Geothermal Energy Lab

Exploration Geology and Geophysics

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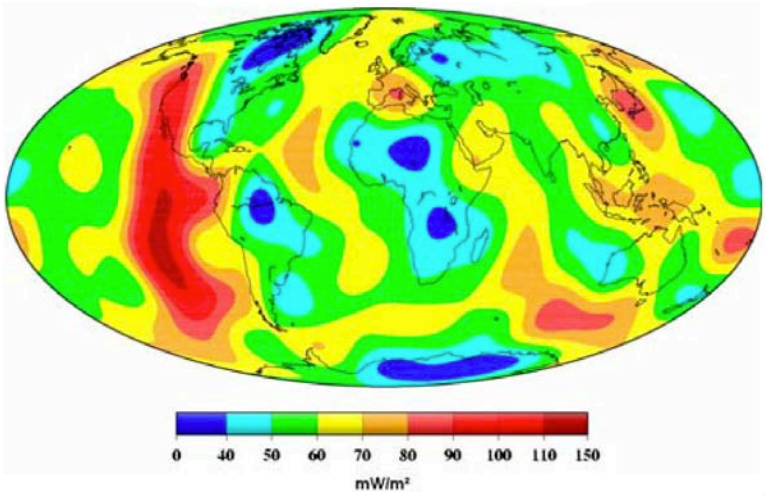
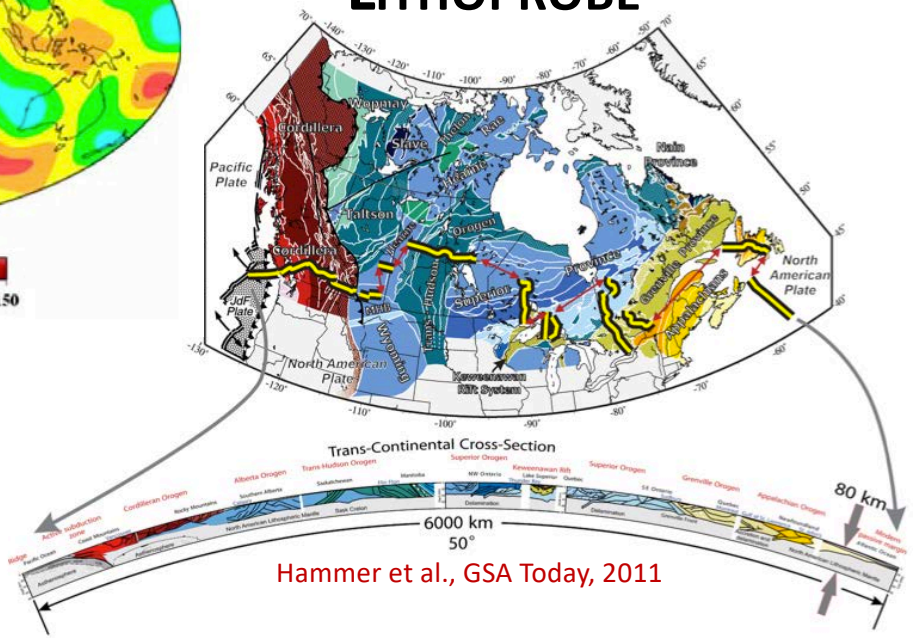
Geophysical Investigations

