Triple oxygen isotope analysis in carbonates – new insights from high resolution mass spectrometry

J. SURMA[1]*, N. ALBRECHT[2,1], O. JÄGER[1], C. S. MARIEN[3], W. XIANG[1], J. REITNER[1], AND A. PACK[1]

[1]Georg-August University Göttingen, 37077 Göttingen, Germany (*correspondence to: surma@gwdg.de)
[2]presently at: Thermo Fisher Scientific (Bremen) GmbH, 28199 Bremen, Germany
[3]Institute of Geology and Mineralogy, University of Cologne, 50674 Cologne, Germany

The oxygen isotope composition reported for Archaean carbonate sediments is systematically lower by 10 to 15 ‰ in $\delta^{18}O$ compared to later Phanerozoic carbonate records [1]. The cause of this isotopic shift is controversially debated and linked to three potential explanations: (i) a hot Archaean ocean, (ii) an ocean that was depleted in ^{18}O, and (iii) diagenetic overprinting of primary carbonates [2 and references therein].

Recent developments in the field of high resolution gas source mass spectrometery enabled the analysis of oxygen fragment ions ($^{16}O^+$, $^{17}O^+$, $^{18}O^+$) generated from CO_2 in the ion source [3]. CO_2 gas is first liberated from carbonates by conventional orthophosphoric acid digestion and subsequently analyzed by high precision dual-inlet measurements of $^{17}O^+/^{16}O^+$ and $^{18}O^+/^{16}O^+$ on a *Thermo Scientific 253 Ultra*, expanding the 'classical' $\delta^{18}O$ paleothermometer by the dimension of $\delta^{17}O$.

We present first triple oxygen isotope data from Mesozoic and Precambrian samples in order to shed light on the cause for the secular shift in $\delta^{18}O$ of chemical sediments through time.

[1] Shields, G. and Veizer, J. (2002), *Geochem. Geophys. Geosyst.*, *3*, 10.1029/2001GC000266 [2] Jaffrés et al. (2007), *Earth-Sci. Rev.*, *83*, 83-122 [3] Eiler, J. M. et al. (2013), *Int. J. Mass Spectrom.*, *335*, 45-56