EXPANDING PEATLANDS IN ALASKA: POSSIBLE LINKAGE WITH CLIMATICALLY-INDUCED GLACIER MELTING

Julie Loisel (advisor: Dr Zicheng Yu)

Department of Earth & Environmental Sciences, Lehigh University

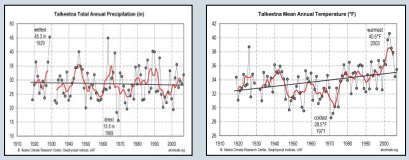
STUDY SITE

Petersville peatland (62°25' N, 150°41' W) is a *Sphagnum*-dominated blanket mire located in the Susitna Basin, near Denali (South-Central Alaska), and is currently expanding.

PROBLEM & HYPOTHESIS

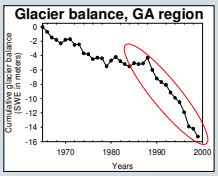
The development and expansion of *Sphagnum*-dominated peatlands can only occur when a positive water budget is maintained throughout the growing season. It is usually believed that high rainfall is needed to maintain such wet conditions.

Instrumental climatic data from Talkeetna show no increase in precipitation but an increase in temperature (and presumably evaporation) over the last decades.

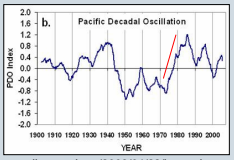


http://climate.gi.alaska.edu/

Around the Gulf of Alaska (GA), glaciers have been recording a negative mass balance over the last century due to global warming, with an intensified recession since 1988. In this region, warmer summers and milder/wetter winters were also recorded since 1977 and associated with a positive shift of the Pacific Decadal Oscillation.



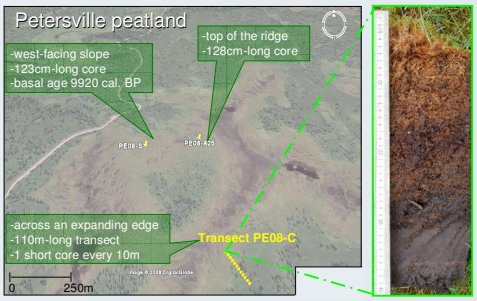
Arendt et al., 2002, Science
Meier & Dyurgerov, 2002, Science



climatesci.org/2008/04/22/internal-radiative-forcing-and-the-illusion-of-a-sensitive-climate-system-by-roy-spencer/

Here we hypothesize that climatically-induced glacier melting has been modifying the local/regional climate, especially summer humidity, promoting the expansion of peatland systems.

APPROACH & METHODS



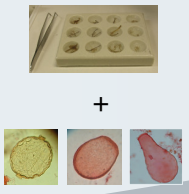
Dating methods:
^{210}Pb & ^{14}C
Dendrochronology & pollen
(see the bottom right panel)

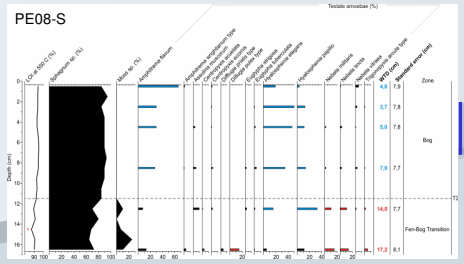
Analyses:
Testate amoebae
(water table reconstruction)
Sphagnum $\delta^{13}C$
(surface wetness)
Pollen & plant macrofossils
(local & regional vegetation)

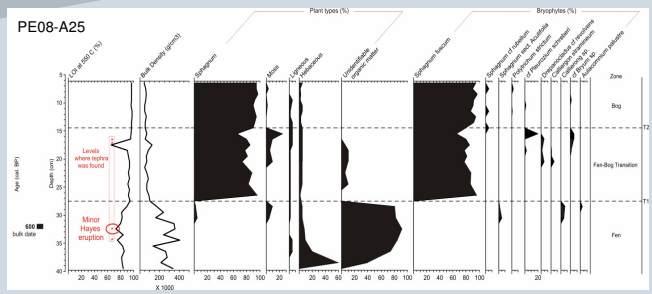
Our objectives are to document peat vertical accumulation and lateral expansion by dating and analyzing several cores along a transect (PE08-C) across an expanding edge of a peatland and to investigate a possible connection between hydroclimatic changes and documented glacier histories in the recent decades and during the Medieval Warm Period. Holocene peat accumulation rates and linkages between past hydroclimatic conditions and carbon dynamics will be reconstructed for cores PE08-S and PE08-A25.

PRELIMINARY RESULTS

Last-millenium plant macrofossil reconstructions for cores PE08-S and PE08-A25 show a sharp transition from highly decomposed peat (fen) to non-humified peat (fen-bog transition), followed by a recent shift to pure *Sphagnum* peat (sub-surface samples). Variable water table values characterize the fen-bog transition and are followed by wet conditions near the surface (core PE08-S).

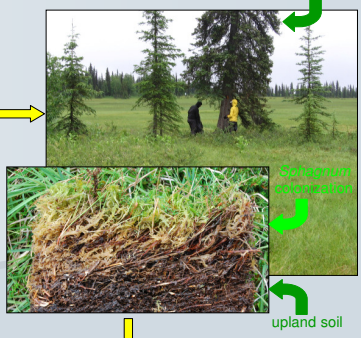




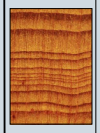


FUTURE WORK

Recent moisture increase



Pollen analysis may reveal change in local and regional vegetation assemblages. As ferns were observed near the *Sphagnum*-upland interface in the field, the presence of fern spores along peat cores may indicate the rate of paludification.



Dendroecological analyses (tree ring width) will be performed on upland black spruce trees (*Picea mariana*) now surrounded by *Sphagnum* in order to date paludification initiation and document its effects on tree structure.

SIGNIFICANCE

The proposed research will help us better understand the interactions and couplings of climate change, glacier dynamics and ecosystem functiong in high latitude regions. Peatland growth in response to meltwater dynamics has important implications for global carbon cycle and global sea-level rise (continental water storage).

ACKNOWLEDGMENTS

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