Global Heat Flow



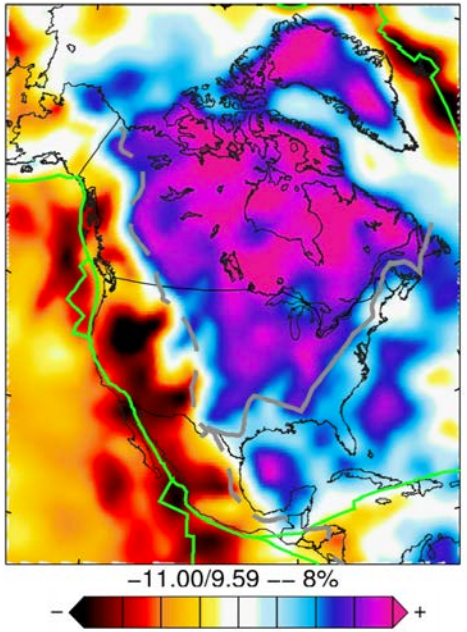
Hamza et al., Int. J. Earth Sci., 2008

Lithoprobe



Hammer et al., GSA Today, 2011

Upper Mantle – V_S @ 100 km



Schaeffer and Lebedev, EPSL, 2014

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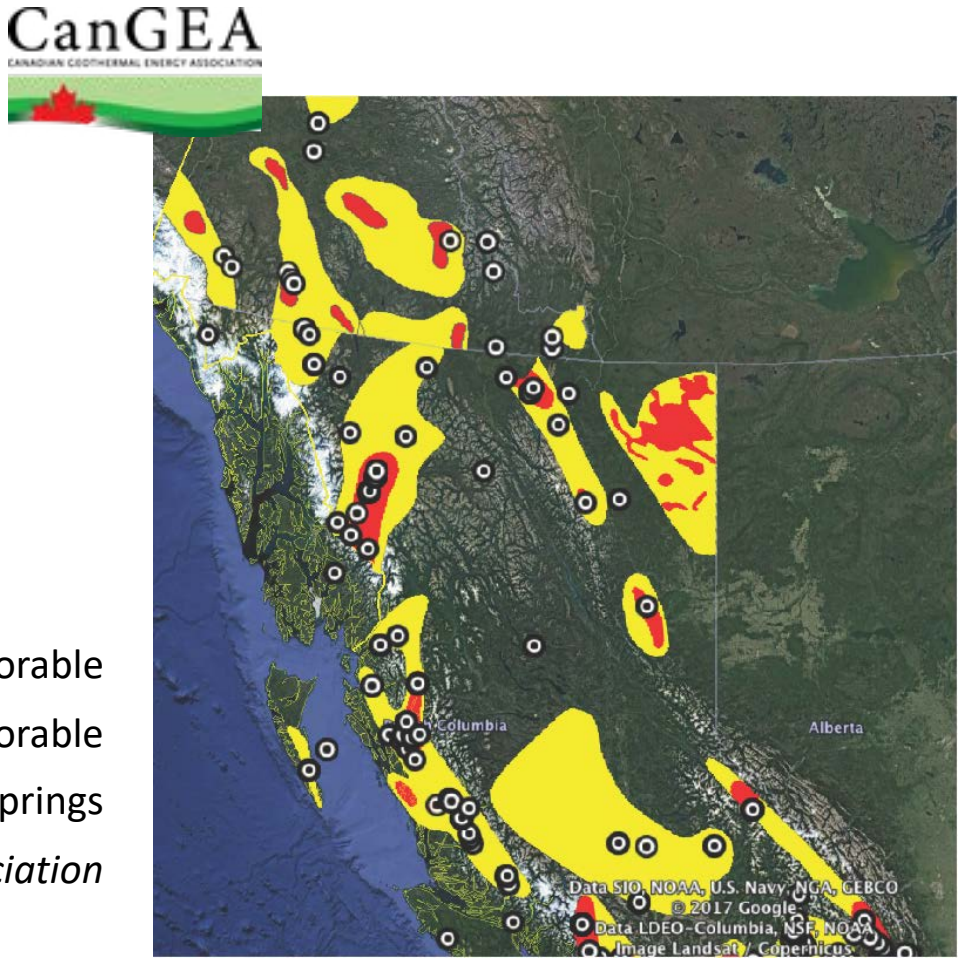
Geothermal favorability in western Canada

- Exploration in areas of moderate and high geothermal favorability
- Linear stretch of hot springs along the Rocky Mountain Trench
- Areas of elevated surface heat flow



