Nd isotopes of seabird guano reflect the composition of upwelling waters off northern Chile? – A pilot study

F. LUCASSEN[1*], S. KASEMANN[1], H-G. WILKE[2], P. VASQUEZ[3] AND F. A. SEPÚLVEDA[3]

[1]Department of Geosciences & MARUM-Center for Environmental Siences, Univ. Bremen, 28334 Bremen, Germany (*correspondence flucassen@ marum.de)
[2]Universidad Católica del Norte, Chile; hwilke@ucn.cl
[3]Servicio Nacional de Geología y Minería, Chile

Seabird guano-deposits are preserved along the arid section of the Chilean and Peruvian Pacific Coast since at least 2.5 Ma. Guano birds feed on small schooling fish (mainly Anchovy) from the upwelling zone in front of the coast. Nd, Pb, Sr isotope systems do not substantially fractionate in the trophic chain and hence transfer the composition of the involved water masses. The guano deposits on land are prone to additions from continental sources. Seawater Sr isotope signature is an excellent tracer for such additions, that are small in modern- and more variable but still close to seawater in fossil samples. The εNd of modern guano from an active nesting place is around -8 and modern to fossil guano from resting places falls between εNd +2 and -2. Seawater from -3 to -17° S sampled 2008/9 [1] shows εNd from -6 to -1, whereas Anchovy fishmeal from the same region (our samples, 2014) plots at εNd of –8. Near surface, northward moving coastal seawater at -34° S [2] shows εNd at +1 to -2 in the upper 100 m and at -4 to -6 between 250 and 800 m. The radiogenic εNd at the southern coast is attributed to boundary exchange with Cretaceous to modern arcs [2] and is the dominant Nd source in fossil and modern guano of northern Chile between ~-24 to -20° S, i.e. the surface water supply from the south is a stable feature. The fishmeal represents unradiogenic Nd of Antarctic intermediate water or compositional similar East Pacific water masses around εNd of -8 [3, 4]. The ingression of Antarctic intermediate water is transitional, with duration longer than the lifetime of the Anchovy of 2 years.

[1] Grasse *et al*. (2012) *EPSL* **353-354**, 198-207. [2] Jeandel *et al*. (2013) *Geochem. Geophys. Geosyst.* **14**, 328-341. [3] Noble *et al*. (2013) *EPSL* **384**, 27-36. [4] Carter *et al*. (2012) *GCA* **79**, 41-59.