In formerly glaciated permafrost regions, extensive areas are still cored by a large amount of glacier ice buried underneath a thick cover of sediments. Its spatial distribution can play a significant role in reshaping periglacial landscapes, in particular the aquatic systems.

This study focuses on lake initiation and development in response to the melting of buried glacier ice on Bylot Island, Nunavut. We studied a lake-rich valley using:

1. Dated lake-sediment cores
2. Detailed bathymetric data
3. Observations of buried glacier ice exposed in the slump headwalls

We have identified 3 types of lakes according to their lake sediment facies and lake-floor geomorphology:

- **Thermokarst lakes that formed from the melting of permafrost intrasedimental ice and ice wedges**

- **Thermokarst lakes that formed from the melting of buried glacier ice**

- **Kettle lakes**

**Lake H**
- Shallow lakes (~2-3 m) "classic thermokarst lakes"
- Fairly uniform depth, with a central pool

**Lake G**
- Enlargement of ponds enclosed in the depression of low-center ice wedge polygons
- Melting of ice wedges and intrasedimental ground ice that formed in the surrounding material

**Lake L**
- Deep lakes (~9-12 m)
- Presence of multiple steep-sided sub-basins (in some cases)
- A body of buried glacier ice was exposed by lakeside slumps

Lake initiation of deeper thermokarst lakes is believed to have been triggered by the melting of buried glacier ice. Over time, they have enlarged through thermal and mechanical shoreline erosion, and subsequently coalesced with neighbouring water bodies to form larger lakes.

These deep lakes were primarily kettle holes that resulted from the melting of buried stagnant blocks of glacier ice. These lakes now evolve as classic thermokarst lakes that expand in area and volume as a result of the melting of the intrasedimental ground ice in the surrounding material.

Buried glacier ice has the potential to initiate major geomorphic changes and significantly alter the trajectory of landscapes in response to the warming of the Arctic.

It is expected that the deepening of talik and enlargement of arctic lakes in response to global warming will reach undisturbed buried glacier ice which in turn will significantly alter lake bathymetry, geochemistry and Green House Gas emissions of arctic lowlands.