Yellow – moderately favorable

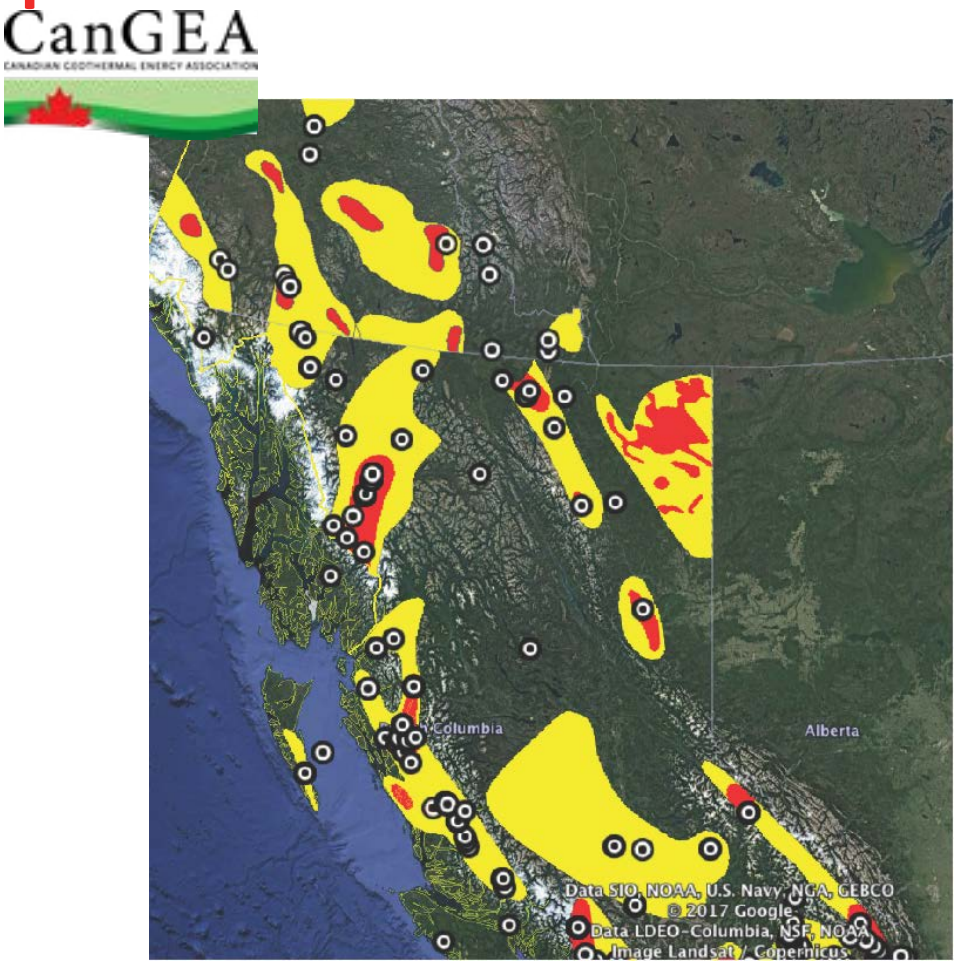
Red – highly favorable

White circles - hot springs

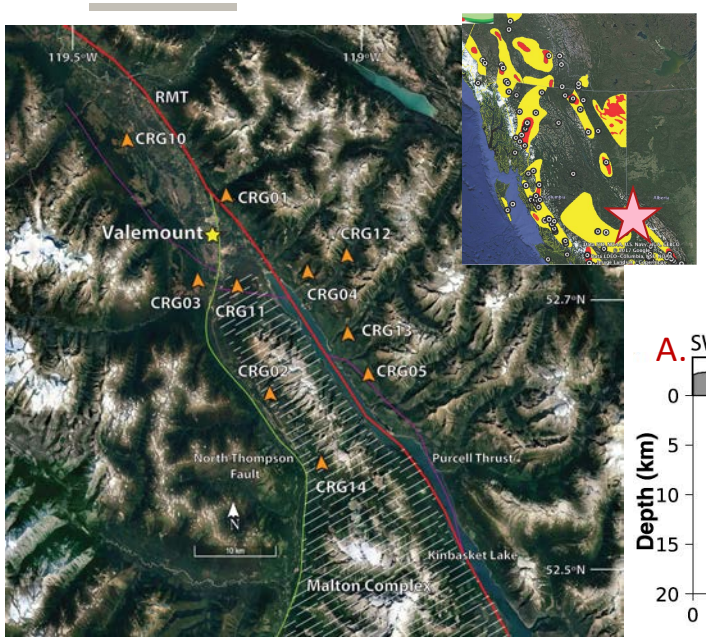
Canada Geothermal Energy Association

Targets/goals of geothermal exploration

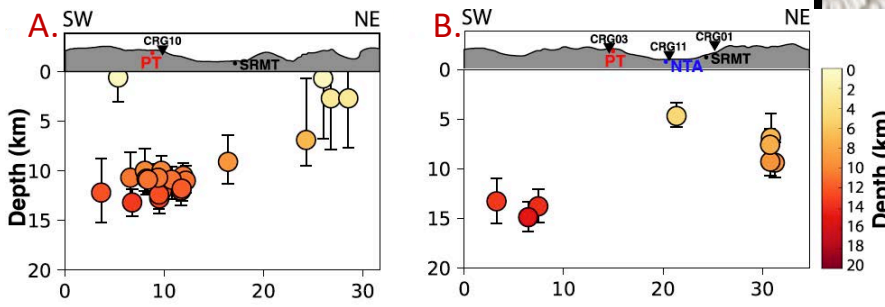
- Sources of geothermal heat
- Identify targets
- Distribution of faults and fractures
  - Define fluid pathways
