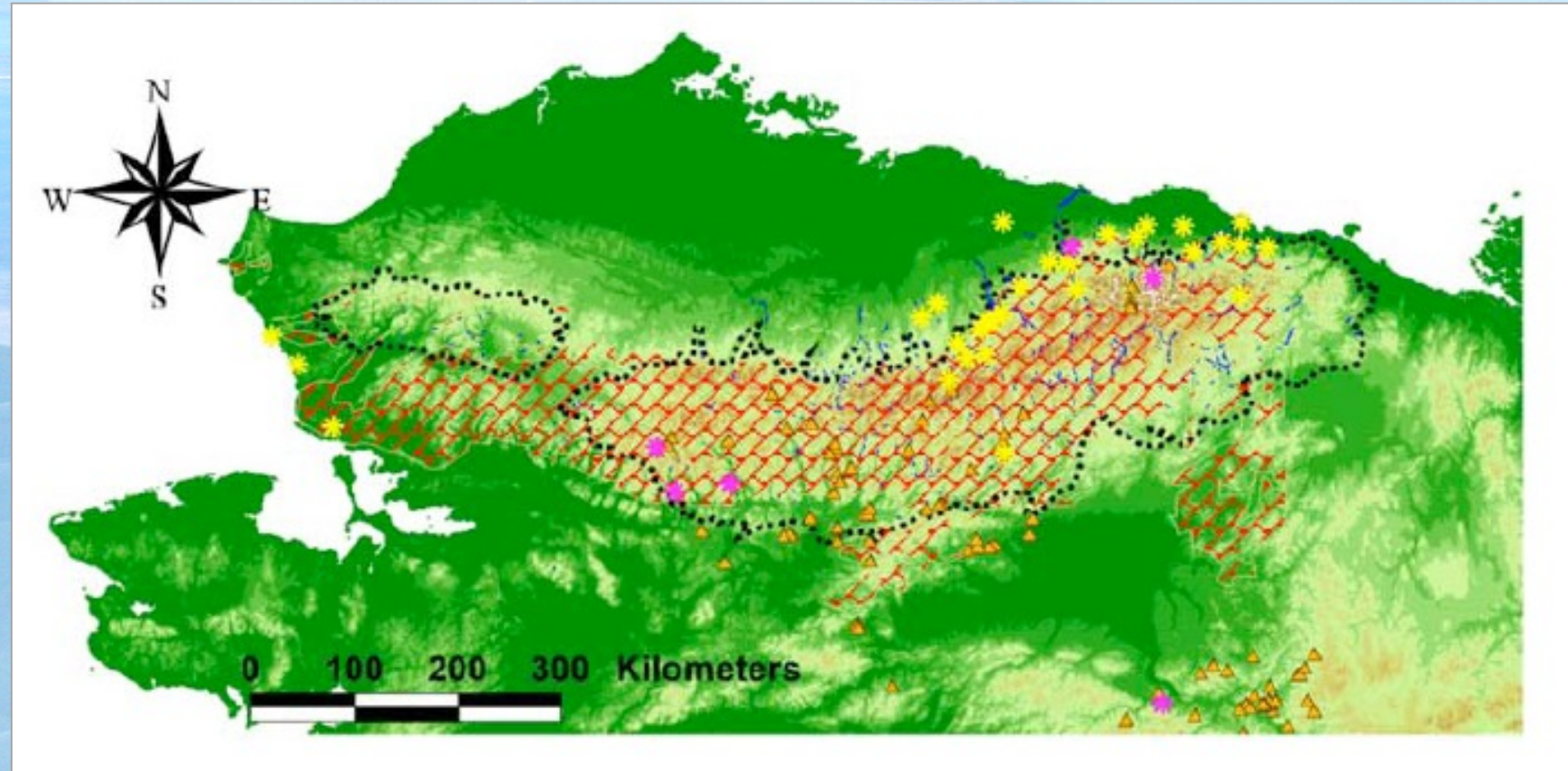




Spring stream - aufeis ecosystems – uniquely Arctic!

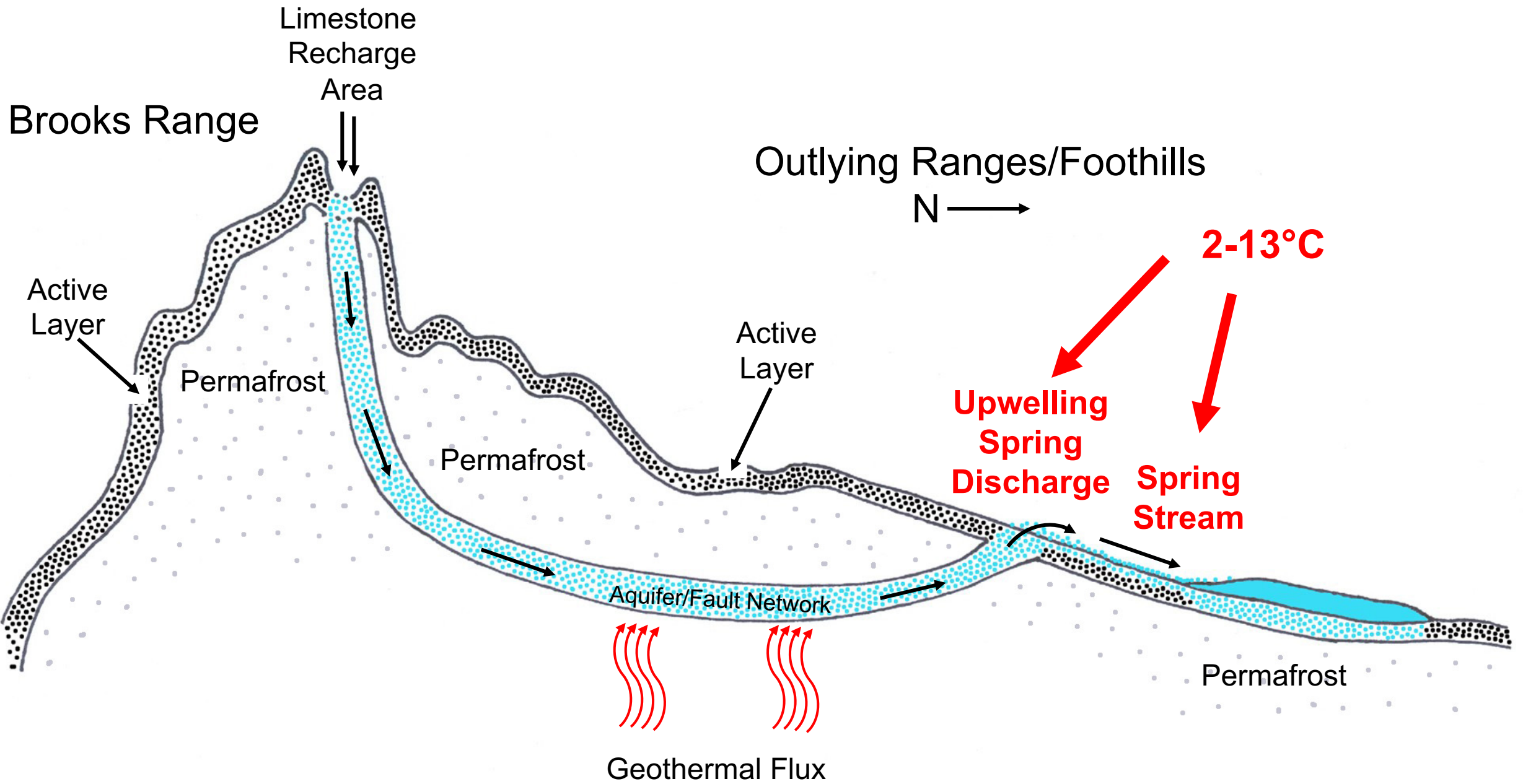
Alexander D. Huryn
University of Alabama

