



**THE
SINKHOLE
CONFERENCE**

Multidisciplinary Conference on Sinkholes and the
Engineering and Environmental Impacts of Karst

March 27–31, 2023

Tampa, Florida

University of South Florida

www.sinkholeconference.com

Photo of Rig in a Sinkhole, 2020.



Photo of Rig in a Sinkhole, 1970.



CONFERENCE HIGHLIGHTS

The 17th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst (aka, The Sinkhole Conference) will be held at the University of South Florida. The University ranks as one of the nation's top 50 public universities. Tampa, Florida, has a mix of historic architecture and modern landmarks, a culture infused with Cuban and Spanish flavors, vibrant business districts and beautiful waterways. As for the conference, here is a preview, some of which is described more in the following pages:

- Monday, March 27, a full day field trip to examine and discuss Florida's karst features ranging from karren and microkarst to large collapse sinkholes, poljes, uvalas and springs..
- Tuesday, March 28, four expert-taught short courses on geotechnical and hydrogeologic aspects of karst.
- Wednesday, March 29 through Friday, March 31, technical paper sessions, kicked-off by a thought-provoking keynote address.
- Thursday, March 30, the Conference Banquet with Jim Griswold, Oil

Conservation Division of the New Mexico Energy, Assistant to Division Director, speaking on what is probably the largest project to date to prevent one giant sinkhole from collapsing beneath a developed portion of the City of Carlsbad, New Mexico.

- Friday, March 31, a half-day field trip to Morris Bridge Sink, a classic Florida karst window into the Upper Floridan aquifer, with a discussion on the history of Morris Bridge area, flood control and water supply management in metropolitan Tampa and the greater Tampa Bay region. Also visited will be Peck Sink Preserve, Hernando County, Fl. A series of sinkholes at Peck Sink Preserve occur as a central terminus for drainage over a 17 square mile watershed into the Upper Floridan aquifer.
- Several restaurants are conveniently located one floor above and below the conference ballroom, ranging from relaxed and stylish to good but quick..
- The widely sought proceedings will be given in digital form to all conference registrants.

