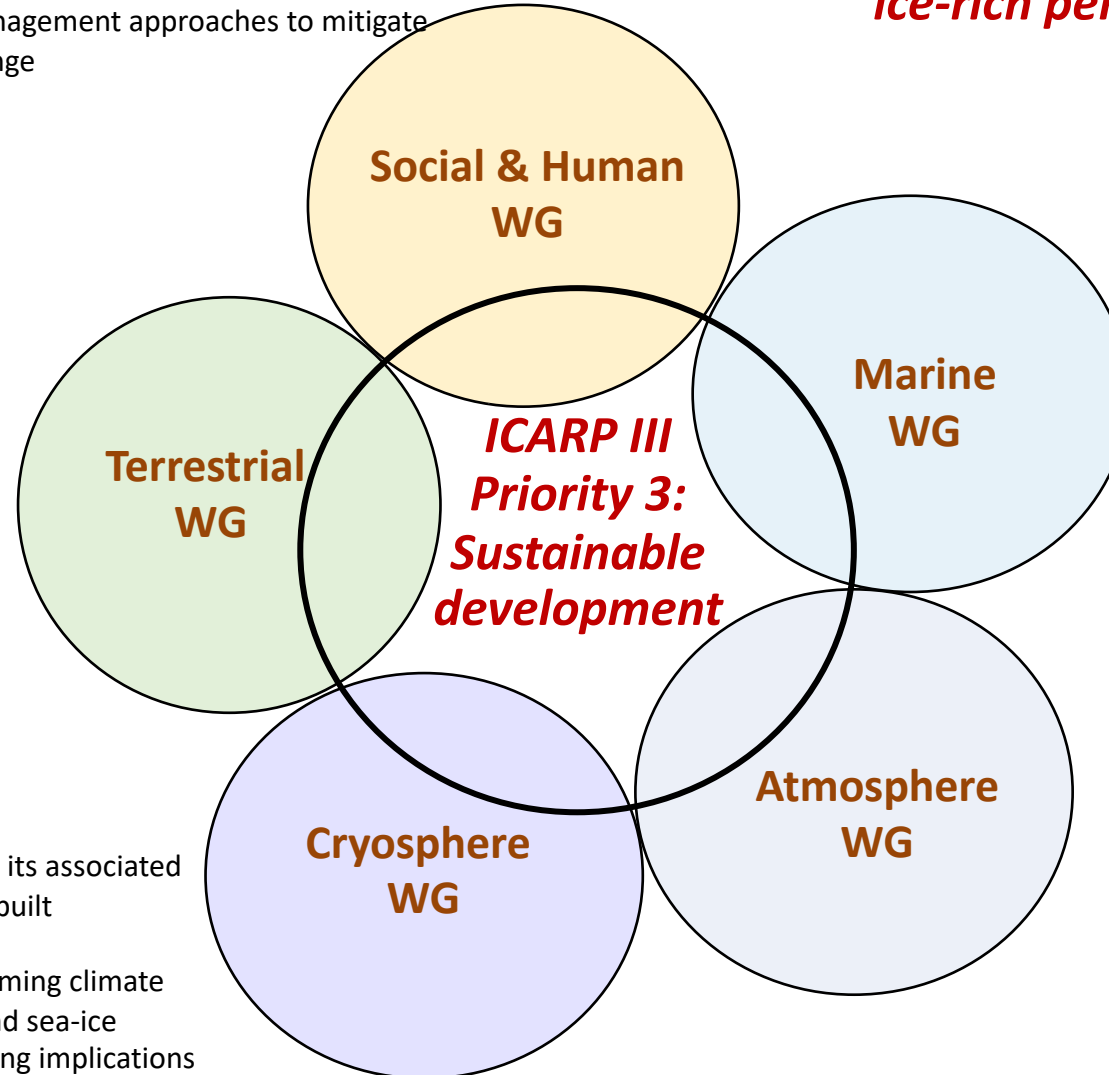
Social and Human

- Cumulative impacts of RATIC to subsistence and culture
- Analysis of historical indigenous infrastructure adaptations to climate change
- IRPS issues related to global economy and global security
- Legal framework, state and federal regulations
- Social, economic, political & technological drivers of IRPS change
- Adaptive management approaches to mitigate adverse change

AT ICARP III, RATIC was conceived as a cross-cutting initiative involving all five IASC working groups to address topics related to sustainable development in ice-rich permafrost systems.

