A Green Blanket

How vegetation insulates the Arctic soil

UNIS Lunch 02-03-2022

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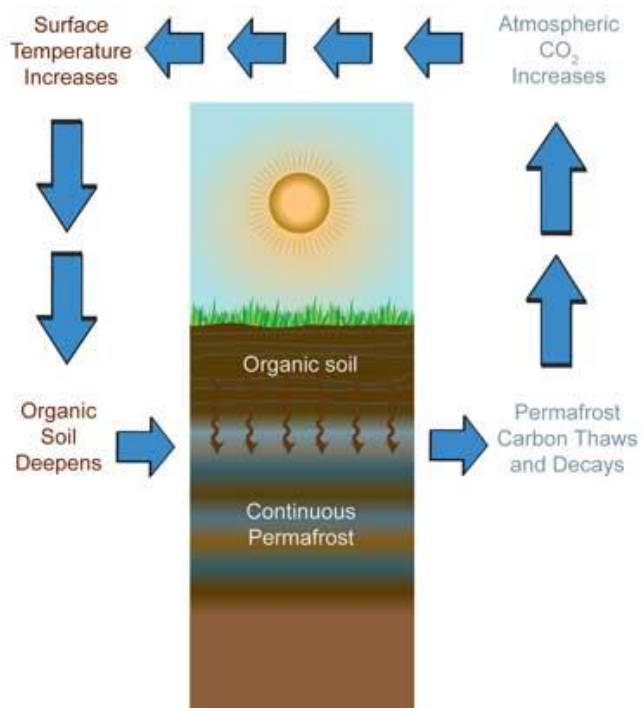
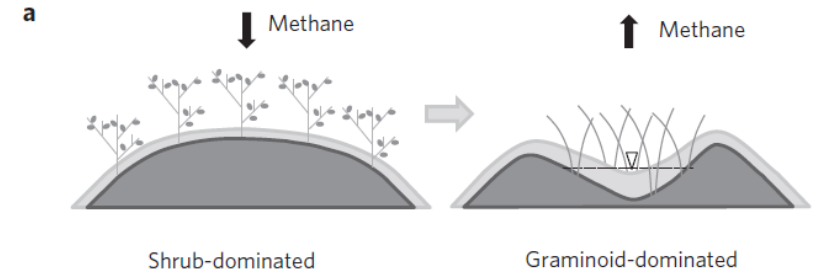
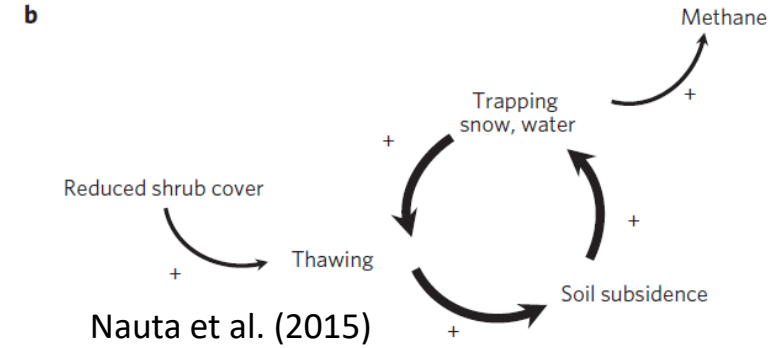
Permafrost degradation

