



Monitoring Culvert Insulation The Dempster Highway, YT

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Dempster Highway - Culvert Monitoring

Objective:

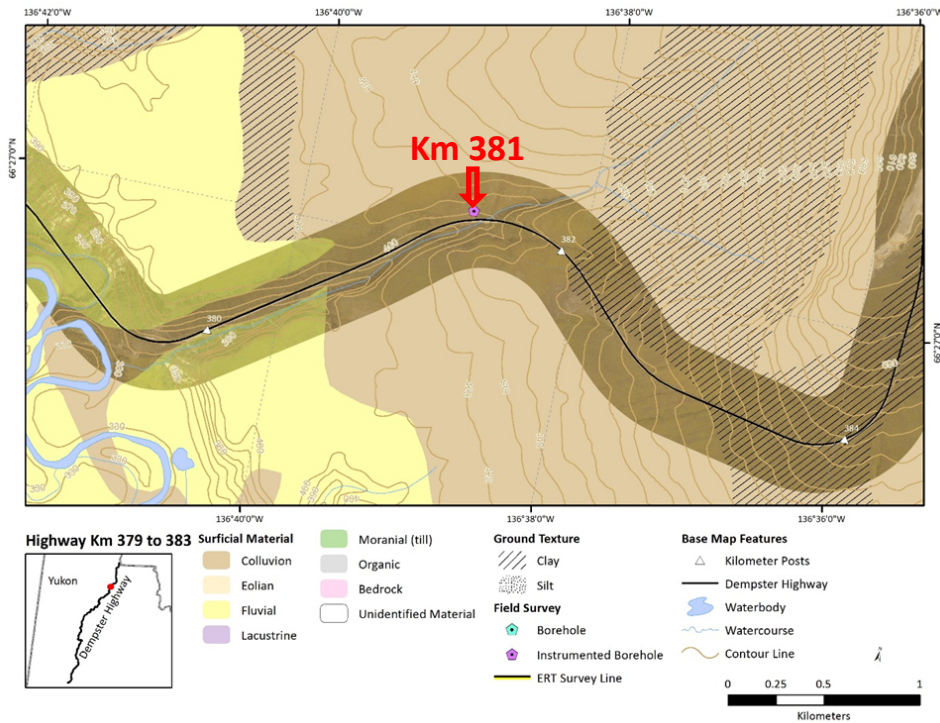
- Monitor the impact of a newly installed culvert on permafrost
- Assess the efficiency a foam insulating layer

Methods:

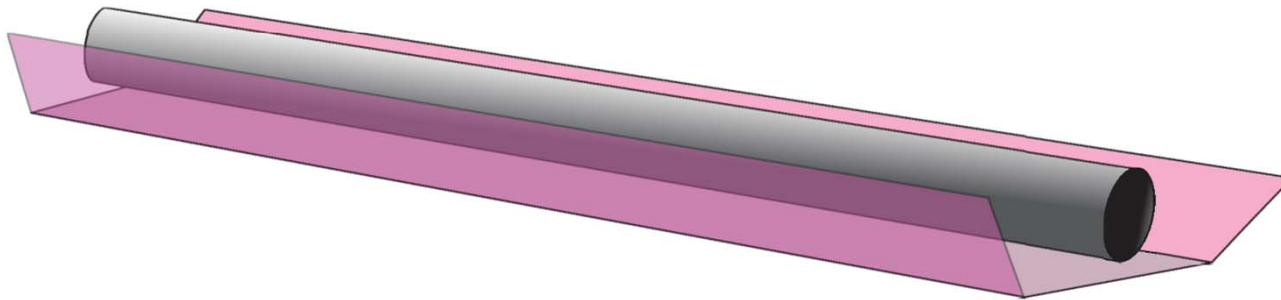
- Ground temperature monitoring
- Electrical Resistivity Tomography (ERT)



