PROTEROZOIC CARBON ISOTOPE SYSTEMATICS ARE INFLUENCED BY REDOX AND COMMUNITY COMPOSITION

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The stable carbon isotopic composition of organic matter can hold valuable clues towards metabolic processes such as carbon fixation and lipid biosynthesis, as well as environmental information in the form of estimates of atmospheric pCO_2 and its bioaccesibility. In particular the compound-specific determination of $\delta^{13}C$ values is a promising tool to obtain more specific information on past ecosystems. Stable carbon isotope systematics in modern photoautotrophic biota and systems of sedimentary organic matter are overwhelmingly consistent in that cellular phytol is slightly ^{13}C-enriched over fatty acids, and hydrocarbons released from kerogen exhibit a slight relative depletion in ^{13}C. But these systematics seem perturbed, particularly in Precambrian rocks: kerogen is frequently significantly lighter than associated bitumens, while alkanes tend to often be ^{13}C enriched in comparison to phytyl lipids (Hayes *et al.* 1992; Logan *et al.* 1995; 1997). These inverse signatures were hypothesized to have co-varied with the evolution of complex life, which increased the preservation of primary produced biomass via fecal pellets at the turn of the Proterozoic/Cambrian transition: i.e. by decreasing its water column residence time and susceptibility to heterotrophic reworking. But over the last years a number of studies have reported highly variable isotopic offsets throughout the Proterozoic, with both typical 'Precambrian' and 'Phanerozoic' values (e.g. Williford *et al.* 2011; Blumenberg *et al.* 2012; Luo *et al.* 2015; Suleimenova *et al.* 2017). Using a thorough and elegant model, Close *et al.* (2011) have suggested that depositional redox conditions (affecting preservation) and community composition (larger eukaryotic cells sink faster than cyanobacteria) may be the primary drivers on the aforementioned carbon isotope systematics.

We here provide the first observational support for Close et al. (2011). In five sedimentary sequences deposited throughout the Proterozoic (1.64 Ga Barney Creek Formation, 1.3 Ga Xiamaling Formation, 1.1 Ga Touirist Formation, 0.75 Ga Chuar Group, 0.55 Ga Ara Group; also see Suleimenova *et al.* 2017: this abstract volume) no typical 'Precambrian' offset prevails. Detailed analyses of kerogen–alkanes and alkanes–phytyl isotopic offsets, between 33 samples from the Chuar Group, revealed strong systematics with, on one hand molecular indicators of depositional redox conditions and on the other the abundance of eukaryotic steranes. These results debunk the idea of 'typical Precambrian' carbon isotope offsets and highlight the complexity of Proterozoic carbon isotopic systematics. At the same time they offer a potential new tool for an enhanced understanding of past ecosystems.

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