Effects

- 1000 Gigatonne C
- Max increase of 140 ppm CO_2 by 2100
- CO_2 or CH_4





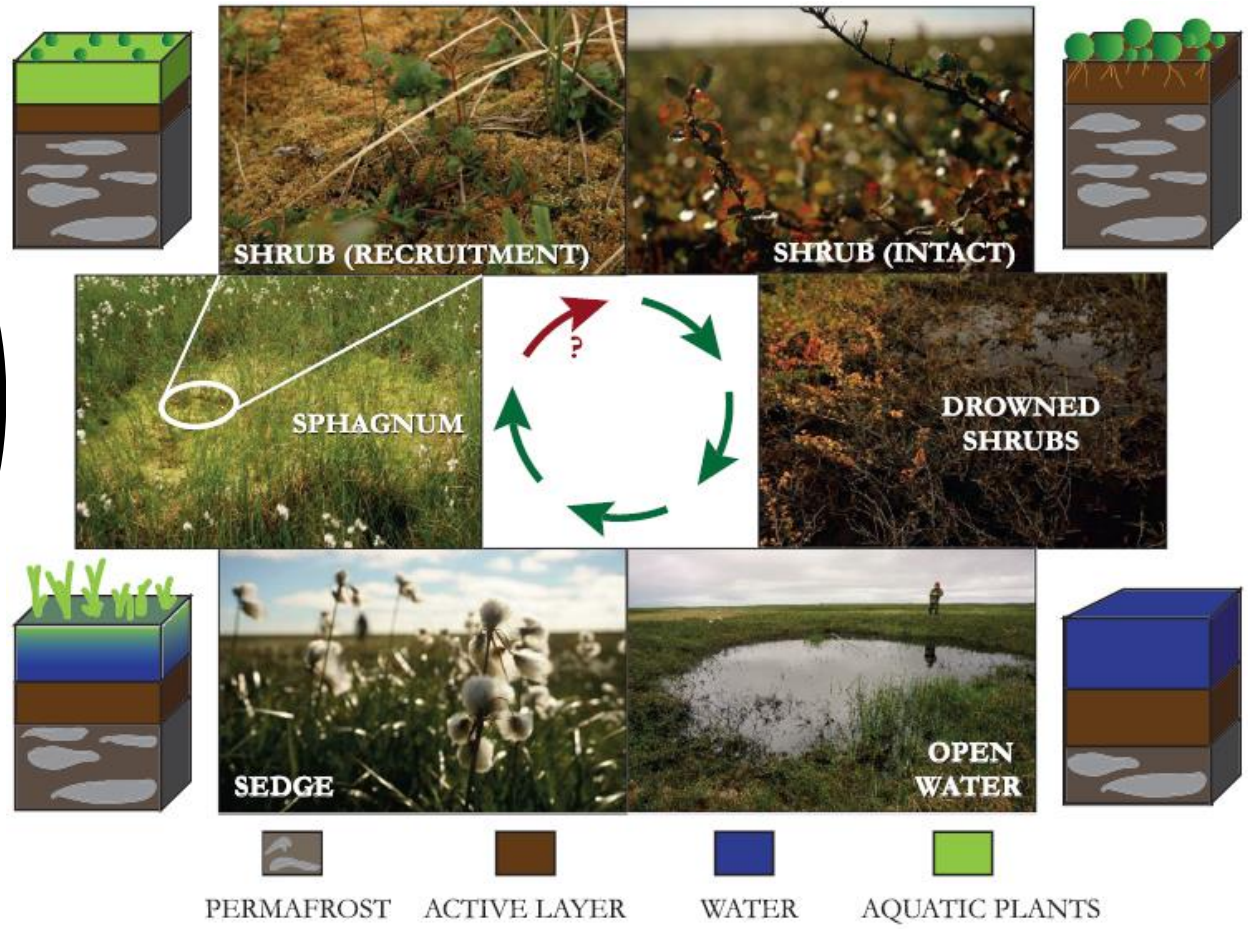


Nauta et al. (2015)

Vegetation

Insulation

- Insulation:
  - Shading
  - Trapping air
  - Snow collection
  - Albedo
  - Evapotranspiration
- Shapes the landscape!

