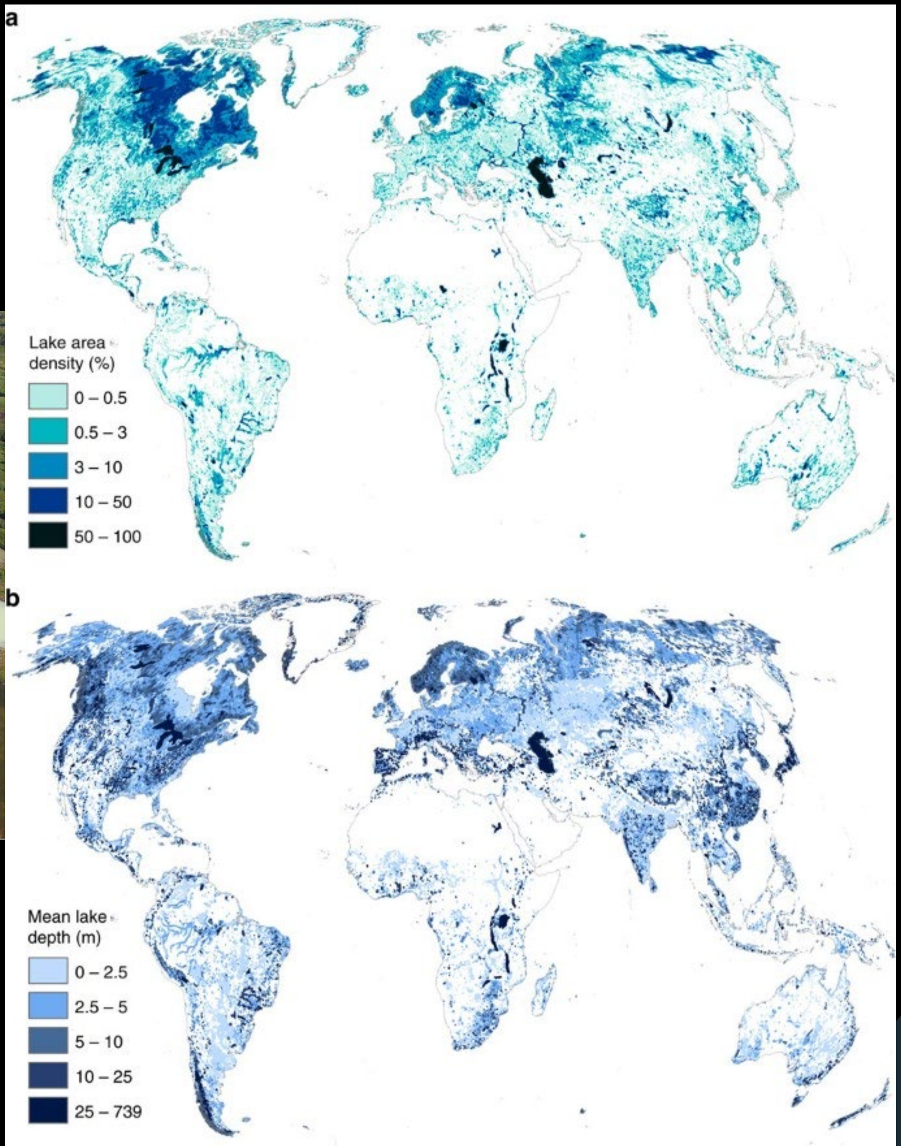
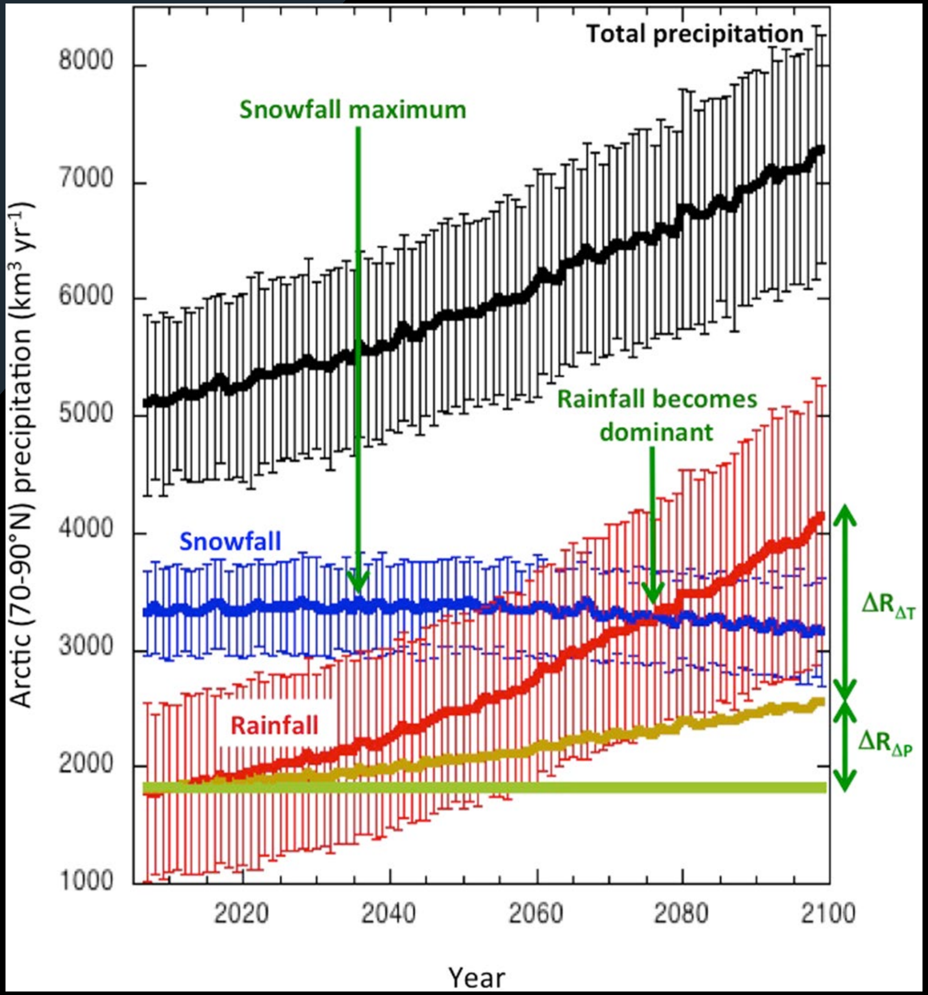