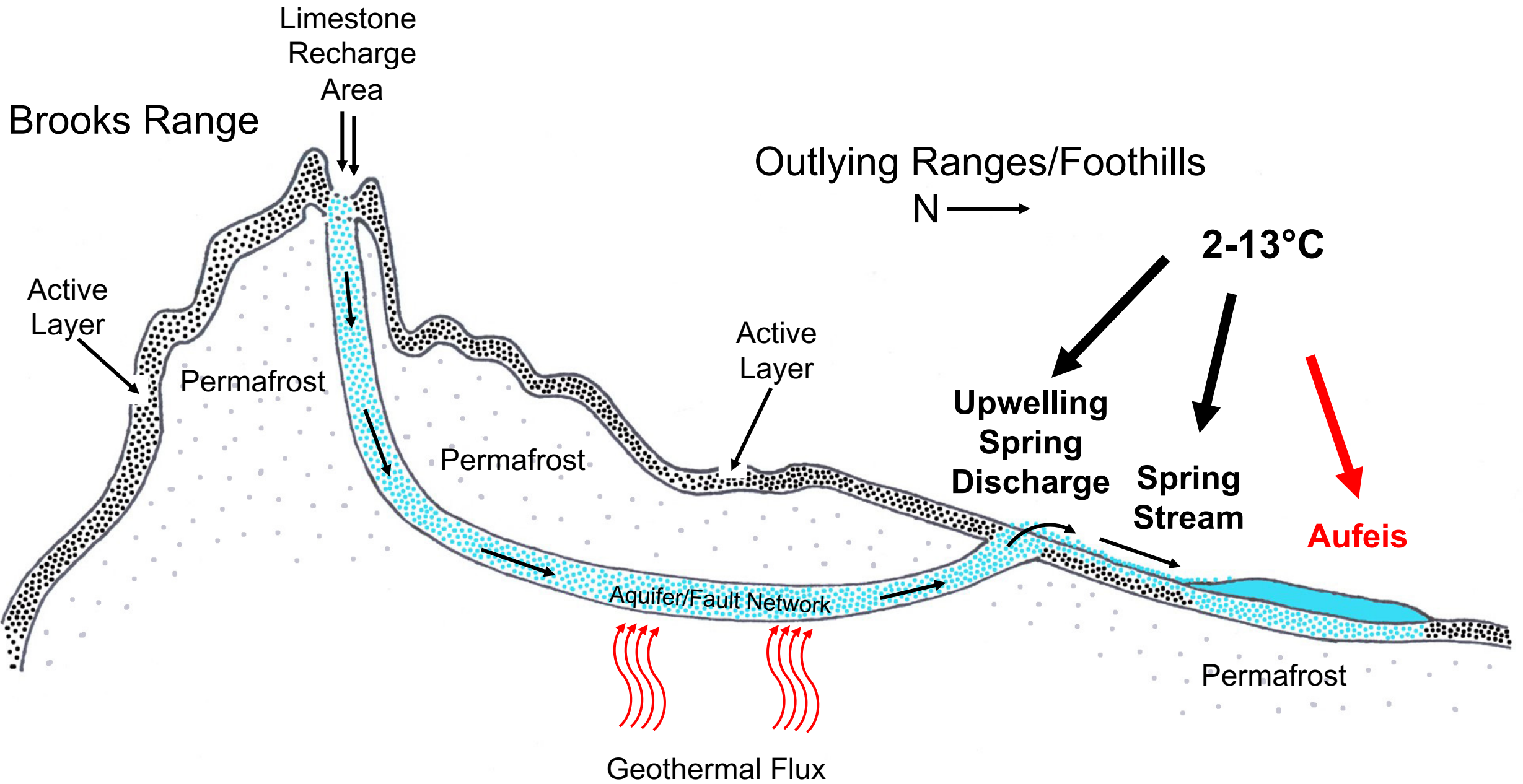
Perennial spring-streams of the North Slope



- ★ cool springs
- ★ hot springs
- ▲ open system pingos

From Yoshikawa et al. 2007





4/18/2010

Echooka River *aufeis* - 18 April 2010

(~ 3 X 12 km)