Study site

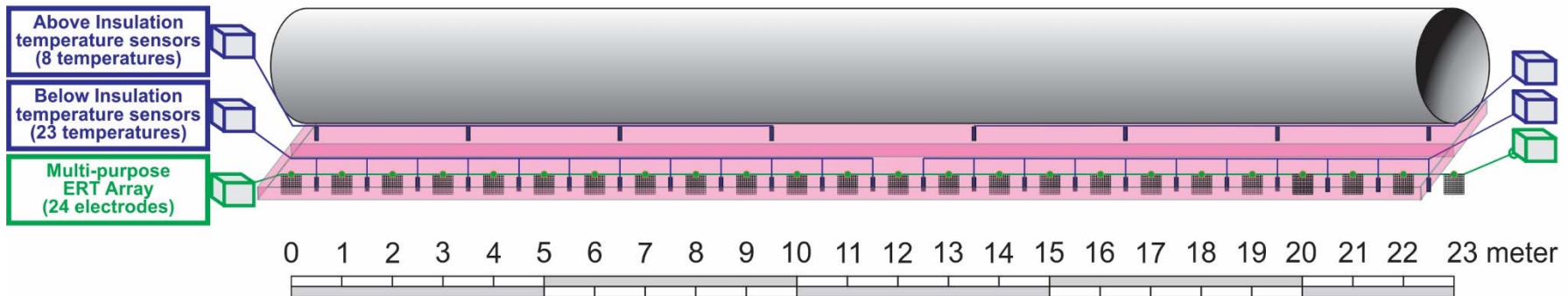


Culvert Monitoring - Setup

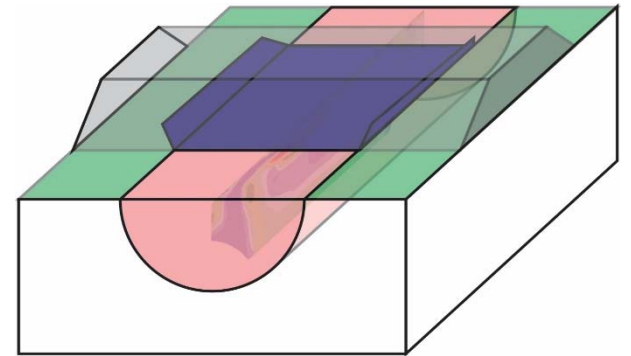
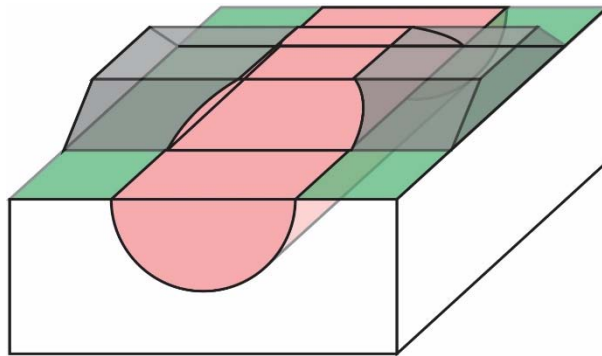
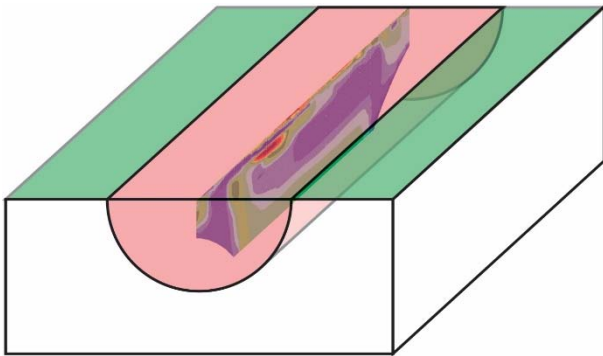
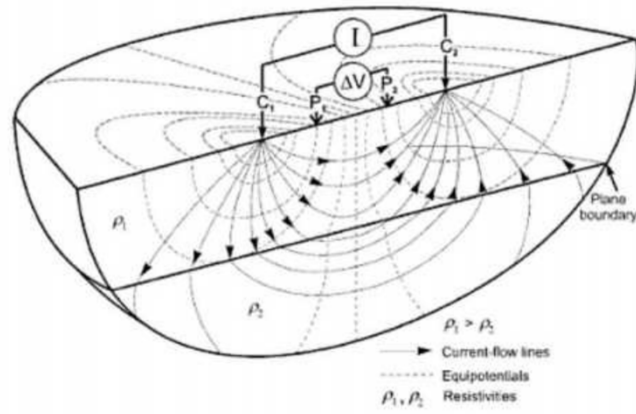