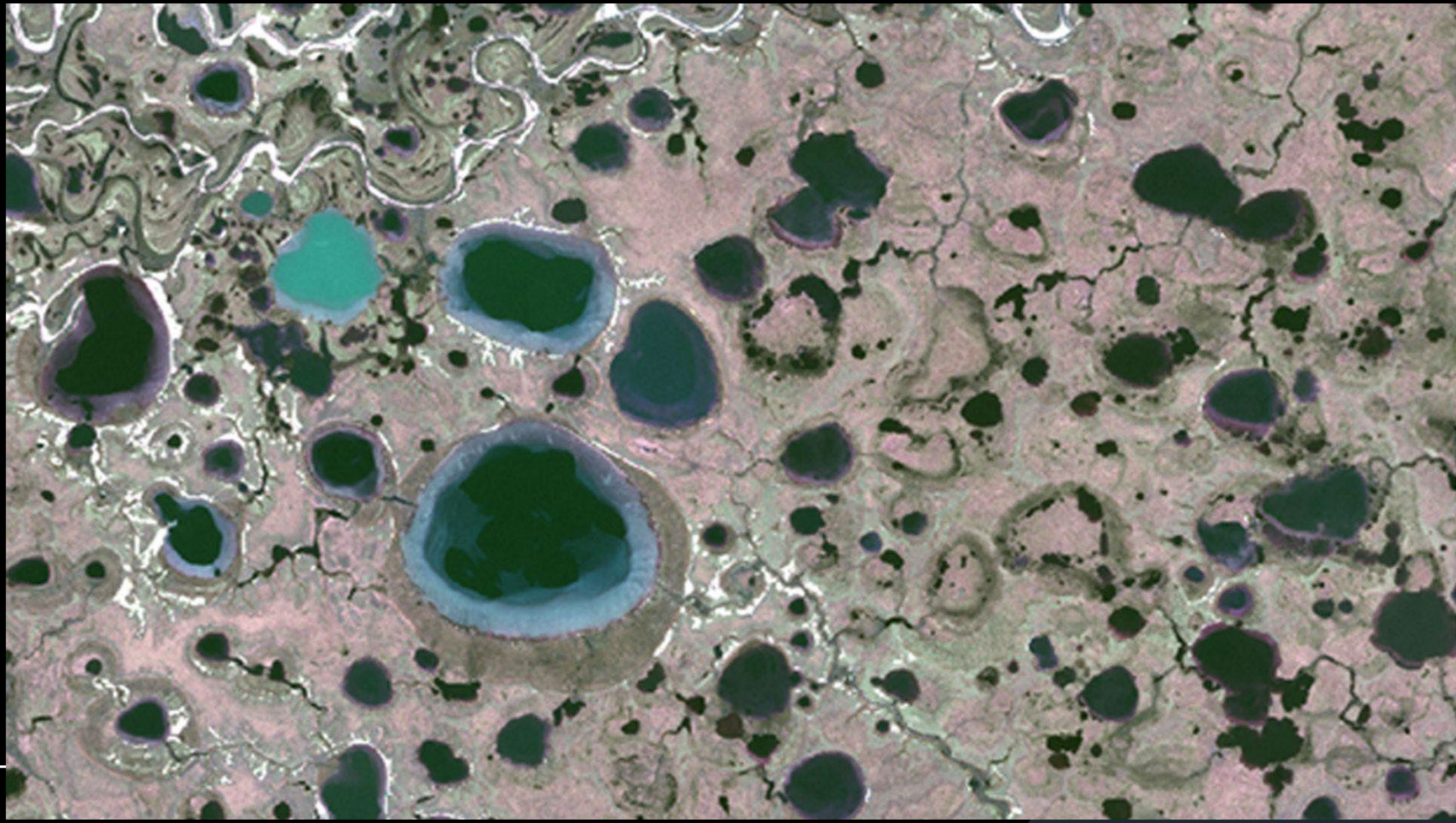
There is more lakes & ponds in the Arctic than anywhere