SPRING

3 km

Image © 2016 DigitalGlobe

Google Earth



2010

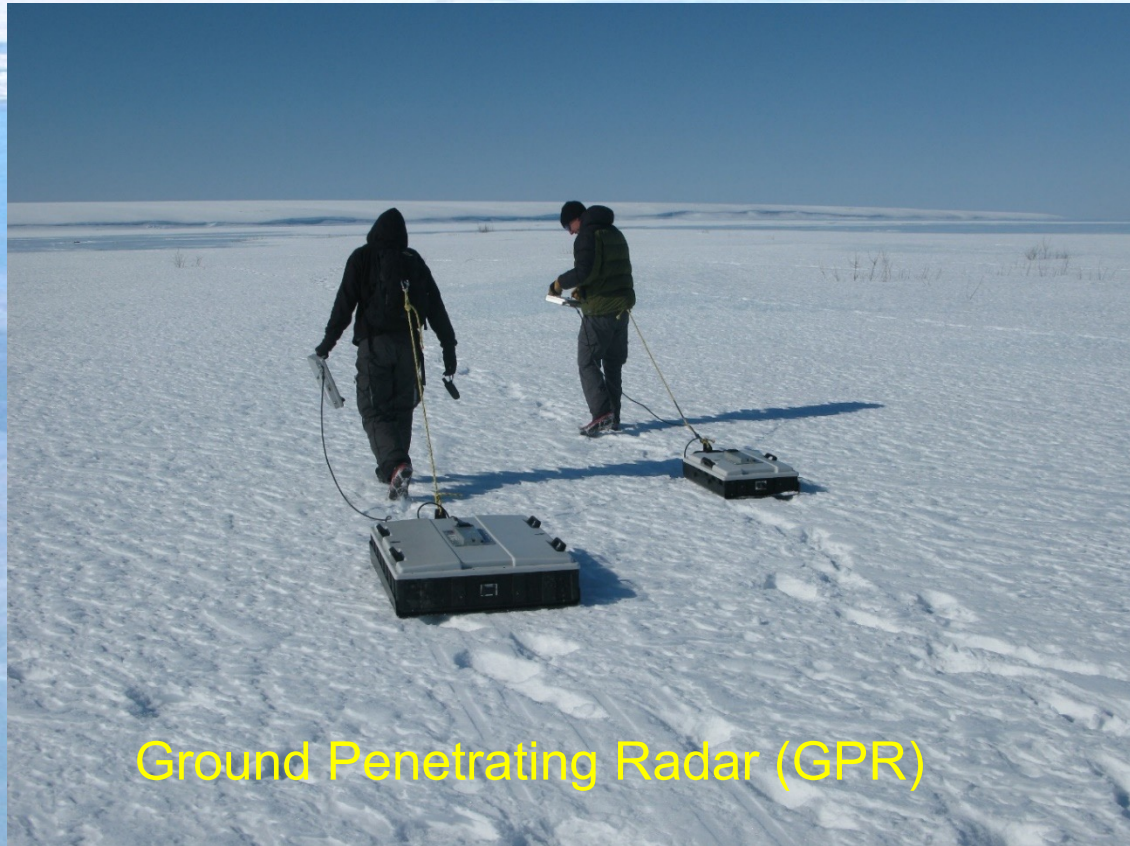
Imagery Date: 4/18/2010 69°16'04.21" N 147°28'43.09" W elev 1237 ft eye alt 32554 ft

Height of Robinson R44
helicopter is 3.3 m



Saviukviayak R.
aufeis in early
June (maximum
ice volume in
March/April)

Used GPR and NMR to assess presence and extent of subsurface water during maximum aufeis development in April 2017....



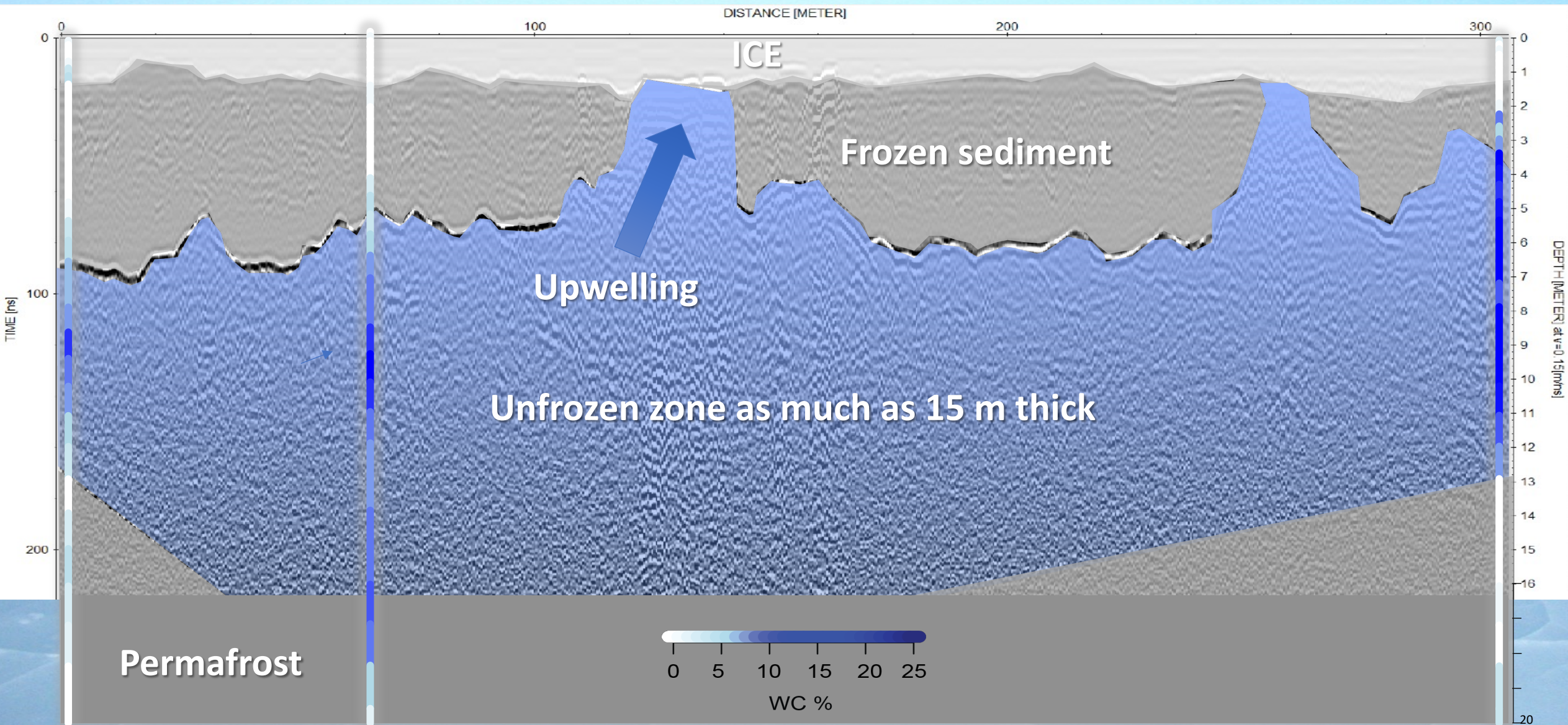
Ground Penetrating Radar (GPR)



Surface Magnetic Nuclear Resonance (NMR)

