Different pockmark systems and their potential importance for the hydrological and biogeochemical balance of a perialpine lake

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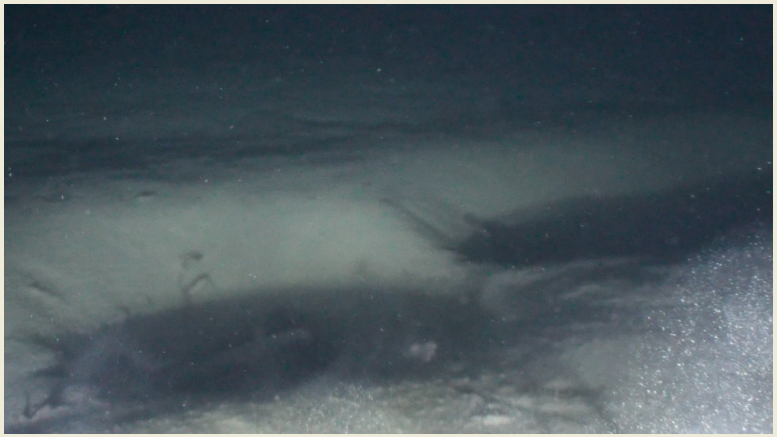
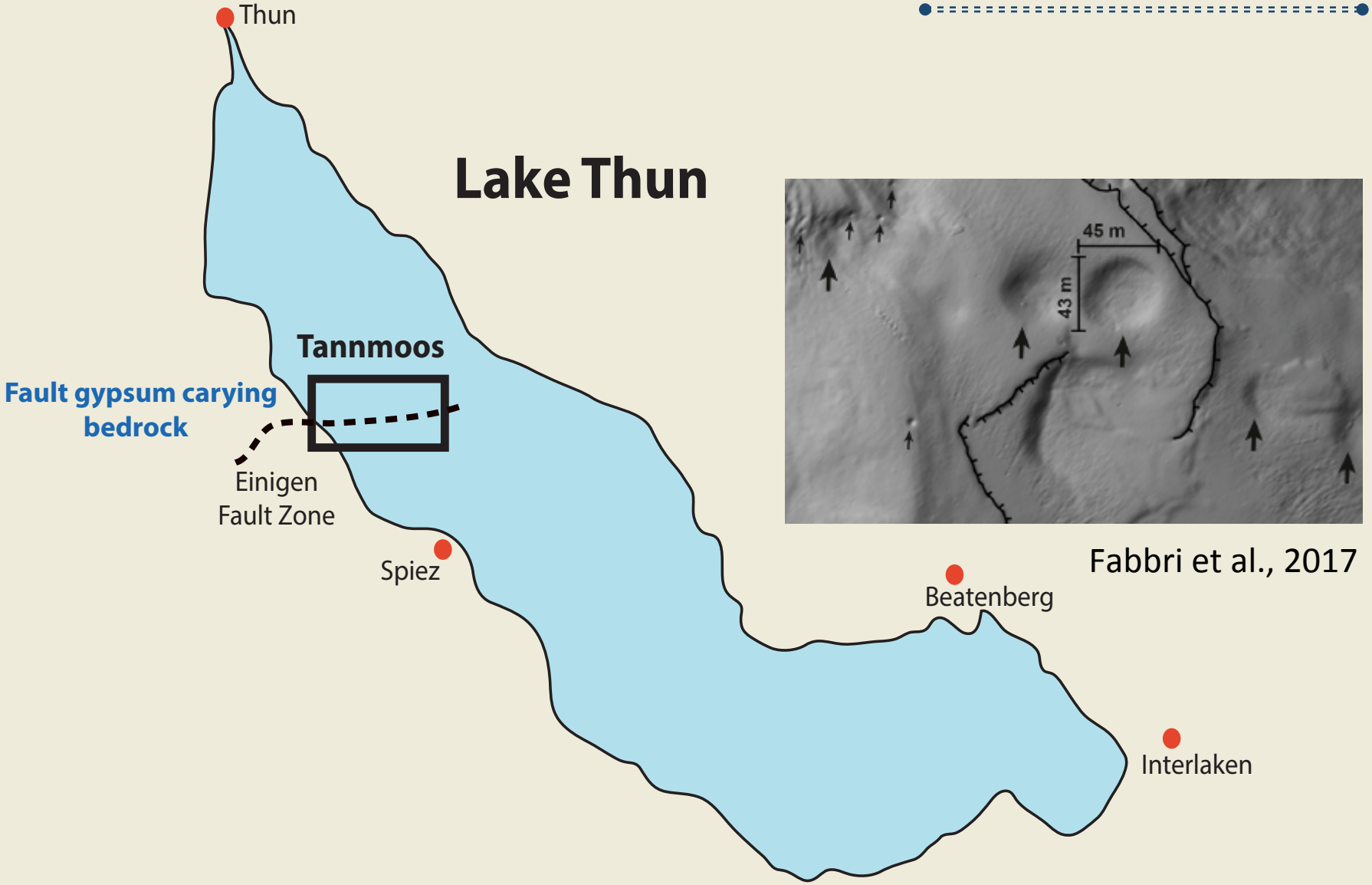
Lacustrine pockmarks