  - Track injected fluids
- Monitor and characterize geothermal reservoir during production
- Monitor hazards
- Integrate seismic with other geologic/geophysical observations

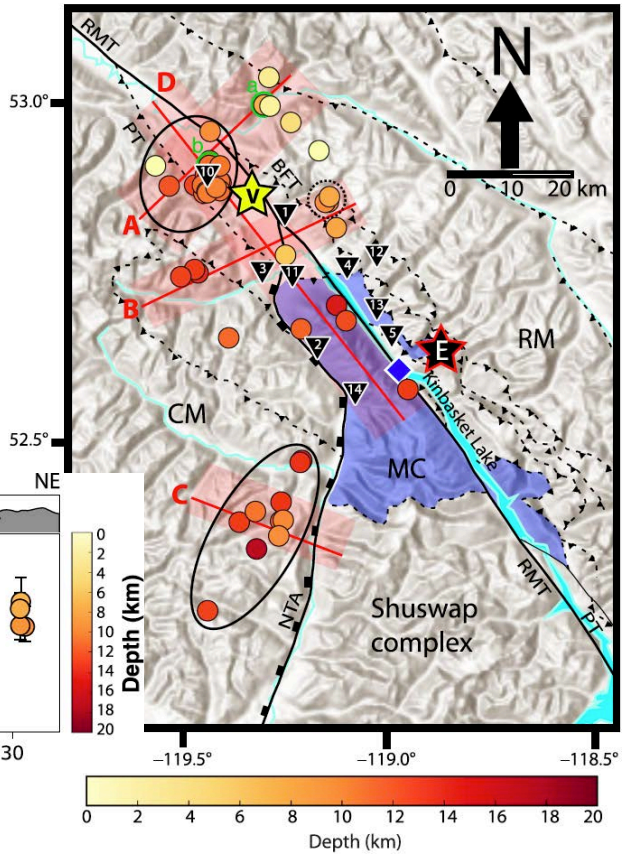


Canoe Reach Monitoring Network



- Detect several clusters of events
- Identify faults and potential fluid pathways
- Ongoing structural investigations into heat source of geothermal springs.





