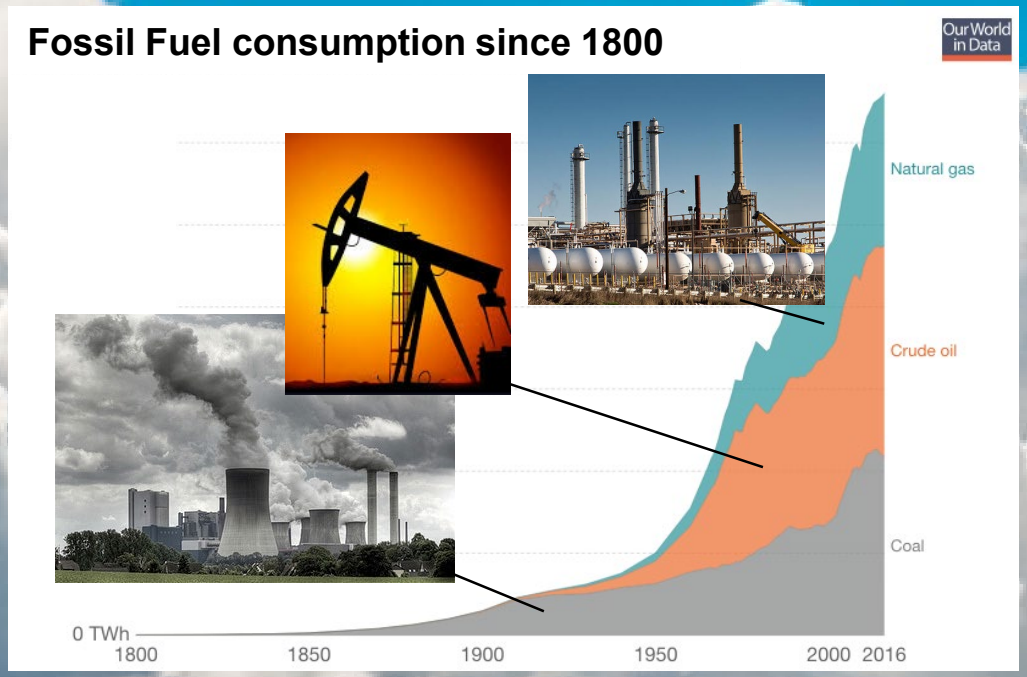
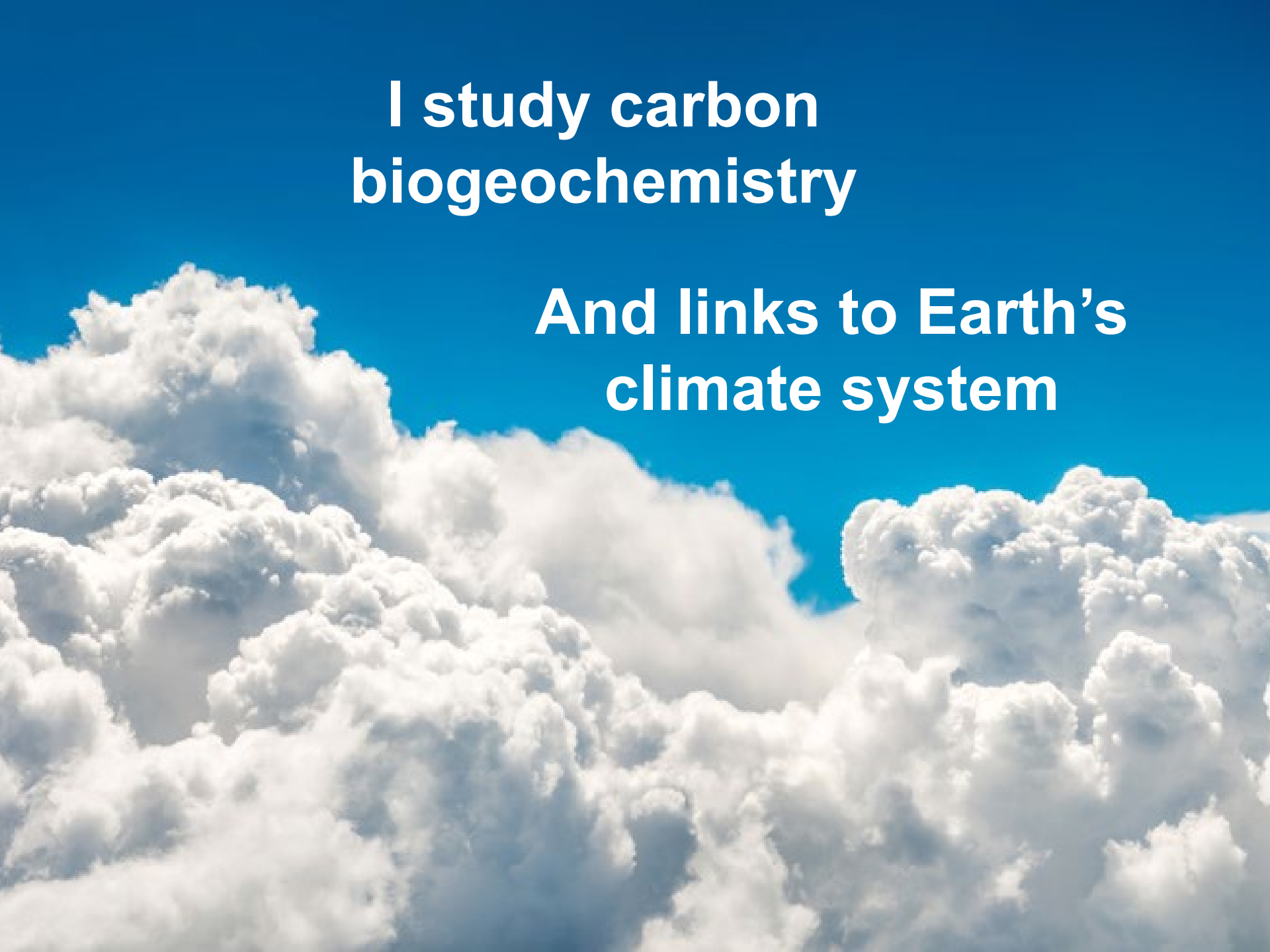
OK, time for the karaoke..

