REFERENCES

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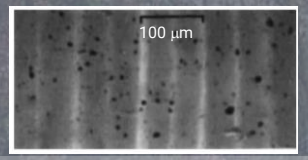
Water and climate science: the use of chemical tracers including applications to speleothem palaeoclimatology

UNSW SYDNEY

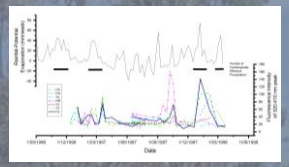
Fluorescent annual laminae in speleothems – how do they form?



Baker et al (1993) showed that fluorescent laminae in stalagmites were annual. But what were they? When are they deposited?

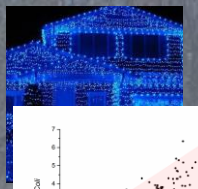
Dissolved & colloidal organic matter optical characterization

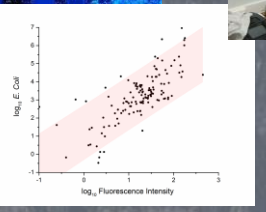
Analysis of cave percolation waters showed that seasonal fluxes of fluorescent dissolved organic matter (fDOM) from the soil above the cave (Tan et al 2006).
In this decade, analytical advances made rapid fDOM characterisation practical. Used by multiple disciplines at the same time, marine, fresh, potable and waste water fDOM knowledge was shared at a Chapman Conference (Coble et al 2014)



Handheld and in-situ water quality measurements using fluorescence

Recent improvements in LED technology permits the ultra-violet excitation of FDOM in portable devices. Applications include real-time microbial enumerations in surface and groundwater (Cumberland et al 2012; Baker et al 2015).





STS

EPSRC
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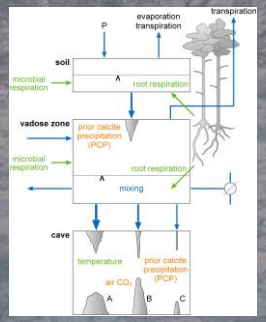
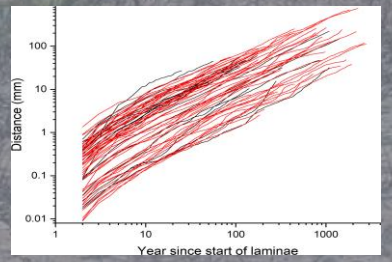
Understanding karst vadose zone hydrology

Annually lamina formation in speleothems requires a seasonal hydroclimate and a suitable karst hydrology e.g. not too much, not too little, vadose zone water storage. Karst hydrology is non-linear and heterogenous. How does that affect lamina formation in speleothems? A process-based understanding karst vadose zone hydrology is necessary (Hartmann & Baker 2017) Shown here are the controls on growth rate.



A precise geochronology for past climate reconstructions

Where the hydrology and climate are suitable for annual drip water geochemical fluxes onto stalagmites, it transpires that the annual stalagmite vertical growth rate is very constant. Stalagmite growth in these samples is metronomic, the perfect geochronometer (Baker et al 2021).

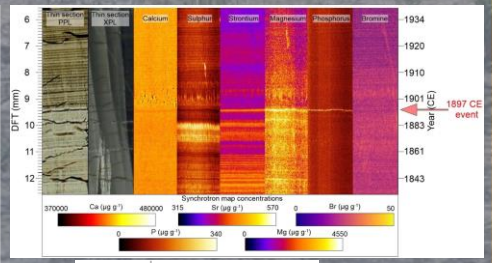


SISAL

UNIL | Université de Lausanne

Soluble, ash-derived elements: a new stalagmite paleofire proxy

By synchrotron X-ray fluorescence mapping of stalagmites, we can build a precise chronology. Unusual concentrations of elements are from the flux of water-soluble, ash-derived elements after fires (McDonough et al., 2022).



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