- Much less investigated than marine pockmark systems
- Fluid-flow formation
- CH_4 gas ebullition => Lake Constance (Wessel 2010; Bussmann, 2011)
- Groundwater discharge => Lake Neuchâtel (Reusch 2015; Wirth et al., in prep.)



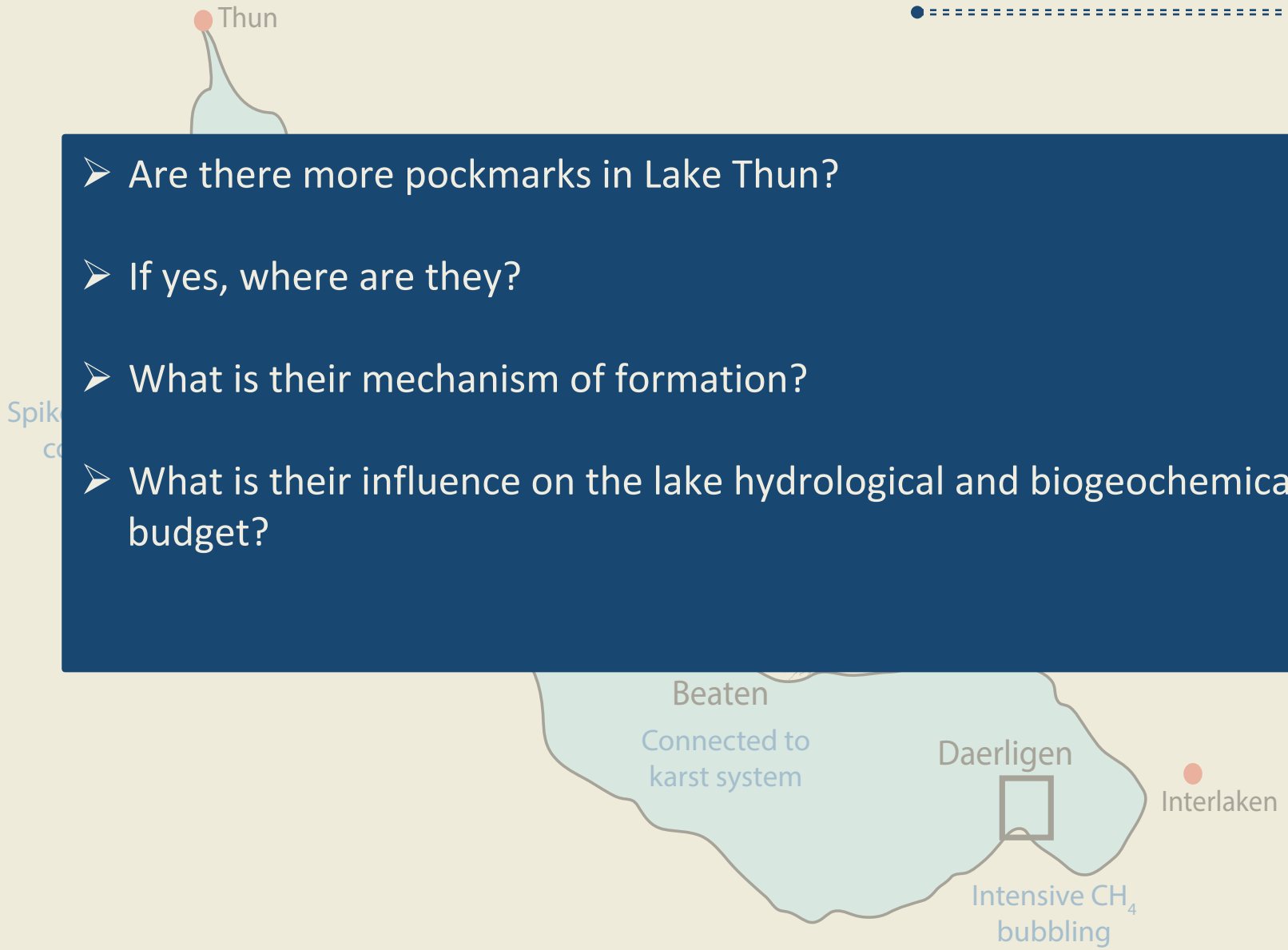
Pockmarks in Lake Thun, Switzerland