Climate is changing, we're all so sorry

We've burned so much fossil fuel



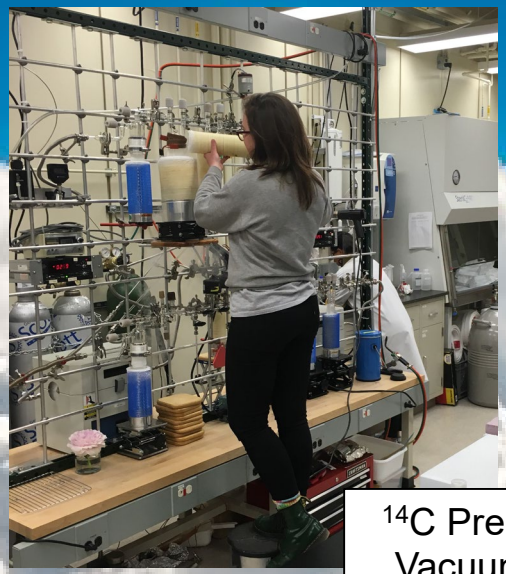

I study carbon biogeochemistry
And links to Earth's climate system

For instance in peatlands, which are all warming

What's the fate of carbon stored there?

Peatland / n. A wetland that has carbon-rich soil

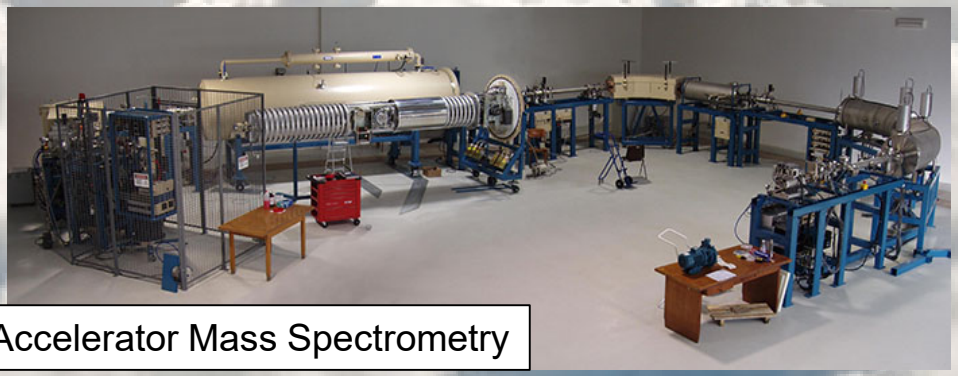
I use chemistry and fancy instruments



^{14}C Preparatory Vacuum Lines

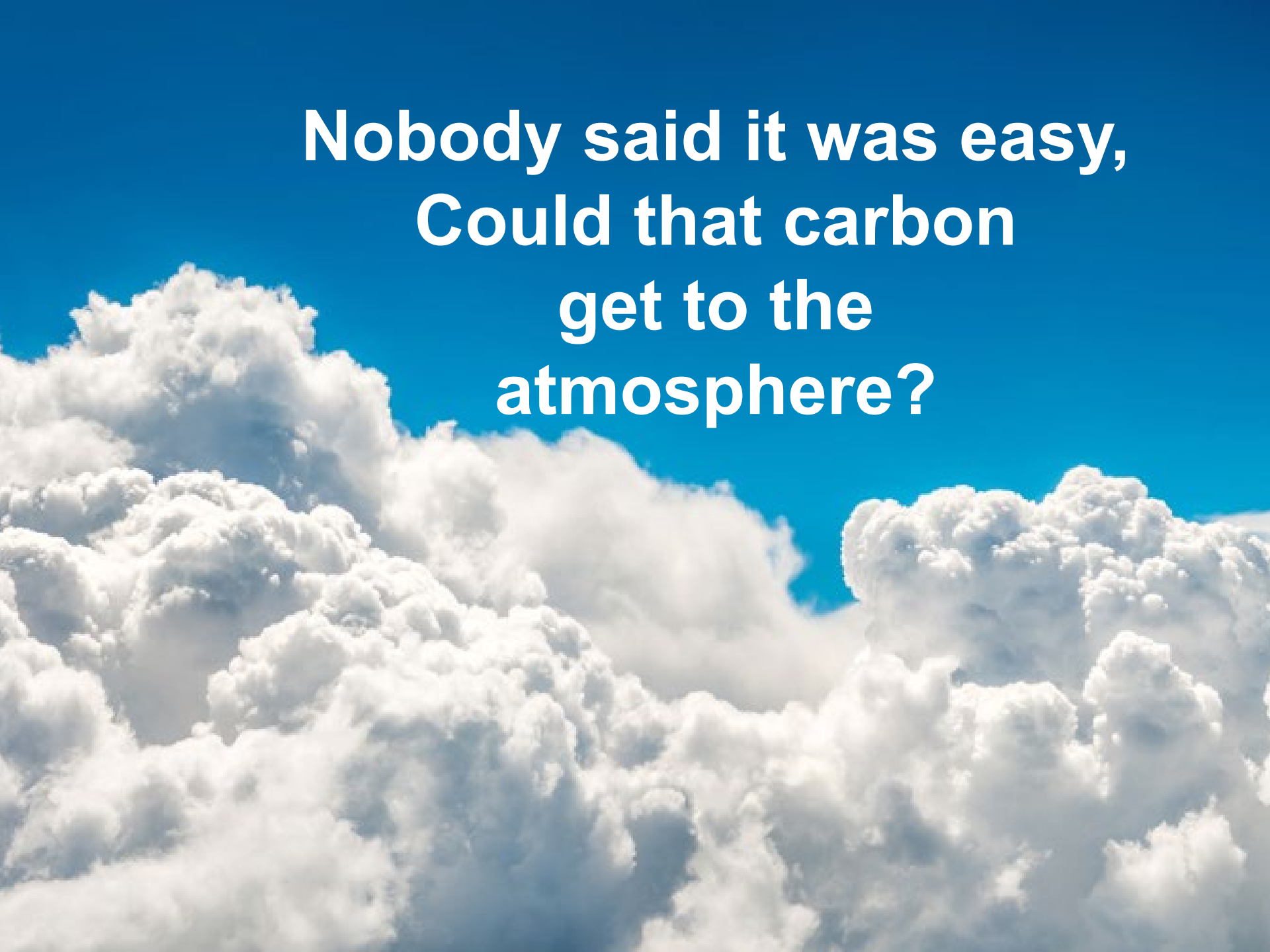
To study this big, pressing question

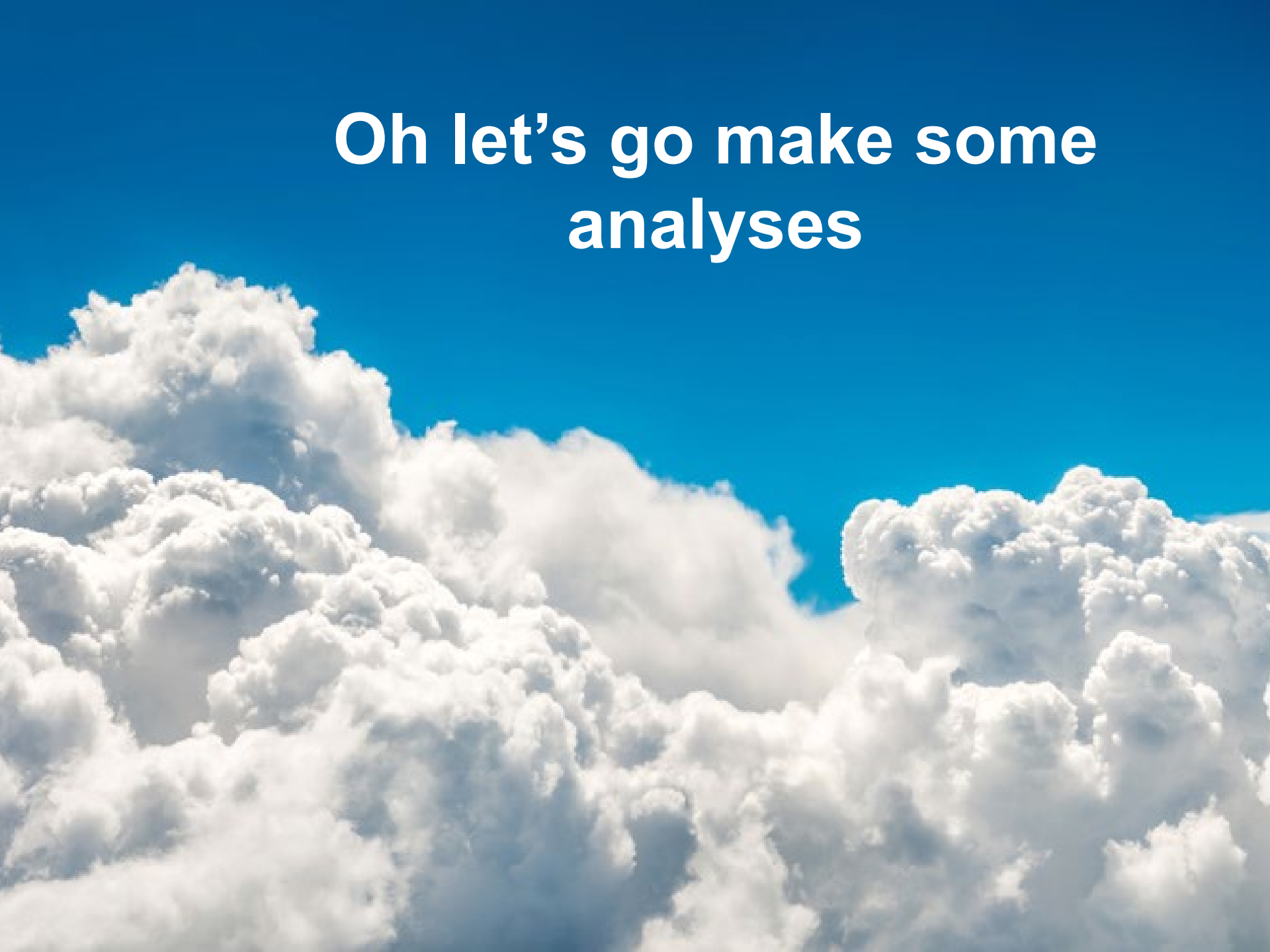
Infrared Spectroscopy



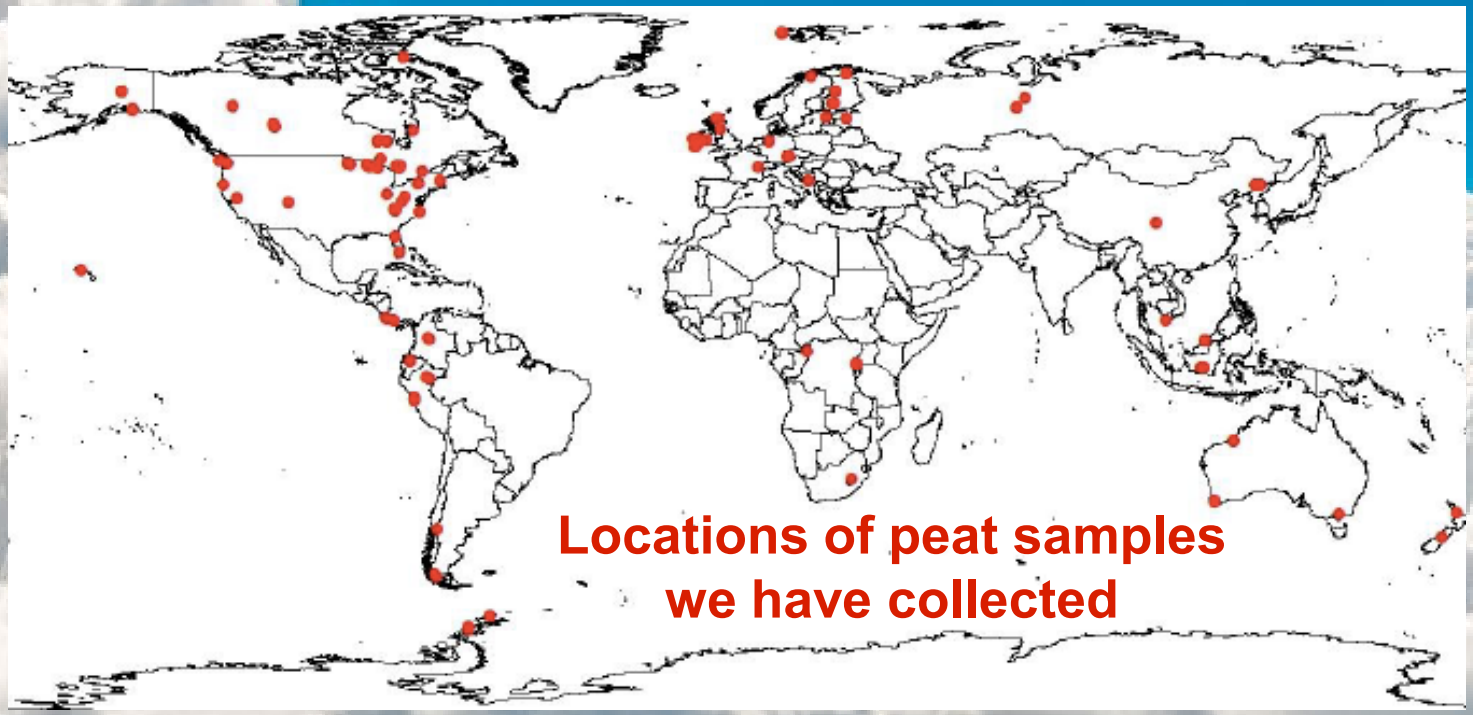
^{14}C Accelerator Mass Spectrometry

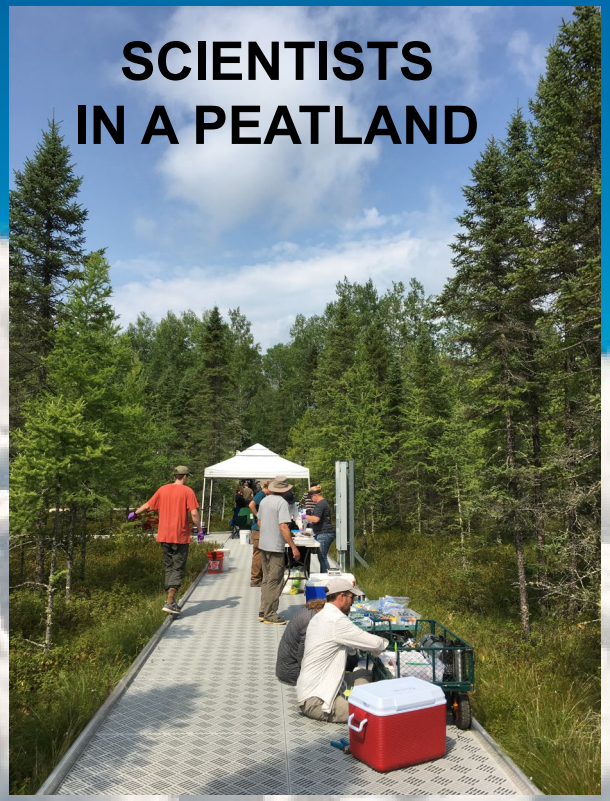

Nobody said it was easy,
but we've gotta
figure it out

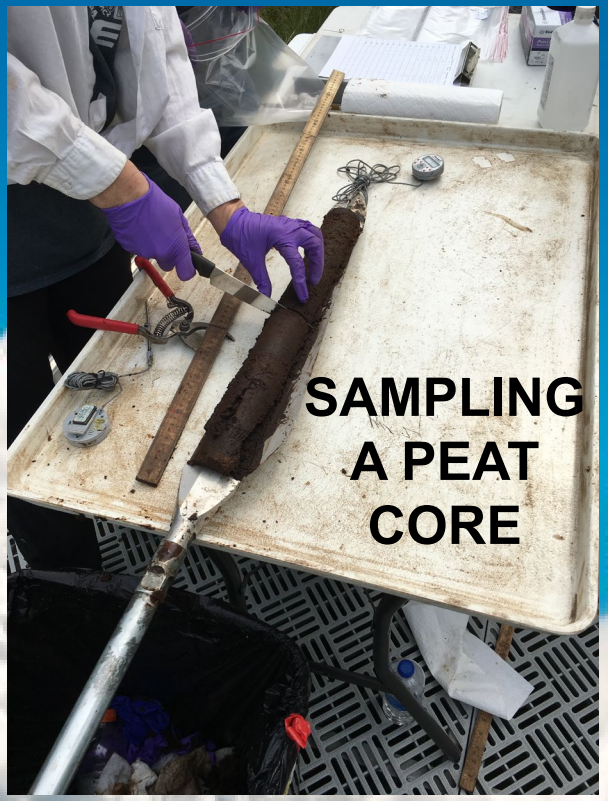

Nobody said it was easy,
Could that carbon
get to the
atmosphere?


Oh let’s go make some analyses

Peatlands are found all over the world, from Singapore to Siberia, from the Congo to Canada.



