# The isotope-geochemical record of a near-shore Neoarchean oxygen oasis

S. EROGLU[1]*, R. SCHOENBERG[1], M. VAN ZUILEN[2], H. TAUBALD[1], E.D. SWANNER[1] AND N. BEUKES[3]

[1]University of Tuebingen, Wilhelmstraße 56, 72074 Tuebingen, Germany (*correspondence: suemeyya.eroglu@uni-tuebingen.de)

[2]Institut de Physique du Globe de Paris, 1 rue Jussieu, 75238 Paris, France

[3]University of Johannesburg, Auckland Park Kingsway Campus, 2006, South Africa

Recent studies on marine sediments indicate that oxygen production might have started several hundred million years before the 2.4 Ga Great Oxidation Event (GOE), and that continental magins were mildly oxygenized during the Neoarchean [1]. It is suggested that bioproductivity of oxygenic photosynthesizers increased contemporaneously, significantly impacting the oceanic carbon cycle [2]. To evaluate this hypothesis, we present carbon, oxygen and iron isotope as well as major and trace element data on carbonates from near-shore drill core samples of the 2.58-2.50 Ga old Malmani-Campbellrand carbonate platform (South Africa).

A slight trend in $\delta^{13}C_{carb}$ towards heavier values in the near-shore part of the platform might indicate an increased burial rate of organic material caused by an increase in primary production. An overall slight increase in $\delta^{18}O_{carb}$ to heavier values from bottom to top throughout the carbonate platform is apparently independent of water depth. A rather abrupt shift of $\delta^{13}C_{org}$ from -32 to -25 ‰ suggests that there was a change in primary producing organisms. Raman analyses confirm that all organic material maximally experienced lower greenschist-facies metamorphism.

Fe concentration and isotope data as well as REE+Y patterns trend with water depth. Peritidal carbonates show flattened REE+Y patterns and average $\delta^{56}$Fe values of about -0.42 ± 0.06 ‰ with Fe concentrations of ca. 2800 $\mu$g/g. Lagoonal carbonates have REE+Y patterns with more positive Y anomalies, lighter $\delta^{56}$Fe values of about -0.70 ± 0.06 ‰ and Fe concentrations of ca. 5600 $\mu$g/g. Drill core samples from the outermost platform show Fe isotope signatures down to -1.25± 0.06 ‰.

We propose that these isotopic and geochemical results can be used to reconstruct the development, structure and activity of an oxygenic photosynthetic community in a marine oxygen oases right before the GOE.

[1] Kendall et al. (2010), *Nature Geoscience* **3**, 647ff. [2] Eigenbrode & Freeman (2006), *PNAS* **103**, 15759-15764