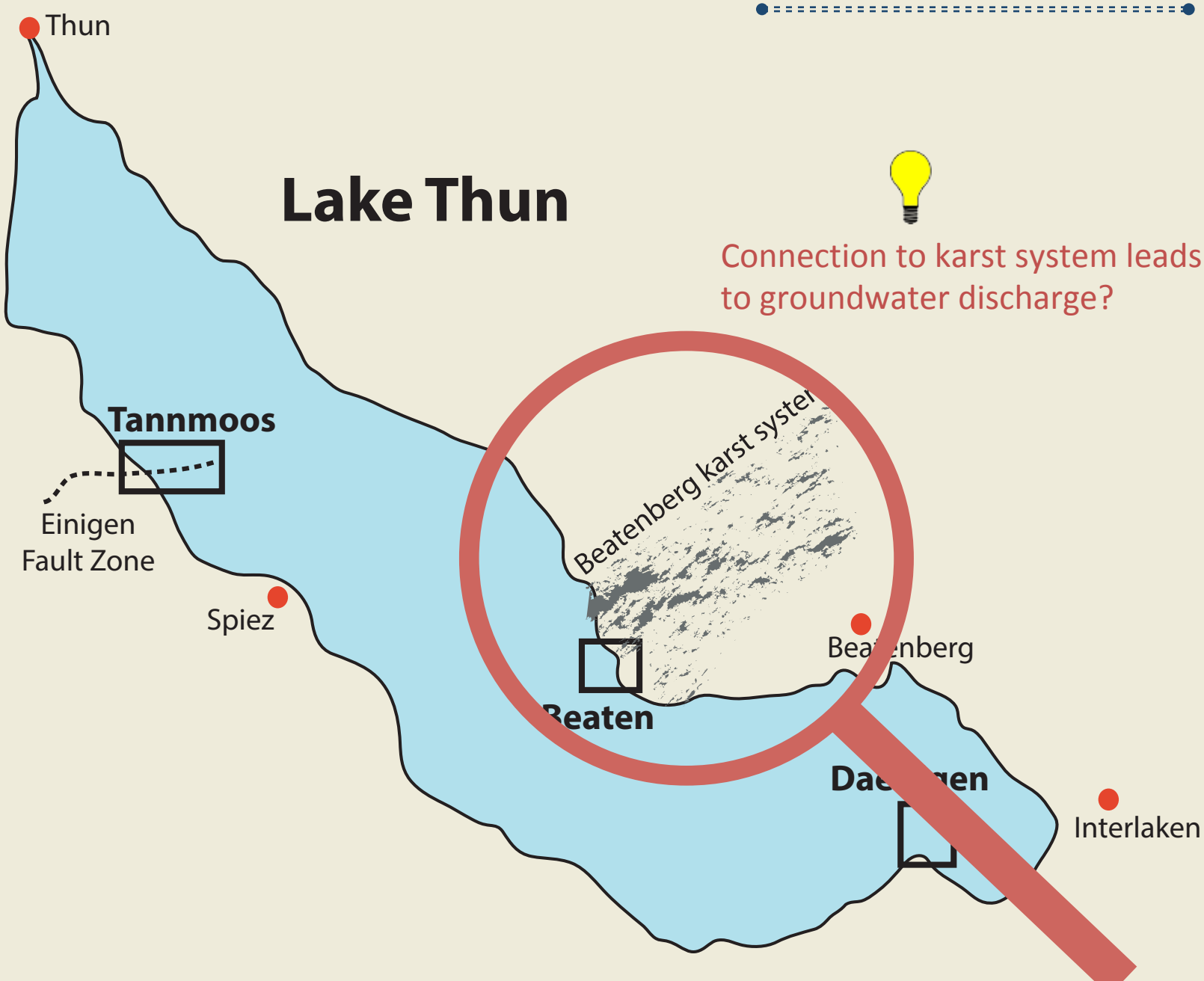
Fabbri et al., 2017

Research questions

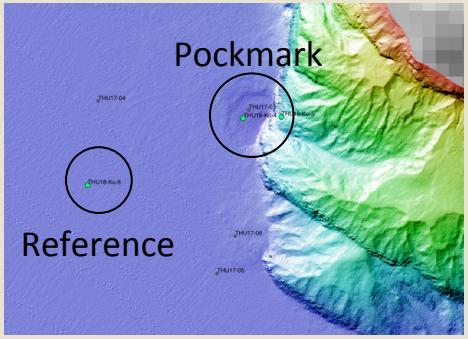
- Are there more pockmarks in Lake Thun?
- If yes, where are they?
- What is their mechanism of formation?
- What is their influence on the lake hydrological and biogeochemical budget?

