

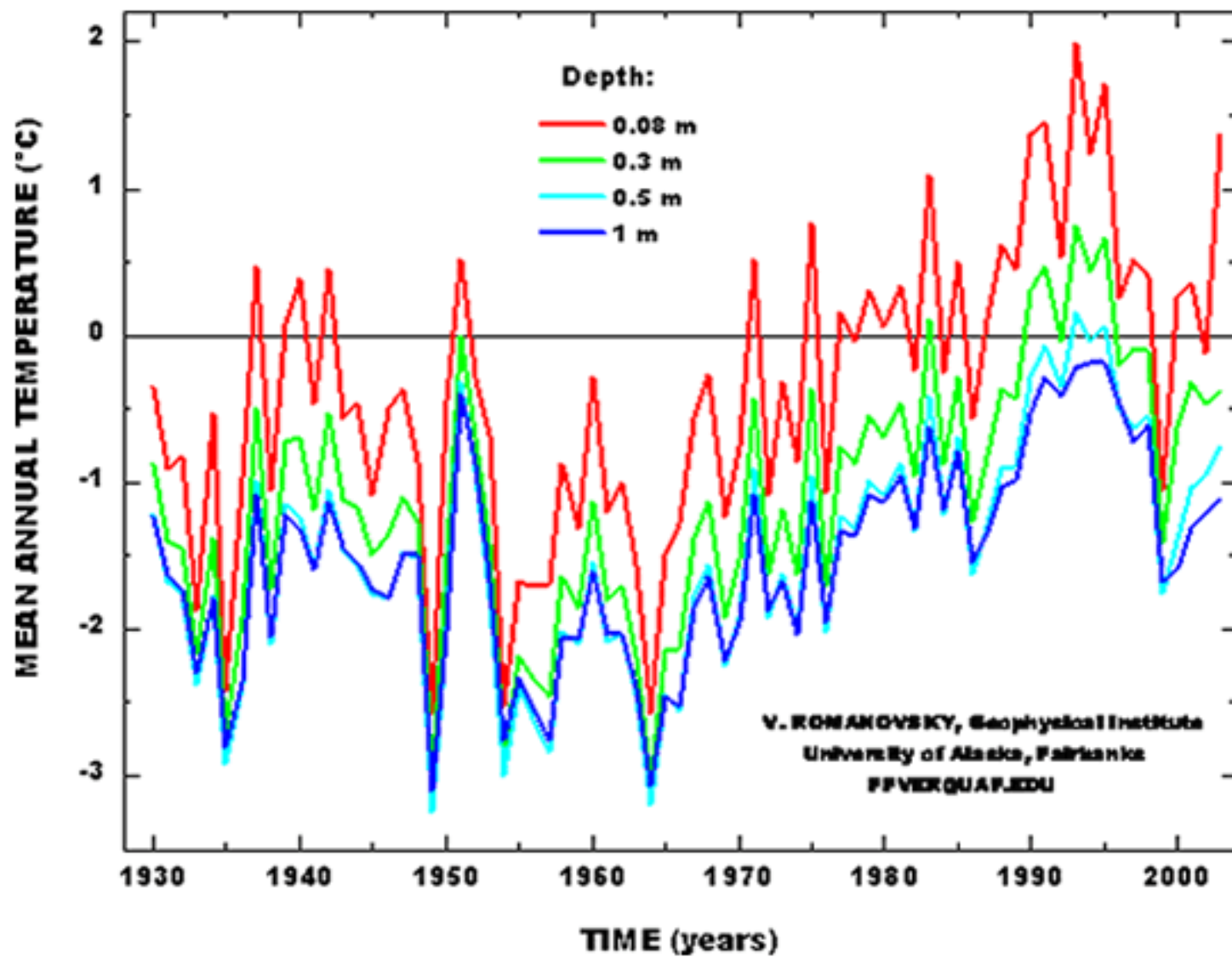
Effects of permafrost thaw on northern peatland methane emissions

Merritt R. Turetsky
Canada Research Chair in Ecology
Department of Integrative Biology, University of Guelph



