

Paper No. 186-5**Presentation Time:** 1:30 PM-5:30 PM***HYDROGEOCHEMISTRY OF CAVE DRIPWATERS FROM A TROPICAL OCEAN ISLAND KARST***

MURGULET, Valeriu¹, AHARON, Paul¹, WHEELER, Christopher W.², and GRAHAM, Elizabeth Y.¹, (1) Department of Geological Sciences, Univ of Alabama, Box 870338, Tuscaloosa, AL 35487, murgu001@bama.ua.edu, (2) Department of Environmental Science, California State University-Channel Islands, Camarillo, CA 93012

Niue Island is a large uplifted former atoll in the tropical South Pacific Ocean where karst is pervasive in the carbonate cap. The elemental chemistry and stable isotopes of dripwaters from which speleothems are actively forming in two adjacent coastal caves were determined in order to identify their sources. This study also examined the differences and similarities between vadose (cave dripwaters) and phreatic groundwaters on the island. Water chemistry data indicate that cave dripwaters are a Na-Ca-HCO₃ type with Na, Ca and Mg as the dominant cations and HCO₃ as the dominant anion. Relatively elevated concentrations of Na (up to 327 ppm) suggest mixing of sea-spray with rainwater at the points of recharge. Differences in Mg/Ca molar ratios of dripwaters from adjacent caves suggest variability intrinsic to the specific infiltration pathways. Cave dripwaters exhibit elevated DIC values (6 ± 1 mM, n=7) and are ¹³C-depleted (δ¹³C = -11 ± 2 per mil PDB, n=7) attesting to contribution of soil CO₂. On the basis of material balance it is estimated that about 40% of the DIC is derived from soil CO₂ and the remainder 60% from dissolution of the carbonate cap. δ¹⁸O values of dripwaters (-4.6 ± 0.5 per mil SMOW, n=7) are statistically indistinguishable from those of the phreatic groundwaters (-4.2 ± 0.8 per mil SMOW, n=19) and are compatible with the δ¹⁸O values of winter monsoon rainfall. Phreatic groundwaters sampled from 19 wells around the island are clustered into two distinct chemical groups: (1) Cl-HCO₃ water with Na and Ca as the dominant cations within 1 km of the coast and (2) Ca-Mg-HCO₃ water over most of the island interior. Carbonate speciation data indicate that phreatic groundwaters are slightly undersaturated with respect to calcium carbonate whereas cave dripwaters are all supersaturated thus explaining the active formation of speleothems in the Niuean caves.

[2003 Seattle Annual Meeting \(November 2–5, 2003\)](#)

Session No. 186--Booth# 150

[Karst Hydrology and Geomorphology in North America Over the Past Half Century \(Posters\): In Honor of Derek Ford and William White](#)

Washington State Convention and Trade Center: Hall 4-F

1:30 PM-5:30 PM, Tuesday, November 4, 2003

© Copyright 2003 The Geological Society of America (GSA), all rights reserved. Permission is hereby granted to the author(s) of this abstract to reproduce and distribute it freely, for noncommercial purposes. Permission is hereby granted to any individual scientist to download a single copy of this electronic file and reproduce up to 20 paper copies for noncommercial purposes advancing science and education, including classroom use, providing all reproductions include the complete content shown here, including the author information. All other forms of reproduction and/or transmittal are prohibited without written permission from GSA Copyright Permissions.