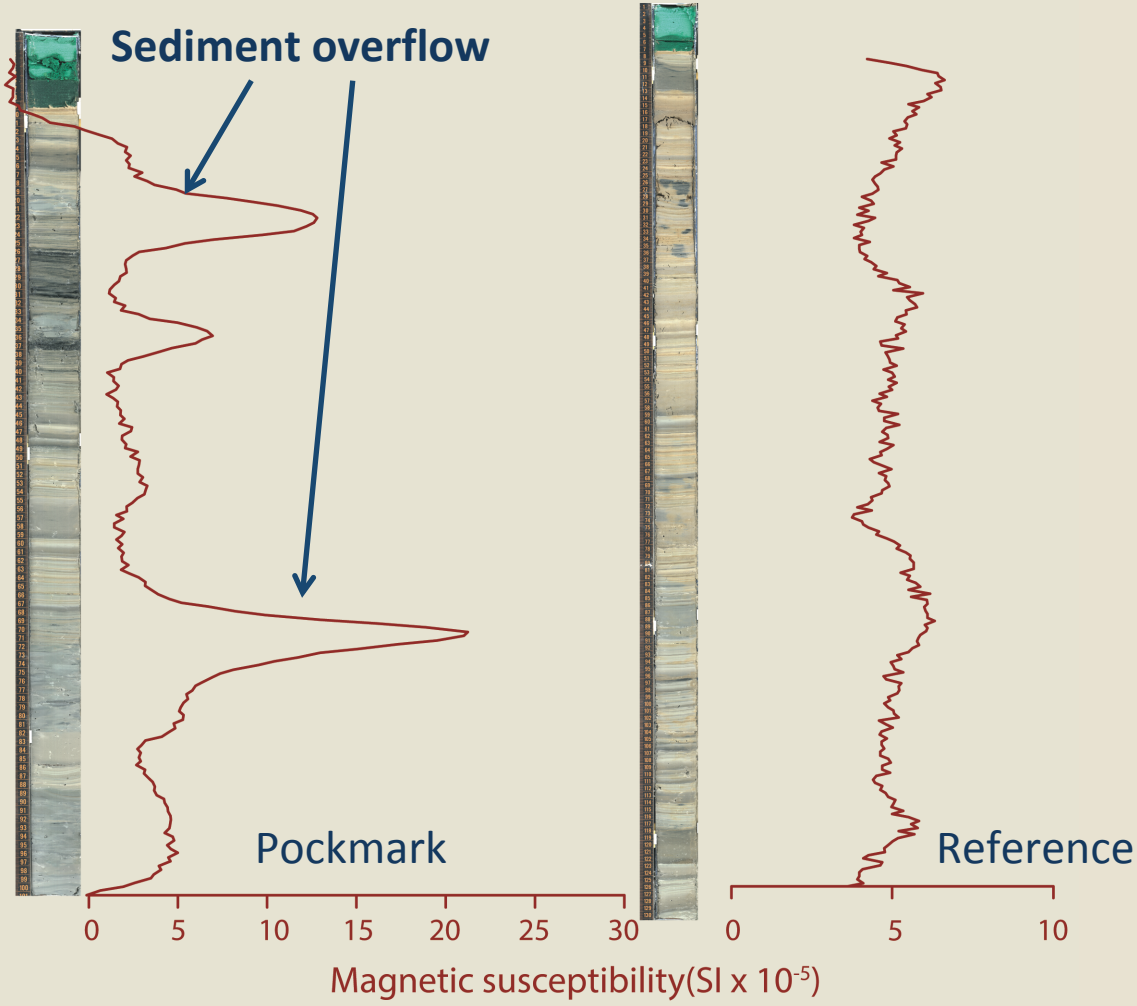


Different pockmarks systems in Lake Thun



Results – Beaten (connected to karst system)

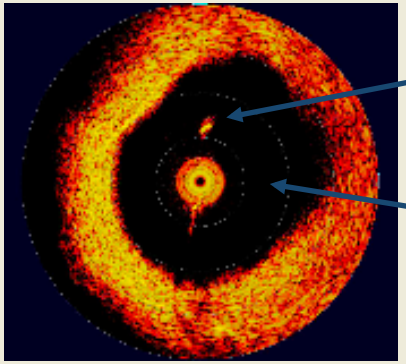


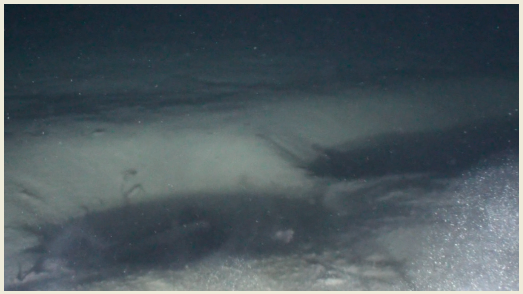


- More intense groundwater discharge to the lake in the past
- Episodically active

Different pockmarks systems in Lake Thun

Results – Därligen (CH_4 bubbling)