FAIRBANKS, BONANZA CREEK, 1930-2003

Mean annual ground temperatures



Permafrost Thaw and Lake Drainage



© Wendy Eisner

Inundation and Thermokarst

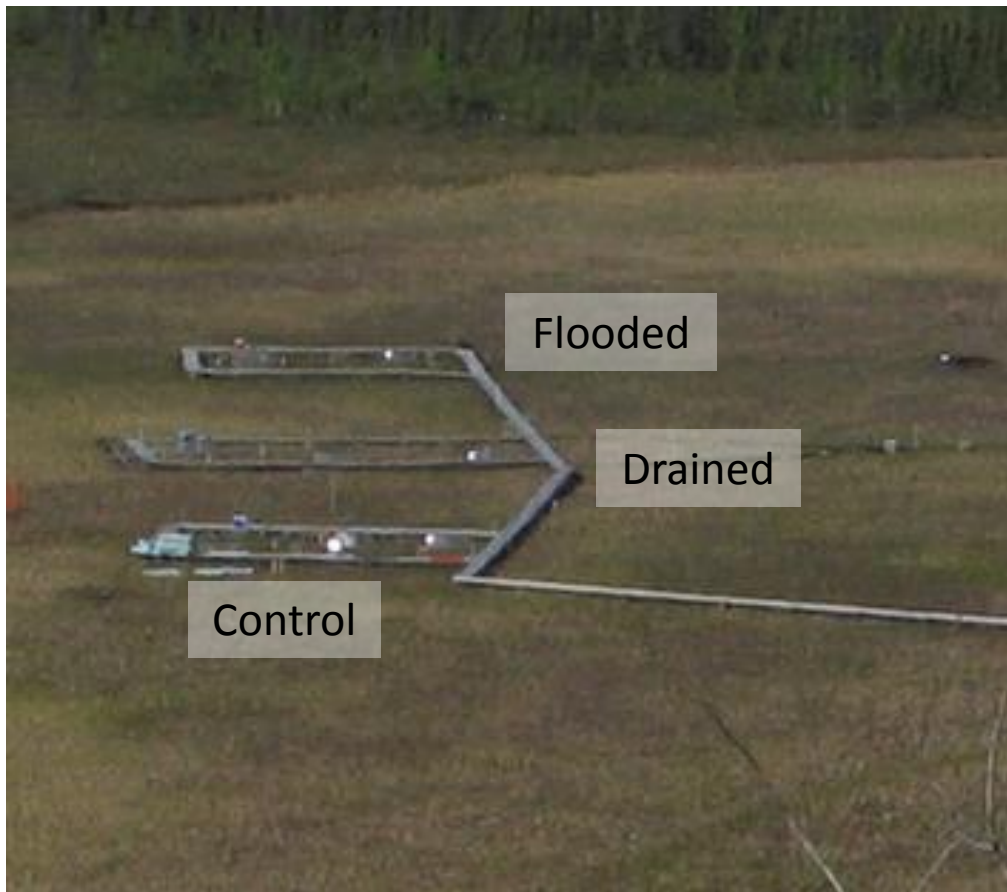


© Britta Sannel



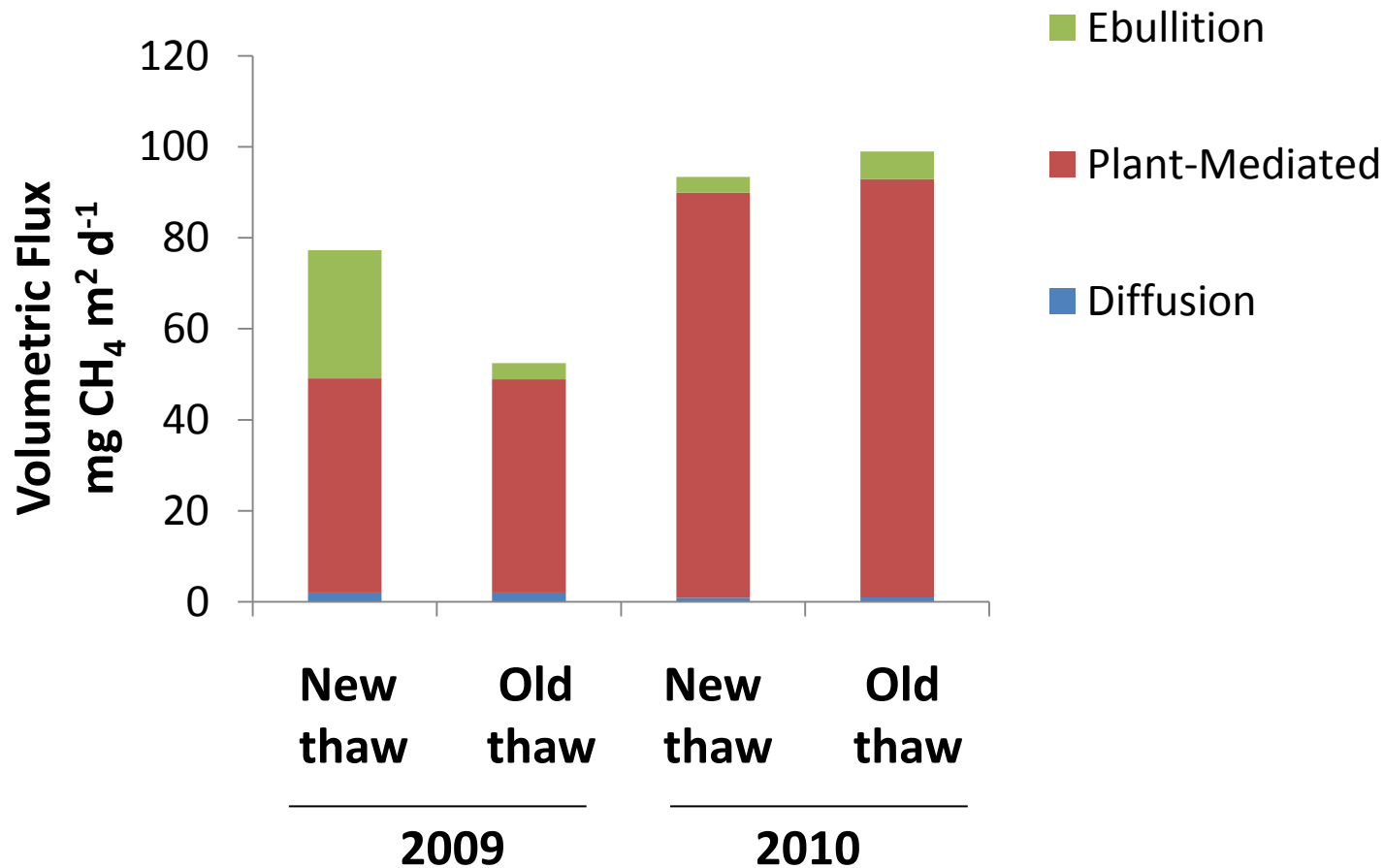
THE BONANZA CREEK FEN MANIPULATION an experimental approach to peatland carbon cycling

