

INTRODUCTION TO THE SYMPOSIUM

David C. Culver, Guest Editor

From January 7 to January 11, 2013, the Karst Waters Institute (KWI) and the National Cave and Karst Research Institute (NCRKI) held an international and multidisciplinary symposium on **Carbon and Boundaries in Karst** at NCKRI headquarters in Carlsbad, New Mexico.

There is growing interest in the dynamics of both inorganic and organic carbon in karst systems, and especially in the flux of carbon and nutrients between the surface and subsurface, and between different components (e.g. epikarst and vadose zone) in the karst subsurface. This symposium was about these and other questions connected to carbon in karst and boundaries in karst. It was especially timely both because of rapid advances in the field and the importance of carbon sequestration in global climate change. The symposium highlighted recent advances in biology, geology, and hydrology that are helping us understand the dynamics of karst ecosystems, especially with respect to carbon. The talks were organized around seven main themes:

- The Upper Boundary – Epikarst
- The Lower Boundary – Phreatic Zone
- Lateral Inputs — Insurgences
- Lateral Outputs — Resurgences

- CO₂ — Processing and Storage
- Organic Carbon — Sources and Quality
- Synthesis and Large Scale Models

Sixty participants from seven countries attended the week-long meeting which included an excursion to Carlsbad Caverns National Park. For the first time at a KWI meeting, several participants, who were unable to attend in person, gave their presentations via Skype. The meeting was highlighted by two keynote presentations:

- *Groundwater Ecology of Alluvial River Flood Plains*, Jack Stanford, Flathead Lake Biological Station, Polson, Montana
- *Karst – Conduit Matrix Exchange and the Karst Hyporheic Zone*, John Wilson, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

Two most distinguished karst scientists, William B. White of Pennsylvania State University and Derek Ford of McMaster University jointly summed up the meeting. The following is a list of oral and poster presentations given at the meeting. Participants were invited to submit articles that elaborated their meeting presentations to *Acta Carsologica*.

MEETING PRESENTATIONS

Chemotrophy meets heterotrophy: the inverted 'critical zone' of the subsurface

Penny J. Boaston

Microbial controls on in situ production of dissolved organic matter

Kathleen Brannen*, Annette Engel, and Ross Larson

Redox state in karst aquifers: Impacts of DOC- and DO-rich river water intrusion into Floridan aquifer springs

Amy L. Brown*, Jonathan B. Martin, Elizabeth Sreaton, John Ezell, James Sutton and Patricia Spellman

Component isolation and lipid profiling to characterize dissolved organic matter transformations along a groundwater flow path

Terri Brown*, Susan M. Pfiffner, and Annette S. Engel

Using biominerals to assess anthropogenic impact: a case study in Carter Salt Peter Cave, Carter County, TN

Sarah K. Carmichael*, Mary J. Carmichael, Amanda Strom, Krissy W. Johnson, Leigh Anne Roble, Yongli Gao, Cara M. Santelli, and Suzanna L. Bräuer

A simple theoretical framework to interpret spring variations and constrain mechanistic models of karst processes

Matthew D. Covington

Convergence and Divergence in Caves and Shallow Subterranean Habitats

David C. Culver* and Tanja Pipan

Microbial activities at geochemical interfaces in cave and karst environments

Annette Summers Engel

- Interactions between surface and subterranean amphipods in springs**
Cene Fišer
- Preliminary carbon sequestration and denudation rates within the karst of the Cumberland Plateau, USA**
Lee J. Florea
- Determinants of macroinvertebrate diversity in karst springs of the Mid-Atlantic region, USA**
Daniel W. Fong*, Christopher Seabolt, and Kaitlin C. Esson
- Bicarbonate water chemistry of Little Limestone Lake, a beautiful marl lake in Manitoba, Canada**
Derek Ford
- The relative importance of speleogenetic phases as revealed by numerical models**
Franci Gabrovšek
- Dynamics and limitations of organic carbon turnover in porous aquifers**
Christian Griebler
- The longitudinal response of benthic invertebrate communities to caves**
Jonathan S. Harding* and Troy Watson
- Experimental design and instrumentation to observe karst conduit hyporheic flow**
Katrina K. Henry*, Kenneth A. Salaz, and John L. Wilson
- Biological control on acid generation at the conduit-bedrock boundary in submerged caves**
Janet S. Herman*, Alexandria G. Hounshell, Rima B. Franklin, and Aaron L. Mills
- Environmental controls on organic matter production and transport across surface- subsurface and geochemical boundaries in the Edwards Aquifer, Texas, USA**
Benjamin T. Hutchins*, Benjamin F. Schwartz, and Annette S. Engel
- Subaerial microbial life in the sulfidic Frasassi Cave System, Italy**
Daniel S. Jones*, Irene Schaperdoth, and Jennifer L. Macalady
- Physical Structure of the epikarst**
William K. Jones
- Stratigraphic control on conduit development in the Ozark Karst, Missouri, USA**
James E. Kaufmann* and Jeffery Crews
- Using isotopes of dissolved inorganic carbon species and water to separate sources of recharge in a cave spring, northwestern Arkansas**
Katherine J. Knierim*, Erik Pollock, and Phillip D. Hays
- Quantitatively modeling source influences on cave air carbon dioxide chemistry**
Andrew J. Kowalczyk
- Quaternary glacial cycles: karst processes and the global CO₂ budget**
Erik B. Larson* and John E. Mylroie
- Karst in the global carbon cycle**
Jonathan B. Martin*, Mitra Khadka, Marie Kurz, John Ezell, Amy Brown
- Spatio-temporal trends in diversity of subsurface assemblages from the vadose zone of the Carpathian karst in Romania**
Ioana N. Meleg
- Comparison of water quality in submerged caves with that of diffuse groundwater immediately proximal to the conduit**
Aaron L. Mills*, Janet S. Herman, and Terrence N. Tysall
- Carbon cycling in arid land caves: implications for microbial processes**
Diana E. Northup*, Noelle G. Martínez, Lory O. Henderson and Elizabeth T. Montano
- Shallow Subterranean Habitats in Volcanic Terrain**
Pedro Oromí^{*1} and Heriberto D. López^{1,2}
- Particulate inorganic carbon flux in karst and its significance to karst development and the carbon cycle**
Randall L. Paylor* and Carol M. Wicks
- Patterns of organic carbon in shallow subterranean habitats (SSHs)**
Tanja Pipan* and David C. Culver