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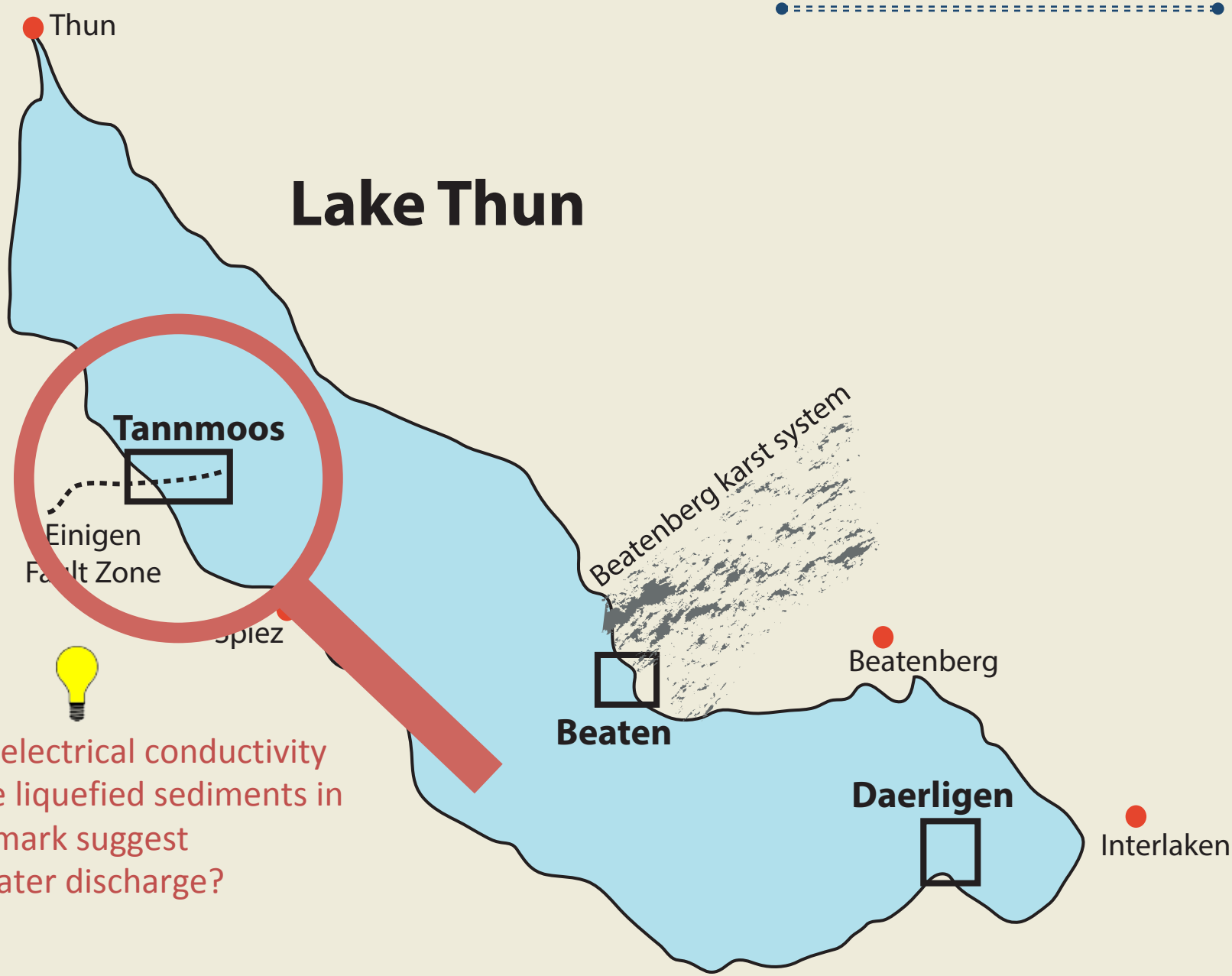
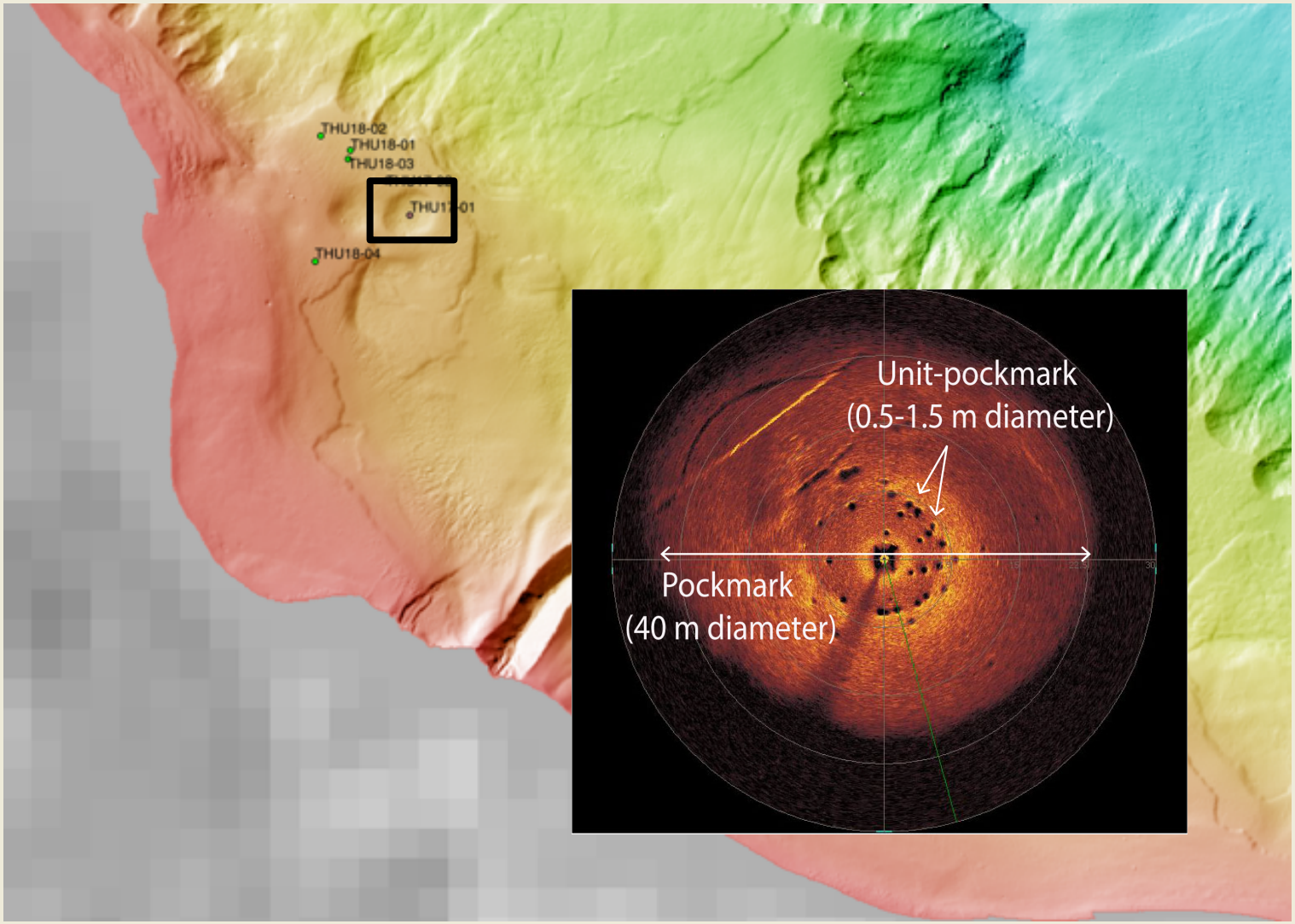