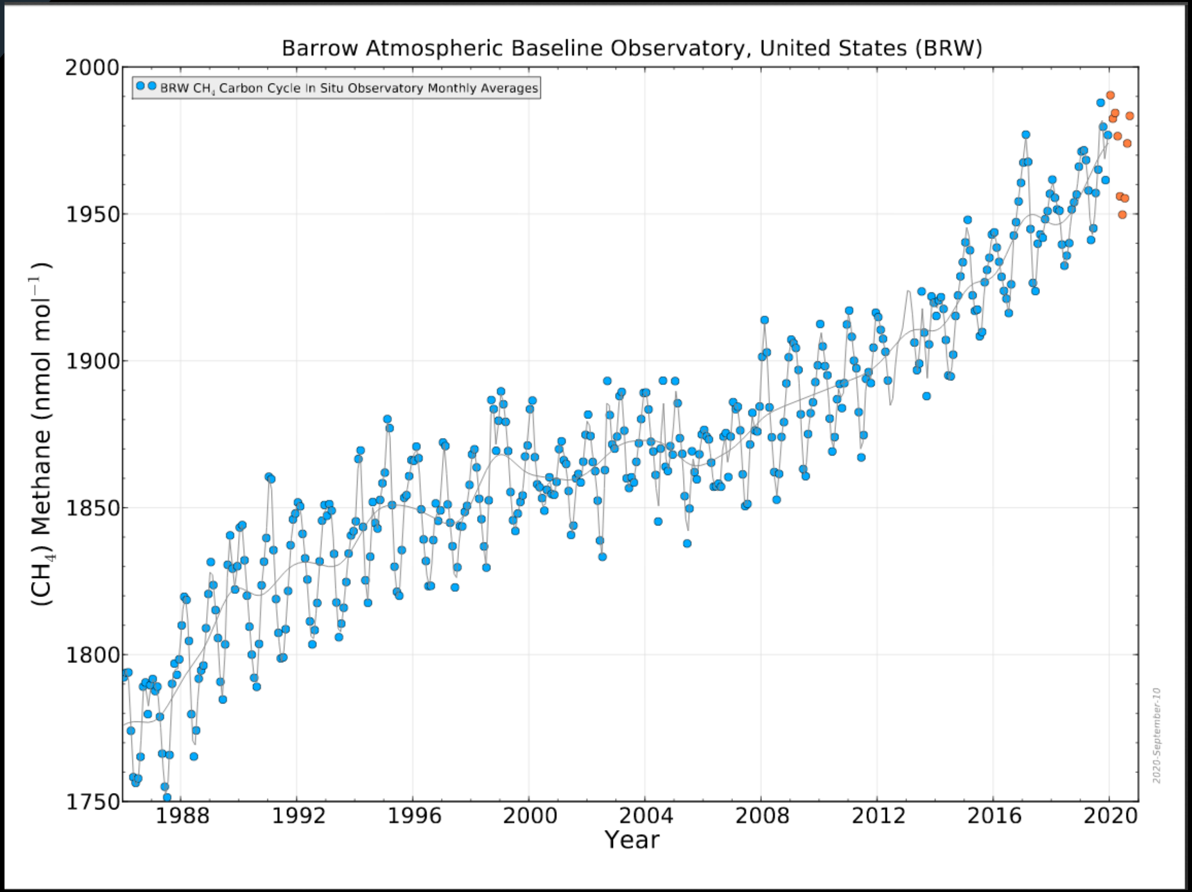


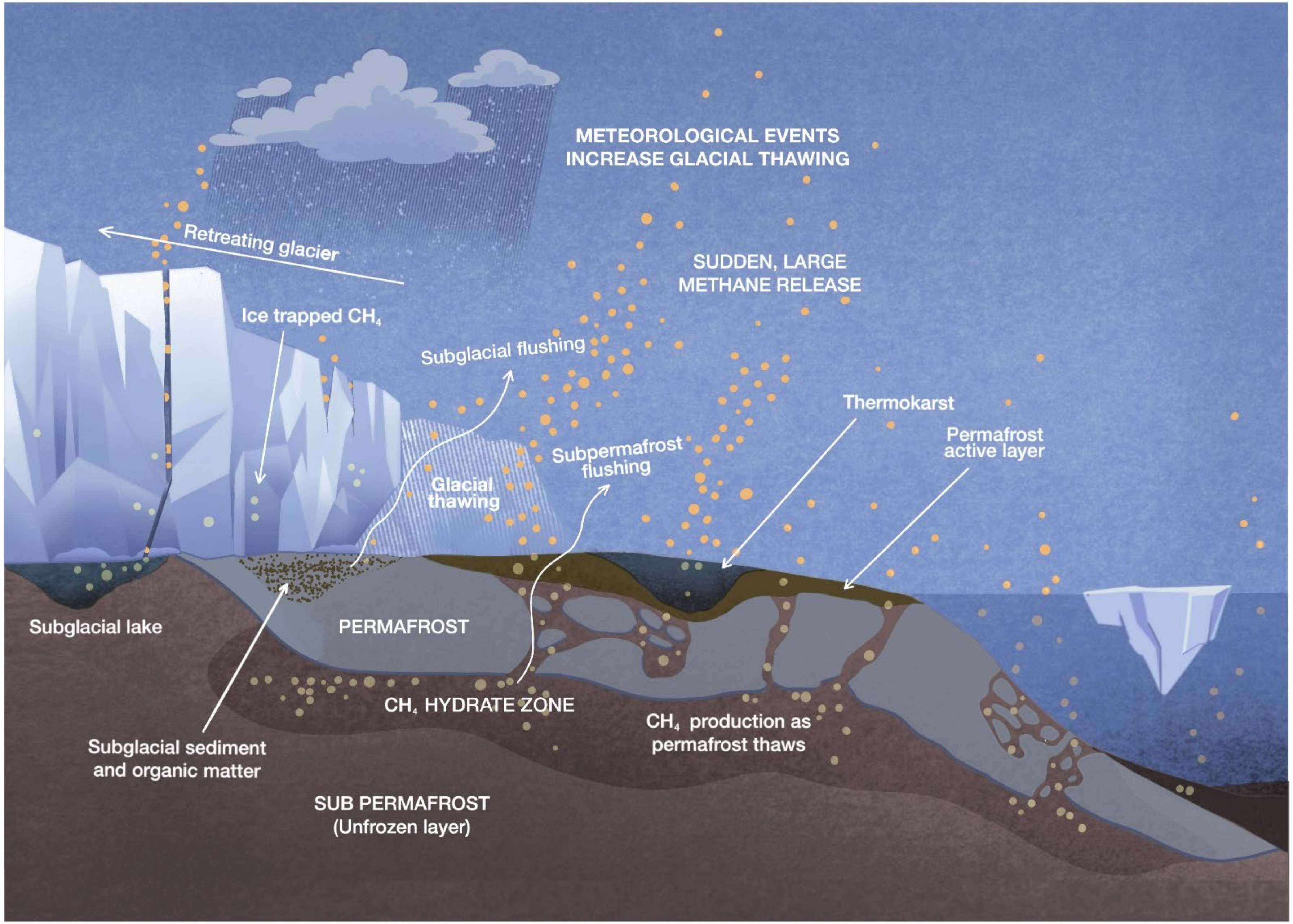
Numbers of thaw lakes and ponds in the Arctic are staggering; 45 000 have been mapped on the Mackenzie River delta and floodplains alone, and ca 200 000 are found on the Yukon River delta alone (after Kling 2009). Figure from Messager, et al 2016; Photo credit: A. Przytulska & I. Laurion


Total precipitation
Snowfall maximum
Rainfall becomes dominant
Snowfall
Rainfall
ΔR ΔT
ΔR ΔP
Arctic (70-90°N) precipitation (km3 yr-1)
Year
8000
7000
6000
5000
4000
3000
2000
1000
2020
2040
2060
2080
2100



METHANE IN THE ARCTIC – WHY THIS MATTERS?





