Carbonate 'Clumped Isotope' Thermometry: Constraining Closure Temperatures for the ^{13}C-^{18}O Order/Disorder Process in Carbonate Minerals

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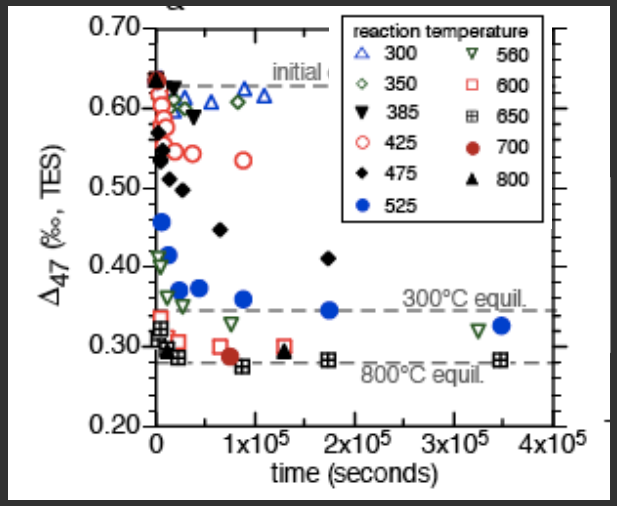
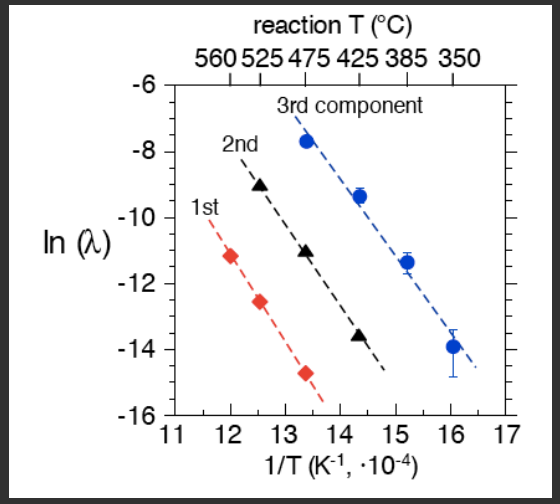
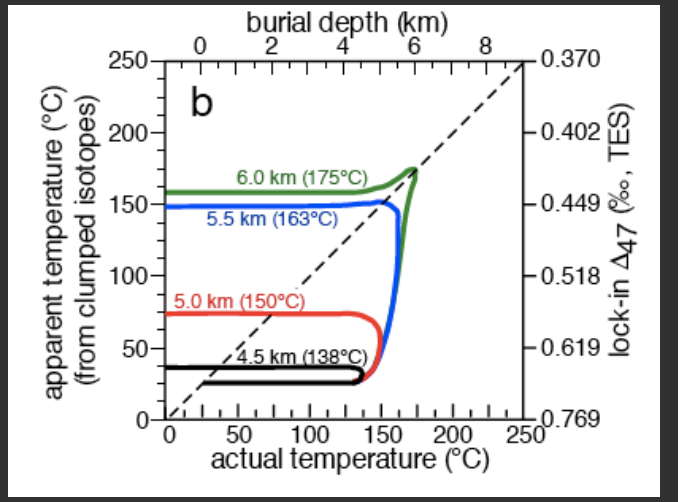
Carbonate minerals are common in hydrocarbon-producing sedimentary basins. The long-standing goal of reconstructing temperatures and fluid isotopic compositions during carbonate mineralization is now realized by the 'carbonate clumped-isotope' thermometer based on ^{13}C-^{18}O bond excess in carbonate minerals. Our research examines how the abundances of ^{13}C-^{18}O bonds in calcite are subsequently altered during high-temperature heating as would be encountered by a mineral subjected to, for example, deep burial, or contact metamorphism.







Our approach is to determine rates of C-O bond reordering in the laboratory (left), use the rate data to determine Arrhenius parameters (center), and use the Arrhenius parameters to predict, among other things, the evolution of apparent clumped isotope temperatures during burial and exhumation (right).