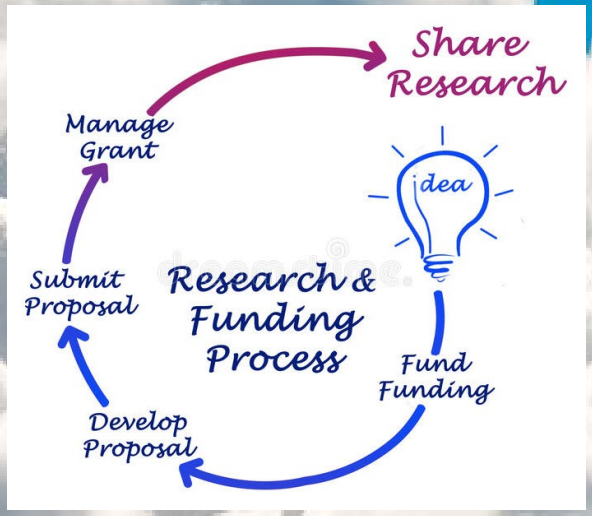

SCIENTISTS
IN A PEATLAND


SAMPLING
A PEAT
CORE


ME
VIAL
OF
PEAT

I've been assembling some numbers and figures

I just wrote an NSF Collaborative Proposal



PROJECT SUMMARY

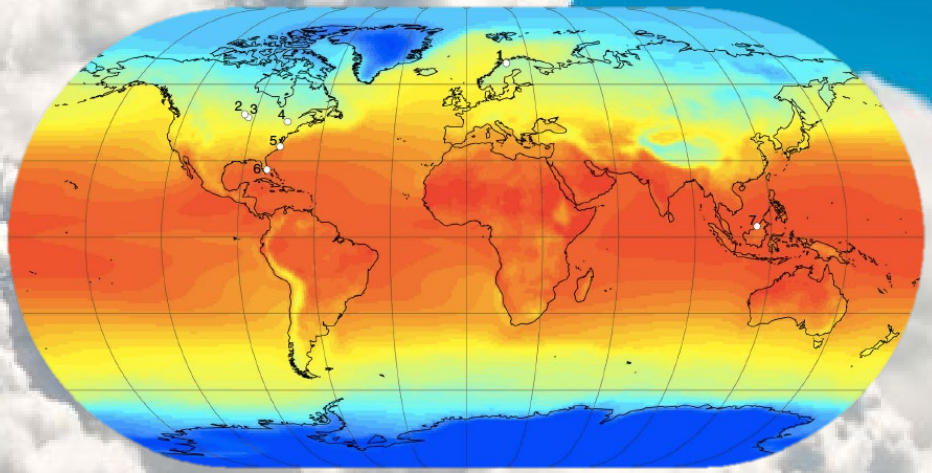
Overview:
Two compelling, complementary methods of characterizing organic matter (OM) quality will be employed to examine the decomposition potential of peat from samples already collected across a latitude gradient from the polar regions to the equator, and across gradients in altitude. Using a combination of ramped pyrolysis oxidation (RPO) and Fourier transform infrared spectroscopy (FTIR), the factors that govern OM storage globally will be investigated to evaluate the effect of warming on contemporary peatland reservoirs. OM quality, a variable that governs whether carbon is readily degraded or preserved, will be assessed in a cross-comparison