MetVISArc - *Visualization of methane fluxes along coastal boundaries of Arctic permafrost and glaciers*

MetVisArc

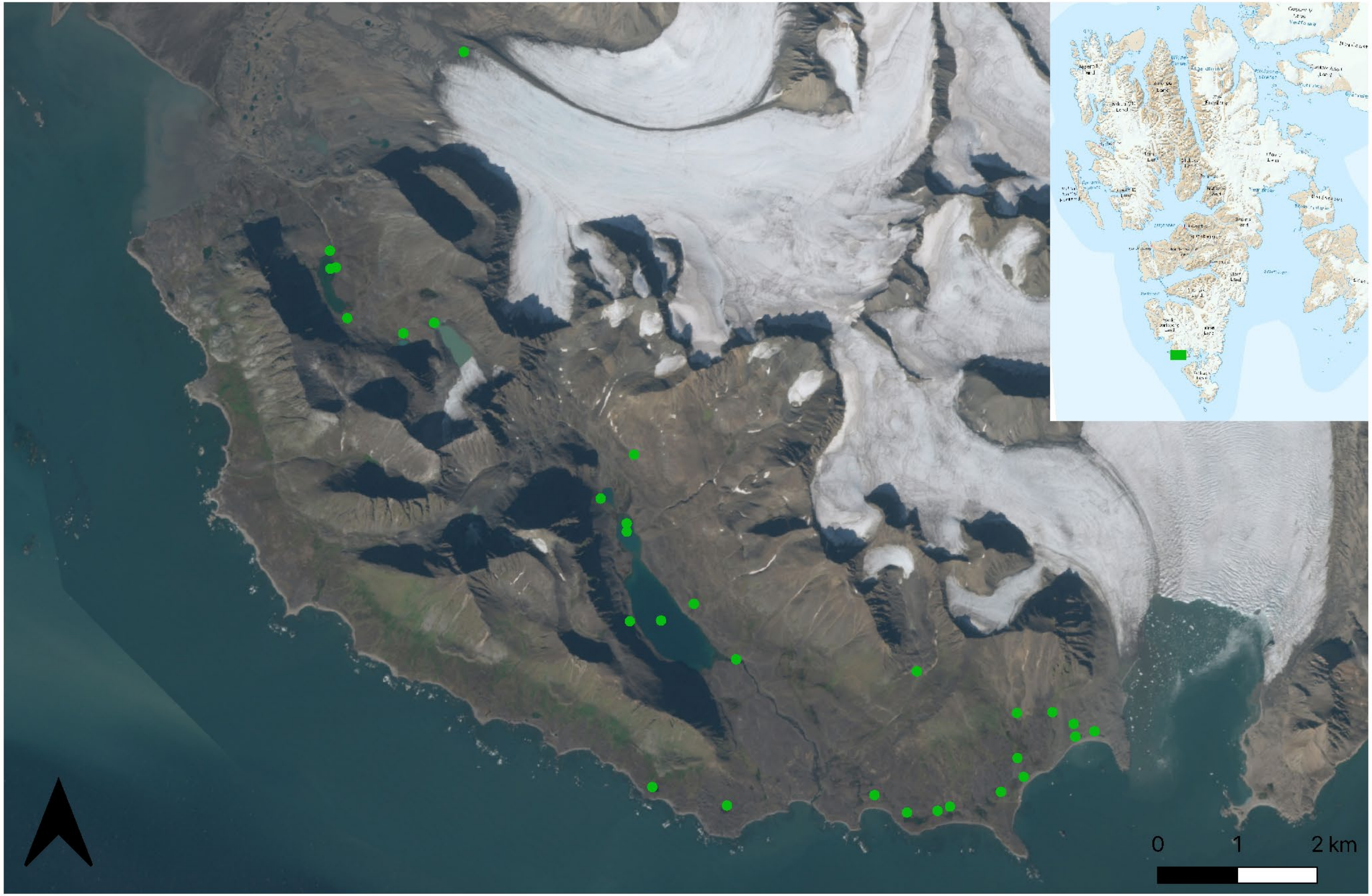
- The main research tasks:
- Assembling the CH_4 monitoring system and coupling to meteorological and hydrological observations.
- Mapping of CH_4 fluxes throughout the permafrost boundary zone and discrete sampling for concentrations and stable isotope characterisation.
- Understading CH_4 fluxes in the permafrost boundary zone