North

South



ERT - Concepts



Construction & Instrumentation

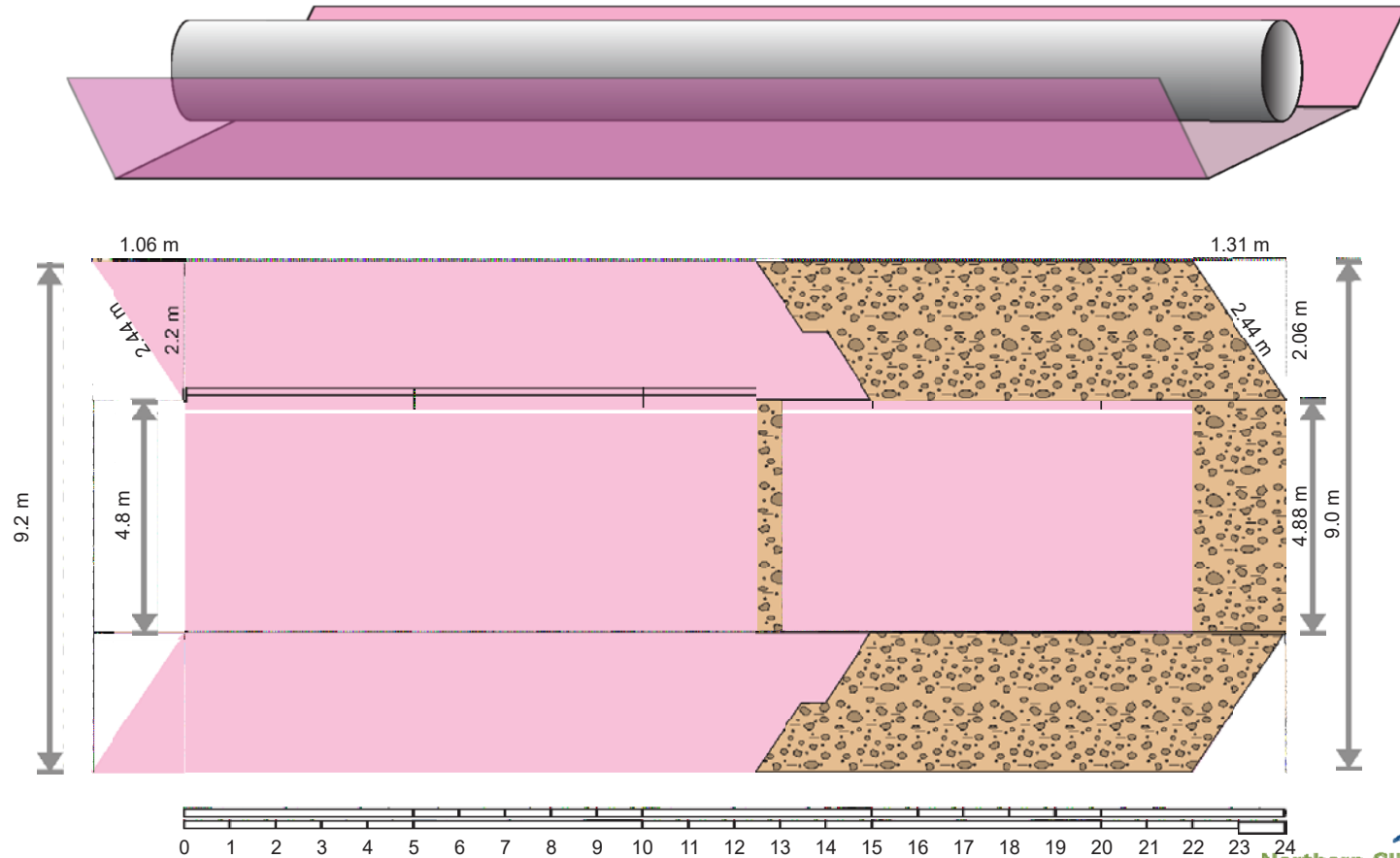


Field ground temperature

- 4.55 m temperature borehole aligned with the culvert and ERT array



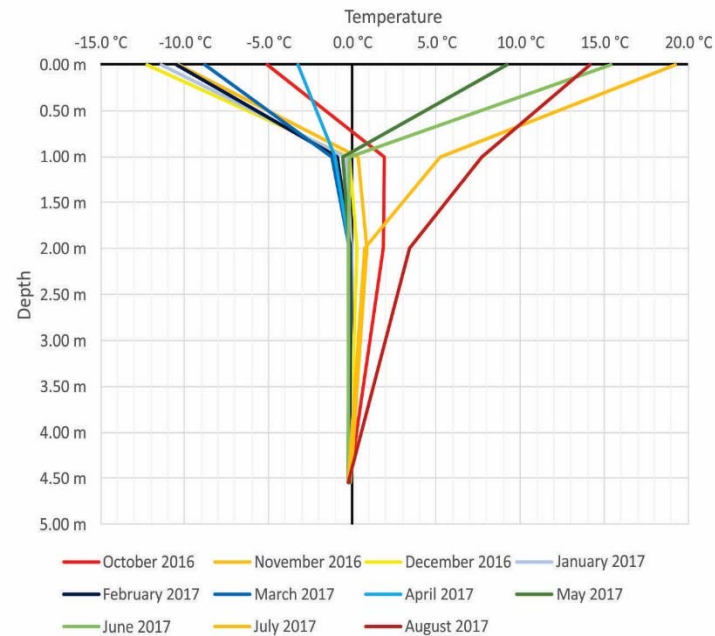
The Contractor Factor



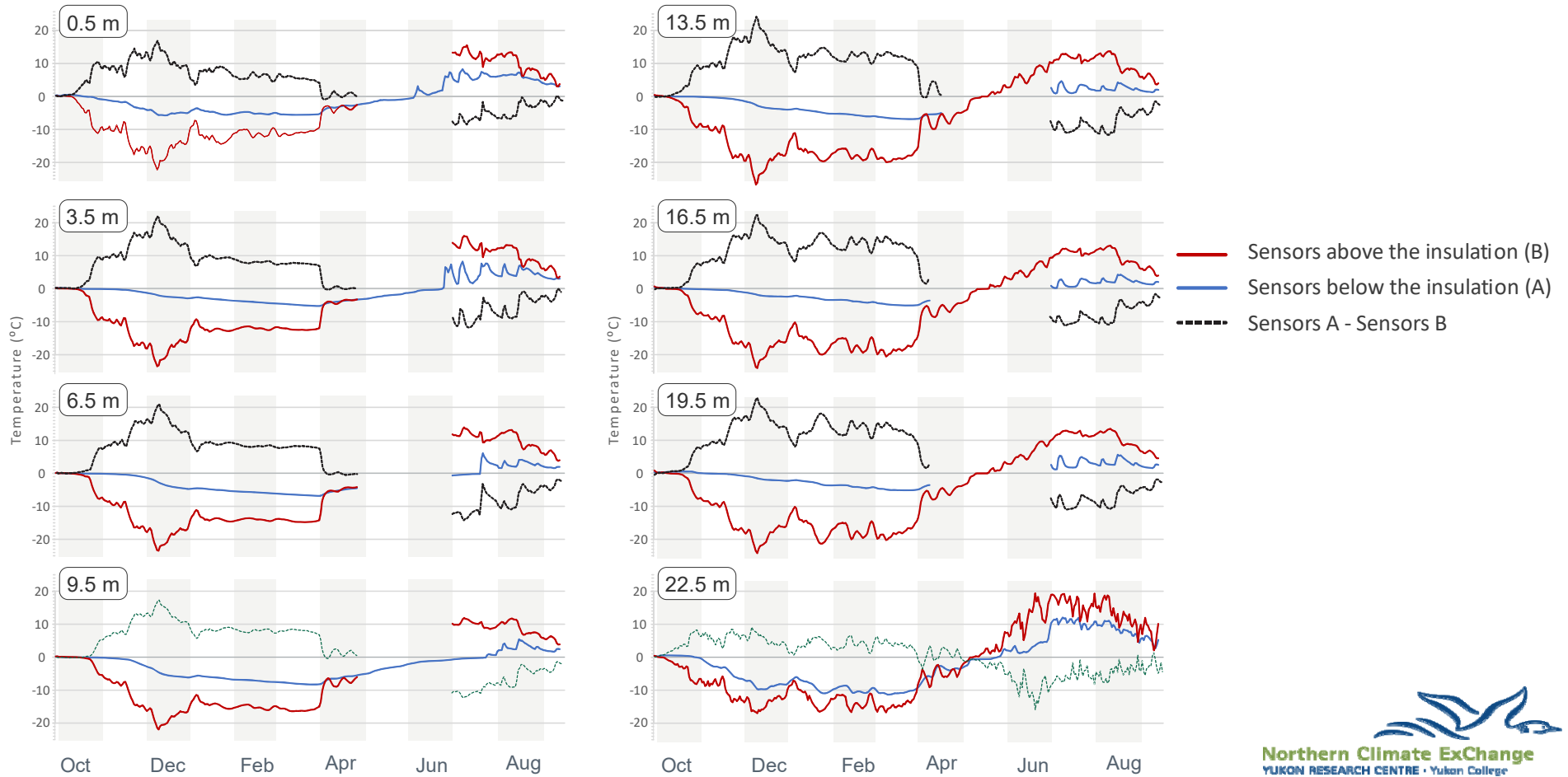
Ground temperature - Field

Depth	2016			2017							
	October	November	December	January	February	March	April	May	June	July	August
0.00 m	-5.1 °C	-10.4 °C	-12.2 °C	-11.4 °C	-10.5 °C	-8.8 °C	-3.3 °C	9.2 °C	15.4 °C	19.2 °C	14.2 °C
1.00 m	1.9 °C	0.4 °C	-0.2 °C	-0.4 °C	-0.9 °C	-1.2 °C	-1.0 °C	-0.6 °C	-0.2 °C	5.2 °C	7.7 °C
2.00 m	1.8 °C	0.9 °C	0.3 °C	0.0 °C	-0.1 °C	-0.2 °C	-0.2 °C	-0.2 °C	-0.2 °C	0.7 °C	3.4 °C
4.55 m	-0.2 °C	-0.1 °C	-0.2 °C	-0.2 °C	-0.2 °C	-0.2 °C	-0.2 °C	-0.2 °C	-0.2 °C	-0.2 °C	-0.2 °C