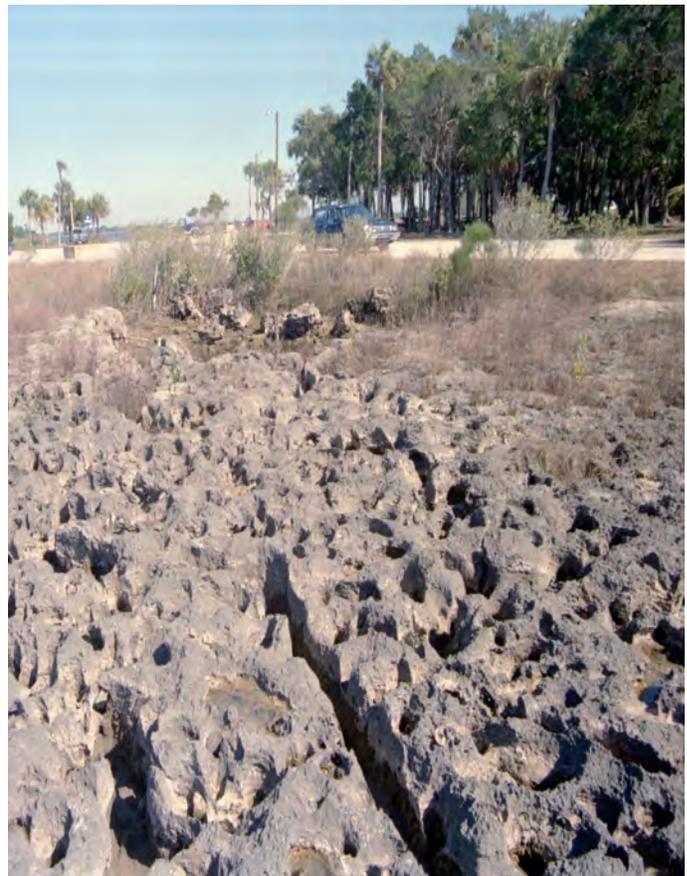


PROGRAM AT-A-GLANCE

March 27, 2023 MONDAY	March 28, 2023 TUESDAY	March 29, 2023 WEDNESDAY	March 30, 2023 THURSDAY	March 31, 2023 FRIDAY
Registration	Registration	Registration	Registration	Registration
Optional Field Trip: Florida's Karst Landscapes 8:00 am – 6:00 pm	Short Courses 1 & 2 8:00 am – 12:00 pm	Keynote Speaker and Session	Sessions	Sessions
	Lunch	Lunch	Lunch	Lunch
	Short Courses 3 & 4 1:00 pm – 5:00 pm	Sessions	Sessions	Optional Field Trip: Morris Bridge Sink, Hillsborough County FL
	Welcome Reception	Beck Memorial Reception & Poster Session	Banquet and Guest Speaker	
		Planning meeting for 18th Sinkhole Conference		

SUBMIT YOUR ABSTRACT TODAY!

Authorship or co-authorship of a full technical paper (approximately 8-10 pages in length) is encouraged of all conference registrants. Abstracts of proposed paper submissions will be accepted through July 29, 2022. Draft paper submissions will be due October 28, 2022. Please check www.sinkholeconference.com for further details and updates.



SHORT COURSES, Tuesday, March 28, 2023 (optional)

SHORT COURSE 1: Stormwater Management in Karst – A Regional Perspective

Instructor

Robert K. Denton Jr., CPG, LPSS
(Terracon)

Course length – 4 hours
8:00 am – 12:00 pm

The short course will detail general principles of karst characterization used for the siting and design of stormwater best management practices (BMPs) in karst.

Topics to be covered will include:

- Utilization of terrain, hydrogeological, and subsurface investigation analyses (borings, electrical resistivity, etc.) to properly characterize and design stormwater BMPs in karst, with special emphasis on the karst terrain of the Appalachian regions of Virginia, West Virginia, and Maryland.
- Environmental issues including the mitigation of the transport and migration of soil- adsorbed contaminants into the karst aquifer.
- Design of stormwater BMPs for internally drained sites (onsite absorption, dry ponds, Class V injection wells, etc.)
- The impact of limestone saprolite on pond design and failure.
- Understanding and utilization of the Karst Reduction Factor.
- A review of regional guidelines and regulations governing karst stormwater BMPs.



Improper stormwater designs can lead to future problems.

Short Course 2: GIS Approaches with LIDAR and Imaging Technologies for Sinkhole Documentation and Analysis

Instructors

Benjamin Mittler, MS, GISP, GIS Administrator
(Center for Digital Heritage and Geospatial Information, University of South Florida)

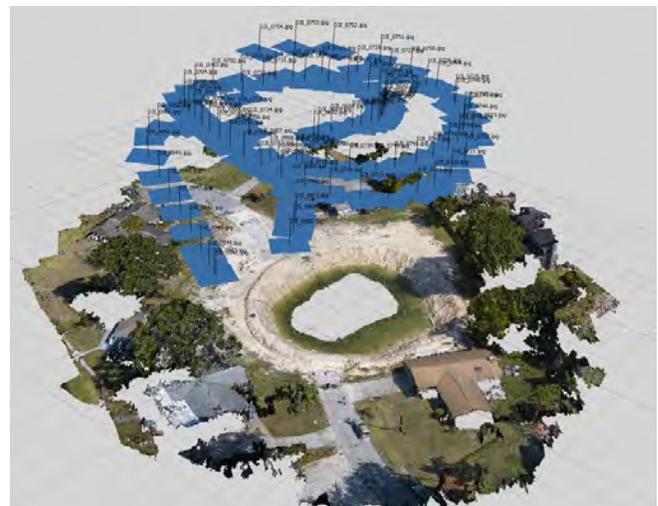
Jorge Gonzalez, 3D Applications Engineer (Center for Digital Heritage and Geospatial Information, University of South Florida)

Course length – 4 hours
8:00 am – 12:00 pm

THE NUMBER OF STUDENTS IS LIMITED TO 20

In this workshop we will examine case studies from Florida, including from a major collapse sinkhole event, where aerial and terrestrial LiDAR applications and drone-based Structure from Motion and imaging were utilized for sinkhole documentation, analysis, and modeling techniques. Workshop attendees will learn about types of aerial and ground-based survey strategies, and workflows for producing high-resolution digital surface models (DSMs) and applications for 3D point cloud and terrain modeling. Attendees will learn sources and applications for incorporating available geospatial data, and gain knowledge and experience in producing digital terrain Sinkhole drone monitoring information in GIS using aerial and terrestrial LiDAR and imaging from drone-based information. Using case studies and laboratory exercises, we will explore applications for hazards documentation using sinkhole case studies for characterization, modeling, monitoring, and visualization in GIS.