GLACIAL LAKES

PROGLACIAL LAKES

TUNDRA PONDS

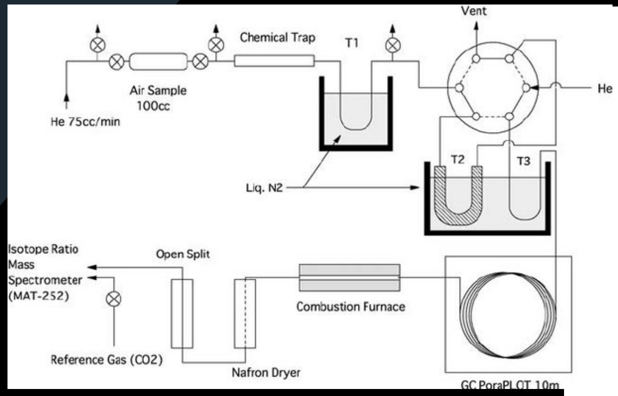
RIVERS

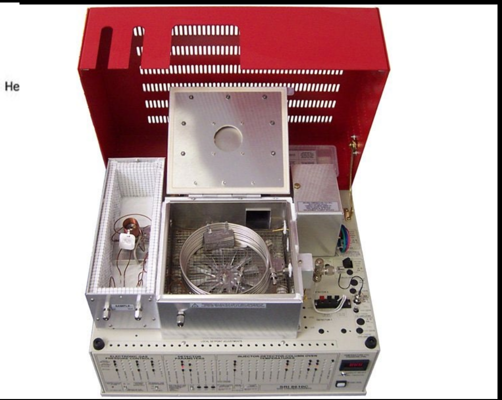

0
1
2 km

METHODS

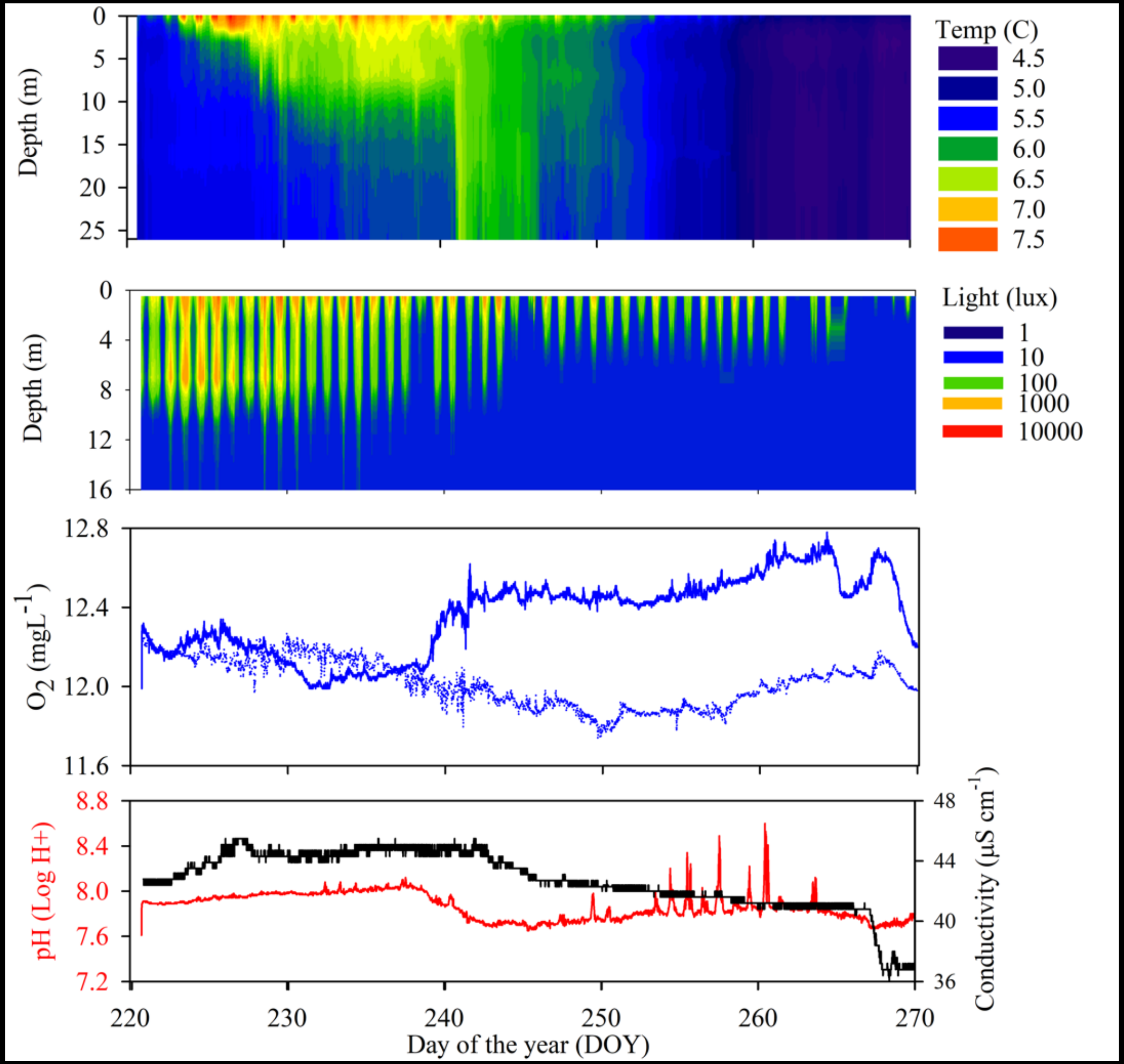
METHODS CD

