



Book Reviews

Sinkholes and the Engineering and Environmental Impacts of Karst.

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Sinkholes and the Engineering and Environmental Impacts of Karst is the proceedings volume from the ninth multidisciplinary conference primarily sponsored since the early 1980's by P.E. LaMoreaux and Associates, Inc. This volume, like others in the past, provides an excellent collection of the current state of the art work conducted in karst landscapes. Over 60 original papers are contained in this proceedings volume written by karst specialists from both sides of the Atlantic. This volume is divided into 11 sections or sessions spread out over 700 pages.

The keynote address presented by Milanovic discusses the difficulty of constructing dam sites in karst with examples of design criteria for grouting.

Session 1 is on the geology and origin of sinkholes and karst. Benson et al. outline steps to assess the risk of subsidence in karst. Day presents the results of an assessment with the use of a probabilistic model to predict the risk failure of a dam site in Edwarton, Jamaica. Horwitz and Smith report the findings of subsidence investigations in an area underlain by paleokarst features in Polk County, Florida. Hubbard stresses that the number of sinkholes identified in the field in Virginia are an order of magnitude greater than those identified on 1:24,000 topographic maps at a contour interval of 20 feet. Additionally, he cautions that using current sinkhole distribution data caused from past and present land use practices may not be effective toward the prediction of future occurrences. Kastning and Kastning re-emphasize Hubbard's view that more detailed mapping provides greater evidence of sinkhole development. Through the inspection of over 1,000 case studies of foundation failures in Florida, Randazzo and Smith demonstrate that many professionals did not apply proper ASTM methods to characterize structural problems in karst. Sasowsky et al. describe the hydrogeology and karst features of the Bellevue-Castalia Karst Plain in northcentral Ohio. Tharp applies an elastic-plastic model to the formation of cover collapse sinkholes. Zisman presents two papers. The first paper stresses a need for a change to the Florida sinkhole statute, the second provides an estimate of the average sinkhole size in west central Florida based on existing data and how this average size can be used to conduct subsurface investigations.

The focus of Session 2 is on karst and sinkholes in evaporites. Papers concentrate on the evaporite karst in the Michigan Basin (Black), subsidence in Huerva River Valley (Guerrero et al) and Cinca River Valley (Lucha et al.) of northeastern Spain, and confirmation of relict and active karstification in the evaporite sediments near Leeds, United Kingdom. Additionally, Yechieli et al. report on the occurrence and mechanism for sinkhole formation along the Dead Sea coastline.

Session 3 includes papers on karst hydrology and dye tracing. Dussart-Baptista et al. study the transfer of bacteria contaminated particles in a karstified chalk aquifer in France. Field introduces the new FLOWTHRU computer program and its use to effectively download and plot data rapidly and clearly. Green et al. use dye tracing to evaluate how dewatering at two limestone quarries in Minnesota changed groundwater flow directions. Lolcama discusses the problems with locating cement kiln dust landfills in karst and provides a review of the draft EPA regulations in siting these landfills. Massei et al. demonstrate the use of a linear graphical method and the Qtracer2 program to study flow dynamics and transport properties of karst aquifers.

As part of a recovery plan for the protection of the federally listing endangered Alabama shrimp, McGregor et al. present the results of a detailed study in Bobcat Cave on the U.S. Army Redstone Arsenal Base. Memon and Ponta report on the results of pumping test variations conducted in karst aquifers in Pennsylvania, Texas, and New York. Smart and Worthington discuss the benefits of electrical conductivity profiling of boreholes and the results of a hydrologic study of site wells near Walkerton, Ontario. Townsend and Macfarland conduct a hydrogeologic and hydrochemical investigation of the Barneston limestone to determine the source water area for Crystal Spring in Florence, Kansas. Through conducting regression analysis on over 180 tracer test data, Worthington and Smart present two new equations that estimate dye concentrations needed for sinkhole to spring traces.

Session 4 concentrates on geoenvironmental engineering in karst. This group of papers describe the results of an investigation designed to detect the presence of karst conditions for a proposed power plant site in southeastern United States (Burton et al.), springs within the Spring Hill Lake watershed in Indiana that showed *E. Coli* contamination (Hasenmueller et al.), and the occurrence of liver cancer in the tower karst in Fusci County, China (Jie et al). Other papers discuss the difficulties with high frequency storm induced sampling of two karst springs in the Mitchell Plain of Indiana as

part of a long term monitoring program near a monofill site (Lounsbury et al.), macroinvertebrate sampling at karst springs as mechanisms to detect groundwater quality at Fort Campbell, Kentucky (Rice and Hartowicz), and an investigation conducted for a proposed industrial site in Tennessee that demonstrated the effective use of dipole-dipole resistivity methods for locating karst features (Tinjum et al.).

