# Radiocarbon and GDGT composition of Swiss soils

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### Objective and research questions

In this project we aim to assess if GDGT composition and proxies are impacted by soil carbon turnover and to see if GDGTs can serve as sentinels for changing soil organic matter quality.

- Is there an effect of **soil age** (depth) on GDGT composition?
- Is there an effect of **soil type** on GDGT composition?
- How do the GDGT-derived proxies for deeper soils hold true to in situ measurements?

## Introduction

- The soil organic matter (SOM) forms the largest terrestrial reservoir of carbon outside of sedimentary rocks
- SOM hosts the microbial communities that in turn generate the GDGT-based proxies (Peterse et al., 2012, Schouten et al., 2013).
- Radiocarbon (14C) measurements help assess SOM turnover and stability
- There is large varibility in radiocarbon age between soils and with soil depth
- The effect of soil age and stability may impact GDGT abundance and ratios
- This study contains a wide range of Swiss soils (WSL LWF sites) measured on the bulk level.



Figure 1: LWF WSL sites (www.wsl.ch)

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#### Bulk Radiocarbon and pH



Figure 2:  $\triangle$ 14C vs. CBT-derived pH values

# Important Results and Conclusions

- Radiocarbon age of soil has no clear correlation with GDGT proxies
- Deeper soils show systematic deviation to the Peterse et al., 2012 calibration. This implies that GDGT-based studies in downslope areas may be prone to errors as deeper and older soils may erode in these regions
- Bulk  $\Delta^{14}$ C and brGDGTs values co-vary with soil depth

# **CBT-derived** pH and measured pH





#### Radiocarbon, brGDGT and depth **Bulk Radiocarbon and MAT**



Figure 3:  $\triangle$ 14C vs. MBT'-CBT-derived MAT values



Walthert et al., WSL, 2002 Conen et al., BG, 2008 Peterse et al., GCA, 2012 Schouten et al., OG, 2013

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# MBT'-CBT-derived MAT and measured MAT



Figure 5: MBT'-CBT-derived MAT estimates for soils with depth



Figure 6:  $\Delta^{14}C$ , brGDGT (normalised per g soil and organic carbon fraction).

### Future work

• Futher explore correlation GDGT signature and radiocarbon signature surface soils • explore correlation GDGT signature and radiocarbon fraction different soil fractions.

### References

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