analyses of peat samples with both RPO and FTIR, which will allow for more meaningful conclusions than a single-approach study. RPO data are a proxy for the biological lability and reactivity of OM and these samples and RPO fractions will be evaluated for C-13 and C-14 isotopes. FTIR analyses will quantify the relative abundances of carbohydrate, aliphatic, and aromatic function groups, which provides information about OM quality; RPO offers a look inside these molecular compound "boxes." This study will characterize a diverse set of peatlands and characterize peat in terms of thermostability, radiocarbon dating, and molecular perspectives.

Intellectual Merit:
Peatlands are found in a wide variety of climates, and present the opportunity to study how climate spatially affects carbon storage. Peatlands compose a major global carbon reservoir at present (several hundred petagrams, on par with the amount of carbon in the pre-industrial atmosphere), but it is difficult to quantify how climate change will impact this reservoir. The effect of contemporary warming on peatlands, could take the form of a positive feedback loop, increasing mobilization and microbial decomposition of OM, producing methane and carbon dioxide that further increase warming. However, as the peat-climate feedback is a just one possible outcome of a complex, dynamic system, identifying its existence and impact on the climate system remains difficult. The existence and preservation of peat in tropical and sub-tropical climates undermines the idea that high latitude peatlands will not survive warming. In addition, peat presents the opportunity to study OM decomposition with minimal influence from minerals, which act as a strong decomposition inhibitor, but exist in low to nil concentrations in peat deposits. Stripped of this major variable, the role of other factors that control decomposition can be more clearly discerned.

