



Contribution ID : 32

Type : Poster

Investigating the stalagmite organic matter record of past fires in shallow caves using synchrotron infrared microspectroscopy

Records of past fire frequency are preserved in cave stalagmites when soluble ash products are transported from the surface into the cave. Recent research indicates that fracturing of limestone after intense heating and cooling caused by fire events may result in an increase in organic material (OM) flushed into cave environments. The character and source of this OM are yet to be investigated. Chemical mapping of a stalagmite from south-west Western Australia were performed using micro-Attenuated Total Reflection (micro-ATR) at the Australian Synchrotron's Infra-Red Microscopy (IRM) beamline. This technique enabled characterisation of the OM in the stalagmite before and after two large fires passed over the top of the cave in 1897 and 1977. Absorption peaks found in the synchrotron-IR spectra were compared with characteristic OM peaks from vegetation reference spectra and the literature. In particular, an increase in aliphatic OM associated with C-H stretching modes at 2850 cm^{-1} and 2920 cm^{-1} was observed, suggesting their incorporation in the years following these fire events. Furthermore, possible aromatic OM associated with C=O and C=C stretching modes at 1732 cm^{-1} and 1612 cm^{-1} were observed to vary between fires. While the 1977 fire appears to have produced an aromatic carbon peak at the time of the fire, the observed depletion for ~5 years post-fire suggests reduced inputs of vegetation OM to soils due to combustion. In contrast, the 1897 event resulted in a decades-long increase in aromatic carbon post-fire. We interpret this to result from bedrock fracturing or fracture widening, leading to increased delivery of soil OM. Future work aims to further validate our synchrotron-IR identification of the OM using Raman Spectroscopy.

Level of Expertise

Early Career <5 years

Presenter Gender

Woman

Pronouns

She/Her

Do you intend to attend UM2022

Online

Students Only - if available would you be interested in student travel funding

Students Only – Do you wish to take part in the Student Poster Slam

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Yes

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