Introductory and general knowledge of GIS is helpful, with workshop geared toward GIS beginner-level applications.



Sinkhole SfM (Structure-from-Motion) Drone Modeling

SHORT COURSES, Tuesday, March 28, 2023 (optional)

Short Course 3: Designing and Conducting Tracer Studies in Karst With Emphasis on Sites with Actual or Potential Contaminant Releases

Instructors

Ralph Ewers, Ph.D. (President, Ewers Water Consultants, Inc.)

Keith White, CPG (Principal Geologist, Arcadis, Inc.)

Course length – 4 hours

1:00 – 5:00 pm

Tracer investigations, particularly those conducted with fluorescent dyes, provide essential information regarding groundwater movement and the fate and transport of contaminants in karst aquifers. They do this quickly, reliably, and inexpensively in most karst terranes. This short course will provide students with a primer on karst hydrogeology and then delve into the various aspects of planning and conducting tracer studies in karst terranes, including:

Test Design Essentials – The four essential steps in conducting a tracer test – reconnaissance, tracer background assessment, tracer introduction, and tracer monitoring – will be explored, and the rationale for each will be given.

Tracer Dyes – Details on the usefulness of each of the common fluorescent tracer dyes and their individual characteristics will be provided. We will discuss the means by which the tracers can be introduced and how, where, and when to monitor for them. The pros and cons for each of the analytical methods will also be examined.

Example Tests – Recent and historical tracing examples will be examined in detail, offering a wide range of karst settings in which tracing has been successfully used. In these examples the hydrogeology demonstrated by the tracing will be compared to the hydrogeology inferred by traditional well data.



Introducing tracer is just one step in a successful trace.

Short Course 4: Conducting Geotechnical Investigations in Karst

Instructor

Michael J. Byle, D. GE, F. ASCE (National Discipline Lead, Civil/Geotechnical Engineering, Tetra Tech, Inc.)

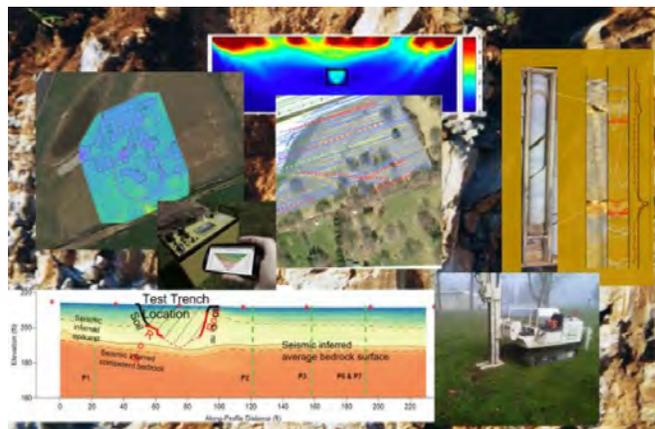
Course length – 4 hours

1:00 – 5:00 pm

Carbonate and evaporite geologic formations underlie a large portion of the world. These formations contain soluble compounds that result in portions of the formations dissolving over time to produce cavities, conduits, enlarged joints, caves, etc. The landforms resulting from these features are referred to as karst. Karst poses many geotechnical concerns such as subsidence, sinkholes, uneven structural support, high groundwater production, and groundwater sensitivity to contamination.

Locating and characterizing karst features at depth is a challenging task. Even large features can be easily missed by conventional borings and may not be detectable by some geophysical methods. This makes it necessary to employ a specially focused investigation that incorporates geological, geotechnical, statistical, and geophysical approaches to evaluate risks and determine the appropriate level of investigation.

This presentation will include a brief introduction to karst and the associated geotechnical issues. A discussion of karst factors to various land use, construction, and development will be presented. Methods and strategies for investigating and characterizing various aspects of karst will be discussed and examples provided. Methods of investigation including, geologic data review, borings, test excavations, and aerial and terrestrial geophysics will be discussed with particular focus on developing an integrated approach to characterizing karst conditions.