Terrestrial

- Terrestrial ecosystem responses to changes in land/ air temperatures, hydrology, permafrost snow &, contaminants
- Monitoring IRPS change at multiple scales
- Predictive models of IRPS change
- Input to engineering, land-use planning and adaptive management responses



Marine

- Implications of industrial infrastructure to marine and sea-ice ecological, and social subsystems
- Implications of changes in marine transport
- Monitoring sea-ice changes to marine transport, off-shore & on-shore infrastructure, developments
- Implications to global marine systems.

Atmosphere

- Climate drivers of change to terrestrial and marine subsystems.
- Atmospheric contaminants, black carbon, dust.
- Implications to global climate system.

Cryosphere

- Permafrost thawing and its associated impacts on natural and built environment
- Sea-ice response to warming climate
- Modeling permafrost and sea-ice response, and engineering implications



Sustainable Arctic Infrastructure Forum (SAIF)

An RATIC Cross-cutting Workshop

Arctic Science Summit Week 2017, Prague



Toward a RATIC strategy document and RATIC publications
Thirty-nine participants, mainly from the TWG and S&HWG



ASSW 2019

T-MOSAIc Session, May 25

RATIC workshop, May 26

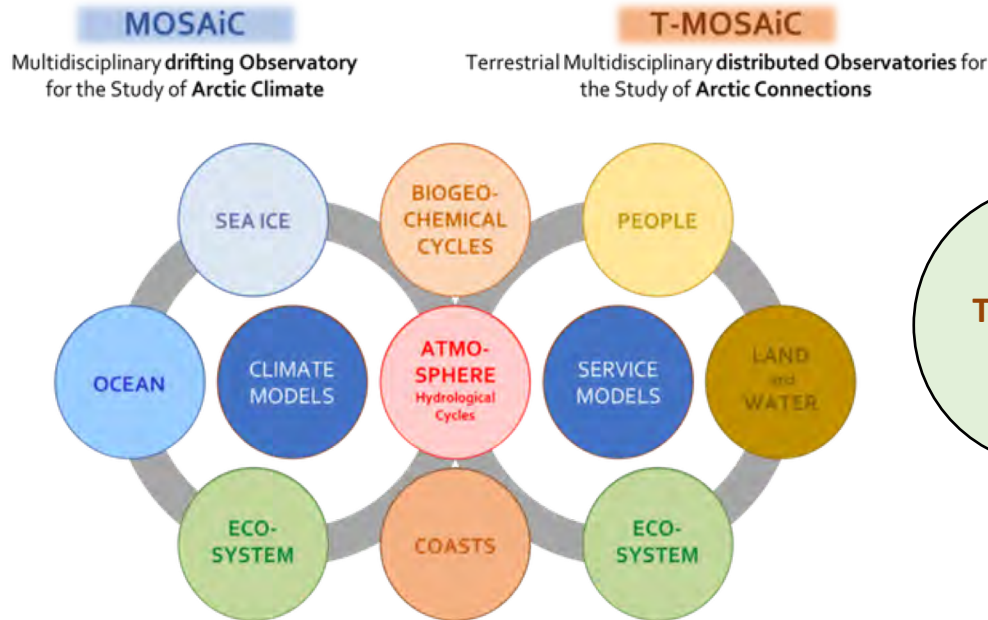


RATIC – T-MOSAIc connections and opportunities

- Collaboration with T-MOSAIc and its systems level themes of connectivity, gradients, discontinuities and thresholds, feedbacks, extreme events, legacy effects and emergent properties.
- We especially encourage IASC Fellows, APECS members, Indigenous people, and industry representatives to participate.