Monitoring of CH_4 and ^{13}C-CH_4 by GC and IRMS

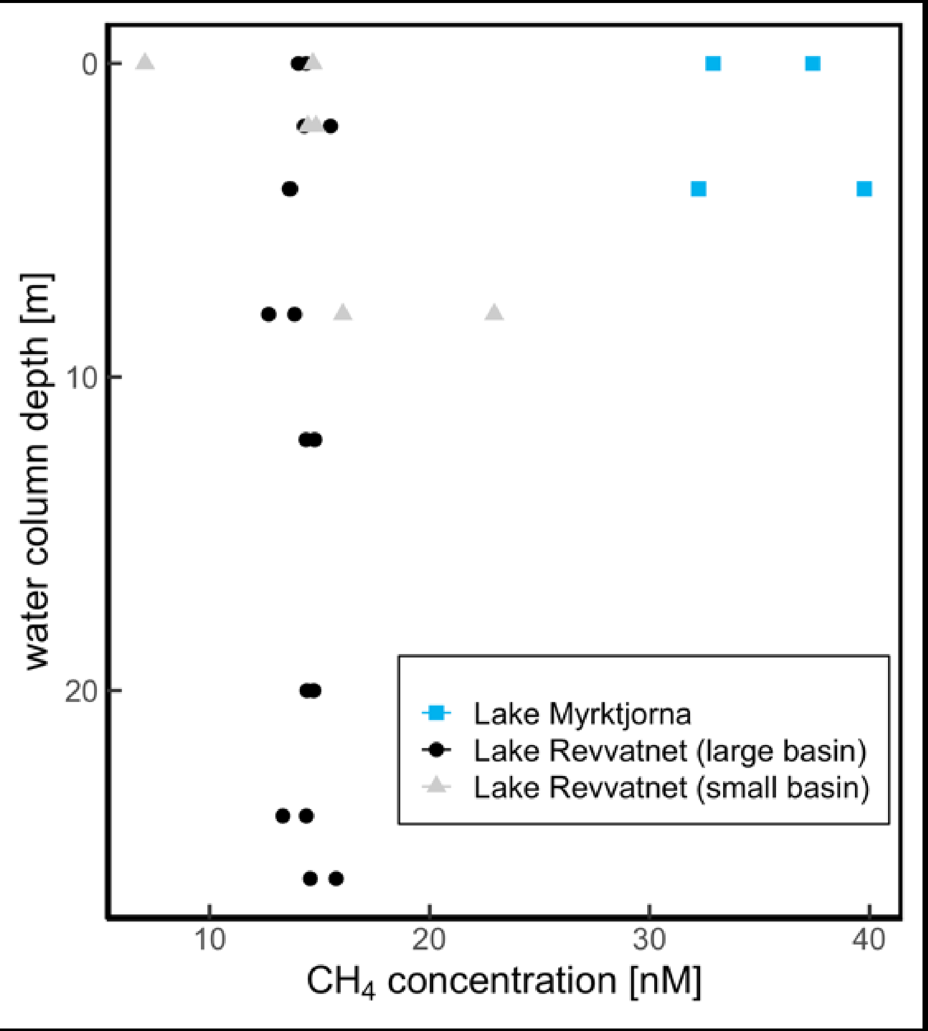


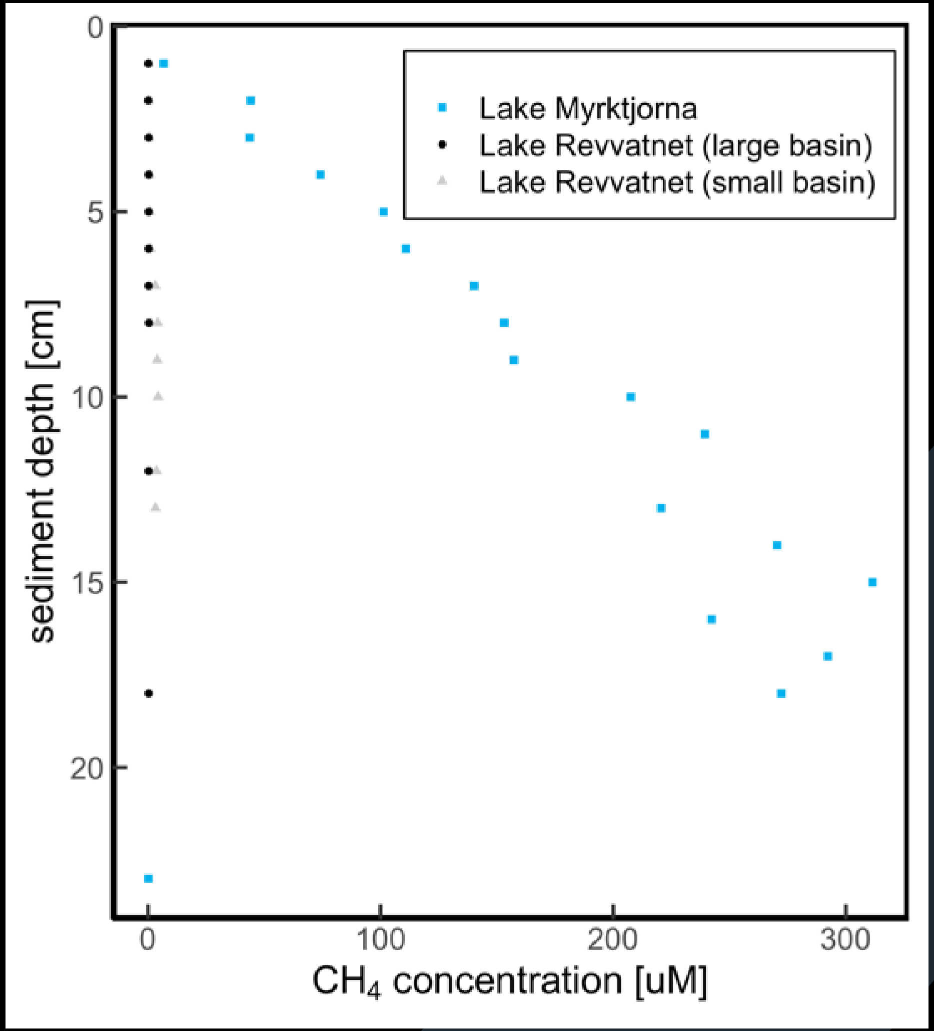


RESULTS - LAKES

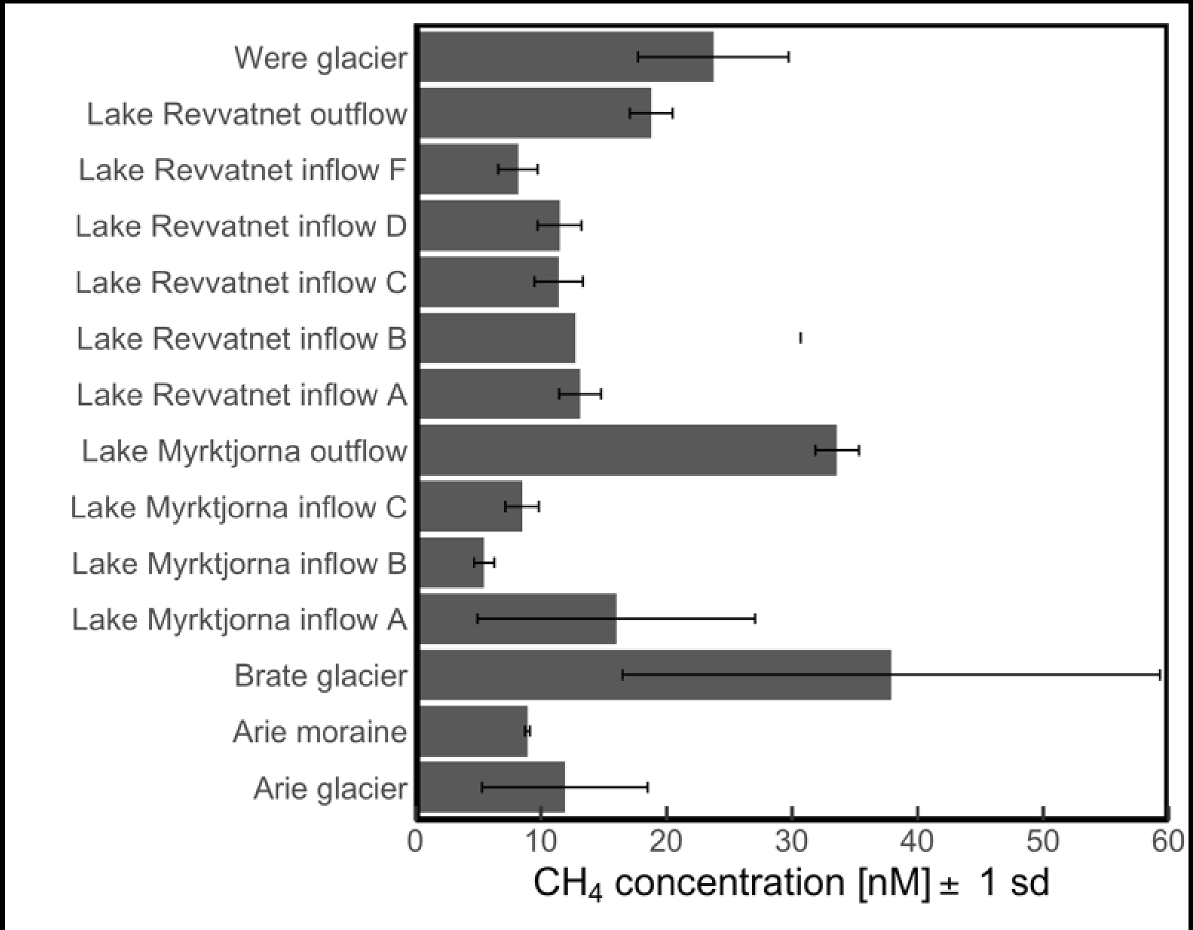


RESULTS - LAKES