Identify the right suite of investigations for you project.

CONFERENCE FIELD TRIP 1 (optional)

Florida's Karst Landscapes Field Trip

Monday, March 27, 2023

All Day Trip: 8:00 am to 5:30 pm

Trip Co-leaders:

Michael C. Alfieri

(Water Science Associates)

Sam B. Upchurch

(Senior Fellow of the Geological Society of America),

Thomas M. Scott

(Assistant State Geologist Emeritus, Florida Geological Survey)

Florida is well known among karst scientists for its geologically young, eogenetic karst. On this field trip, we will examine and discuss Florida's karst features ranging from karren and microkarst to large collapse sinkholes, poljes, uvalas and springs. Participants will see numerous examples of karst geomorphology as the trip travels to the field stops and returns to the USF campus.

The field trip will begin at the USF campus and proceed north on I-75 to Gainesville. Along the route we will see Paynes Prairie, a large polje.

The first stop is at Devil's Millhopper Geological State Park north of Gainesville where participants can view the Devil's Millhopper, a large collapse sinkhole that penetrated from the Eocene Ocala Limestone through the Miocene Hawthorn Group and younger sediments.



Devil's Millhopper Geological State Park

The second stop is at Haile Quarry near Newberry west of Gainesville. Here, the Eocene Ocala Limestone is riddled with solution pipes, cavities and other dissolutional features. There will be fossil-collecting opportunities at the quarry.

The third stop will be at Rainbow Springs State Park near Dunellon approximately 105 miles north of the USF campus. The Rainbow Springs Group

consists of numerous springs that create the Rainbow River. Our group will visit the spring and discuss the issues surrounding springs in Florida. Along the entrance road to the park, we will visit an abandoned hardrock phosphate mine and discuss the origin of hardrock phosphate in Florida.



Haile Quarry



Rainbow Springs State Park

PLEASE NOTE: Hard hats, good field boots and safety vests are required to participate in the trip. Conference organizers cannot provide the necessary safety items. Bring rock hammers and sample collection bags as desired. Lunch and drinks will be provided.

CONFERENCE FIELD TRIP 2 (optional)

Morris Bridge Sink, Hillsborough County Florida

Friday, March 31, 2023

Afternoon trip, 1:30 pm to 6:00 pm

Trip Co-leaders:

David J. DeWitt (Southwest Florida Water Management District, Retired)

Jason LaRoche (Geohydrologic Data Section, Southwest Florida Water Management District)

Robin Speidel (Environmental Data Project Manager, Water Quality Monitoring Program, Southwest Florida Water Management District)

The Morris Bridge Sinks complex is located at the Flatwoods Park associated with the Lower Hillsborough River Flood Detention Area north of Tampa; FL. Morris Bridge Sink is a classic Florida karst window into the Upper Floridan aquifer. The sink has been studied as a potential source of water for environmental augmentation of the lower Hillsborough River during periods of protracted drought. A discussion on the

history of Morris Bridge area, flood control and water supply management in metropolitan Tampa and the greater Tampa Bay region will highlight complexities of managing water resources in an urban setting.

Peck Sink Preserve, Hernando County, FL

Peck Sink is a large drainage feature located south of the City of Brooksville in Hernando County, FL. A series of sinkholes at Peck Sink Preserve occur as a central terminus for drainage over a 17 square mile watershed into the Upper Floridan aquifer. Peck Sink is on the western margin of the Brooksville Ridge, a prominent landform in west-central Florida, that provides the geologic setting and topographic relief for karst development and contains many closed depressions, sinkhole lakes that dominate the internal drainage features found on the Ridge.

Drinks will be provided for the half-day field trip.

THE BARRY F. BECK SINKHOLE CONFERENCE STUDENT SCHOLARSHIP

The Barry F. Beck Sinkhole Conference Student Scholarship (Beck Scholarship) is a competitive grant that is awarded to one or more students who are presenting the results of their research at the Sinkhole Conference. The award was established in 2013 in memory of the late Dr. Barry Beck, a pioneer in the scientific study of sinkholes who founded the Sinkhole Conferences, and who died in 2011.