Seasonal, diurnal and storm-scale PCO₂ variations of cave stream in subtropical karst area, Chongqing, SW China

Junbing Pu*, Daoxian Yuan, Licheng Shen and Heping Zha

Variability of groundwater flow and transport processes in karst under different hydrologic conditions

Nataša Ravbar

Where's the fire? An analysis of carbon precipitates in Black and other caves of the Upper Guadalupe Mountains, New Mexico

Sam Rochelle*, Michael N. Spilde, and Penny J. Boston

Using hydrogeochemical and ecohydrologic responses to understand epikarst processes in semi-arid systems, Edwards Plateau, Texas, USA

Benjamin F. Schwartz*, Susanne Schwinning, Brett Gerard, Kelly R. Kukowski, Chasity L. Stinson, and Heather C. Dammeye

Carbon flux in the Dorvan-Cleyzieu karst: lessons from the past to guide future research

Kevin S. Simon

Groundwater ecology of alluvial river flood plains

Jack A. Stanford

Seasonal influx of organic carbon into Marengo Cave, Indiana, USA

Philip van Beynen*, Derek Ford and Henry Schwarcz

Testing carbon limitation of a cave stream ecosystem using a whole-reach detritus amendment

Michael P Venarsky*, Brock M Huntsman, Jonathan P Benstead, Alexander D Huryn

The role of karst conduit morphology, hydrology, and evolution in the transport, storage, and discharge of carbon and associated sediments

George Veni

Carbon fluxes in karst aquifers: sources, sinks, and the effect of storm flows

William B. White

Hydrograph interpretation – changes in time

Carol Wicks

Karst conduit-matrix exchange and the karst hyporheic zone

John L. Wilson

The role of geological processes in global carbon cycle: a review

Yuan Daoxian

The stability of carbon sink effect related to carbonate rock dissolution: a case study of the Caohai Lake geological carbon sink

Zhang Qiang

EDITORIAL

The initiator of this issue was professor David Culver, who suggested the publication of papers presented at the multidisciplinary symposium on Carbon and Boundaries in Karst in our journal. Being familiar with the high quality of past meetings organized by the Karst Waters Institute, the editorial board of AC agreed with the proposal and invited Dave as a guest editor. His editorial work was highly efficient and thorough; he found relevant reviewers and provided a high quality reviews for each manuscript. The issue contains high quality review and original research paper, presenting a comprehensive coverage of the role of karst in the global carbon cycle. This issue would not be possible without a wide cooperation of reviewers who provided thorough and thoughtful reviews of all manuscripts. Several manuscripts have been rejected for different reasons, and most of the others were

considerably improved after the review. Even though the review process was anonymous, we present the list of those reviewers that have agreed to be acknowledged in alphabetical order: Pavel Bosák, Annette S Engel, Derek Ford, Christian Griebler, Ellen Herman, Janet S Herman, William K Jones, Alexander Klimchouk, Florian Malard, Pierre Marmonier, Jonathan B Martin, MaryLynn Musgrove, John E Mylroie, Diana Northup, Metka Petrič, Tanja Pipan, Nataša Ravbar, Benjamin Schwartz, Kevin Simon, Branka Trček, Michael Venarsky, George Veni and William B White.

We hope that the readers will enjoy reading the issue.

Franci Gabrovšek, the editor