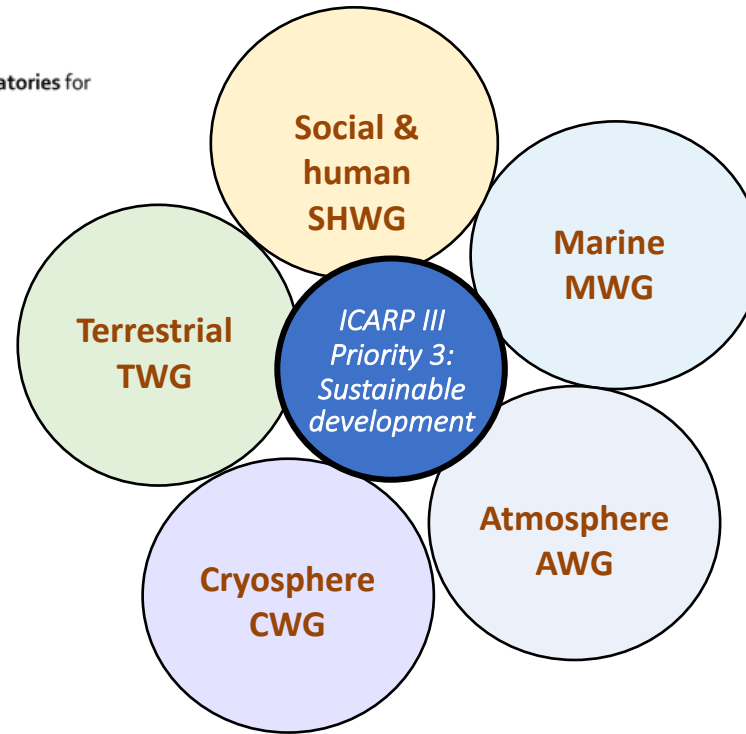
Conceptual thematic diagrams

T-MOSAiC–MOSAiC



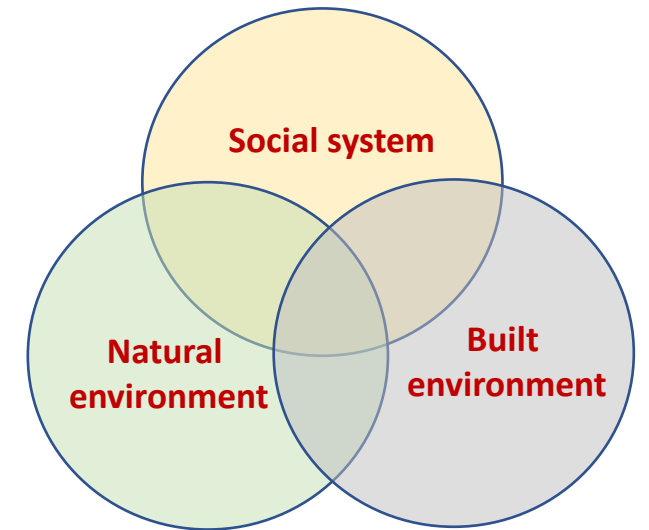
Major area of overlap is coastal environment
Where most Arctic infrastructure is located.

Original RATiC



Linkages are strongest between TWG,
SHWG, and CWG

Navigating the New Arctic (NNA)



Infrastructure and
sustainable development
important

T-MOSAiC

Terrestrial Multidisciplinary distributed Observatories for the Study of Arctic Connections



- Forum for developing and sharing new ideas and methods regarding sustainable development in the face of rapid Arctic change.



Pan-Arctic, land-based program that would extend the activities that are currently in MOSAiC.

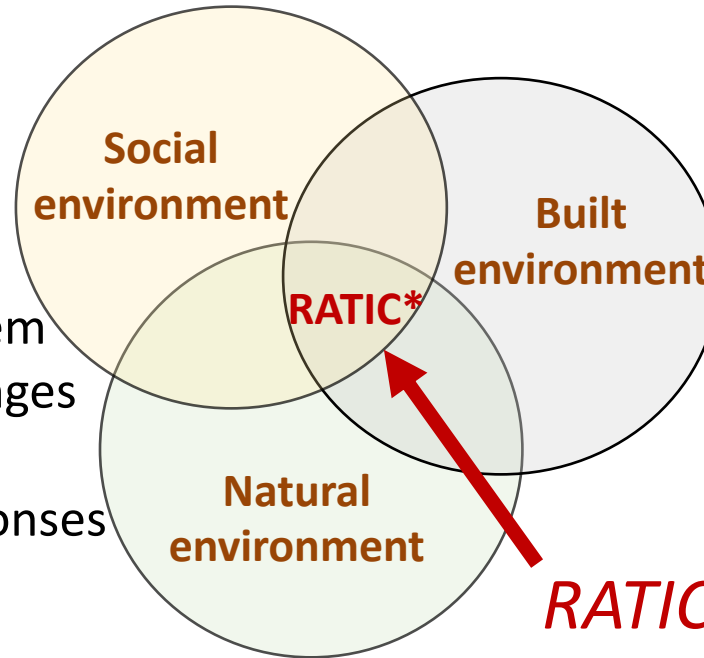
Simpler current RATIC conceptual diagram