Spikes in electrical conductivity and more liquefied sediments in the pockmark suggest groundwater discharge?

Results – Tannmoos (groundwater discharge)



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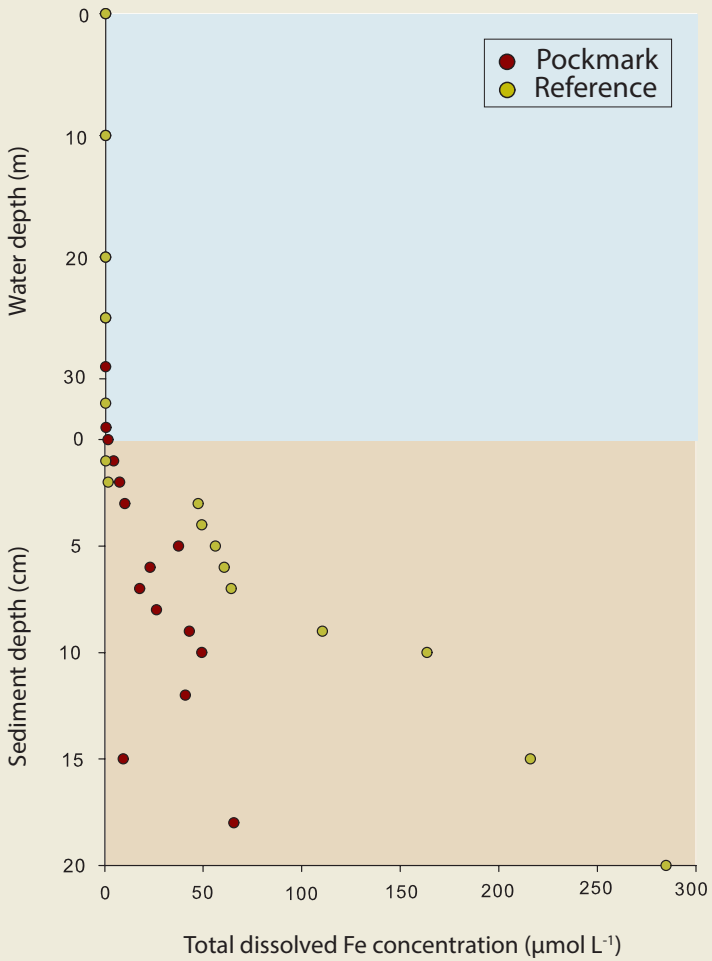

