

Of Pile dwellers, Roman and Medieval Farmers – Deciphering the impact of early human land-use on Lake Murten (Switzerland) and its catchment

MISCHA HAAS^{1,2}, FRANZISKA BAUMANN¹, ANNA REUSCH³, MICHAEL STRASSER⁴, TIMOTHY IAN EGLINTON¹, NATHALIE DUBOIS^{1,2}

¹Department of Earth Science, ETH Zürich, Sonneggstrasse 5, CH-8006 Zürich, mischa.haas@eawag.ch

²Department of Surface Waters Research and Management, Eawag, Überlandstrasse 133, CH-8600 Dübendorf

³Institute of Geology, University of Bremen, Bibliothekstrasse 1, DE-28359 Bremen

⁴Institute of Geology, University of Innsbruck, Innrain 52, A-6020 Innsbruck

Agriculturally induced soil erosion has a strong influence on the global carbon cycle, however, the historical evolution of its extent and rate is poorly known. This study seeks to address this issue by investigating lacustrine sediments from Lake Murten (Swiss Midland) to reconstruct past soil loss and soil degradation in the catchment, with a focus on soil carbon dynamics.

We applied a multi proxy approach including several geophysical, geochemical and biological methods on a 10 m sediment core from the deepest part of the Lake. Our paleolimnological data show that the historical evolution of agriculture is well preserved in the sedimentary record. During the Roman period, slightly decreasing C/N ratios, but raising TOC and biogenic Silica content were detected. Also the magnetic susceptibility, grainsizes and amount of detrital elements (Ti) are elevated. At the same time, radiocarbon ages of the bulk sediment fraction are increasing compared to the modeled deposition age, indicating a rapid flushing of old soil carbon from the surrounding catchment. Analyses on plant derived leaf waxes, such as *n*-alkanes and *n*-carboxylic acids, revealed a rough vegetation change from a tree to a more grass dominated landscape.

These findings are consistent with the development of first large-scale farming practices and the growing influence of the Roman city *Aventicum* 2000 years ago. Deforestation and soil cultivation led to increased runoff of terrestrial nutrient-rich material resulting in eutrophication of Lake Murten and the deposition of varves. Similar trends can be recognized from the medieval period until today.