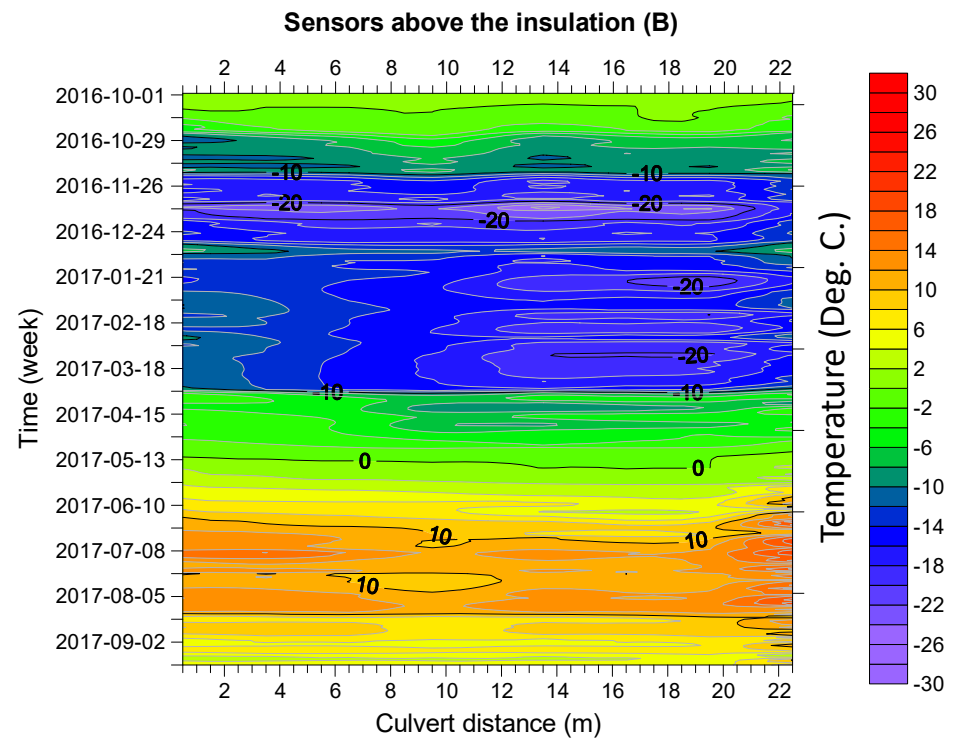
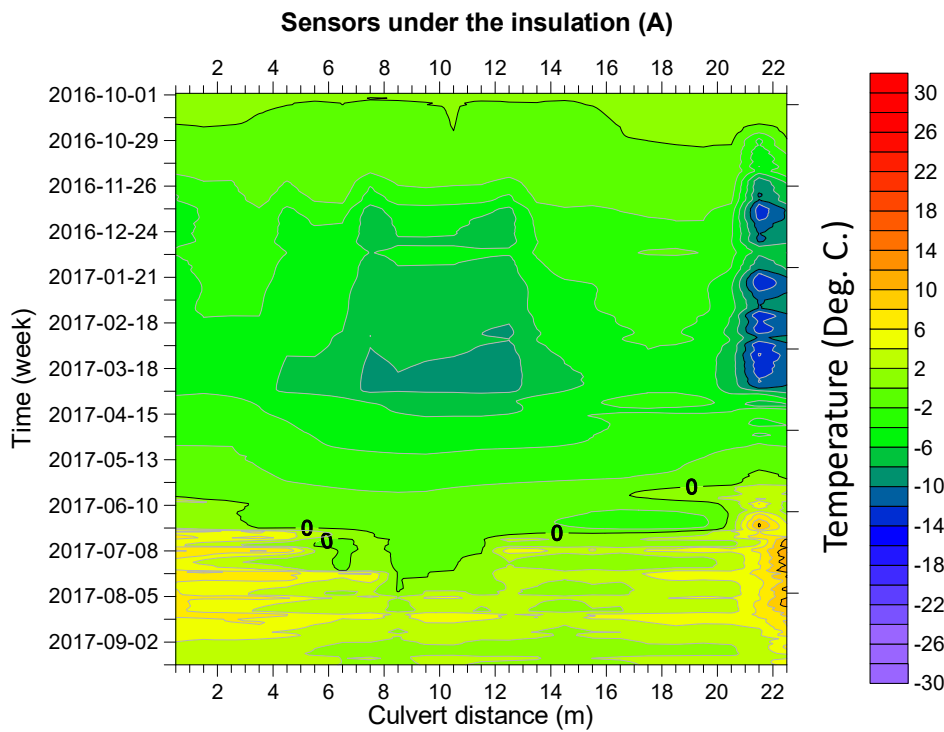
Ground temperature at km 381