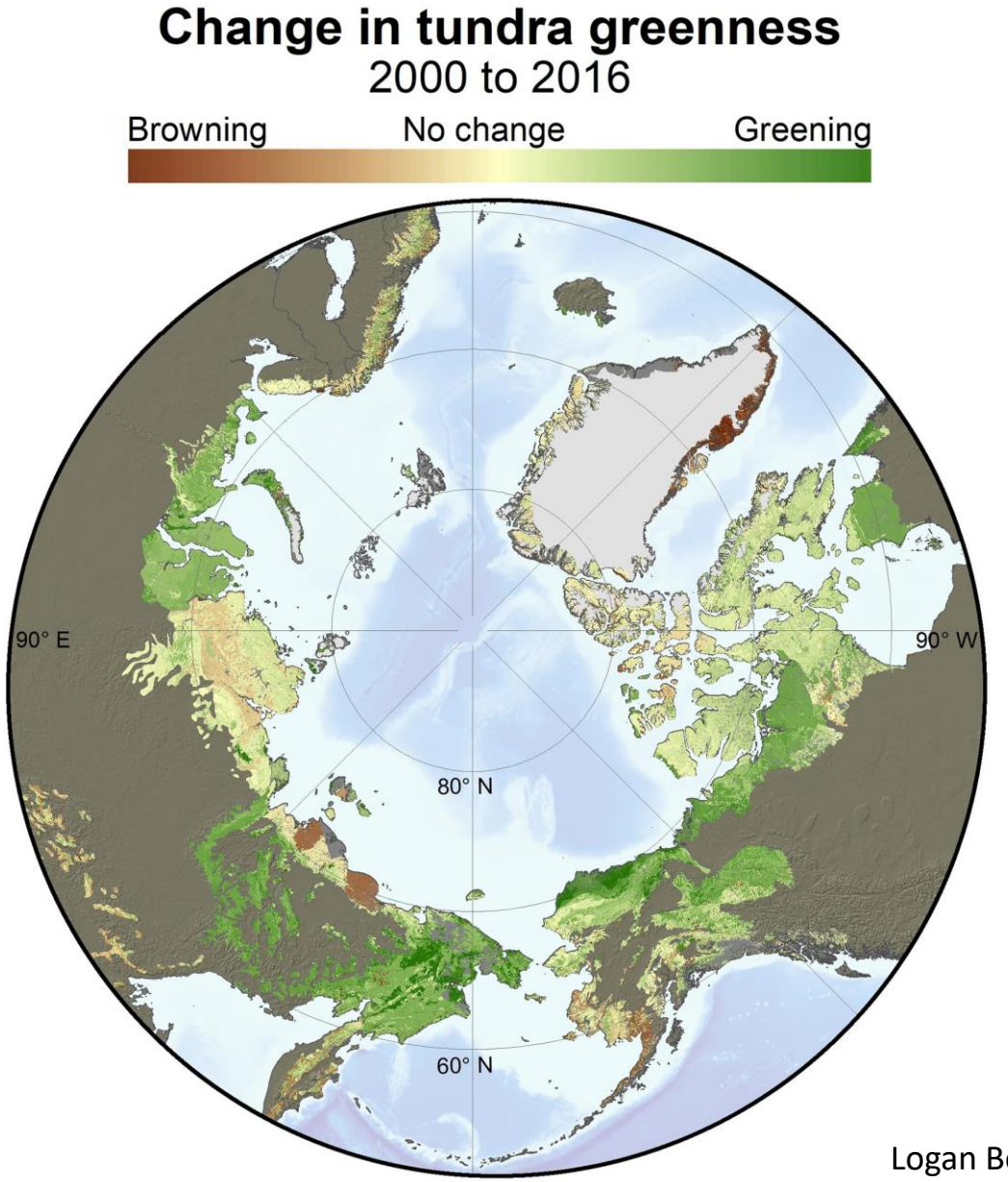


Magnusson et al. (2020)

Vegetation

Changes

- Changing climate -> changing vegetation
  - Greening and browning
- If plants change, what will happen to the permafrost?