Broader Impacts:
This project will forge a collaboration between the PI Sparrow, a female postdoctoral researcher at FSU, and co-PI McNichol, a senior research specialist at WHOI, encouraging the full participation of women in science. On three two-week visits to NOSAMS/ WHOI, Sparrow will be trained on the RPO method, conduct the analyses, and benefit from close contact with McNichol and researchers in the NOSAMS preparatory laboratory. Towards the goals of inspiring and training the next generation of earth scientists and facilitating student engagement with earth science, Sparrow will serve as a mentor in three local programs. Undergraduates will be mentored by Sparrow to assist with sample preparations and analyses through the Undergraduate Research Opportunity Program at FSU. As well, Sparrow will serve as a mentor and volunteer for Envirothon and National Ocean Sciences Bowl competitions, which are organized for high schoolers nation-wide; Sparrow is an alumnus of both programs. Co-PI Chanton brings his research into the classroom and into his interactions with graduate and undergraduate students. In addition to teaching large undergraduate and smaller graduate classes, Chanton directs numerous directed independent study projects each year to provide undergraduates with research experience and sponsors and interacts with several student organizations at FSU. The results of this research will be disseminated to the community via peer-review articles and in presentations at meetings, at other universities, and to the public.

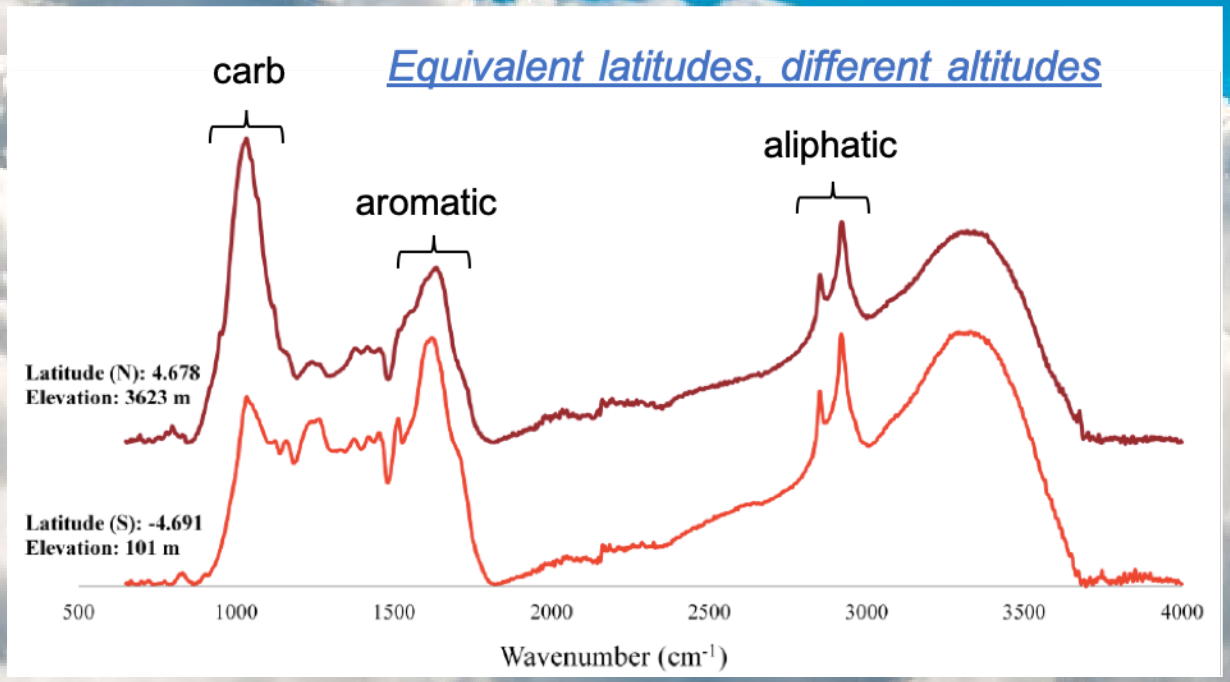
It’s about changes in latitude and altitude

