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Radiocarbon and stable carbon isotope systematics in a high alpine cave system

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Speleothems are valuable archives of the past climate, because they can be precisely dated using the U/Th method and at the same time offer several high-resolution proxies. These cave carbonates form by precipitation of Ca-carbonate derived from the dissolution of the host rock. In most karst systems dissolution is driven by soil-derived carbonic acid. However, there are examples where oxidation of sulfide minerals in the host rock contributes considerably to the dissolution of karst host rock [1,2]. As a consequence, the stable C isotope signal of speleothems such as stalagmites lacks a depleted soil-derived signature and the radiocarbon (^{14}C) content is low. SPA-127 is a stalagmite from Spannagel cave (W Austrian Alps) that grew between 8500 and 2500 a BP at an average rate of 25 μm/a [3]. The δ^{13}C record of this stalagmite exhibits large and fast changes between -8 and +1 ‰. These variations are possibly a consequence of rapid switches between the more common process of carbonate dissolution due to carbonic acid and sulfide oxidation. ^{14}C provides important insights to better understand these water-rock interactions in the karst rock. To this end, a continuous, highly resolved ^{14}C record of this stalagmite will be presented, which was obtained using laser ablation accelerator mass spectrometry [4, 5]. The spatial resolution of 400 to 800 μm allows to examine the nature of the high-amplitude high-frequency δ^{13}C changes.

[1] Spötl, C. et al. (2016). Chemical Geology, 435, 60-70. [2] Bajo, P. et al. (2017). Geochimica et Cosmochimica Acta, 210, 208-227. [3] Fohlmeister J. et al., (2013). Holocene, 23: 749–754. [4] C. Welte, et al., (2016). Radiocarbon, 58, 419–435. [5] C. Welte, et al., (2016). Anal. Chem., 88, 8570– 8576.