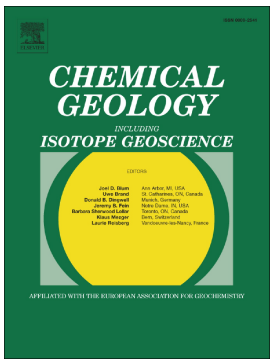
Accepted Manuscript



Rapid measurement of strontium in speleothems using core-scanning micro X-ray fluorescence

Nick Scroxton, Stephen Burns, Pete Dawson, J. Michael Rhodes, Kaylee Brent, David McGee, Henk Heijnis, Patricia Gadd, Wahyoe Hantoro, Mike Gagan

PII: S0009-2541(18)30178-5
DOI: doi:10.1016/j.chemgeo.2018.04.008
Reference: CHEMGE 18728

To appear in: *Chemical Geology*

Received date: 25 October 2017
Revised date: 23 February 2018
Accepted date: 8 April 2018

Please cite this article as: Nick Scroxton, Stephen Burns, Pete Dawson, J. Michael Rhodes, Kaylee Brent, David McGee, Henk Heijnis, Patricia Gadd, Wahyoe Hantoro, Mike Gagan , Rapid measurement of strontium in speleothems using core-scanning micro X-ray fluorescence. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Chemge(2017), doi:10.1016/j.chemgeo.2018.04.008

Rapid measurement of strontium in speleothems using core-scanning micro x-ray fluorescence

Nick Scroxton, Department of Geosciences, 611 North Pleasant Street, University of Massachusetts, Amherst, MA 01003, USA
Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge MA 02139, USA
Stephen Burns, Department of Geosciences, 611 North Pleasant Street, University of Massachusetts, Amherst, MA 01003, USA
Pete Dawson, Department of Geosciences, 611 North Pleasant Street, University of Massachusetts, Amherst, MA 01003, USA
J Michael Rhodes, Department of Geosciences, 611 North Pleasant Street, University of Massachusetts, Amherst, MA 01003, USA
Kaylee Brent, Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge MA 02139, USA
David McGee, Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge MA 02139, USA
Henk Heijnis, Australian Nuclear Science and Technology Organisation (ANSTO), Lucas Heights, NSW 2234, Australia
Patricia Gadd, Australian Nuclear Science and Technology Organisation (ANSTO), Lucas Heights, NSW 2234, Australia
Wahyoe Hantoro, Research Center for Geotechnology, Indonesian Institute of Sciences, Bandung 40135, Indonesia
Mike Gagan, Research School of Earth Sciences, The Australian National University, Canberra, ACT 2601, Australia

ABSTRACT

Speleothem trace element ratios such as Mg/Ca and Sr/Ca are increasingly used in speleothem paleoclimatology as a supplement to stable oxygen and carbon isotope ratios as proxies for past variability in the hydrologic system. Using multiple proxies together allows for a better understanding of both the local and distal hydrologic changes recorded in speleothem chemistry, and therefore of changes in past rainfall. Despite the potential benefits, trace element analysis of speleothems has yet to become widespread, which is likely due to the significant time and costs required by traditional trace element analytical techniques. In this study, we present an in-depth investigation into a rapid, relatively non-destructive and competitively priced technique for measuring Sr/Ca in speleothems: Core-Scanning micro X-ray Fluorescence (CS-μXRF).

We show that CS-μXRF reliably and precisely records Sr concentration in speleothems. Ratioed to near-stoichiometric Ca, the Sr/Ca ratio accounts for variations in beam strength and machine settings, producing a more reliable reported measurement for both intra- and inter- run comparisons. CS-μXRF compares favorably with more conventional trace element procedures such as Quadrupole ICP-MS and ICP-AES, giving confidence in the ability of CS-μXRF to produce