Social environment

- Cumulative impacts of RATIC to subsistence and culture
- Analysis of historical indigenous infrastructure adaptations to climate change
- Social, economic, political & technological drivers of IRPS change
- Adaptive management of climate and infrastructure changes

Natural environment

- Documenting ice-rich permafrost system response to climate warming and changes to infrastructure
- Monitoring terrestrial ecosystem responses to changes in land/ air temperatures, hydrology, permafrost snow & contaminants at multiple scales
- Predictive ecosystem models of IRPS change



Built environment

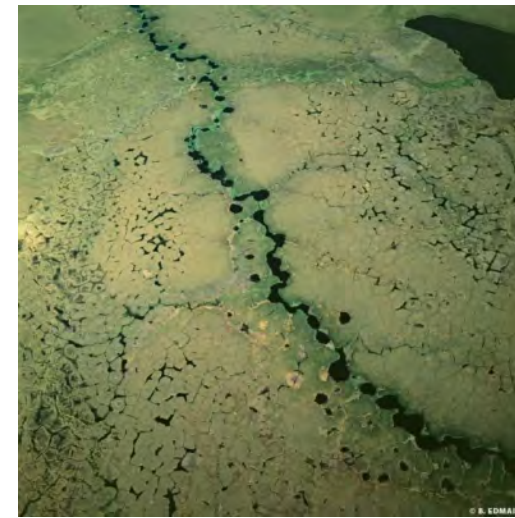
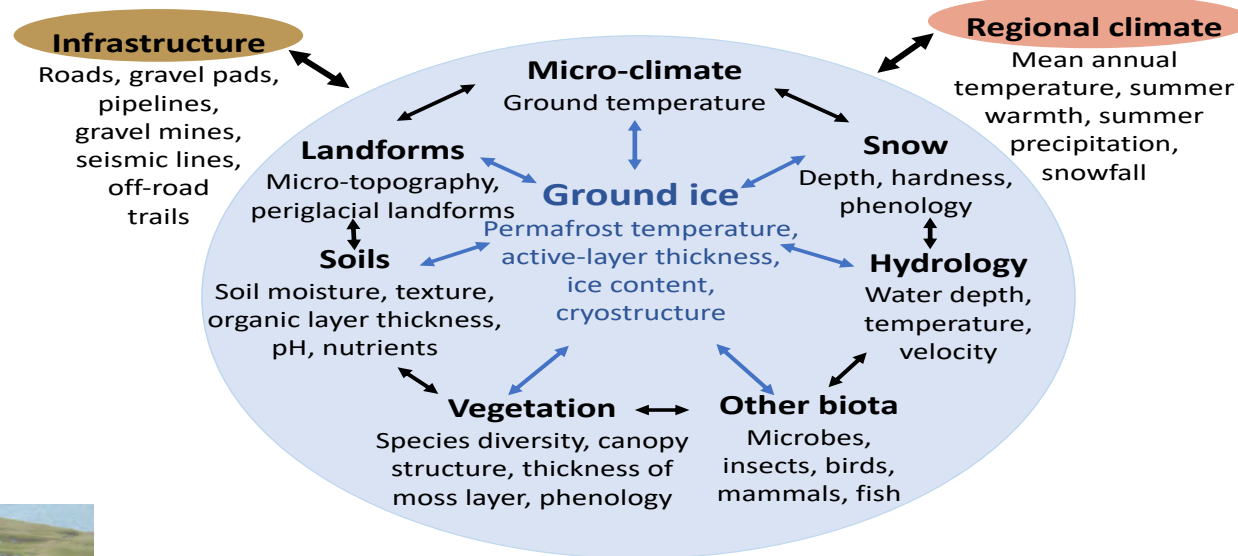
- Documenting and monitoring infrastructure response to climate warming
- Engineering solutions for infrastructure in urban nodes, remote villages, corridors
- Adaptive engineering solutions that include consideration of local culture, and indigenous knowledge

RATIC is focused at the interface between the Social, Built, and Natural Terrestrial Environments.

