Carbon isotopic signatures of methane and ethane in fluids inclusions compared to dissolved hydrocarbon in saline fracture fluids

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Recent studies have highlighted the need to understand the production of reduced gases (H_2, CH_4) in fluid inclusions [1], vis a vis water-rock reactions on host rock mineral surfaces, and have opened debate about the relative contribution of both sources to fluids in oceanic and terrestrial systems. Carbon isotopic signatures have been characterized for methane and ethane in fracture fluids kilometers deep throughout the Canadian Shield, Fennoscandian Shield and the Witwatersand Basin of South Africa, but to date information on hydrocarbons in fluid inclusions in surrounding host rocks have been more limited. What information has been published for noble gases in these ancient cratons demonstrates contributions from remnants of billion year-old metamorphic fluids to some of the deepest, most saline fracture waters [2, 3].

In previous work, saline fracture fluids from 1.4-1.7 km below surface in the north rim of the Sudbury Basin were shown to have significant concentrations of H_2, CH_4 and ethane, and noble-gas derived-residence times of hundreds of Ma [4, 5]. To date the carbon isotope signatures in the hydrocarbons dissolved in the flowing fracture fluids have not been compared to those trapped in fluid inclusions in the surrounding host rocks. In this study fluid inclusions in Sudbury Ignenous Complex (SIC) breccia, were found to have ^{13}C values for the methane and the ethane comparable to that of methane and ethane sampled from associated macroscopic fracture fluids. This intriguing similarity potentially suggests a degree of cogeneticity

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