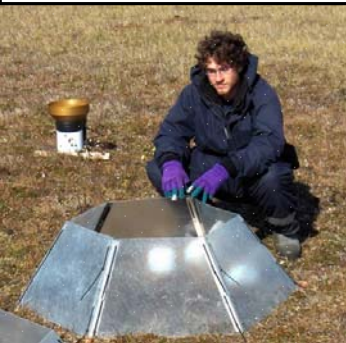


# Insulating Properties of Changing Tundra Vegetation

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Rob has been working in the lab since the summer of 2007 and plans to return for the 2008 field season. Currently he is in his third year pursuing a major in biology and education along with minors in earth science and chemistry. He plans to teach middle or high school science.

An increase in global temperature is expected to dramatically effect arctic ecosystems. Warming may also release large stores of carbon from tundra soils into the atmosphere in the form of greenhouse gasses (IPCC 2007). Studies from the International Tundra Experiment (ITEX) have shown changes in plant communities under simulated warming conditions, including a general increase in plant cover (Walker et al. 2005).

This study examined the role of plants in the transfer of heat between air and soil. ITEX Open Top Chambers (OTC's) were used to simulate warming conditions in wet and dry plant communities near Barrow (71°18'N 156°40'W) and Atqasuk (70°29'N 157°25'W), Alaska. 1m<sup>2</sup> plots were established in which vegetation was either removed down to bare ground or increased, using the plant material from removal (Figure 2). These treatments were compared to OTC and control plots established in 1998. Temperature was recorded for the duration of the growing season (June-August) at heights of 13cm, 0cm, and -10cm from ground level (Figure 1).

In all four sites, the greatest difference in temperature between canopy height (13cm) and soil (-10cm) was seen in plots with added vegetation (Figure 3). It was also noted that at each site the air to soil difference in OTC's with nine years of warming was within 10% of the OTC's with added vegetation, both of which were at least 20% cooler than OTC's with bare ground. These results indicate that vegetation acts as a significant insulator in the tundra ecosystem, and suggests that soil temperatures may be buffered from warming air temperatures by an increase in plant cover.

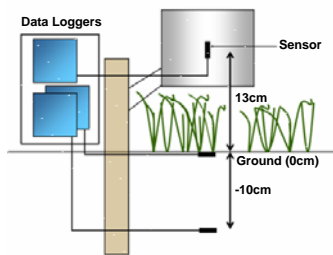


Figure 1: Diagram of study setup showing placement of temperature sensors relative to ground height.



Figure 2: Manipulations of warmed plots. Plots to the left show removed vegetation while plots to the right show added vegetation.

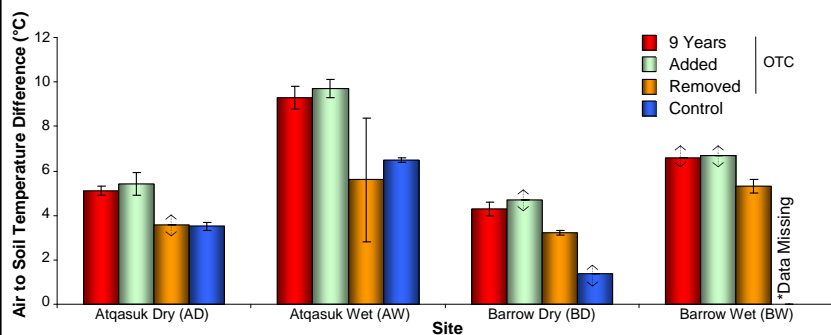


Figure 3: Temperature variation by manipulation and site for 2007 field season. Error bars show the standard error of the mean. Arrow-tipped bars indicate missing data due to instrument malfunction.

## References

IPCC (ed) 2007. *Climate Change 2007: The Scientific Basis. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. Cambridge, United Kingdom. 230 pp.

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