And new peat analyses we should do



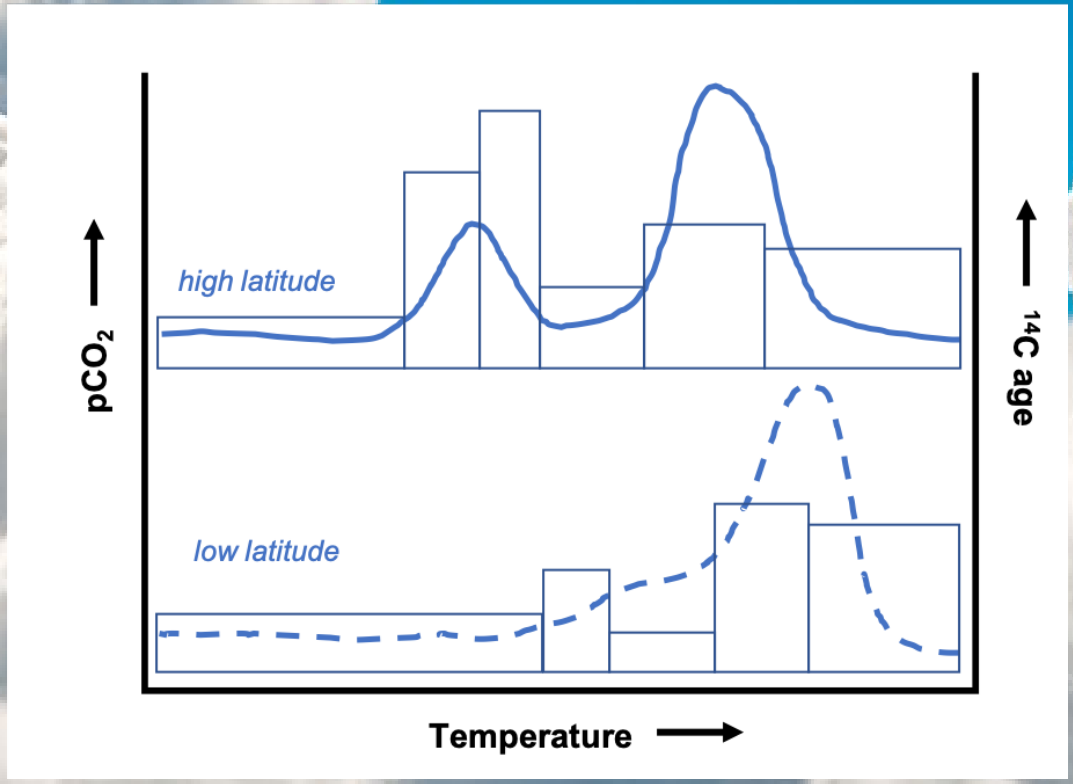
One is Fourier Transform Infrared Spectroscopy

to look at peat molecular composition



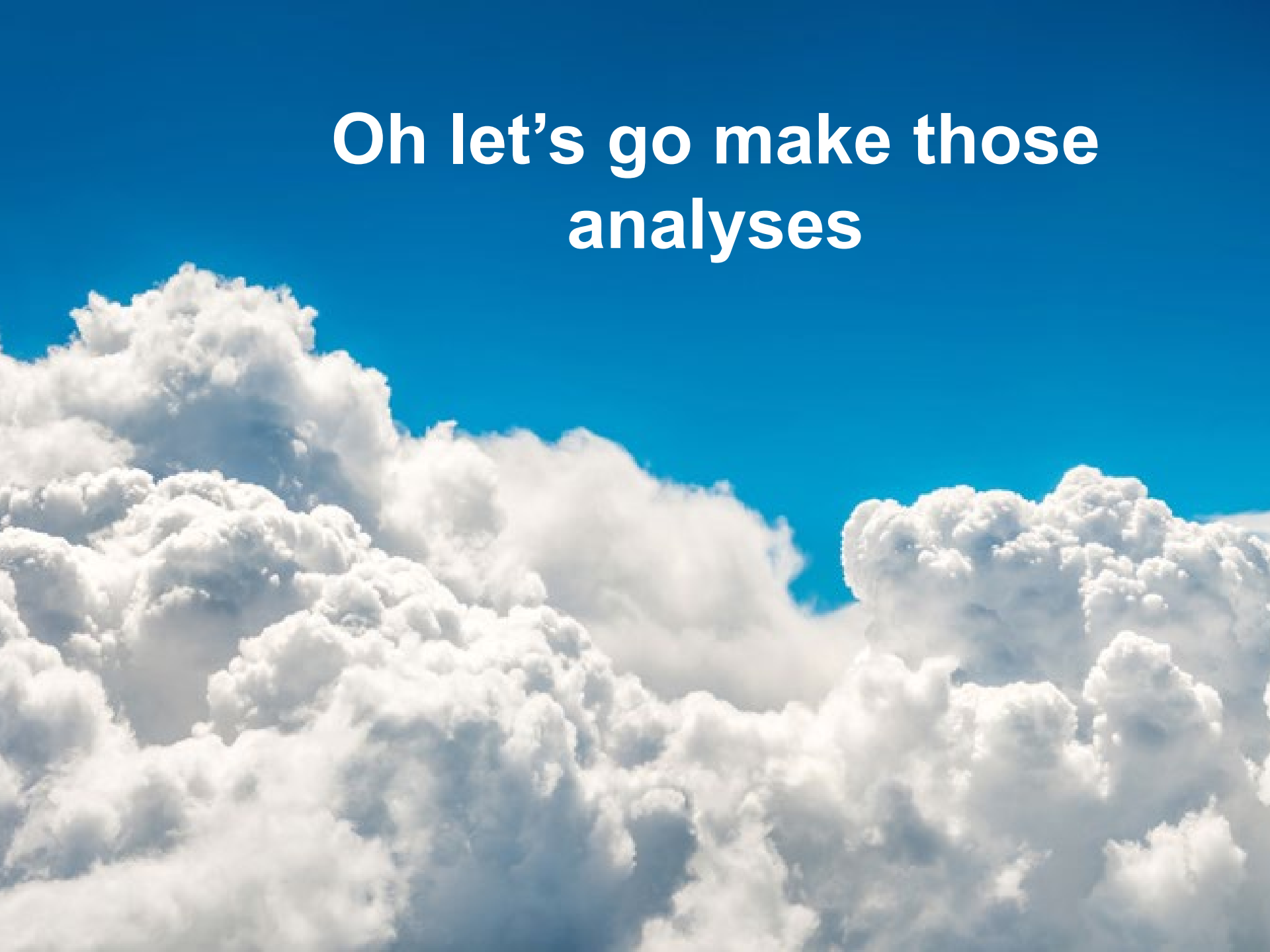
The other is pyrolysis with ^{14}C dating