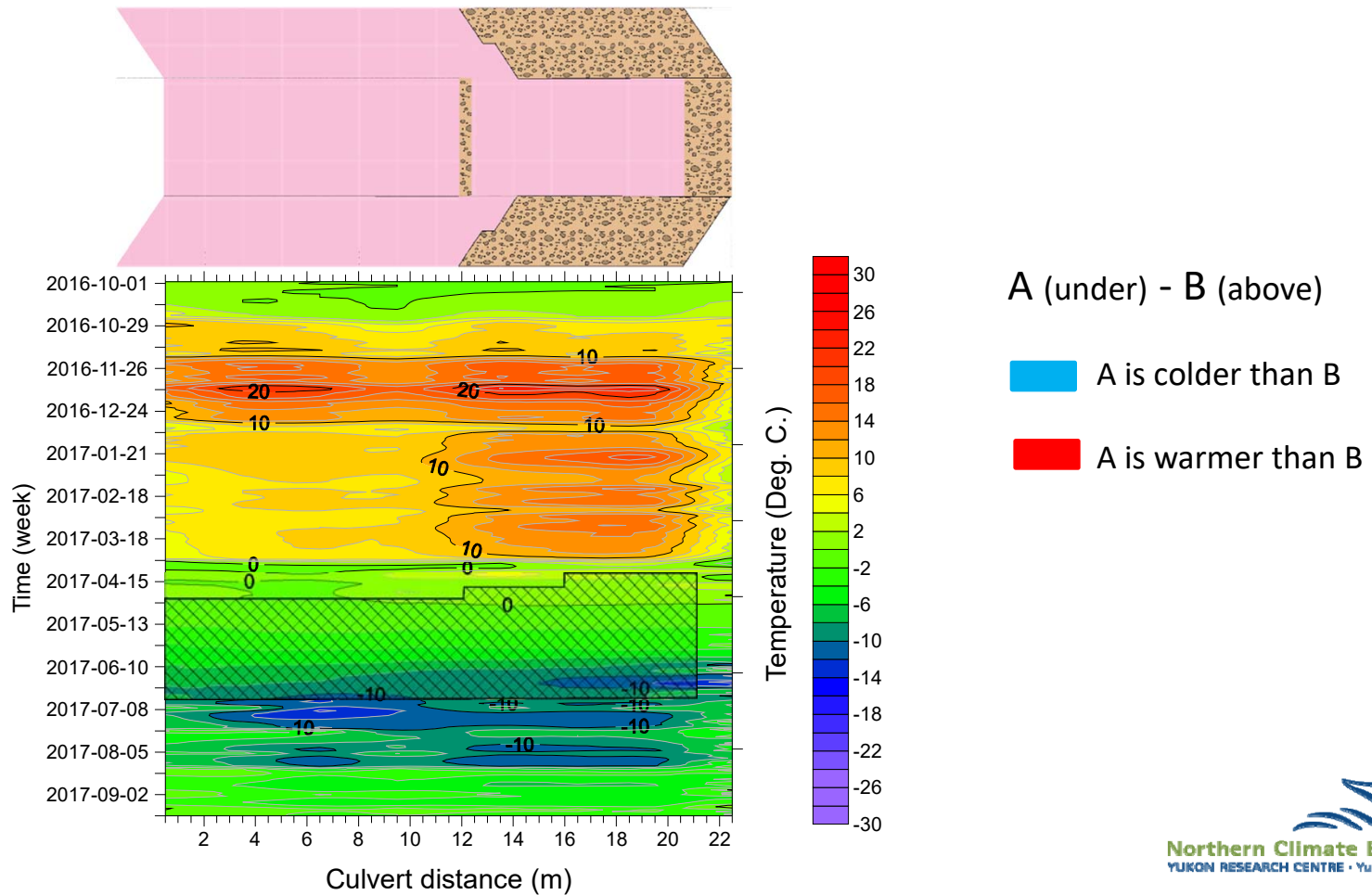
Temperature monitoring Culvert



Ground temperature monitoring



Ground temperature monitoring

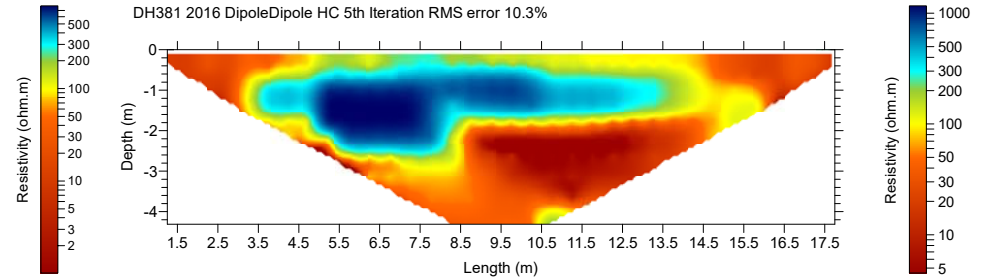
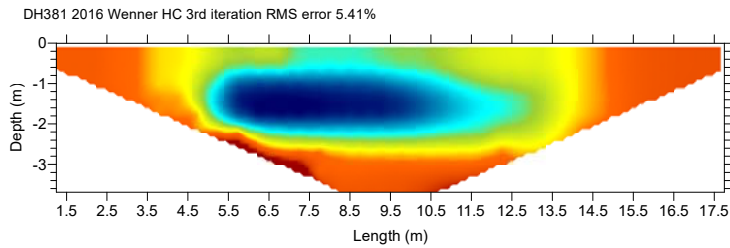


