Investigating The Age Of Soil Carbon In Karst Terrains

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Several recent studies have attempted to use records of the radiocarbon bomb peak in speleothems to understand the age spectrum of soil organic material (SOM) above caves to infer the relationship between SOM decomposition and climate in the past [1]. These studies assume that the degree of attenuation of bomb peak in speleothems is controlled by the mean age of soil gas at the time of speleothem formation and employ a simple soil carbon model to model the soil above the cave as three SOM pools with three distinct tunover times. This approach results in predictions of pre-bomb mean ages of soil gas above some caves on the order of decades to centuries, with the majority of soil gas derived from SOM pools with turnover times on the order of centuries to millenium. However these predictions are at odds with observations of soil gas ages, which are typically on the order of years. [2]

The discrepency between observed the soil gas ages typically observed and the mean age of soil gas required by the shape of the bomb peak in speleothems suggest 1) that SOM in karst settings may have a very different age distribution than sites that have been studied previously and/or 2) that soil gas is not the predominate pathway through which modern and slightly aged carbon is incorporated in drip water DIC. To resolve this cause of this discrepency, we have developed an improved model for estimating the age of soil gas above caves, and investigated the soil carbon dynamics at Heshang Cave, China. Our work suggests that soil gas in karst sites may indeed be much older than soil gas in sites studied previously, and highlights gaps in our understanding of the pathways of carbon incorporation in speleothems.

[1] e.g. Rudzka-Phillips *et al* (2013) *GCA* **112**, 32-51. [2] Trumbore (2000) *Ecological Applications,* **10** (2), 399-411.