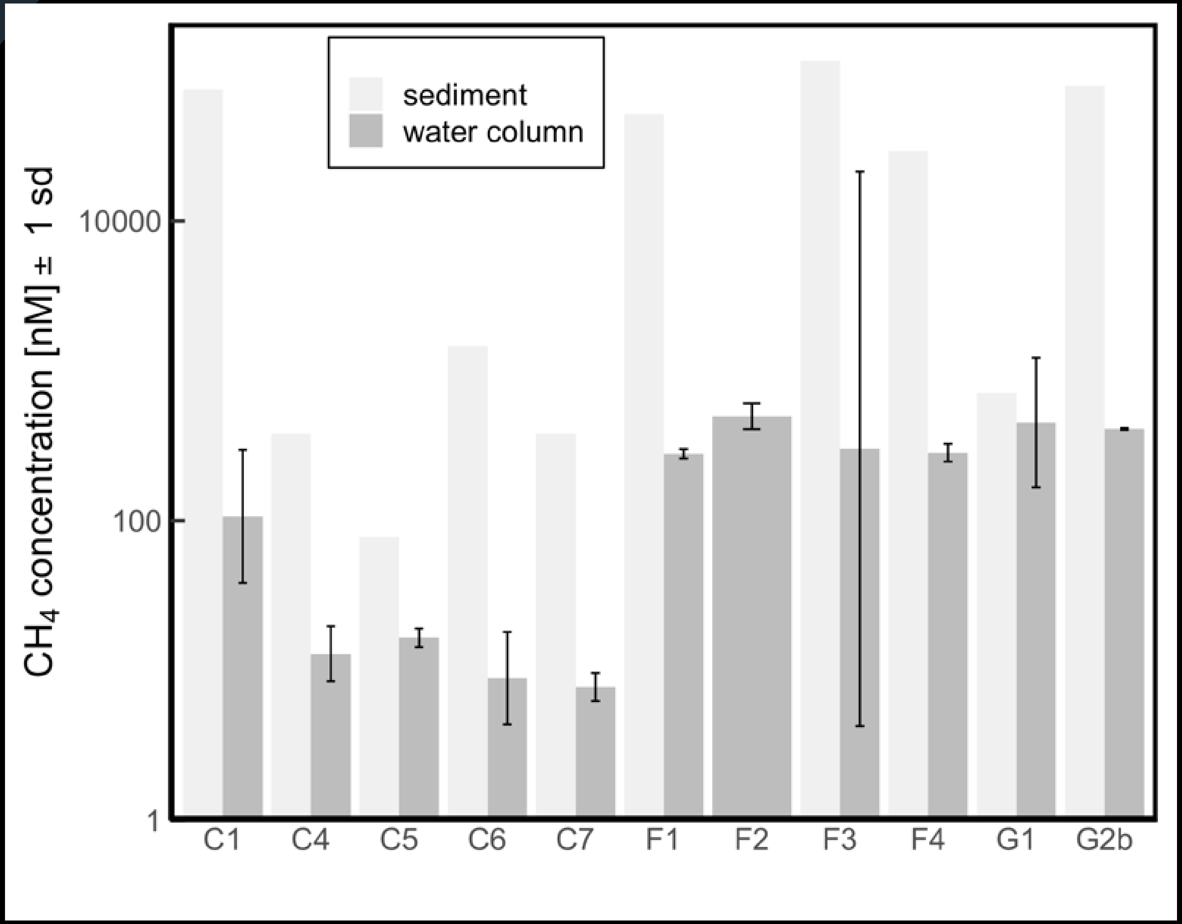




RESULTS – RUNNING WATERS



RESULTS - PONDS



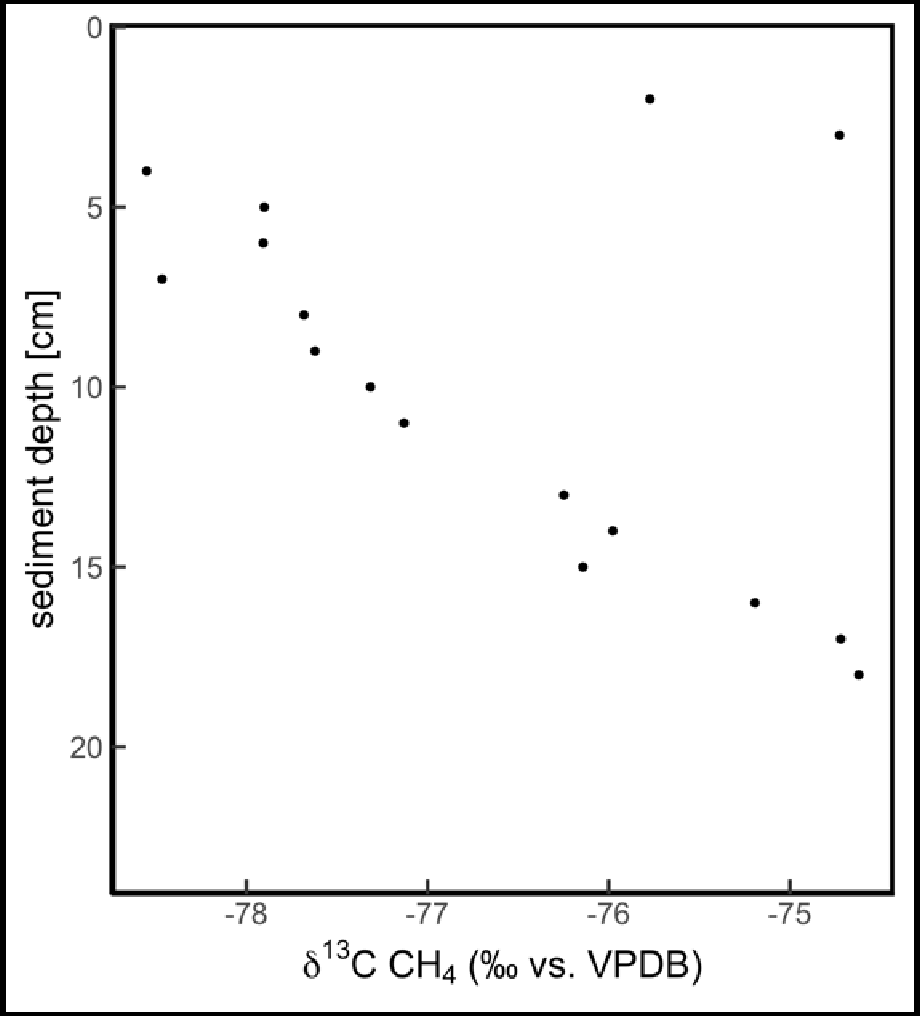
Groundwater samples
Well 1: 2621 ± 66 nM CH4
Well 2: 26 ± 29 nM CH4
Well 3: 7 ± 3 nM CH4