Effects of climate change and infrastructure on Ice-rich-permafrost systems (IRPS)



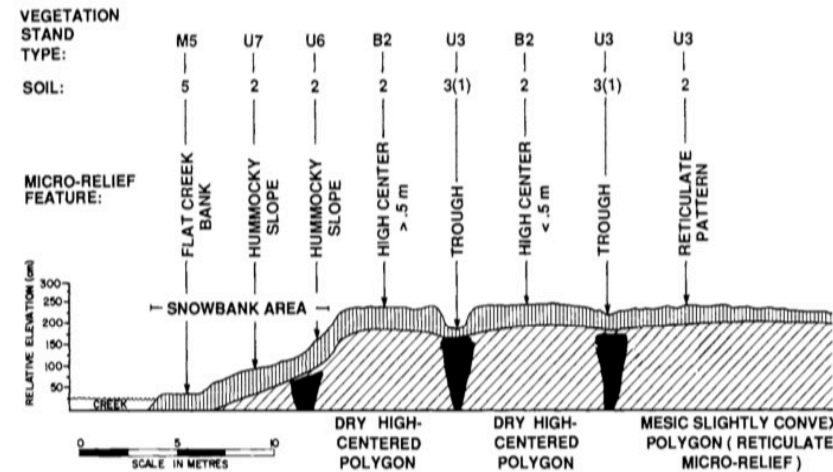
M. Kanevskiy.



TheGrapes. 2012. flickr.



M. Kanevskiy.



Walker & Everett. 1991. *Ecological Monographs*.



Walker et al. 2015. AGC 151.

Thermokarst collapse due to flooding Dalton Highway 2015



Dalton Highway near Deadhorse, May 25, 2015.

Shur et al. 2016. TICOP and in prep.

