Master thesis project
What can stalagmites tell us about soil carbon dynamics?

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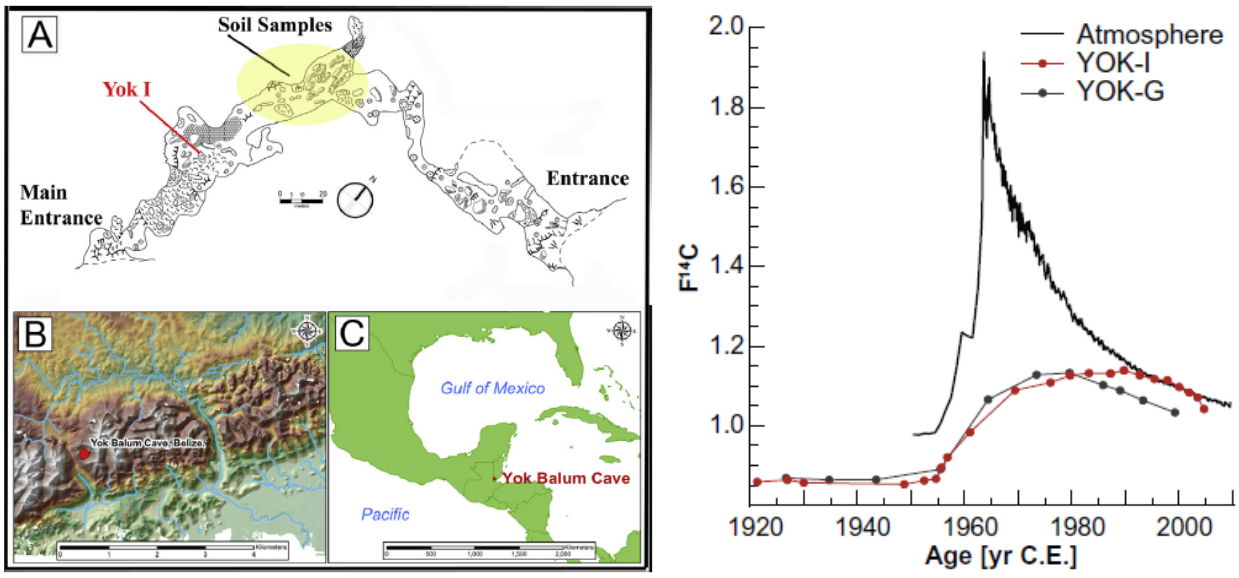
Project background
One of the major carbon reservoirs on Earth is the carbon stored in soils. However, the turnover time of soil organic carbon (SOC) is still not well constrained. SOC dynamics have been investigated using direct radiocarbon (^{14}C) measurements on different soil fractions that were sampled periodically over several decades. Recently, a novel attempt has been made to constrain turnover times of SOC from the ^{14}C bomb peak in stalagmites. However, so far no direct comparison of the two approaches has been conducted. Yok Balum Cave in Belize is an ideal candidate for such a comparison, since a ^{14}C record exhibiting the bomb peak allows to model SOC pools and turnover times.



Maps of Yok Balum Cave in Belize (left) and ^{14}C bomb peak in stalagmite (right) [1]

Project aims
Samples from a soil depth profile above Yok Balum Cave should be separated into distinct soil fractions using density fractionation at D-USYS. Bulk soils and soil density fractions should be prepared for ^{14}C analysis at D-ERDW and analyzed for ^{14}C using accelerator mass spectrometry (AMS) at the Laboratory for Ion Beam Physics (D-PHYS). Results on the relative proportions and ages of distinct soil fractions should be interpreted with respect to the ^{14}C bomb peak and compared with results from stalagmites. Possibilities to model SOC dynamics using stalagmite data should be explored (in collaboration with modelers from Max Plank Institute for Biogeochemistry).

References
[1] Lechleitner et al., 2016. Hydrological and climatological controls on radiocarbon concentrations in a tropical stalagmite. Geochimica et Cosmochimica Acta 194, 233-252.