ORIGIN OF METHANE

Definition of the δ-value (‰):

$$\delta = \left[\frac{R_{Sample} - R_{standard}}{R_{standard}}\right] * 1000$$

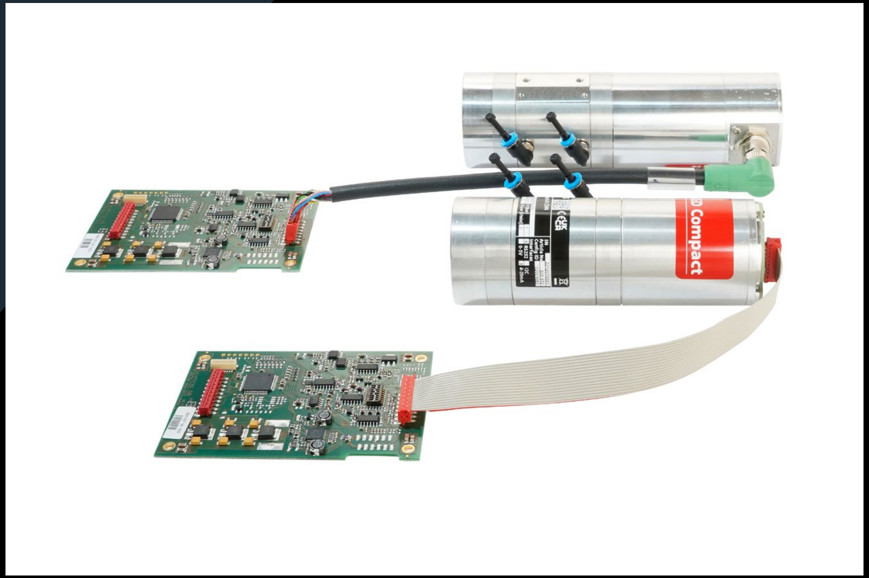
R = the ration of the heavy (^{13}C) to the light (^{12}C) stable isotope.



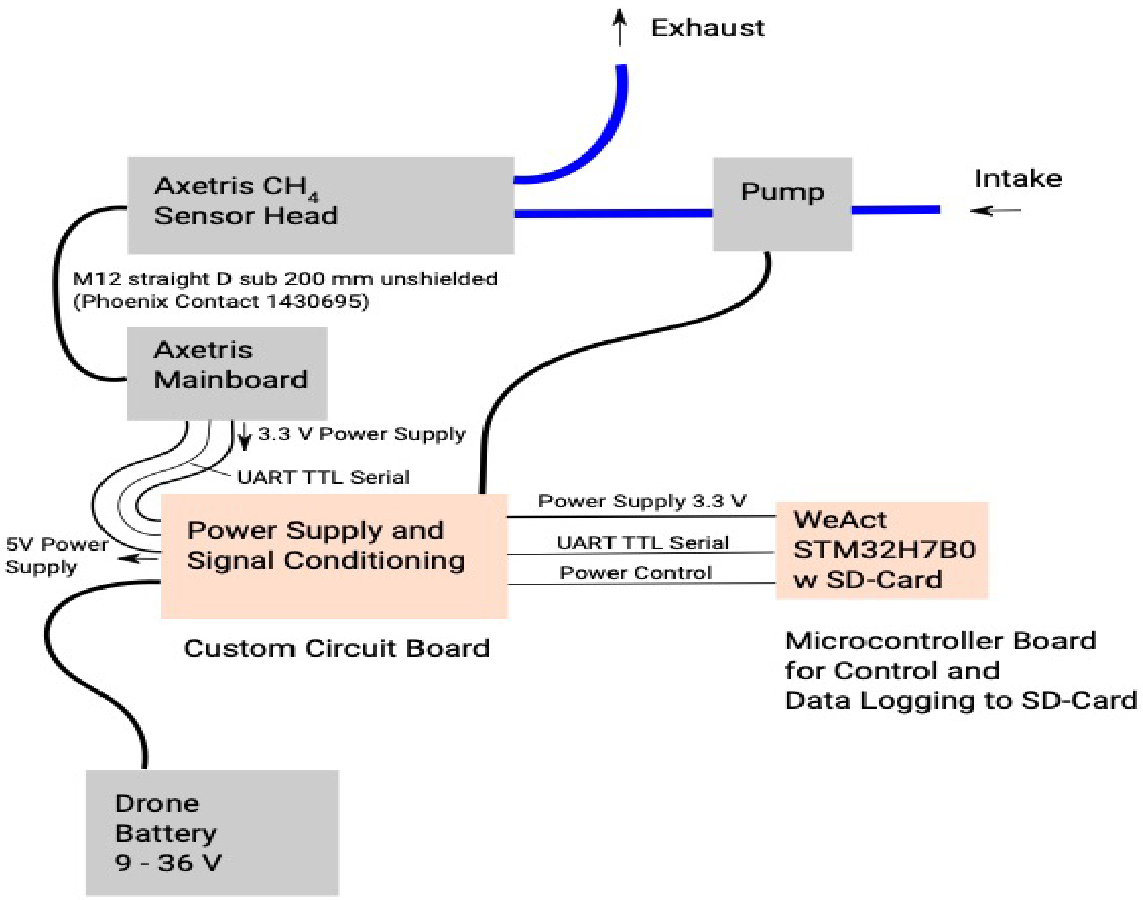
CONCLUSIONS AND OUTLOOK

- ALL TESTED FRESHWATERS WERE OVERSATURATED WITH METHANE THUS CONTRIBUTING TO ATM INCREASE
- HIGH VARIABILITY IN METHANE LEVELS
- PONDS AND GROUND WATERS EMERGING AS HOT SPOTS
- GLACIERS WITH POTENTIALLY HIGH EMISSIONS
- OXIDATION IS IMPORTNANT EVEN IN THESE COLD SYSTEMS
- NEED TO DEVELOP NEW EQUIPMENT FOR CH4 MONITORING

NEW APPROACH



Drone Methane Platform



THANKS TO CONGAS TEAM:

LUKASZ STACHIK
SASKIA LAUBII
JAKOB ZOPFI
CLAUDIA FREY
MORITZ LEHMANN
LUKAS ZIMMERMAN

Marie Sklodowska-Curie fellowship 847639.

MARIE CURIE ACTIONS

NCN grant 2020/39/I/ST10/02129

NARODOWE CENTRUM NAUKI