Terry, N.C., E. Grunewald, **M. Briggs**, **M. Gooseff**, A.D. Huryn, M.A. Kass, K. Tape, P. Hendrickson & J.W. Lane, Jr. 2020. Seasonal subsurface thaw dynamics of an aufeis feature inferred from geophysical methods. *Journal of Geophysical Research: Earth Surface*, 125.3, e2019JF005345. <https://doi.org/10.1029/2019JF005345>

“Large volume of unfrozen groundwater habitat in winter”

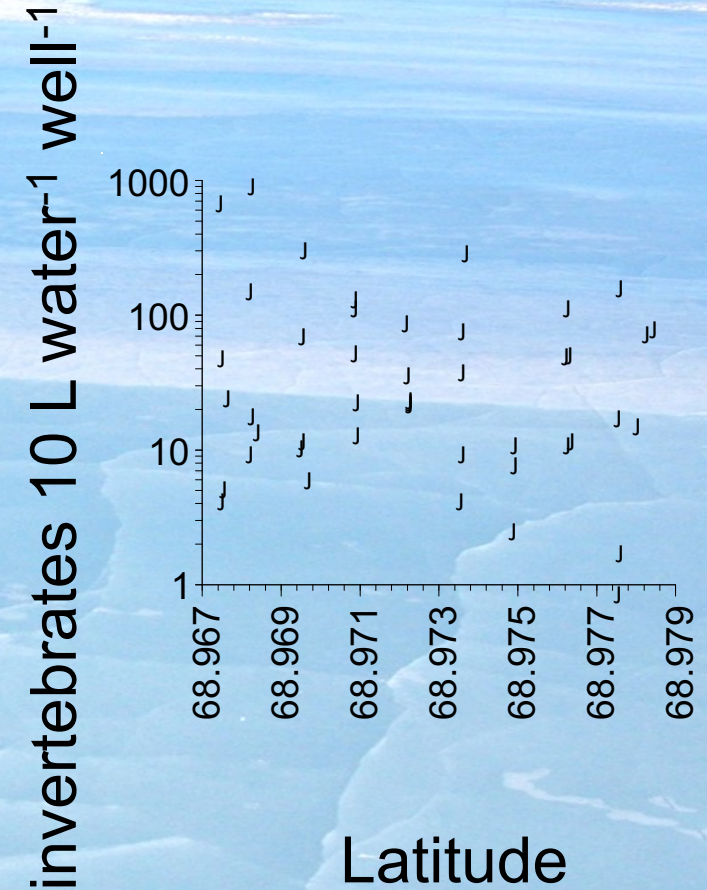


The
“ah ha”
moment!



Habitat beneath aufeis hosts community characterized by groundwater-specialist invertebrates

- **capniid and chloroperlid stoneflies**
- flatworms
- annelids
- cyclopoids & harpacticoids
- *Krenosmittia* (hyporheic midge)
- *Trichotanypus* (midge)
- others...

