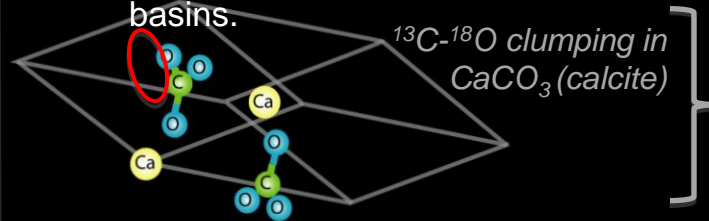


Calcite clumped-isotope thermometry reveals conditions of diagenesis & temperatures of fluid migration along faults

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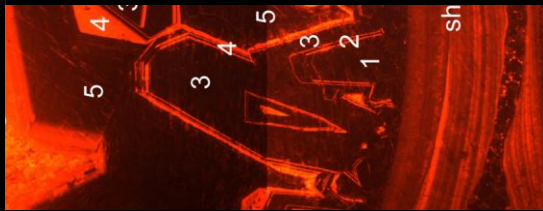
We are developing **clumped isotopes** as a tool to quantify **temperatures ($\pm 1-2^\circ \text{C}$)** of sub-surface carbonate growth and re-crystallization and the $\delta^{18}\text{O}$ of fluid-rock systems in basins.



A single clumped isotope measurement gives independent estimates of the growth temperature and $\delta^{18}\text{O}$ of carbonate minerals, enabling the $\delta^{18}\text{O}$ of diagenetic waters from which the minerals grew to be calculated

Burial Diagenesis on the Colorado Plateau, AZ

This proof-of-concept study shows how clumped isotopes can constrain the crystallization temperature of diagenetic calcite, $\delta^{18}\text{O}$ values of diagenetic waters, and fluid-rock ratios.



Huntington, Budd, Wernicke, Eiler., 2011
J. of Sedimentary Research, v 80, 656-669

Syn depositional deformation features, Guadalupe Mountains, NM

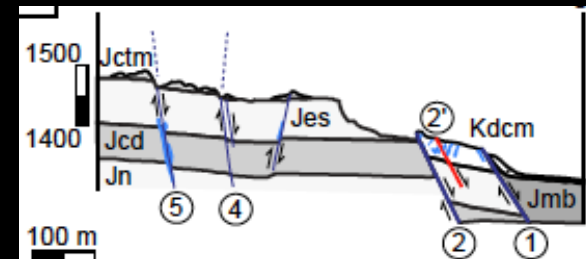
Syn depositional faults and fractures affect early fluid flow in carbonate platforms. Our study (petrography, fluid inclusions, clumped isotopes) shows that they are active fluid conduits throughout a strata's entire history.



Budd, Frost, Huntington, Allwardt, *in press*
J. of Sedimentary Research

Structures & Fluids along the Moab Fault, Paradox Basin, UT

Clumped isotopes show rapid penetration of surface waters down intensely jointed fault intersections while deformation bands block fluids—confirming the key role of structures in transmission and compartmentalization of fluids in porous rocks.



Bergman, Huntington & Crider, *submitted*
American Journal of Science