Purba et al., Seismo. Res. Lett., 2021

- Joint investigation by Univ. of Calgary, Borealis, and Nanometrics
- 10 broadband stations operated 2017-2018

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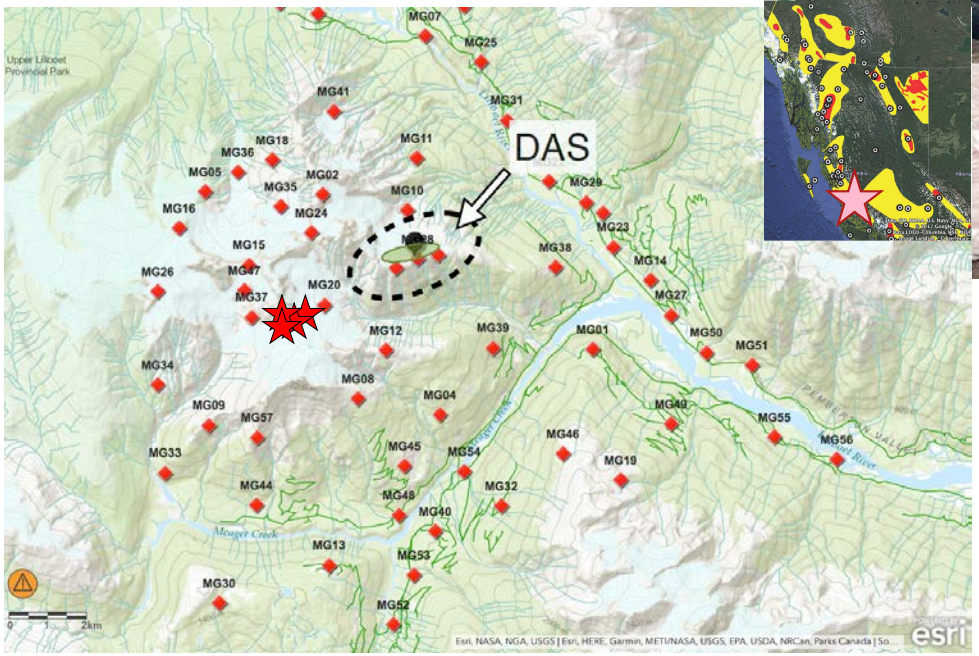
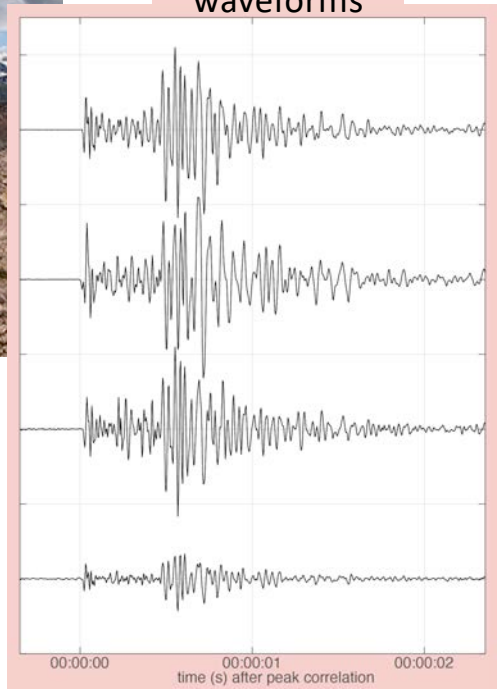
Mt. Meager Array



Grasby and Salas, EOS., 2020

- Goal to identify distribution of faults and fluids through a joint interpretation of MT, gravity, and seismic observations.

repeating microseismicity waveforms



- Repeating microseismicity often associated with fluid migration

- Multidisciplinary project including NRCan, Geoscience BC, UBC, SFU, UofA, seismic array operated by Univ. of Calgary
- 30-60 10 Hz geophones deployed Summer, 2019