Session 5 focuses on the central Kentucky karst. Two papers describe investigations with regard to the proposed Trimodal Transpark in Bowling Green, Kentucky. Brucker discusses the potential impacts to the local karst area including potential threats to karst groundwater resources within Mammoth Cave National Park. Crawford presents the results of a fourteen month hydrogeologic investigation. Results demonstrate that groundwater would not flow into the Turnhole Spring Groundwater Basin of Mammoth Cave. Other papers report seasonal variation of groundwater flow from sinkholes adjacent to I-65 identified by dye tracing of the Mammoth Cave karst aquifer (Capps), an investigation subsequent to the evening rush hour sinkhole collapse along Dishman Lane in Bowling Green, Kentucky (Kambesis et al), and the use of geophysical surveys, borings, and groundwater monitoring in an investigation of a diesel spill along Interstate 65 (Stephenson et al.).

Session 6 contains papers on the use of computer applications in karst investigations. The use of the GeoHMS and Geomedia Grid software by Campbell et al. resulted in the development of two hydrologic models for the Newsom Sinks watershed in north Alabama. Gao and Alexander used Arc View and Arc Info GIS to construct a relative sinkhole risk map of Fillmore County, Minnesota based on a decision tree model. Derivative maps have been used by the Pennsylvania Geologic Survey using GIS software to show karst surface features (Kochanov and Reese). Siegal et al. used FLAC analysis to characterize the seismic stability of caves at a proposed landfill site in the karst of Tennessee. Veni reports on the use of a GIS model that incorporated geologic, biologic, and hydrologic data to better characterize the Edwards Aquifer in San Antonio, Texas.

Session 7 is about governmental regulation programs related to karst.

Drew and Daly describe the European Approach to characterize the intrinsic vulnerability of carbonate aquifers. Fischer et al. revisit a geotechnical investigation conducted prior to the construction of a nuclear power plant in the karst of eastern Nebraska. Richardson reveals the lack of local government regulations in West Virginia and Virginia with respect to land use in karst hazard prone areas. Tolmachev et al. provide an historical overview of karst research conducted in Russia.

Session 8 is on the geophysical applications used in investigating karst areas. Harrison and Hiltunen provide the results of Spectral Analysis of Surface Waves (SASW) used at two proposed bridge abutment locations in a mantled karst in Pennsylvania. Hoover discusses the geophysical methods commonly used to evaluate karst

conditions. Kase et al. provide case studies from projects in Oklahoma, Washington, D.C., Florida, and Brazil that used a three dimensional tomographic imaging system to assess subsurface conditions in karst

The center point of Session 9 is on engineering transportation and infrastructure in karst. Two geomechanical models were developed to assess the potential for sinkhole formation along a planned high velocity railroad line in south Germany (Molek). Moore et al. describes a joint research effort between the University of Tennessee and the China Guizhou Highway Engineering Corporation to study bearing capacity over karst areas in southwest China. Peterson et al. discuss the problems that occurred during the widening of State Route 202 in King of Prussia, Pennsylvania and methods used for sinkhole mitigation. Another paper provides the results of an exploratory drilling and karst grouting program along two roads underlain by the Wakefield Marble in Carroll County, Maryland (Watson et al.). Zhou et al. present a hard core Strauss Model that was used to predict the occurrence of new sinkholes based on existing sinkhole clusters in the vicinity of Interstate 70 south of Frederick, Maryland.

Session 10 focuses on prevention and remediation of sinkholes and karstic settlement. These papers deal with an overview of subsurface investigations conducted due to a sinkhole collapse along the Burlington Northern Santa Fe railroad near Cape Girardeau, Missouri from a sinkhole collapse (Abkemeier et al), guidance on how to remediate catastrophic inflows at dam and quarry sites (Bruce), the use of micropiles as a solution to foundation problems in karst (Dotson and Tarquinio), and the preference of limited mobility grouting as opposed to compaction grouting for sinkhole remediation (Kannan). The last two papers of the session provide an overview of sinkhole problems in the Lehigh Valley carbonates of Pennsylvania (Perlow), and a case history the describes sinkhole problems within a portion of the Norfolk Southern Railroad near Knoxville, Tennessee (Vance).

Session 11 is about karst in the Huntsville Area of Alabama. Baker and Campbell present dye tracing results conducted for the City of Huntsville, Alabama used to establish the speed and direction of groundwater flow from sinkholes on the Chapman Mountains to municipal supply wells and nearby springs. Smart and Campbell discuss the speleogenesis of caves within the Cumberland Plateau in northeast Alabama. St. John et al. provided a review of geotechnical investigations conducted for the City of Huntsville regarding the stability of surrounding mountain slopes and subsequent land development regulations. A field trip guide is provided by Campbell at the end of the proceedings volume.

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