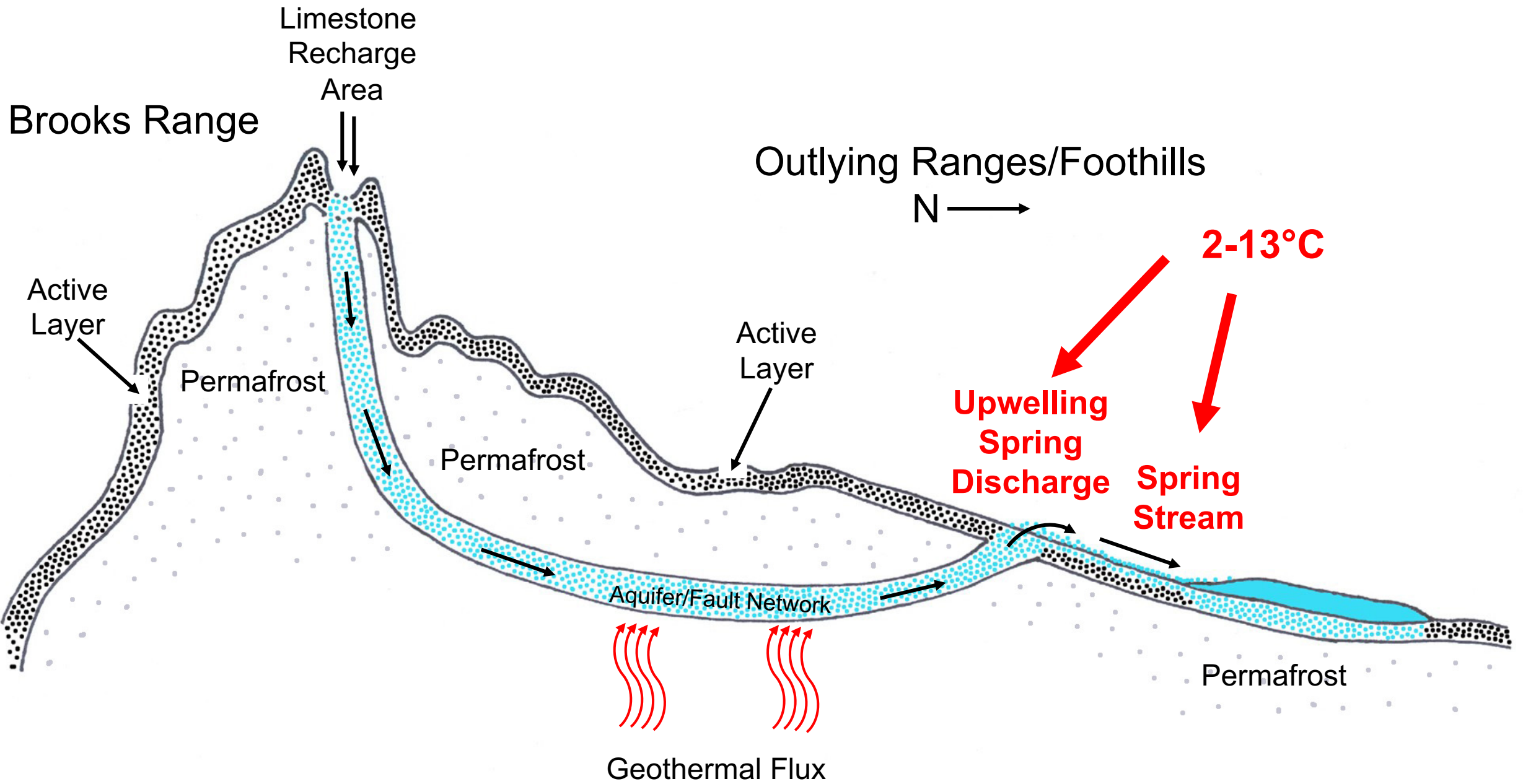


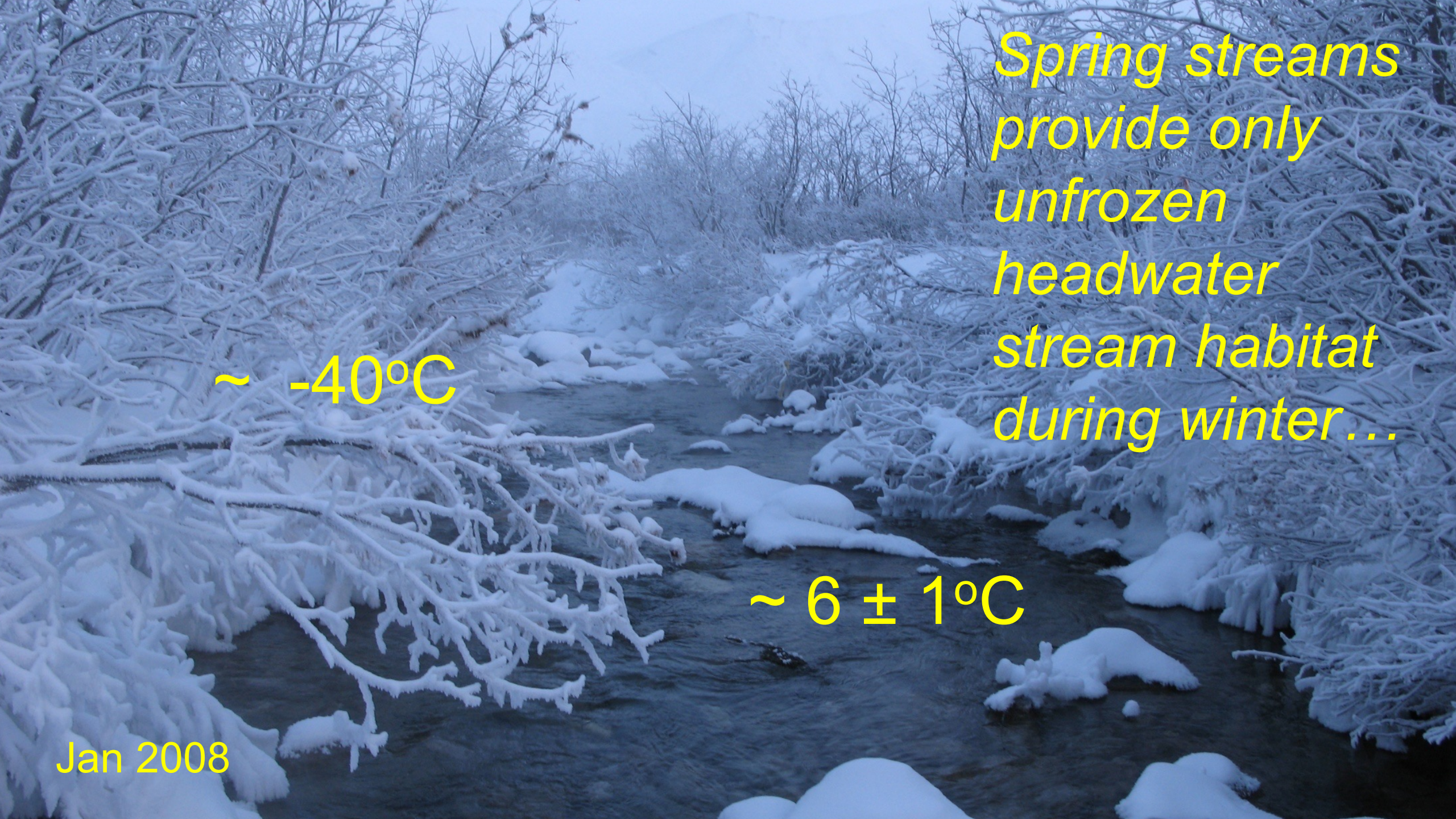
Huryn, A.D., M.N. Gooseff, P.J. Hendrickson, M.A. Briggs, K.D. Tape & N.C. Terry. 2020. *Aufeis* fields as novel groundwater-dependent ecosystems in the arctic cryosphere. *Limnology & Oceanography* 66:607-624.

Groundwater-specialist stoneflies in aufeis fields on the North Slope of Alaska and the Flathead River drainage, Montana (Stanford et al. 1994, Kendrick & Huryn 2014).

	Montana	North Slope, AK
<i>Isocapnia crinita</i>	X	X
<i>I. grandis</i>	X	X
<i>I. integra</i>	-	X
<i>I. vedderensis</i>	X	X
<i>Kathroperla perdita</i>	X	-
<i>Paraperla frontalis</i>	X	X
<i>Perlomyia utahensis</i>	X	-