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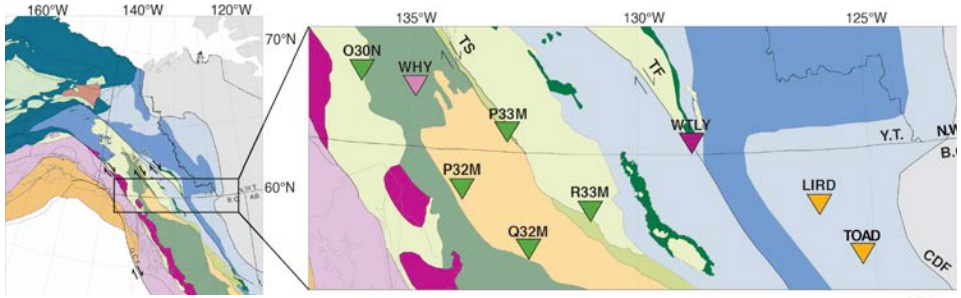
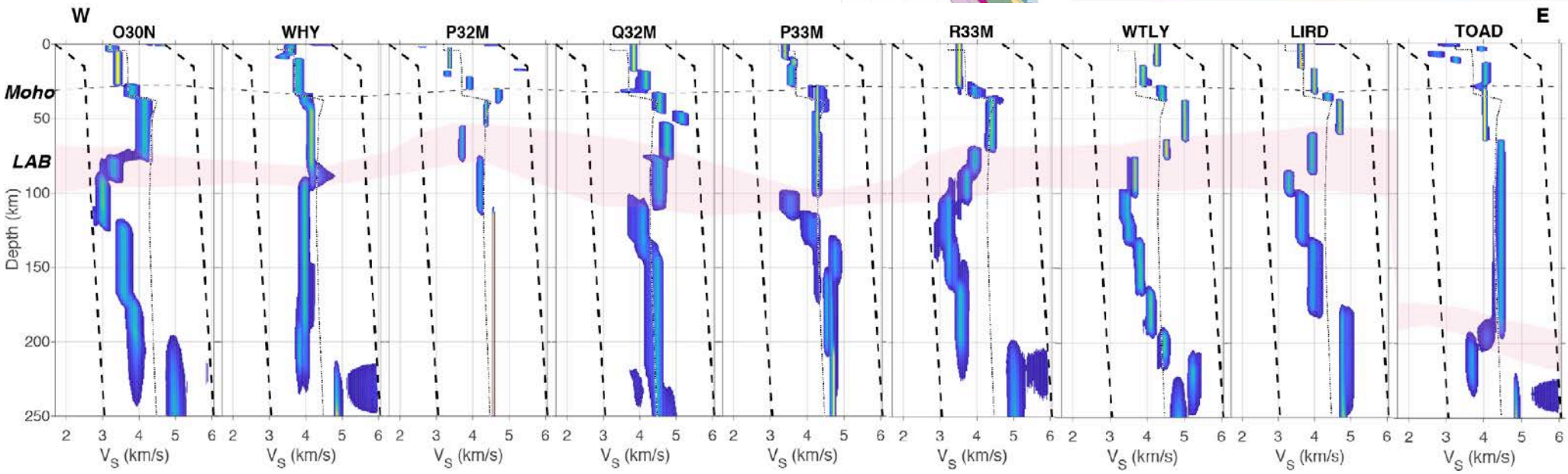
Northern Canadian Cordillera





- Receiver function inversion by Jacquelyn Smale (UofC MSc, 2020) utilizing openly available seismic data
- Asthenosphere at 50-70 km depth characterized by low V_S beneath Northern Cordillera volcanic province
- Large reduction of V_S requires the presence of ~2.5% partial melt in the uppermost mantle.