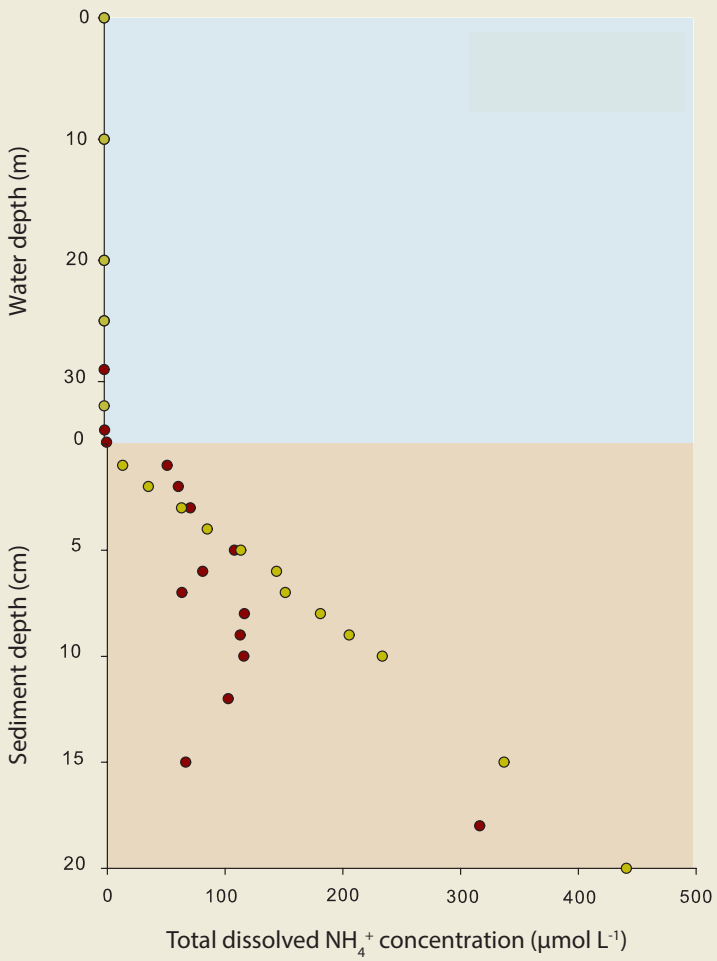

- NH_4^+ concentration is also lower inside the pockmark, particularly in deeper sediment layers
- Total dissolved Fe and NH_4^+ display similar vertical profiles

Take-home messages

Lake Thun

- Three pockmark systems were found in Lake Thun
- Variable formation mechanisms; via gas-flow at Därligen and groundwater discharge at Tannmoos and Beatenberg

Tannmoos

- More liquified sediments inside the pockmark than at a reference site
- Lower total dissolved Fe and NH_4^+ concentrations inside the pockmark than at a reference site => episodic O_2 penetration?

Active groundwater discharge?

- Further experimental work and sampling campaigns will help to better assess the influence of this pockmark system on the lake biogeochemistry