

High temperature calibration of calcite clumped isotopes: When theory meets experimentation

JOSUÉ J. JAUTZY¹, MARINE M. SAVARD¹, RYAN S. DHILLON², STEFANO M. BERNASCONI³, ANNA SMIRNOFF¹

¹Geological Survey of Canada, Natural Resources Canada, Québec, Canada

²Queen's University, Geological Sciences and Geological Engineering, Kingston, Canada

³ETH-Zürich, Department of Earth Sciences, Zürich, Switzerland

*josue.jautzy@canada.ca

Measurements of clumped isotopes (Δ_{47}) excess abundances in carbonates is becoming a widespread isotopic geothermometer which also casts the precipitating fluid $\delta^{18}\text{O}$ composition. While Δ_{47} –temperature (T) relationship discrepancies between laboratories have been considerably reduced over the past 10 years, theoretical and experimental calibrations have still not been reconciled. Moreover, a lack of high T measures has weakened the application of the method to high temperature calcite contexts. Here, we present a calcite Δ_{47} –T calibration between 5 and 750°C, using synthetically precipitated and heated calcites, to extend the calcite Δ_{47} –T calibration at high temperature. By showing strong similarities between the calibration proposed here, theoretical and all published T–calibrations made using a full-carbonate referencing scheme, this study: (1) provides a calibration allowing more precise application in high T geological contexts, (2) further supports the improvement of inter-laboratory comparison by using carbonate standards, and (3) reconciles empirical T-calibrations with theory.