<http://www.uoguelph.ca/Apex>

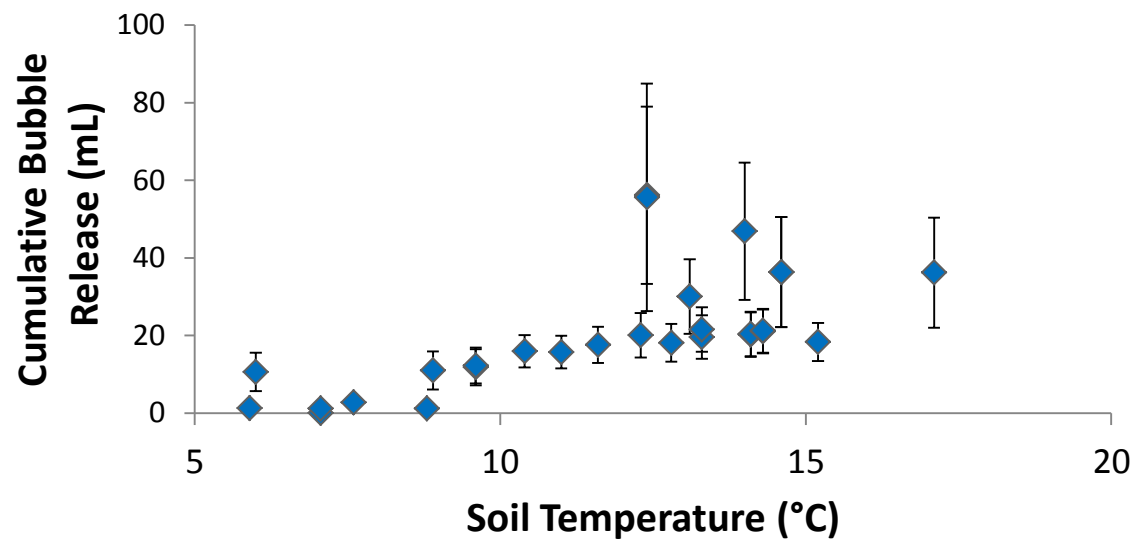
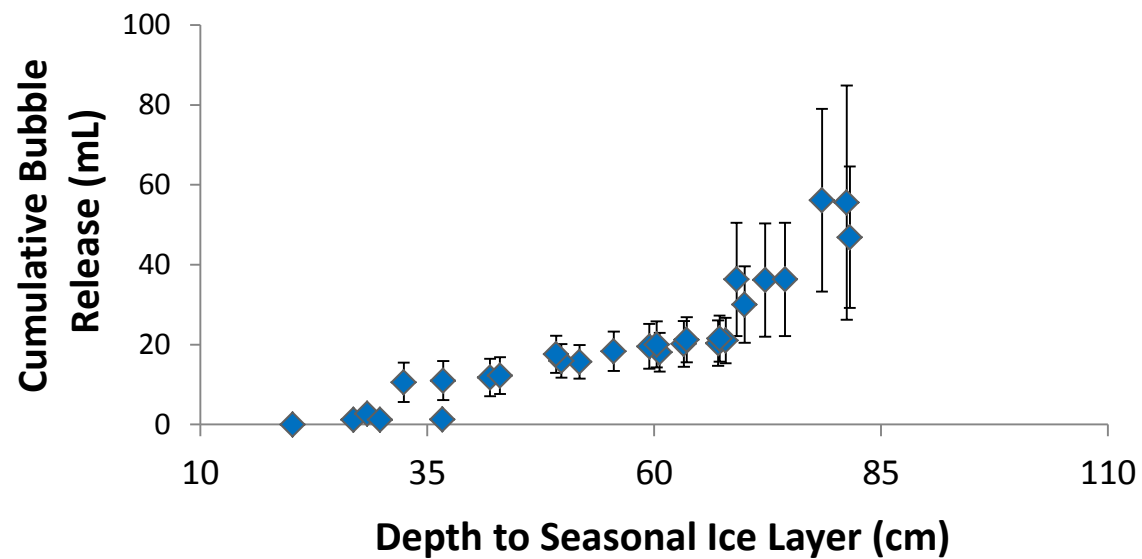


