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# Different pockmark systems and their potential importance for the hydrological and biogeochemical balance of a peri-alpine lake

Adeline N.y. Cojean<sup>\*1</sup>, Maciej Bartosiewicz<sup>2</sup>, Jeremy Zimmermann<sup>1</sup>, Moritz F. Lehmann<sup>2</sup>, Katrina Kremer<sup>3</sup>, and Stefanie B. Wirth<sup>1</sup>

<sup>1</sup>Centre for Hydrogeology and Geothermics, University of Neuchatel, Rue Emile-Argand 11, CH-2000 Neuchâtel – Suisse

<sup>2</sup>Department of Environmental Sciences, University of Basel, Bernoullistrasse 30, CH-4056 Basel – Suisse

<sup>3</sup>Swiss Seismological Service (SED), ETH Zürich, Sonneggstrasse 5, CH-8006 Zürich – Suisse

## Résumé

Pockmarks are crater-like depressions on the floor of oceans and lakes formed by the upward transport of fluids through the unconsolidated sediment column. The fluid flow through marine pockmarks is considered to enhance hydrological and biogeochemical exchanges between the sediments and the water body. While a similar relevance can be expected in lakes, the importance of lacustrine pockmarks in this regard is virtually unexplored.

Lake Thun (48.3 km<sup>2</sup> surface area), Switzerland, is an excellent system to study lacustrine pockmarks as it exhibits several sites with different geological and biogeochemical settings. One of the pockmark sites is characterized by evident methane (CH<sub>4</sub>) ebullition and high CH<sub>4</sub> concentrations from ~2.4 to 8.9 mM within the sediments beneath. A large pockmark with a diameter of 110 m is located adjacent to the rock wall of a karst system and might thus be associated with groundwater discharge into the lake. Finally, spikes in electrical conductivity detected during a survey with a remotely operated vehicle (ROV) at a third pockmark site suggest a hydrogeological connection with the groundwater system in the underlying Triassic bedrock.

This third pockmark site we are studying more closely. We observed that the sediments inside the pockmark were clearly more liquified as compared to those at a reference site (outside the pockmark), providing further evidence for groundwater discharge that might presently be active. Further chemical analysis of porewaters and the water column above the pockmark as well as molecular investigation (e.g. 16S rRNA) of the sediments will be performed at two different seasons of the year (in fall and spring during the snowmelt season). All together, these results should help us to better assess the influence of groundwater discharge via this pockmark site on the hydrological balance and on the biogeochemistry of the lake, as well as to expand our limited knowledge on the mechanism of lacustrine pockmarks in general.

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