PHOTOTROPHY AND CARBON ISOTOPE SYSTEMATICS IN THE PALEO-PROTEROZOIC BARNEY CREEK FORMATION

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The 1.64 Ga Barney Creek Formation (BCF) from the McArthur Basin, northern Australia, has received great attention in the past decades because it hosts the oldest clearly syngenetic biomarker hydrocarbons (Pawlowska *et al*., 2013), providing a unique window into Paleoproterozoic ecology. The prospectivity for unconventional oil and gas and stratiform base metal deposits make it the focus of regional geological surveys, petroleum and mineral exploration. Previous geochemical and biomarker studies on the BCF have reconstructed a stratified marine water column with anoxic conditions extending into the photic zone, as indicated by abundant biomarkers for green and purple sulfur bacteria (e.g. Brocks *et al*., 2005). Our study integrates biomarkers and compound-specific stable carbon isotope analyses in view of increasing our understanding of the ecologies, palaeoenvironmental conditions, and the composition of the primary producing community in the BCF.

Fifteen samples from two drill holes were solvent extracted and fractionated using multiple organic geochemical techniques for biomarker analyses, and to overcome the interference of an underlying unresolved complex mixture in isotope analyses. Biomarker distributions were found to be consistent with previously reported patterns indicative of anoxygenic phototrophic communities thriving in a shallow stratified sea. In addition to traditional saturated and aromatic biomarkers, such as hopanes and aryl isoprenoids, we also examined the polar fractions for the presence of maleimides (1Hpyrrole-2,5-diones), the transformation products of (bacterio)chlorophylls of phototrophic organisms (Grice *et al*., 1996). In addition, we measured compound-specific isotopes on *n*-alkyl and phytyl hydrocarbons to gain insights into dynamics and sources of organic carbon in the early Proterozoic. Logan *et al.* (1995) hypothesised that *n*-alkanes in Proterozoic sediments are enriched in $\delta^{13}C$ relative to the bulk organic matter due to enhanced heterotrophic reworking, whereas a more recent model by Close *et al.* (2011) suggests that the isotopic systematics can also provide information about community distribution and redox conditions during the deposition (also see abstract by van Maldegem *et al*., 2017, this abstract volume). Here we investigated compound-specific isotopic relationships ($\Delta\delta^{13}C$) between *n*-alkanes derived from fatty acids and phototrophically derived phytyl lipids (pristane and phytane) as well as associated kerogens, which will be discussed in light of the community composition, environmental redox, and trophic cycling of biomass.

References

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