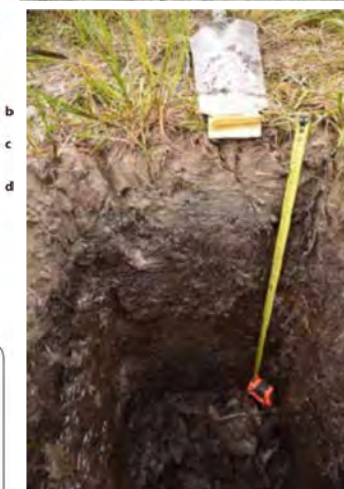
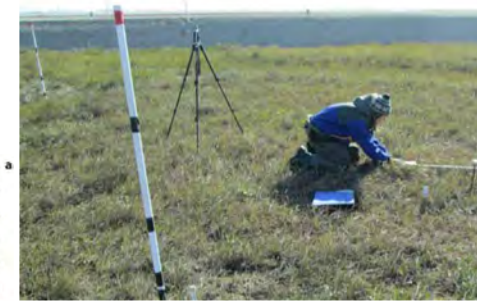
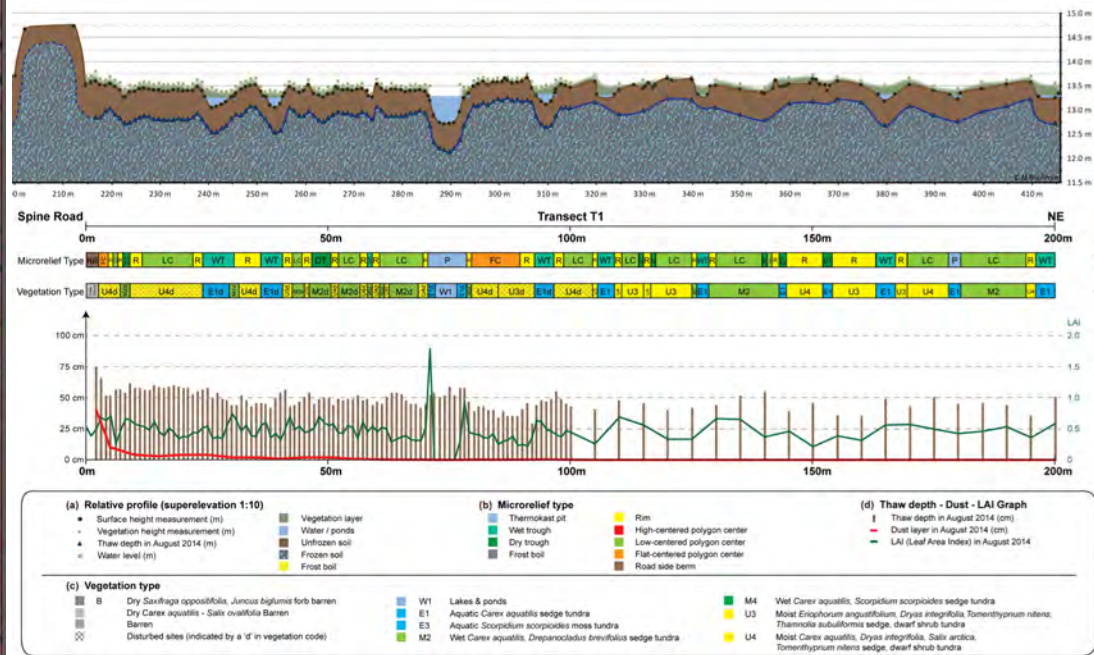
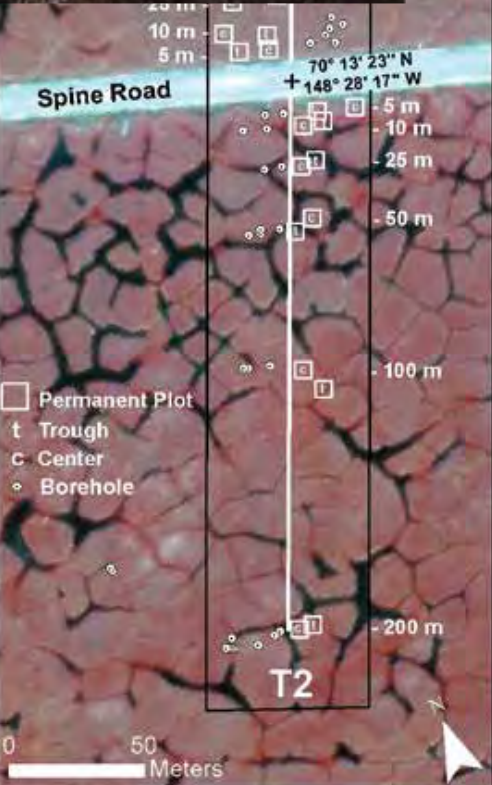


Photos: Courtesy of AKDOT & PF.

Underground thermal
erosion of ice wedges

ArcSEES roadside observatories

- Aerial photo time series
- Transect surveys
 - Micro-topography
 - Permafrost cores
 - Active layer
- Vegetation
- Soil
- Snow
- Dust
- Flooding



Housing adaptations to changing permafrost regimes



Adaptations at
Point Lay, Alaska

Photos courtesy of the Cold Climate
Housing Research Center, Fairbanks



RATIC Workshop Agenda, 26 May



- 9:00 Welcome and introductions
- 9:20 Presentations: Impacts and interactions of climate and infrastructure in the Arctic
- 10:30 Coffee and posters
- 11:00 Presentations: Approaches to research and adaptation
- 13:00 Lunch
- 14:00 Research directions: Prague workshop synthesis
- 14:20 Breakout groups: Natural, social and built environment perspectives on research needs
- 15:30 Coffee and posters
- 16:00 Research priorities: Report from breakout groups
- 16:30 Linkages and opportunities: Working across disciplines and geographic boundaries
- 17:30 RATIC 2020: Planning the next steps
- 18:00 Adjourn