*Spring streams
provide only
unfrozen
headwater
stream habitat
during winter...*

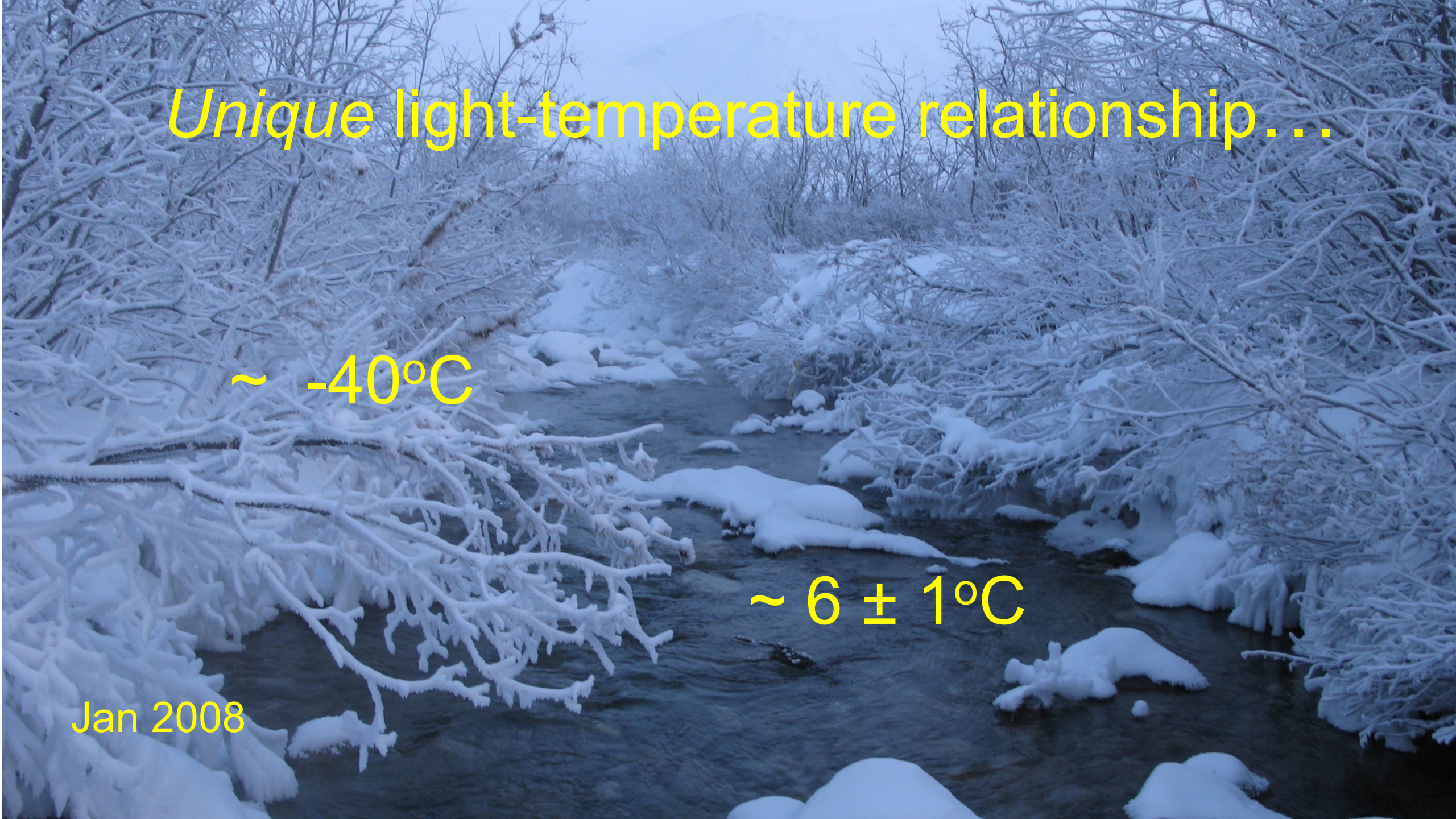
~ -40°C

~ $6 \pm 1^\circ\text{C}$

Jan 2008



*... are critical habitat for
species requiring shallow,
flowing water during
winter...*



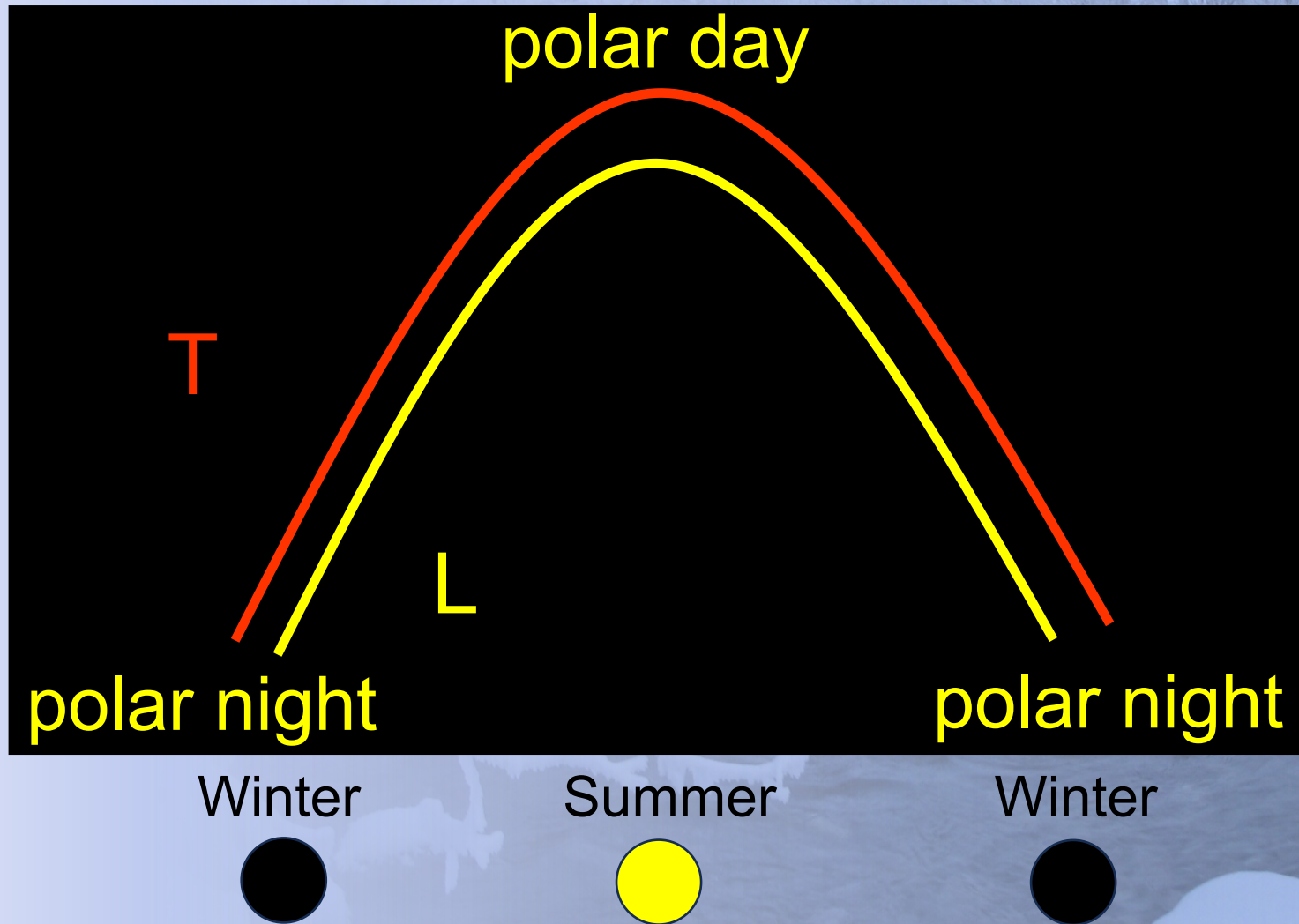
Unique light-temperature relationship...