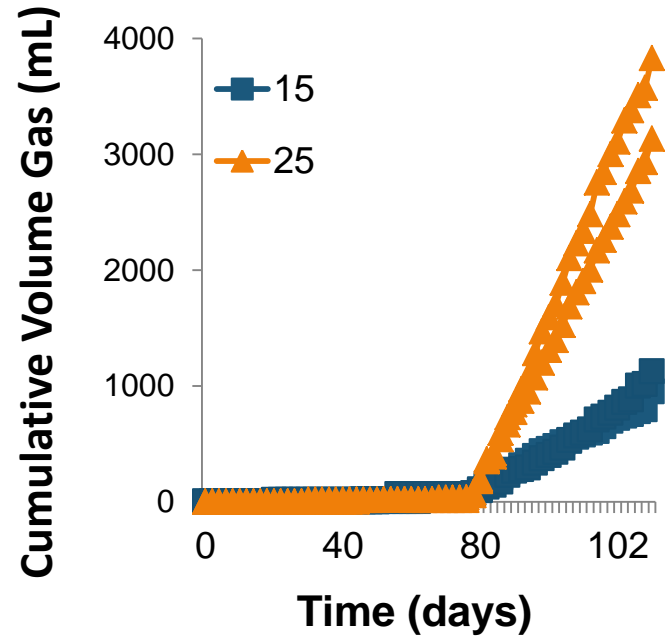
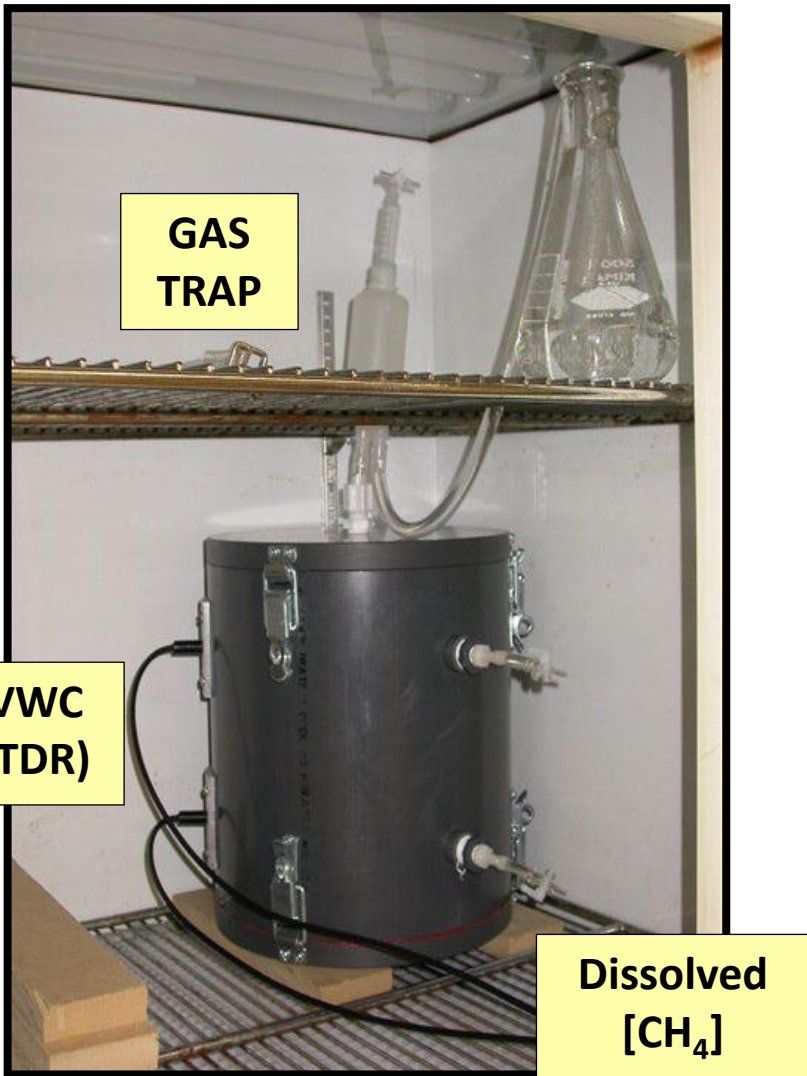


Partitioning CH₄ fluxes



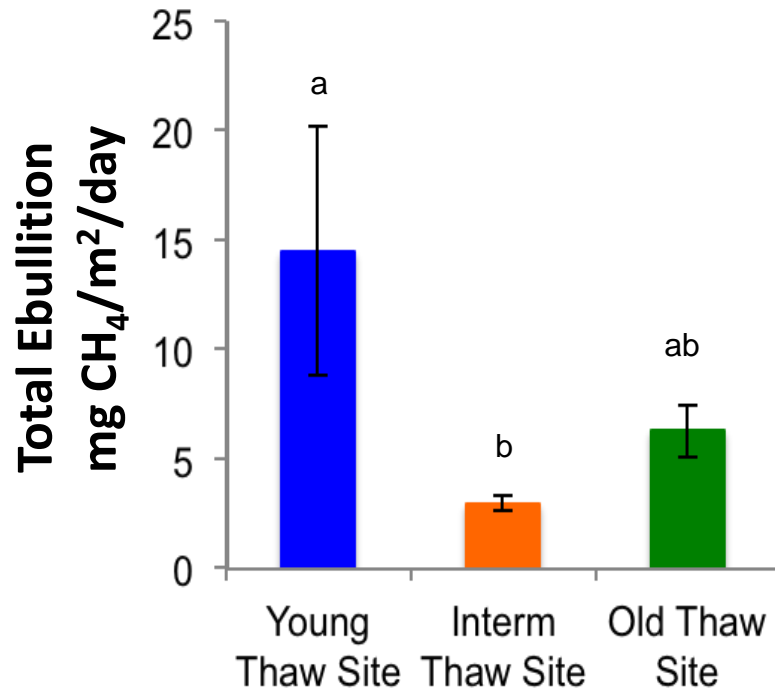
Katie Shea (MSc, 2011)



