The Influence of Climate and Topography on discharge from retrogressive thaw slumps: Implications for sediment release to aquatic environments

C.N. Teschner[1,2], H. Lantuit[2], M. Krautblatter[1], M. Fritz[2], W.H. Pollard[3]
[1]*University of Bonn, Bonn, Germany;* [2]*Alfred Wegener Institute for Polar and Marine Research, Potsdam, Germany;* [3]*McGill University, Montréal, Canada*
Authors contact: cordula.teschner@uni-bonn.de

Coastal erosion; Retrogressive thaw slumps; climatic influence on meltwater discharge; nutrient release to aquatic environments; Herschel Island; Yukon Territory

1. Introduction

Coastal erosion of ice-rich permafrost induces retrogressive thaw slumps. The **eroded material contains** considerable quantities of **carbon** and other nutrients **being delivered** to the Arctic near-shore zone. For example the Yukon Coast (Canada) releases **40,000,000 kg C/yr** for the entire coast (retrogressive thaw slumps not included). It is assumed that one retrogressive thaw slump alone releases as much as **28,400,000 kg C/yr** (Couture 2010). The released nutrients have an impact on food webs and alter trophic levels (Dunton et al. 2006). It is therefore very important to **quantify** the amount of nutrient release and figure out the **driving climate factor**. **This poster describes the influence of radiation and air temperature on the meltwater discharge of a retrogressive thaw slump on Herschel Island.**

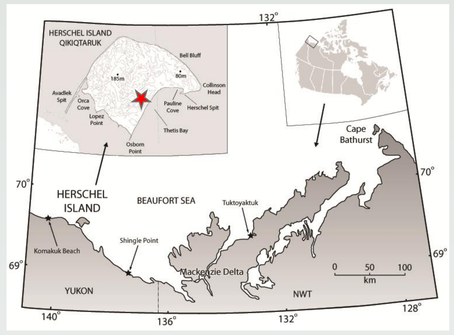


Fig.1: Location of ‚Slump D' on Herschel Island, Canada.
(after Lantuit et al. 2008)

3. Methods

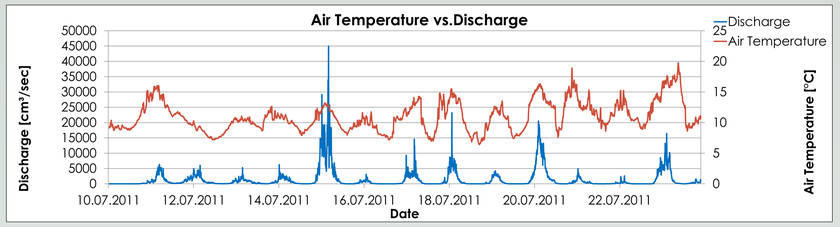
- ➢ Field observation
  - 14 days in July 2011
- ➢ Statistical analyses
  - Regression analyses tool of MS Excel 2010

Fig.3: Position of the climate station and the cutthroat flume in Slump D.
(Photo: B. Barbier, 20.07.2011)

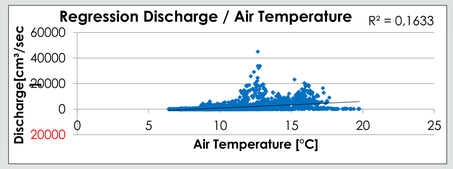
☆Climate station:
- Radiation
- Precipitation
- Air Temperature

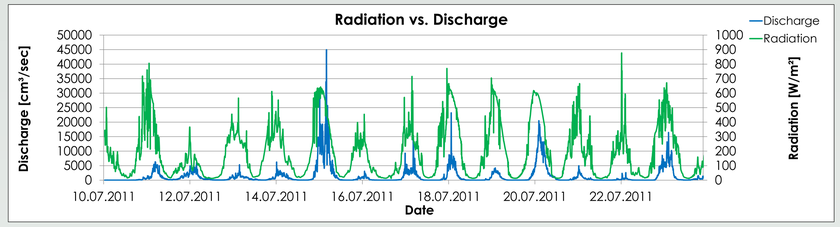
★Cutthroat flume:
- Discharge
- Conductivity
- pH-value
- Turbidity

4. Results

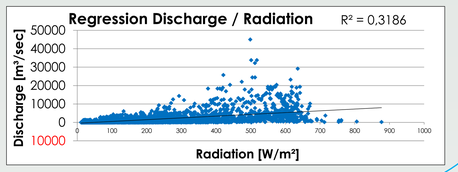


- coefficient of determination = 0.16
- correlation coefficient = 0.40





- coefficient of determination = 0.32
- correlation coefficient = 0.56



2. Study area

Herschel Island (69°36‘N; 139°04‘W) in the northern Yukon Territory (**Fig. 1**) lies within the continuous permafrost and is located in the Beaufort Sea. Along the Yukon Coastal Plain permafrost is up to 600m deep and the active layer ranges from 45 cm to 90 cm. Lantuit et al. (2008) counted 164 slumps in total on Herschel Island for the year 2000.

The retrogressive thaw slump which was investigated during a the summer of 2011 is the larges on Herschel Island (**Fig. 2**) with a length of 420 m and a width of 413 m. The maximum headwall retreat rate was 9.0 m/a between the years 2004-2006. (Lantuit et al. 2005, 2012)

Fig.2: Slump D, headscarp marked in red.
(Photo: B. Barbier, 20.07.2011)

5. Summary and Conclusion

❖ During the field season in July 2011 radiation, air temperature and meltwater discharge were measured from a retrogressive thaw slump

❖ The regression analyses showed a stronger correlation between the radiation and the discharge as between the air temperature and the discharge

6. Literature

Couture, N. (2010): Fluxes of Soil organic carbon from eroding permafrost coasts, Canadian Beaufort Sea. unpublished Phd-thesis McGill University. P. 155

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