to quantify the age and reactivity of peat stores

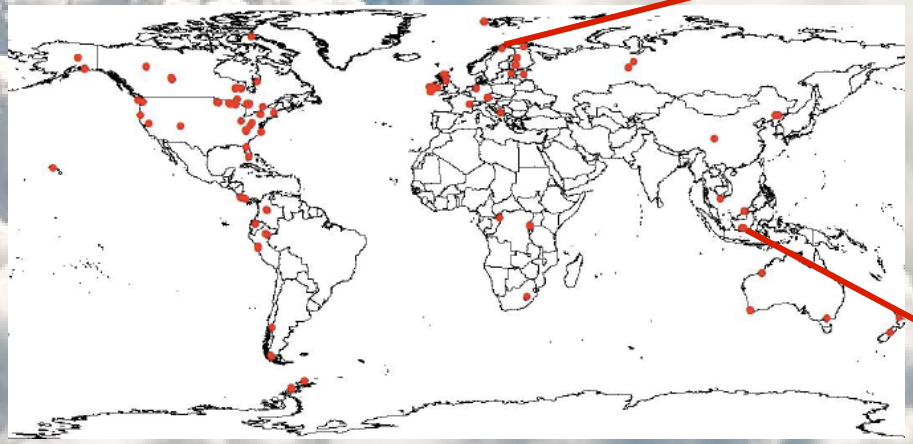



Nobody said it was easy,
but we've still got
so much to find out


Nobody said it was easy,
We just wanna know
what's in store


Oh let’s go make those analyses

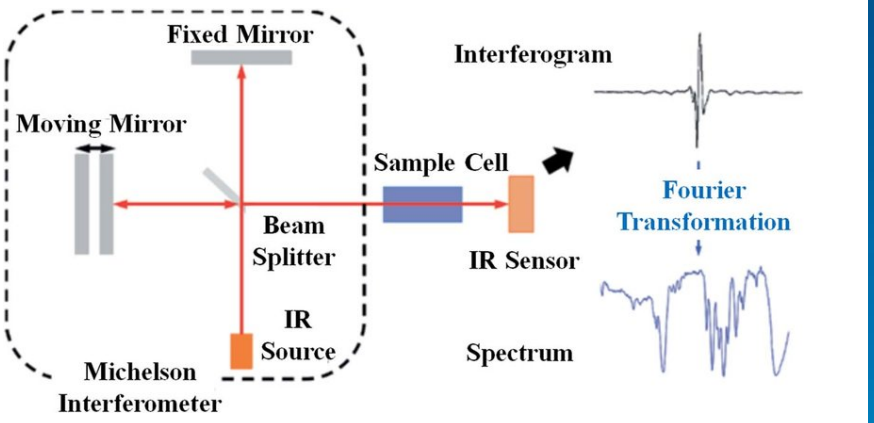
I am proposing to analyze a suite of modern peat samples that have been collected from all over the world, from the tropics to polar regions.



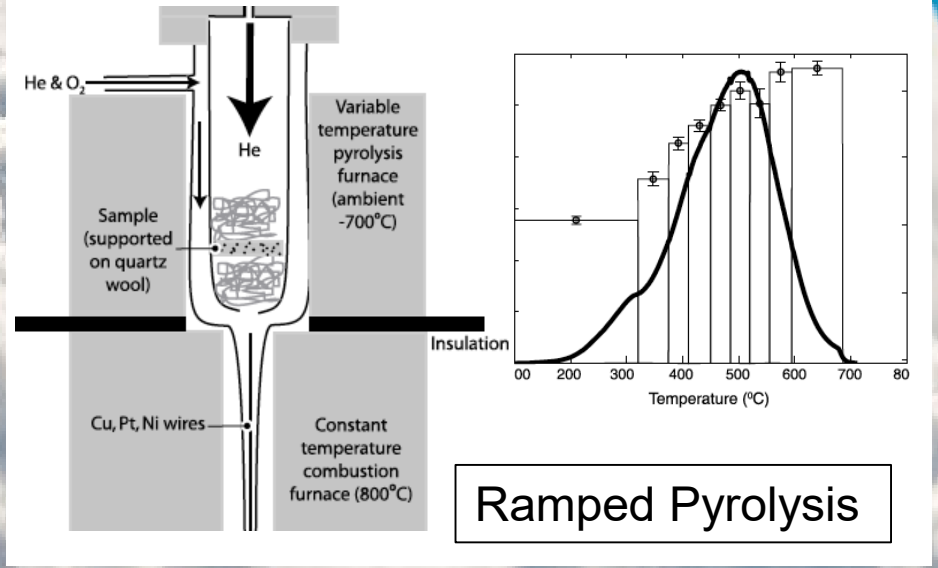
Q: How does climate affect the quality of peat and its ability to store carbon?

- Comparing peats from a variety of latitudes and altitudes will allow us to better understand how peatlands will respond to climate change

- More juicy, easily decomposable molecules should be found in polar region peats, which are most vulnerable to change with warming



FTIR Spectroscopy



Ramped Pyrolysis

Data from FTIR Spectroscopy and Ramped Pyrolysis with ^{14}C-dating will be analyzed in tandem to uniquely answer questions about the vulnerability of peat to decompose across a range of climates.

Thank You!

Thanks to my co-PI's: Jeff Chanton (FSU, EOAS) and Ann McNichol (WHOI)

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Katy Sparrow
ksparrow@fsu.edu
Dept. of Earth, Ocean, and Atmospheric Science

"The Scientist" by Coldplay *Recording by: backtracks professional karaoke*