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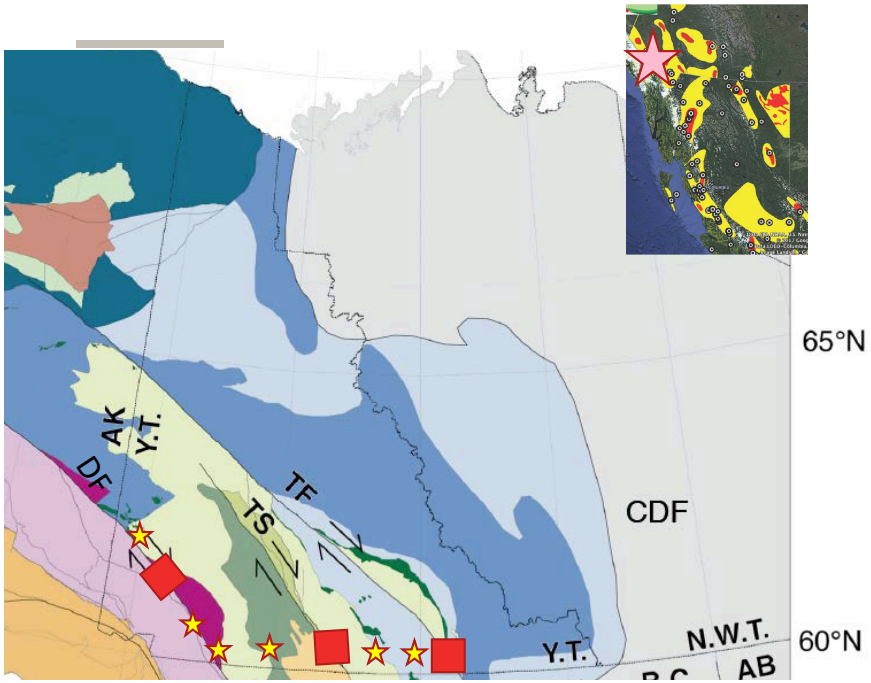
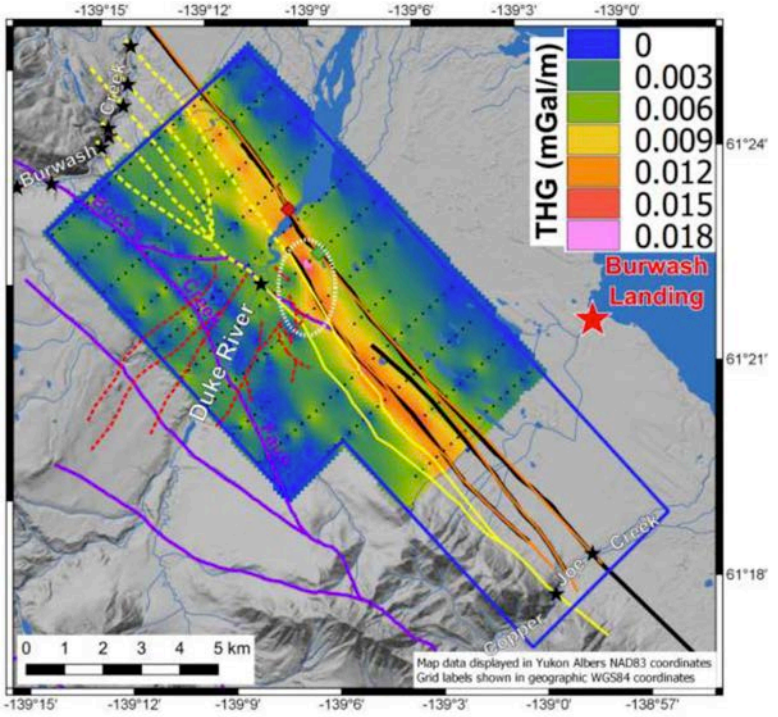
Geothermal along strike-slip faults in southern Yukon



Denali Fault - THG (total horizontal gradient) of gravity survey data at Burwash Landing.

Focus areas of upcoming local and regional scale imaging and monitoring.



Witter, YGS Report, 2020

- Joint project w/ Yukon Geologic Survey, NRCan, Univ. of Calgary, and others.
- Focused geothermal exploration around Burwash Landing, Watson Lake, and Teslin
- Characterize seismic activity, structure, and fluid pathways of major SS faults

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Thank you

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