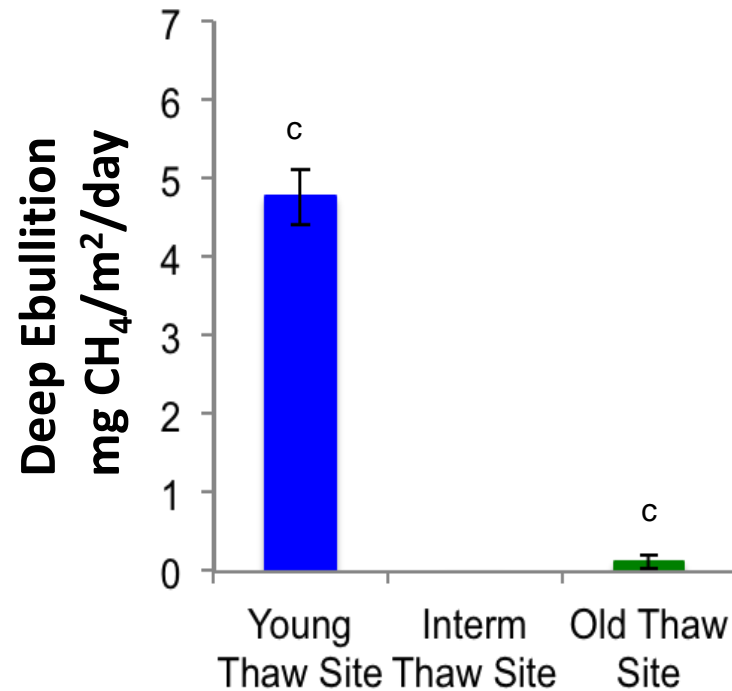
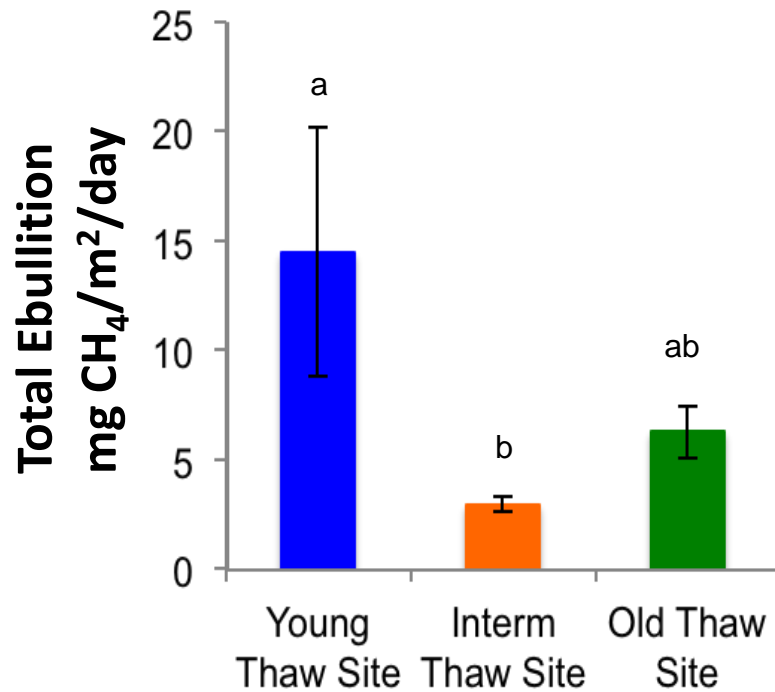


Q₁₀ values
 CH₄ ebullition: 3.4
 CH₄ production: 2.1

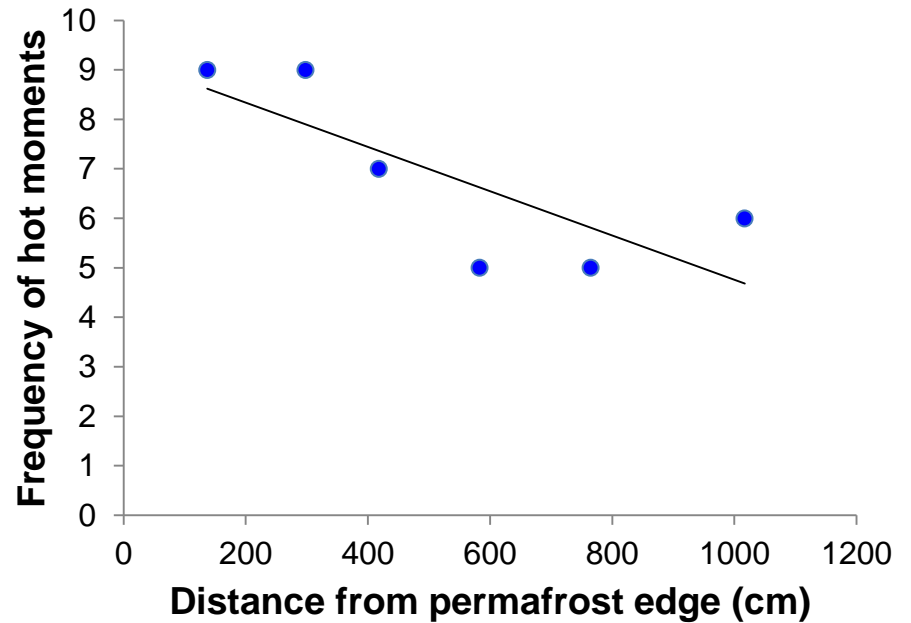
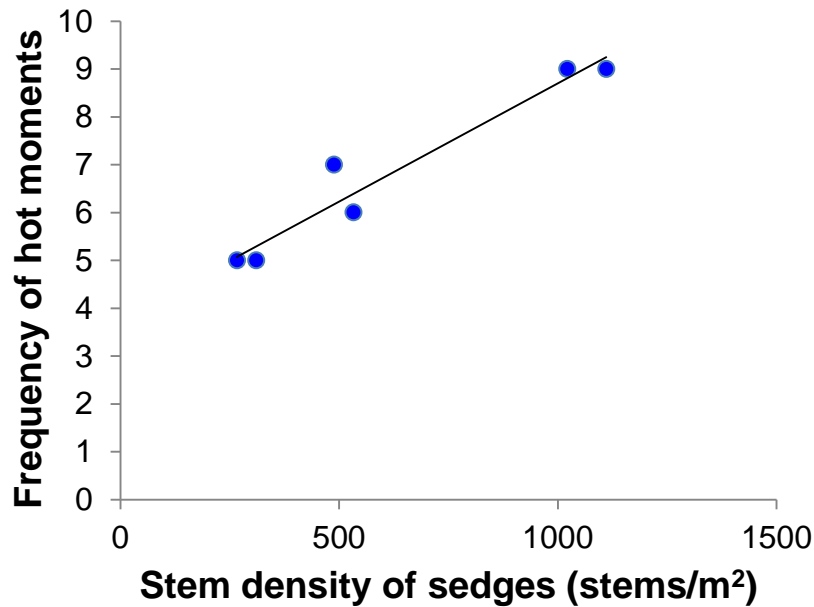
Ecosystem sources of ebullition



