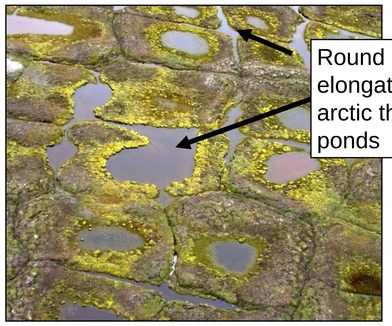
Arctic ponds: a fascinating world!

Véronique Gélinas and Isabelle Laurion, Institut national de la recherche scientifique, Centre Eau, Terre et Environnement, Québec, Canada

What are thaw ponds?

Thaw ponds are small water-filled depressions formed by melting of permafrost (permanently frozen soil).

Global warming amplifies this phenomenon.



Why studying thaw ponds?

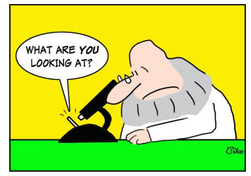
- To discover microbial diversity in thaw ponds and determine the factors influencing their activity
- To understand the role of thaw ponds on climate

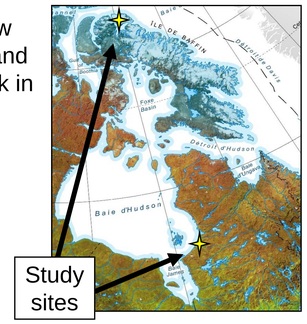
Greenhouse gases

- Carbone dioxide (**CO_2**) and methane (**CH_4**) are two important greenhouse gases.
- They are the result of human activities but are also produced by natural processes!
- Greenhouse gases keep the heat in our atmosphere

How to study arctic thaw ponds?

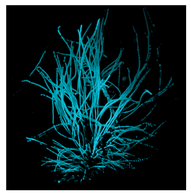
- Water sampling in many arctic thaw ponds in Sirmilik Park on Bylot Island and near the village of Kuujjuarapik in Nunavik.
- Sample analyses at the laboratory

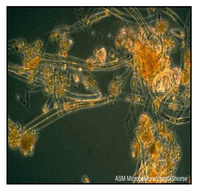




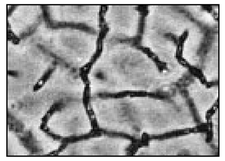
A pond full of microscopic life!

Microbe size ranges from 1 to 100 microns
1 micron = 1000x smaller than a millimetre

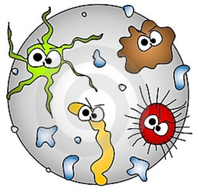


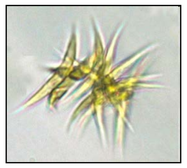


Crenothrix polyspora

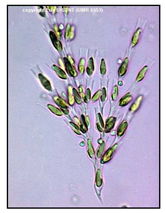


Pelodictyon clathratiforme

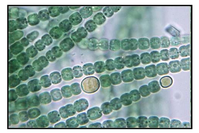




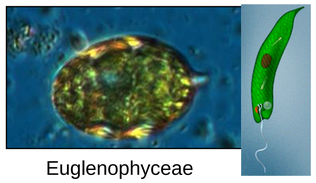
Chlorophyceae
Ankistrodesmus sp.



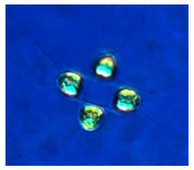
Chrysophyceae
Dinobryon sp.



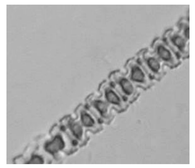
Cyanophyceae
Anabaena sp.



Euglenophyceae

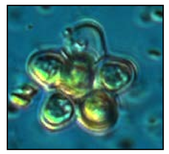


Gonium sp.

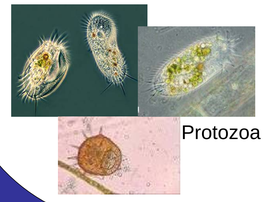


Teilingia sp.

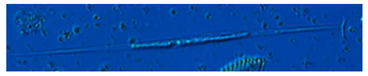
Cosmarium sp.



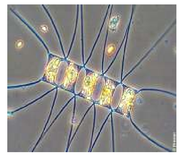
Coelastrum sp.



Protozoa



Ankyra sp.



Diatomée
Chaetoceros sp.

Thaw pond carbon exchanges

1. Soil erosion is a source of organic matter (soil particles with carbon and nutrients)

The impact of thaw ponds on our life?

Scenario 1. Global warming → More thaw ponds → Intensification of erosion → Increase in organic matter and nutrients in water → Amplified greenhouse gas production by microbes → Further warming through positive feedback...

Scenario 2. Global warming → Drainage of ponds or colonization by plants → Reduced greenhouse gas emissions to the atmosphere.

Acknowledgments: C. Dupont, P.-G. Rossi, C. Vallières, S. Lévesque, W. F. Vincent, C. Lovejoy, G. Gauthier, NSERC-IPY MERGE, Federal IPY, ArcticNet, FQRNT, Parks Canada, PCSP, Indigenous and Northern Affairs Canada