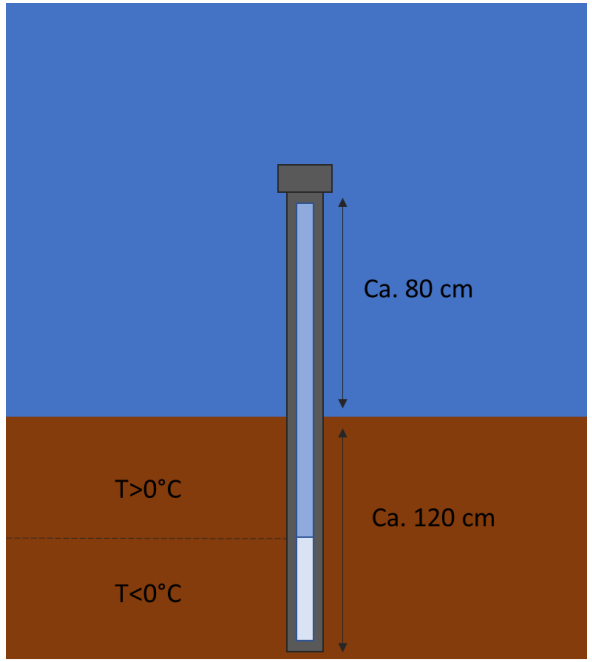
Logan Berner

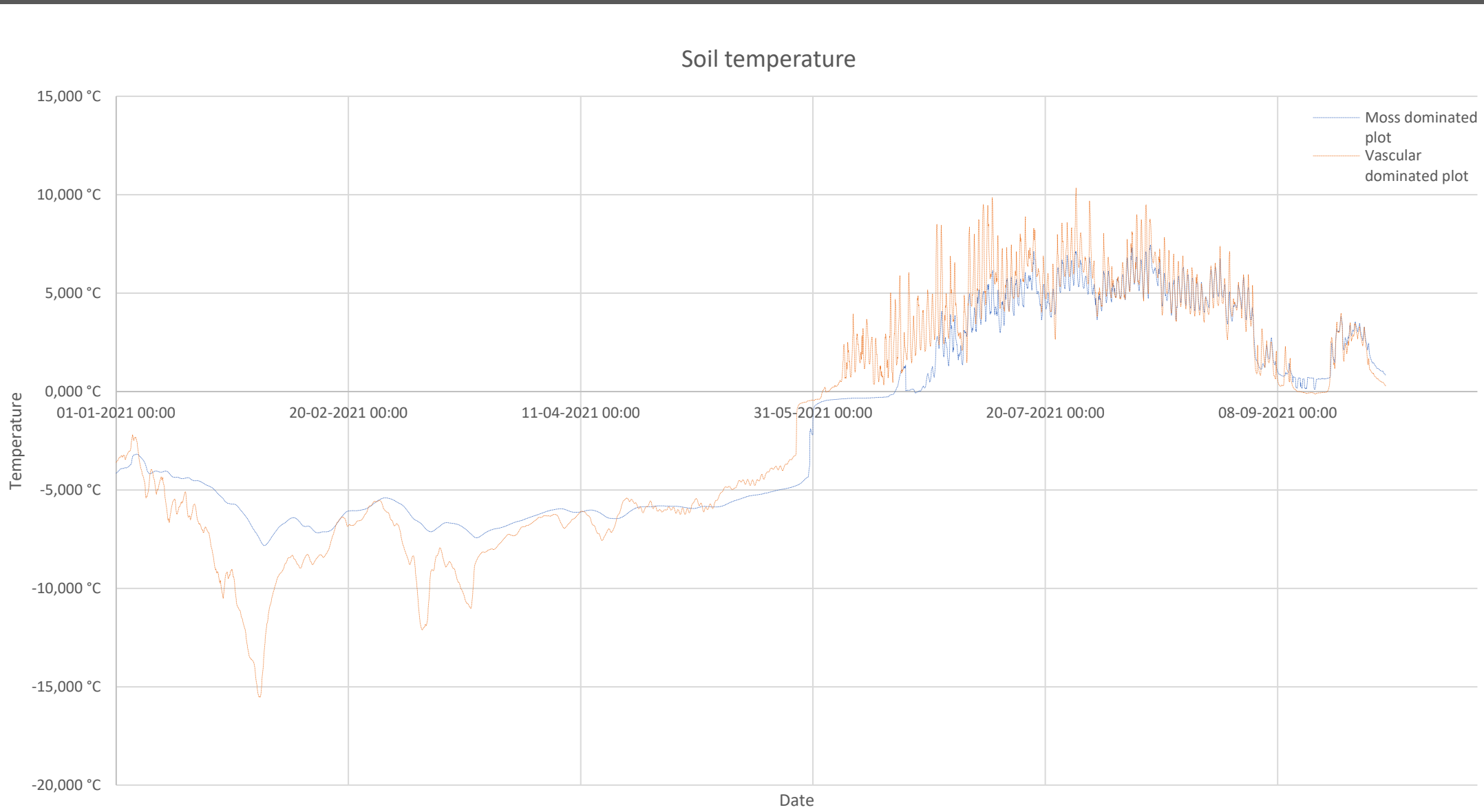
My Research

- Vegetation & permafrost on Svalbard
- Difference between types
- Traits

My Research
How do plants affect the active layer?

