

Exploring the clumped and bulk isotopic systematic of carbonates near two deep-water cold seeps offshore Nova Scotia, Canada

JOSUÉ J. JAUTZY¹, MARTINE M. SAVARD¹, CALVIN CAMPBELL¹ AND ADAM W. A. MACDONALD²

¹Natural Resources Canada

²Nova Scotia Department of Energy and Mines

Presenting Author: josue.jautzy@canada.ca

Clumped isotopes (Δ_{47}) excess measurements in carbonates is becoming a widespread isotopic geothermometer, which also casts the precipitating fluid $\delta^{18}\text{O}$ composition. The measurement of clumped isotopic abundances in authigenic carbonates near marine cold seeps has revealed an unprecedented range of isotopic ordering, and several explanations have been put forward to account for the various disequilibrium signals observed. Here we report $\delta^{13}\text{C}$, $\delta^{18}\text{O}$ and Δ_{47} measurements performed on two sediment core profiles from two deeply-seated cold seeps (water depth >2400 m), on the platform margin offshore Nova Scotia. The cores contain several indications of hydrate presence. Data obtained from sub-surface depth varying between 34 and 235 cm reveal a clear CH_4 oxidation signal in the investigated calcites, associated with Δ_{47} and $\delta^{18}\text{O}$ values mostly in apparent disequilibrium with seafloor conditions. Here, we will discuss the observation of higher apparent Δ_{47} and $\delta^{18}\text{O}$ disequilibrium at depth in comparison to surficial samples. We will compare them to results from other cold seep settings and explore the possible causes of these isotopic patterns.