New perspectives on the marine Sr-isotope record: $\delta^{88/86}$Sr, ^{87}Sr/^{86}Sr* and $\delta^{44/40}$Ca signatures of aragonitic molluscs throughout the last 27 Ma

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Applying a recently developed ^{87}Sr-^{84}Sr double spike the Sr-isotope fractionation for both ^{88}Sr/^{86}Sr and ^{87}Sr/^{86}Sr ratios in water and carbonates can precisely be determined using the TIMS-technique [1]. Measurements of seawater standard (IAPSO) and samples from different environments (shallow brackish Baltic Sea, N- and E-Atlantic, Mediterranean Sea; $\delta^{88/86}$Sr=0.382(11)‰, 2SD, n=8) are in general accord with previous observations [1-3] and reflect homogeneous signatures. Data of JCp1-coral powder, introduced as carbonate standard for this study ($\delta^{88/86}$Sr=0.193(9)‰, 2SD, n=2), are in close accordance to earlier findings on corals [1,2], implying marine carbonates systematically lighter than seawater (JCp-1 about 70ppm even in ^{87}Sr/^{86}Sr).

13 bulk carbonate samples of aragonitic composition, representing marine shallow water molluscs (0 to 100m water depth) with close correlation of bio-stratigraphic ages and Sr isotope stratigraphy (SIS), are covering an age range from the Late Oligocene to Pleistocene (about 27 Ma).

The $\delta^{88/86}$Sr record reflects an overall variation of about 0.2‰ with a minimum value of 0.08 around 21 Ma followed by a dominant increase of about 0.15‰ until 17 Ma. This pattern closely correlates with the timing of the highest rate of change in the marine radiogenic Sr record throughout the last 100 Ma at approx. 18 Ma.

The $\delta^{44/40}Ca_{(NIST\text{-}SRM\text{-}915a)}$ values represent a very similar pattern compared to the $\delta^{88/86}$Sr record, just reflecting a higher amplitude with an overall variation of about 0.45‰ and a minimum value of 0.3‰, implying comparable fractionation systematics and/or source changes.

The determined ^{87}Sr/^{86}Sr* seawater record shows higher values than classical normalized ^{87}Sr/^{86}Sr data, with increasing offset at higher $\delta^{88/86}$Sr. Preliminary interpretation take seawater temperature variations and varying Sr supply from isotopically distinctively different sources into account.

[1] Krabbenhoeft *et al*. (2009) *GCA*, this volume. [2] Fietzke & Eisenhauer (2006) *G^3* **7**, doi: 10.1029/2006GC001243. [3] Halicz *et al*. (2008) *Earth Planet Sci Lett* **272**, 406-411.

Sensitivity of cosmogenic nuclide production rate scaling to an updated geomagnetic framework

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Scaling time-integrated *in situ* cosmogenic nuclide (CN) production rates from calibration sites with known exposure histories to other locations with different exposure durations requires knowledge or assumptions of how temporal and spatial geomagnetic field variations have affected instantaneous production rates. Lifton *et al.* [1] detailed a new geomagnetic framework describing temporal and spatial variation in effective vertical cutoff rigidity (R_C), for 0-7 ka and earlier, based on a recent continuous geomagnetic model (CALS7k.2) [2]. This framework explicitly accounts for non-dipole field effects while attempting to mitigate systematic scaling biases, an advantage over previous methods based on simplified geocentric dipolar approximations. However, detailed geomagnetic models are lacking for time periods before 7 ka, forcing one to rely on simplified field approximations to R_C. Due to the time-averaged nature of CN inventories in terrestrial materials, Lifton *et al.* [1] proposed an axial dipolar approach based on the mean CALS7k.2 field over the entire 0-7 ka period, driven by paleointensity records.

Korte *et al*. (in review, G-cubed) have developed a newer continuous geomagnetic model with significantly higher temporal and spatial resolution, covering the last 3 ka (CALS3k.3). Recent advances in dating latest Holocene and even historic surfaces using *in situ* CNs (e.g., Finkel *et al*. [3]) suggest that incorporating this more robust, higher resolution model into the Lifton *et al.* [1] framework may be worthwhile. Additionally, recent growth in CN research at low latitudes, where paleointensity effects are greatest, necessitates accurate long-term paleointensity records. I plan to assess whether an updated CALS3k.3- and CALS7k.2-based framework (0-3 ka and 3-7 ka, respectively) and improved paleointensity records yield CN scaling predictions that are significantly better than those of Lifton *et al.* [1].

[1] Lifton, Smart & Shea (2008) *Earth Planet. Sci. Lett.* **268**, 190-201. [2] Korte & Constable (2005) *Geochem., Geophys., Geosyst.* **6**, Q02H16, doi:10.1029/2004GC000801. [3] Finkel, Schaefer & Schwartz (2008) *GCA* **72**, A269.