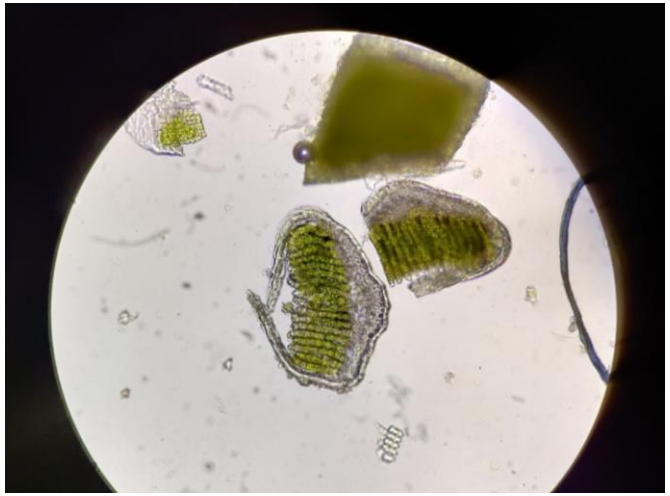
- 4 Sites with natural variation
- Measure in plants:
  - Vegetation composition
  - Height
  - Water holding capacity
- Measure in soil:
  - Active layer depth
  - Moisture
  - Temperature
  - Snow cover and -depth

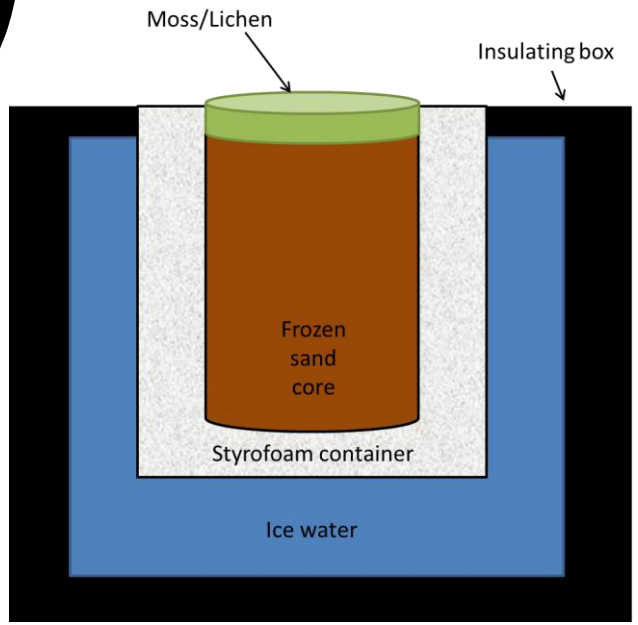



Soil temperature
15,000 °C
10,000 °C
5,000 °C
0,000 °C
-5,000 °C
-10,000 °C
-15,000 °C
-20,000 °C
Temperature
01-01-2021 00:00
20-02-2021 00:00
11-04-2021 00:00
31-05-2021 00:00
20-07-2021 00:00
08-09-2021 00:00
Date
Moss dominated plot
Vascular dominated plot

Coming soon...

- Sampled a range of moss species from the field
- Put in a styrofoam container with ice core underneath, and place in climate room (5^{o}C)
- Measure:
  - Biomass
  - Density (shoots mm-2)
  - Water holding capacity
  - Albedo
  - Evapotranspiration rate
- Field comparisson: 5 blocks with 50x50 cm on sand soil, monitor ALT underneath throughout spring and summer





Conclusion

- Permafrost thaw = **Bad!**
- Vegetation mitigates thaw
- Mosses more insulation in early season
- Future Svalbard?