Ecosystem sources of ebullition

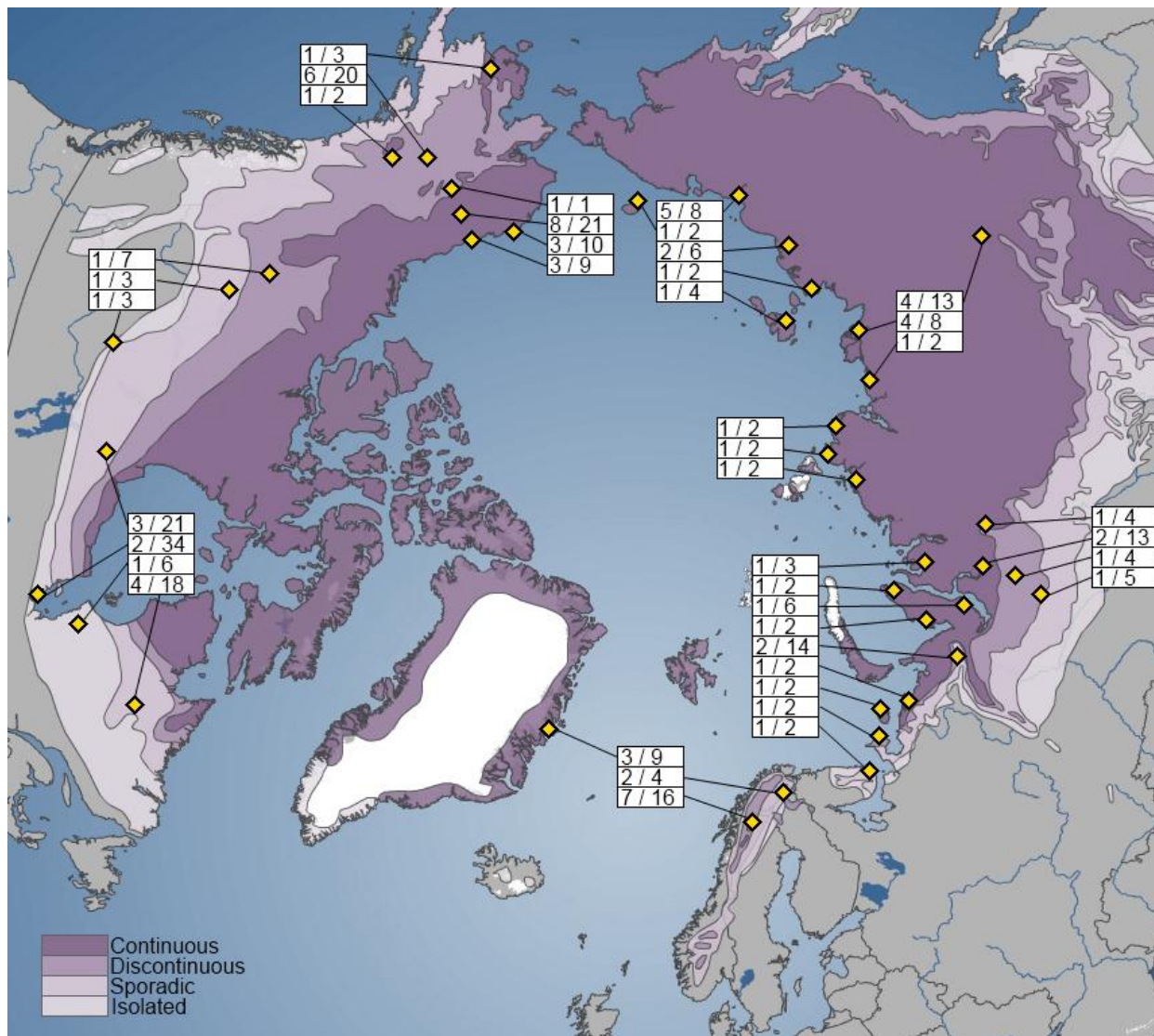


Hot spot and hot moments



Sara Klapstein (MSc, 2012)