At least one Beck Scholarship is awarded for each conference. Additional scholarships are awarded if funded from donors. For this conference, a record eight scholarships have been awarded! We thank them for advancing the careers of eight highly talented young people. Donations to support students at other upcoming Sinkhole conferences are tax deductible and your company is given recognition as outlined below.

Sponsor: A donation of \$1,500 or more allows the award to be labeled with the Sponsor's name, such as Acme Corporation – Beck Scholarship. The Sponsor will be distinguished in this manner in all recognitions and announcements of the student's scholarship, including the conference program and website. If the donation exceeds

\$1,500, additional awards will be given in \$1,500 increments. Any excess funds will go into the...

General Beck Scholarship Fund: This fund is for donations less than \$1,500. Donors will be acknowledged in the conference program and website. Money in this fund will be carried until the total is sufficient to support a scholarship and will be spent for the next Sinkhole Conference with a qualifying student.

Supporting students through this scholarship provides them the opportunity to grow substantially as scientists, learn more about the significant challenges of karst environments, and to establish personal connections with potential employers and partners in future cave and karst research. We hope you will support them. Donations may be made online or by contacting the National Cave and Karst Research Institute's Executive Director, Dr. George Veni at gveni@nckri.org. For more information see www.sinkholeconference.com/how-to-sponsor-the-scholarship.

Applications to the Beck Scholarship Fund are due by October 28, 2022.

COMMITTEE MEMBERS

Co-Chairs

- George Veni
- Bogdan Onac
- Jim LaMoreaux

Banquet and food

- George Veni
- Bogdan Onac

Beck Scholarship & Auction

- E. Calvin Alexander, Jr.
- Pete Hutchinson

Circulars

- Ty Black

Educational Accreditation

- Devra Heyer

Exhibitors and Sponsors

- Dave Harro

Field trips

- Clint Kromhout

Hotel/conference facilities

- George Veni
- Bogdan Onac

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- Yongli Gao

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Proceedings Assistant Editors

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- Pete Hutchinson

Proceedings Layout

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Program w/ Abstracts Editors

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- Justin Camp
- Jeff Watson

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- NCKRI

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- Keith White

Social Media

- Devra Heyer

Symbolic sale items

- Dave Decker

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- NCKRI

Virtual coordinator

- Dave Decker

Website

- Gheorghe Ponta (main website)

Professional organization liaisons

- Dave Decker (AEG, AGI, KWI, NSS)
- Said Irvani (ASCE)

Members at Large

- Michael Byle
- Connie Campbell Brashear (ASFM, ASCE)
- Said Irvani
- Steve Rice
- Ira Sasowsky
- Brad Stephenson
- Wanfang Zhou

CONFERENCE SPONSORS



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Edwards Aquifer
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LODGING OPTIONS

Lodging at the 17th Sinkhole Conference is available at the following hotels:

1. Embassy Suites Hotel that is on University of South Florida campus, and closest to the venue. For general information about the hotel, to register and to make reservation, please visit the following link:
<https://www.hilton.com/en/book/reservation/deeplink/?cityhcn=TPAFRES&groupCode=CESSHC&arrivaldate=2023-03-26&departuredate=2023-03-31&cid=OM.WW.HILTONLINK.EN.DirectLink&fromId=HILTONLINKDIRECT>

The special discount rates of \$179/night for the conference are available through March 1, 2023.

2. Quinta Hotel located across the street from the University of South Florida campus. For general information about the hotel, to register and to make reservation, please visit the following link:
<https://www.wyndhamhotels.com/laquinta/tampa-florida/la-quinta-usf-near-busch-gardens/rooms-rates?&checkInDate=03/26/2023&checkOutDate=04/01/2023&groupCode=CGNCKC>
The special discount rates of \$129/night for the conference are available through March 1, 2023.



Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst

Please complete this registration form, including signature and payment information. Use one registration form per person. Registrations will not be processed without full payment and the registrant's full name. *Please note: If someone else is registering for you, the name of the actual registrant must be filled out and not the name of the person paying*

Full Registration and Full Student Registration includes evening reception, poster session, evening banquet, and a choice of up to two short courses. If you are not registering for the full conference, you must purchase a Day Pass in addition to other registration activities for that day. The conference is scheduled for 27-31 March 2023.