Electrical Resistivity Tomography

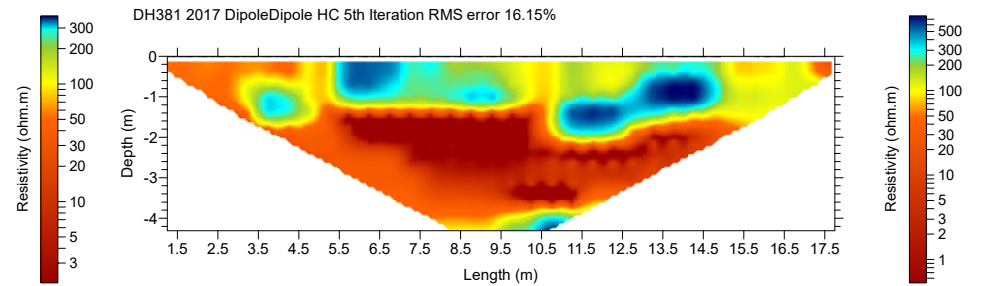
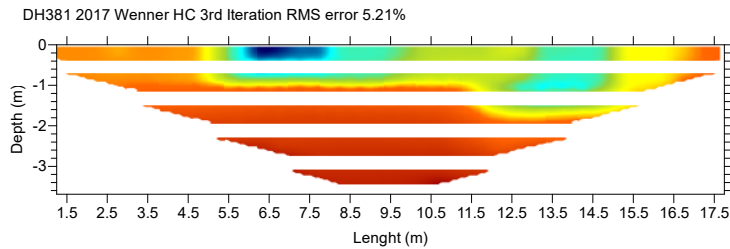
Wenner