$\sim -40^{\circ}\text{C}$

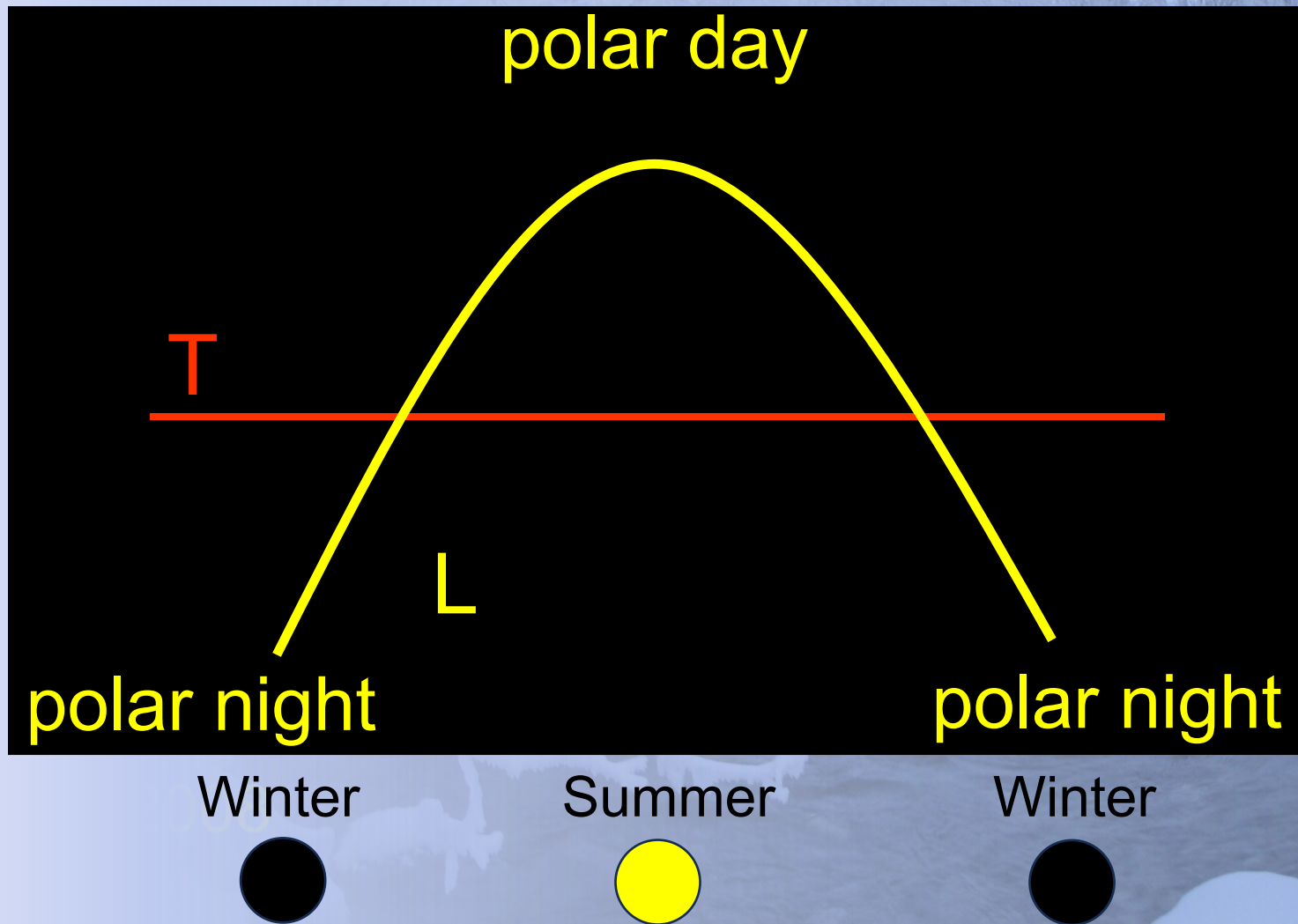
$\sim 6 \pm 1^{\circ}\text{C}$

Jan 2008

Unique light-temperature relationship...



Unique light-temperature relationship...



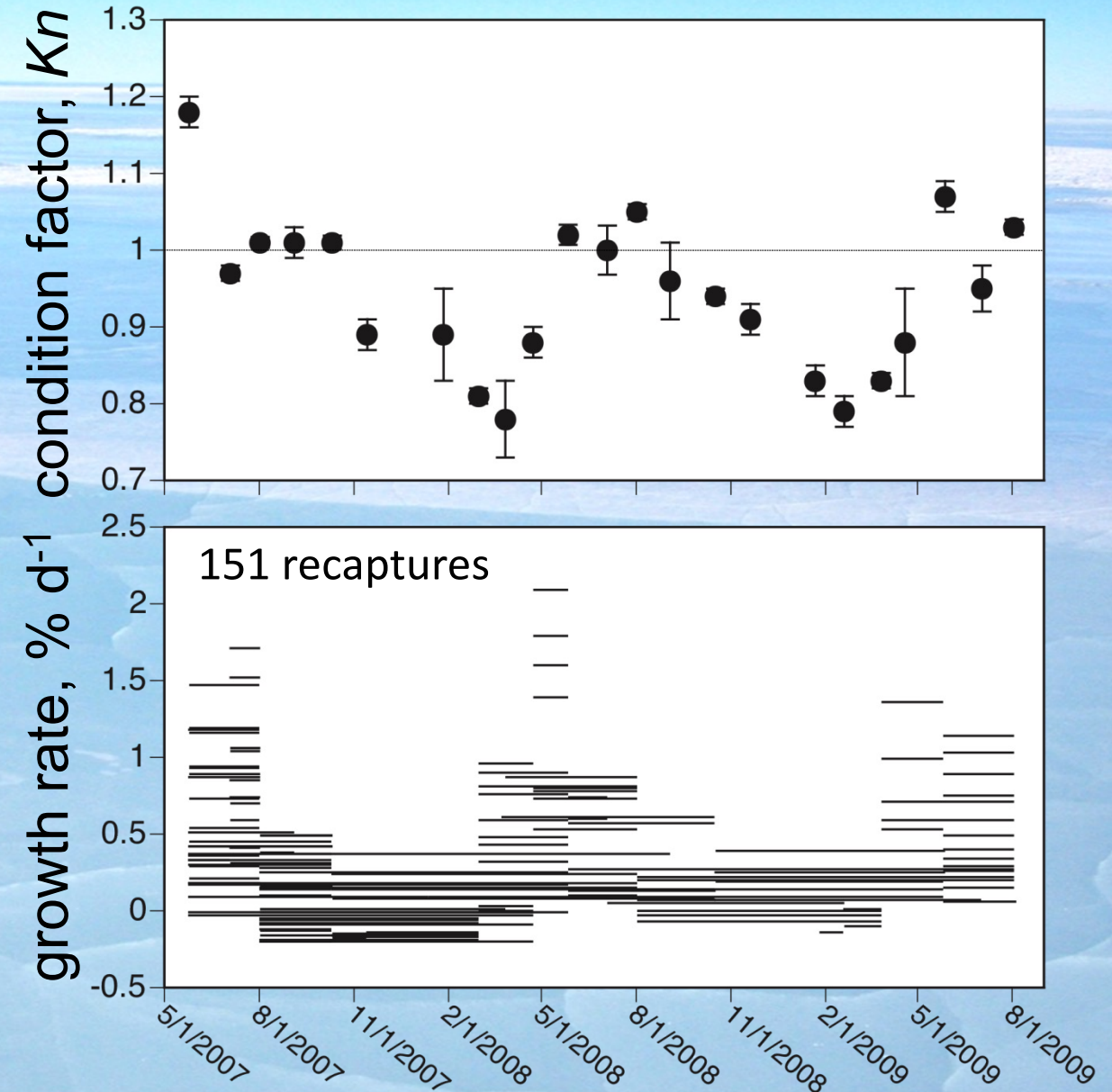
A key
mystery
to
solve!