Contact Information (*Indicates required information)

*First Name _____ MI _____ *Family Name _____ Badge Nickname _____

*Company/Organization/University _____

*Street Address/PO Box _____

*City _____ *State _____ *Zip/Postal Code _____ *Country _____

*Work Tel _____ *Home Tel _____ *Cell _____ *Email _____

	<i>Prices until December 1</i>	<i>Prices after December 1</i>
Full Registration		
Regular Registration	<input type="checkbox"/> \$475	<input type="checkbox"/> \$575
Student Registration**	<input type="checkbox"/> \$150	<input type="checkbox"/> \$150
**Copy of student ID must accompany registration form		

Special Events—The following three items are included in Full Regular or Student, and certain Day Pass registrations. These items apply only to guests of Full Regular or Student registrants, and if the guests attend only these events (such guests must complete their own registration form and identify their Regular or Student registrant).

Tuesday, March 28: Guest Evening Reception	<input type="checkbox"/> \$35	<input type="checkbox"/> \$35
Wednesday, March 29: Guest Poster Session Reception	<input type="checkbox"/> \$35	<input type="checkbox"/> \$35
Thursday, March 30: Guest Banquet	<input type="checkbox"/> \$50	<input type="checkbox"/> \$50

Field Trips (Not included in Conference Registration)

Full Day Field Trip – Florida’s Karst Landscapes	<input type="checkbox"/> \$100	<input type="checkbox"/> \$120
Friday, March 31 (Price with Full Regular or Student registration only)		
Half Day Field Trip – Morris Bridge Sink and Peck Sink Preserve	<input type="checkbox"/> \$55	<input type="checkbox"/> \$75

Short Courses, Tuesday, March 28 (Two included in Full Regular or Student registration. All courses 4 hours in length)

Morning Short Courses—select no more than one morning course

Short Course 1 – Stormwater Management in Karst

Short Course 2 – GIS and LiDAR Approaches in Karst

Afternoon Short Courses—select no more than one afternoon course

Short Course 3 – Designing & Conducting Tracer Studies

Short Course 4 – Conducting Geotechnical Investigations in Karst

(Registration form continues on next page)

Livestream Registration (provides live Internet viewing of all sessions for attendees not at the conference site)

- Regular Registration \$75
 Student Registration** \$50

**Copy of student ID must accompany registration form

Day Pass Options (if you are not Full Regular or Student registrant)

Monday, March 27

Day pass: Full Day Field Trip – Florida’s Karst Landscapes \$175

Tuesday, March 28

Day pass: up to two Short Courses (all 4 hours in length) and Evening Reception \$175

Morning Short Courses—select no more than one morning course

Short Course 1 – Stormwater Management in Karst

Short Course 2 – GIS and LiDAR Approaches in Karst

Afternoon Short Courses—select no more than one afternoon course

Short Course 3 – Designing & Conducting Tracer Studies

Short Course 4 – Conducting Geotechnical Investigations in Karst

Wednesday, March 29

Day pass: Sessions with Evening Poster Session Reception \$175

Thursday, March 30

Day pass: Sessions with Evening Banquet \$175

Friday, April 16

Day pass: Sessions & Half-day field trip to Morris Bridge Sink & Peck Sink Preserve \$175

Day Pass total amount \$ _____

Please tally all your registration choices:

- Full Registration \$ _____
 Day Pass total \$ _____
 Field Trips \$ _____
 Live streaming \$ _____
 Special Events \$ _____
GRAND TOTAL (pay this amount) \$ _____

Credit Card:

- AMEX VISA MC DISC

PAYMENT:

Full payment must accompany this registration form.

SEND THIS COMPLETED FORM BY:

- Fax: 575-887-5523, or
- E-mail: info@nckri.org, or
- Mail: NCKRI, 400-1 Cascades Avenue
 Carlsbad, New Mexico 88220 USA

Payments by check must be payable to “New Mexico Tech” with “NCKRI Sinkhole Conference” in the memo field.

REFUND POLICY:

- 80% by September 1, 2022
- 50% by December 16, 2022 (no refunds after this date).

For online credit card payment, register at:

https://secure.touchnet.com/C22533_ustores/web/store_cat.jsp?STOREID=13&CATID=75&SINGLESTORE=true

Card Number	
Exp. Date (MM/YY)	
CVC (three digit #)	
Cardholder Name	
Billing address	
Total to be Charged	\$ _____