Geophysical Research Abstracts
Vol. 15, EGU2013-2402, 2013
EGU General Assembly 2013

Deciphering past changes in continental humiditiy/aridity using trace element variations in stalagmites interpreted with I-STAL model

Heather Stoll
University of Oviedo, Geology, Oviedo, Spain (hstoll@geol.uniovi.es)

Geochemical records of stalagmites are now widely used to reconstruct continental climates, particularly the hydrological cycle. While the most important trace elements in stalagmites (Mg, Sr, Ba) in theory have close relationships with the hydrological balance and are easily measured, the interpretation of trace element variations in stalagmites has remained a challenge because of the multiple, often competing, factors controlling their abundance. The I-STAL model was developed as a tool for the community to permit quantitative evaluation of the changes in drip rate and dripwater saturation state which could explain a given sequence of Mg and Sr variations in stalagmites. The model simultaneously simulates the resulting variation in growth rate which can be compared to independent chronologies. The model can simulate both prior calcite or prior aragonite precipitation and can be adapted to model calcitic or aragonitic stalagmites, although kinetic data are much better constrained for calcitic stalagmites. We describe multiple examples of application of I-STAL to resolve interpretation of complex trace element data over seasonal to millennial scales. These include analysis of the effect of seasonal cave pCO_2 cycles on synchroneity of Mg /Ca and Sr/Ca cycles, effect of temporal changes in saturation state on the amplitude of trace element cycles, and the consequences of changing precipitation seasonality on trace element records in seasonally ventilating caves.