Dipole-dipole

Sept.
2016

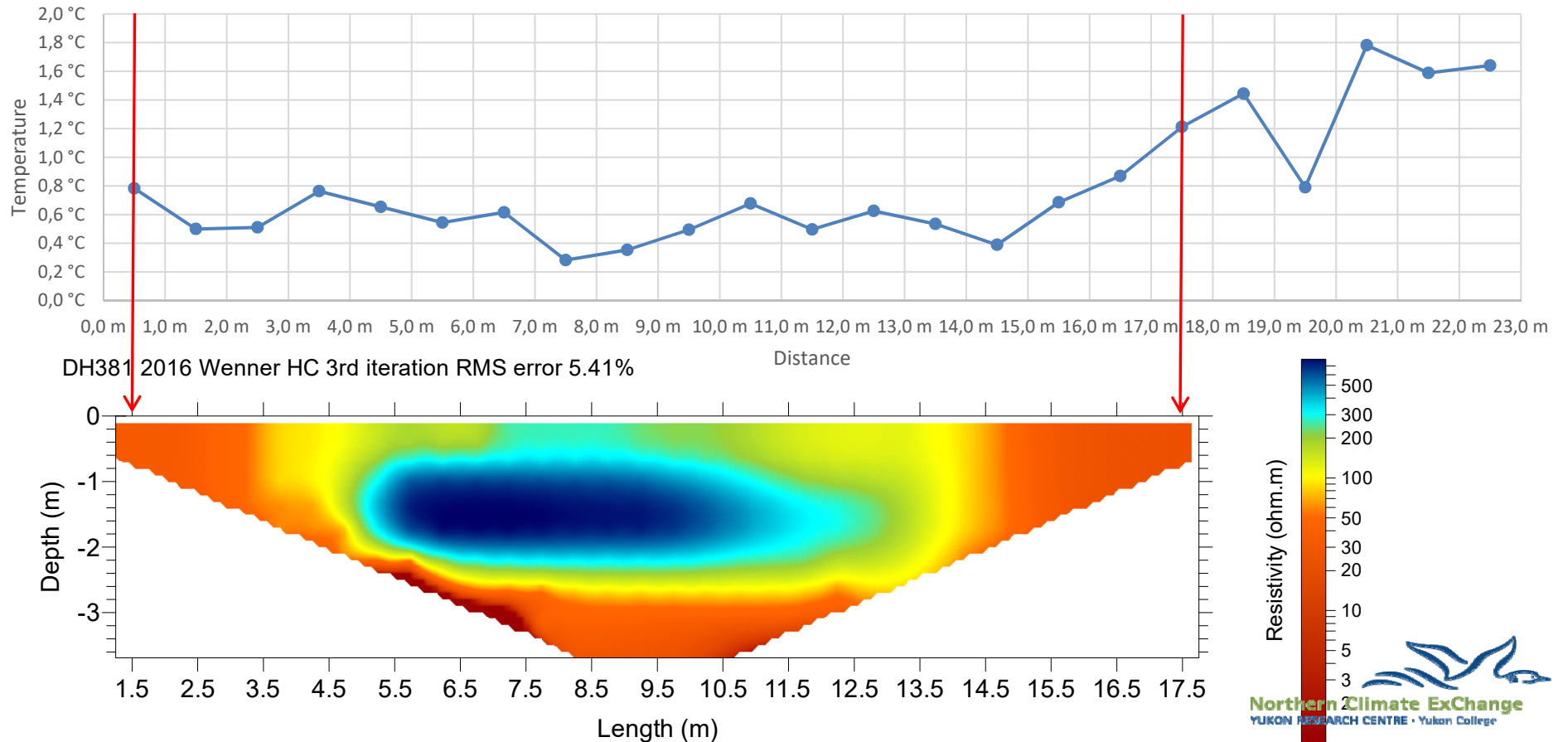


July
2017



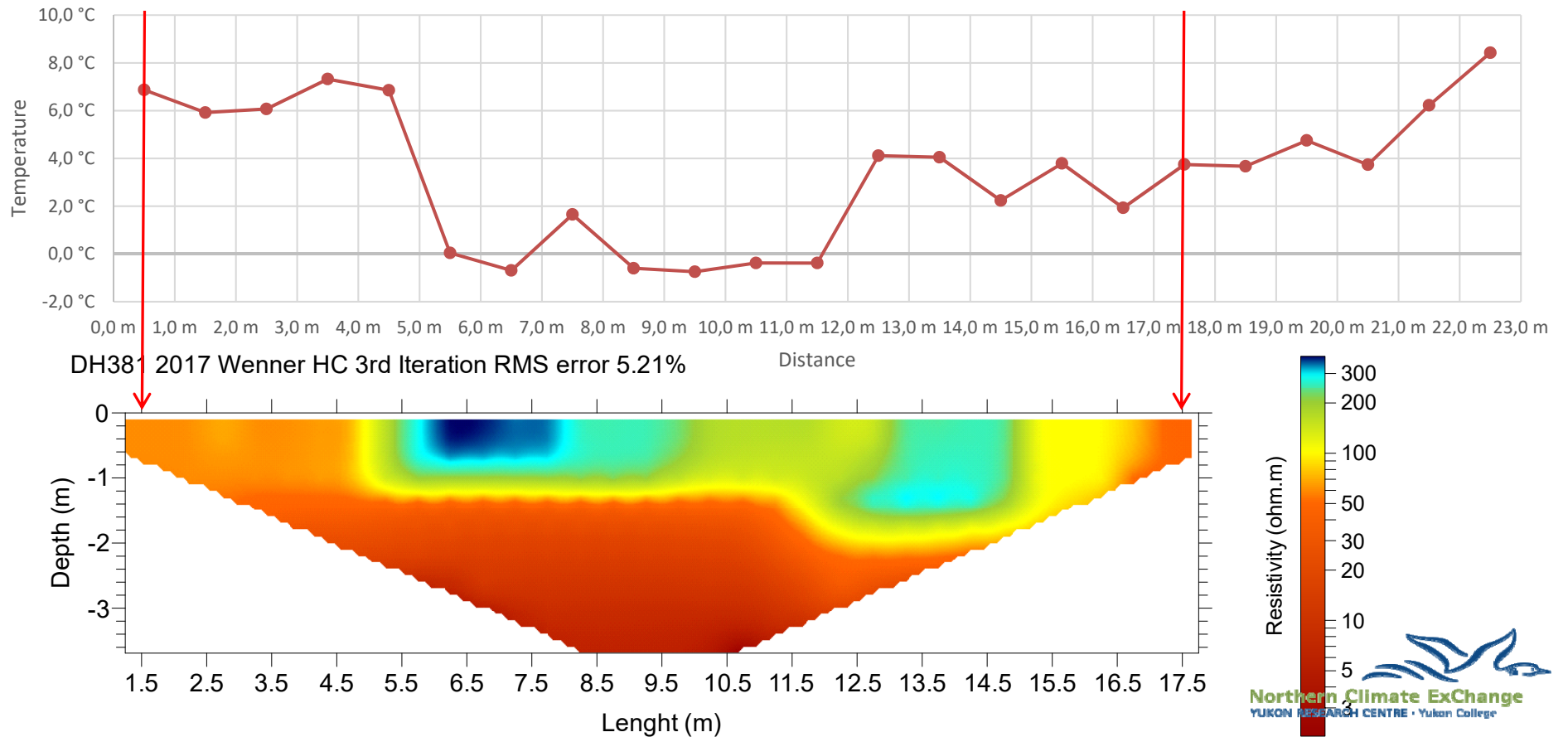
Electrical Resistivity Tomography & Temperature

Temperature between electrodes - 12PM September 29th 2016



Electrical Resistivity Tomography & Temperature

Temperature between electrodes - 14PM June 30th 2017



Conclusion

- Monitoring works: Temperature and ERT.
- “Altered” design will require 3D modelling of the ERT data.
- Work still in progress, yet the insulation seems to delay warming and cooling

Research Partners and Funders



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