Meta-analysis of high latitude CH₄ fluxes

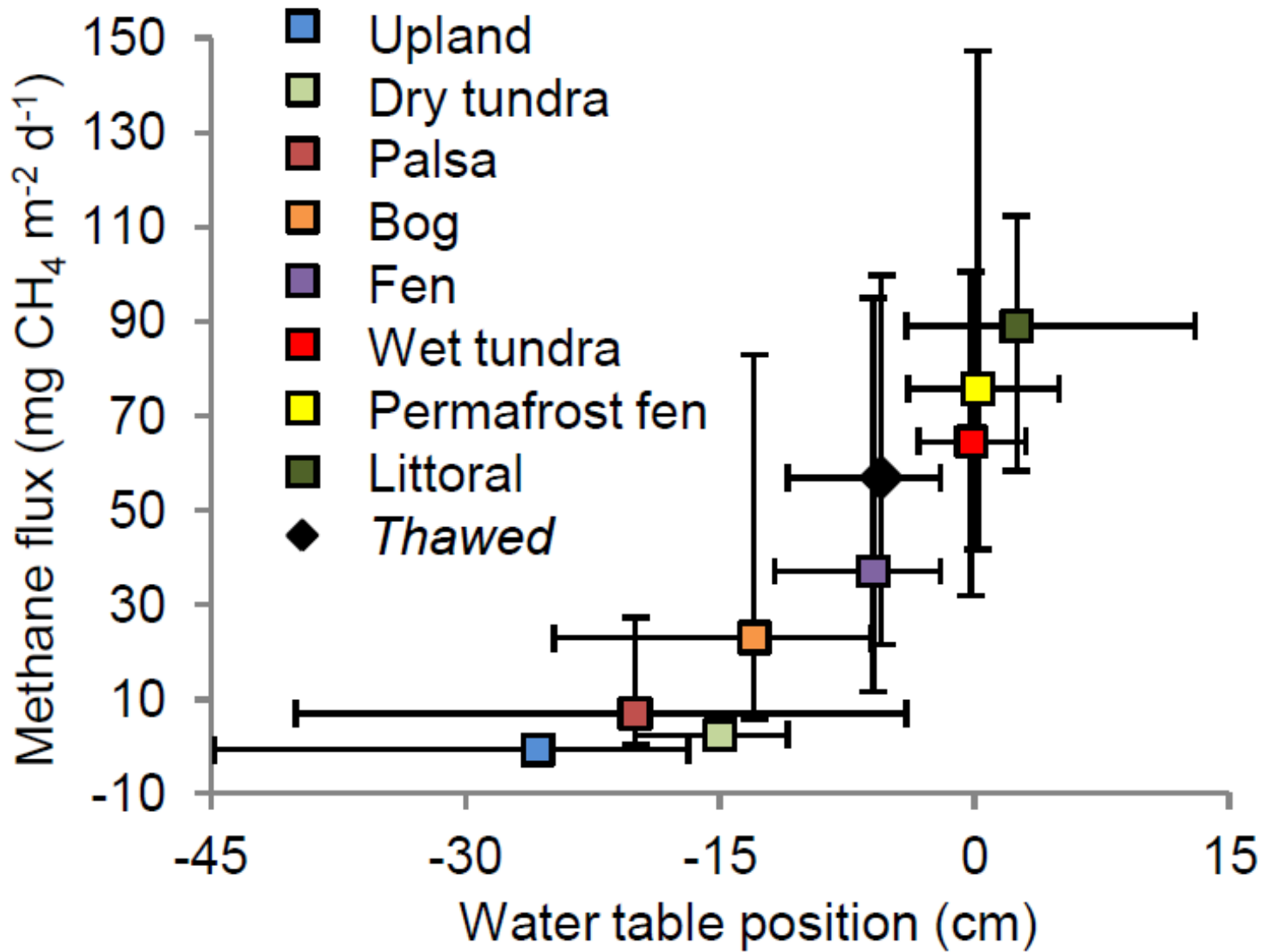


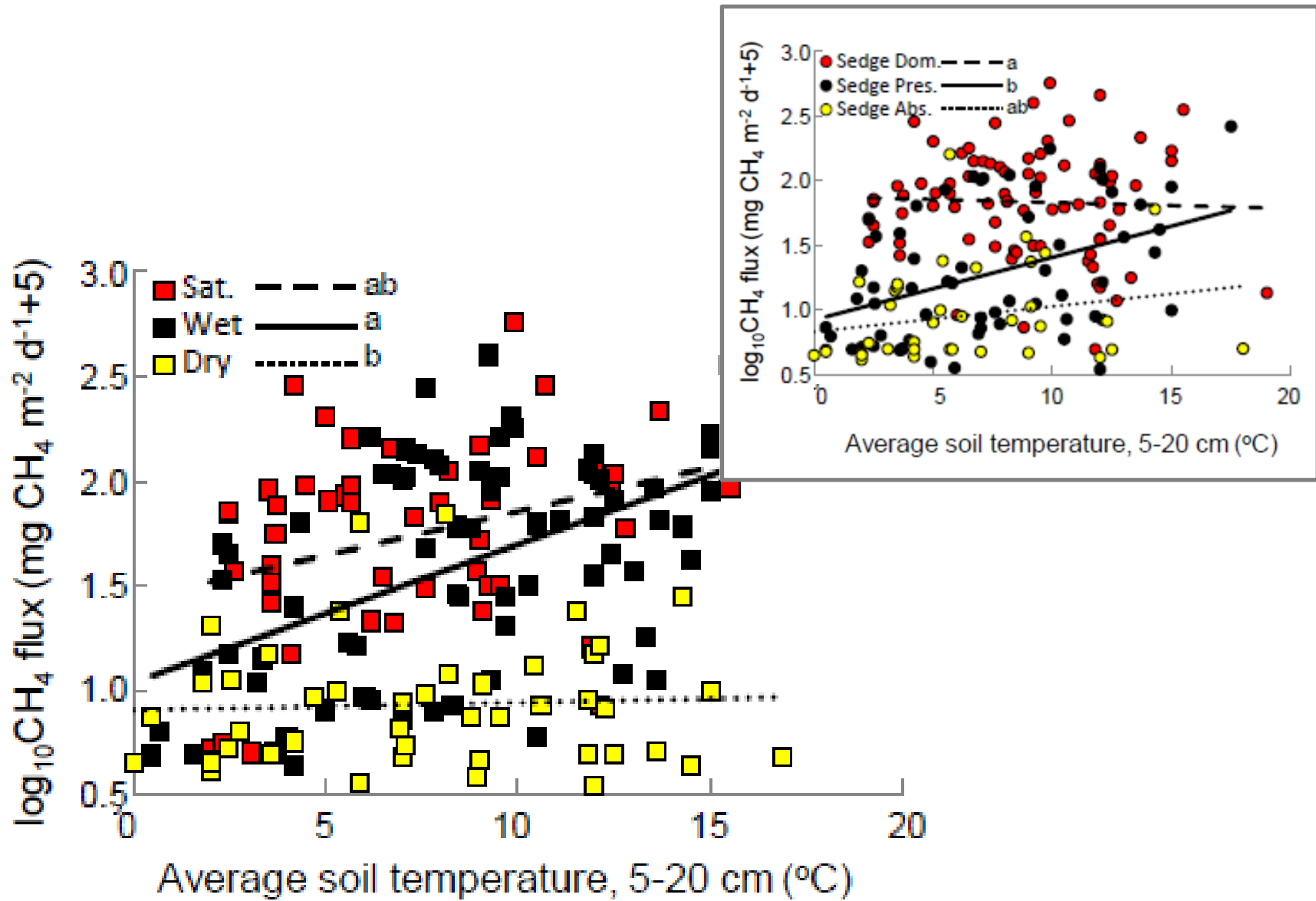
61 studies, 303 sites

~14,000 manual flux measurements from 1973-2012

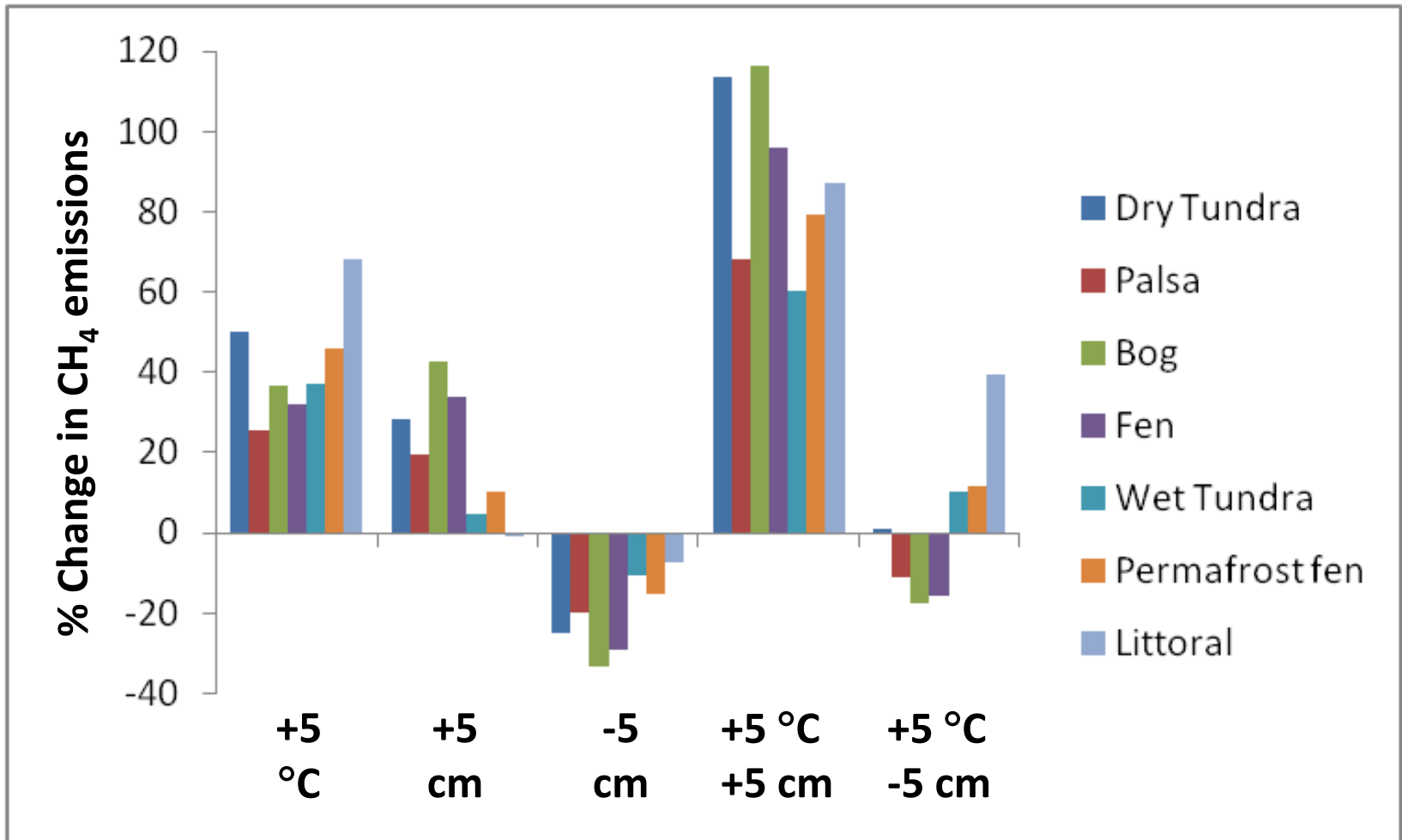
Mean growing season CH₄ fluxes, water table position, soil and air temperature, CO₂ fluxes & vegetation composition

Olefeldt, unpublished





Estimated steady state sensitivity of CH₄ emissions





Conclusions

- Permafrost thaw in peatlands leads to thermokarst and inundation
- Increases in CH₄ emissions is primarily due to plant-mediated release and ebullition
- Ebullition in our thermokarst bog is a surface process, and likely maintains peat buoyancy



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Jennifer Harden, Dave McGuire, Eugenie Euskirchen, Mark Waldrop, Evan Kane, Mike Waddington, and many many dedicated students!



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