Severe winter carbon-limitation of consumer growth!



Salvelinus malma

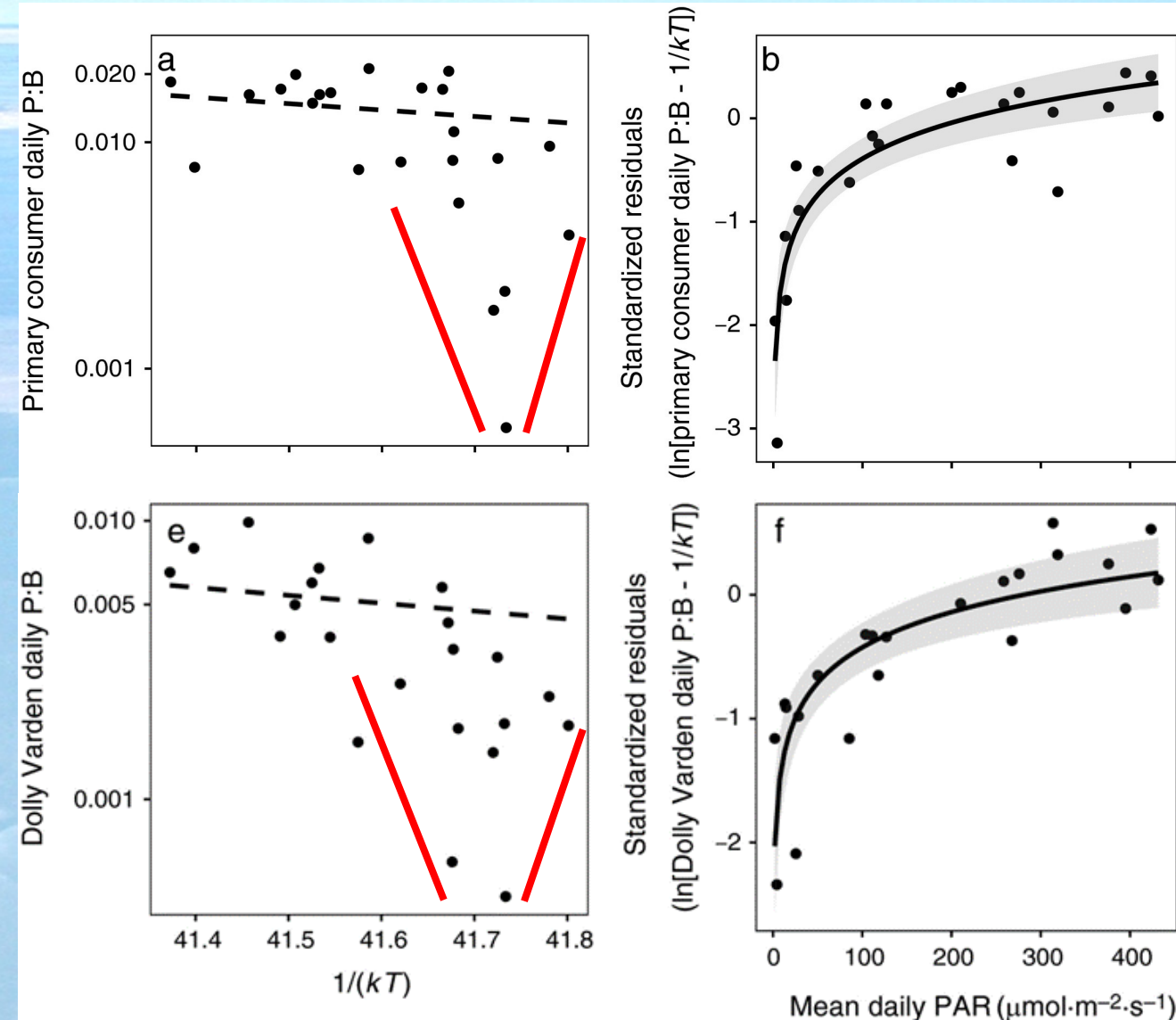
Hurn, A.D. & J.P. Benstead. 2019. Seasonal changes in light availability modify the temperature dependence of secondary production in an arctic stream. *Ecology* **100**:1-15. doi:10.1002/ecy.2690



Consumer growth rates lowest at lowest light levels rather than coldest temperatures



Hury, A.D. & J.P. Benstead. 2019. Seasonal changes in light availability modify the temperature dependence of secondary production in an arctic stream. *Ecology* **100**:1-15. doi:10.1002/ecy.2690



A photo from
the field!







*Be sure to check out posters by Tori Hebert and Adam Hensley to learn about **our current “Freeze and Famine” project** which uses multiple spring-streams to further explore the relationship between temperature, light and ecosystem energetics*



Tori Hebert

- **Hebert, Tori.** “Seasonal eco-enzymatic activity of primary producers in arctic spring-streams along a temperature gradient”



Adam Hensley

- **Hensley, Adam.** “Light and temperature as drivers of organismal metabolism in arctic spring-streams”

Acknowledgments



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Carla Atkinson



Tori Hebert



Adam Hensley



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- Arctic National Wildlife Refuge
- Alaska Department of Fish & Game
- Mike Gooseff, Marty Briggs, James Ramsey & Annie Blalock
- Department of Biological Sciences, University of Alabama

