TWO-DAY SHORT COURSE ON ROCK FRACTURE GEOMETRY CHARACTERIZATION AND NETWORK MODELING IN 3-D INCLUDING VALIDATIONS

will be taught by

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March 14-15, 2010
Course will be taught at
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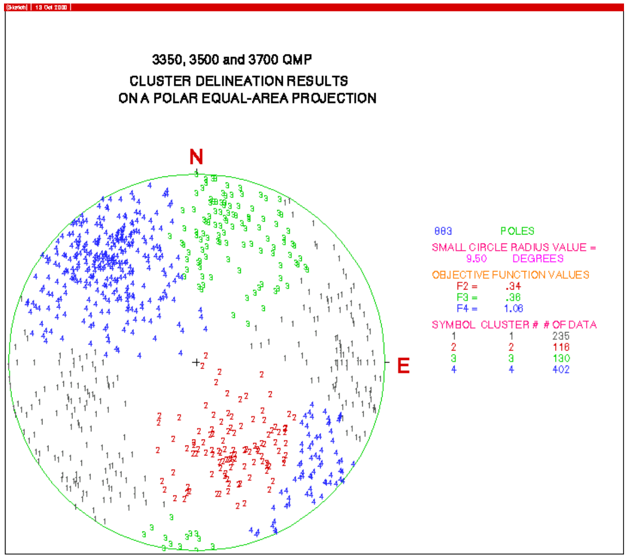
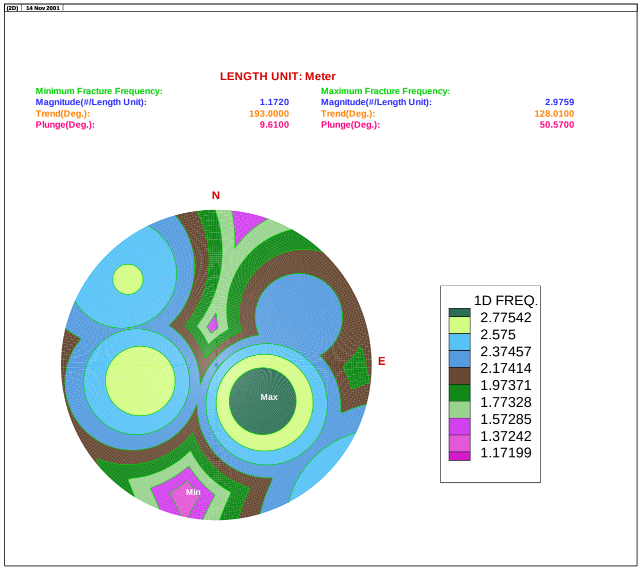
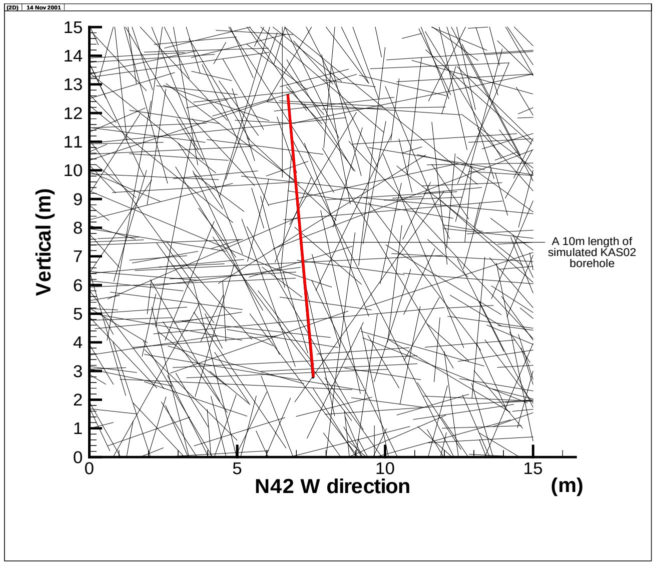
Fax: 520-327-0276
Email: 97506FrontDesk@fourpoints.com
http://www.starwoodhotels.com/fourpoints/

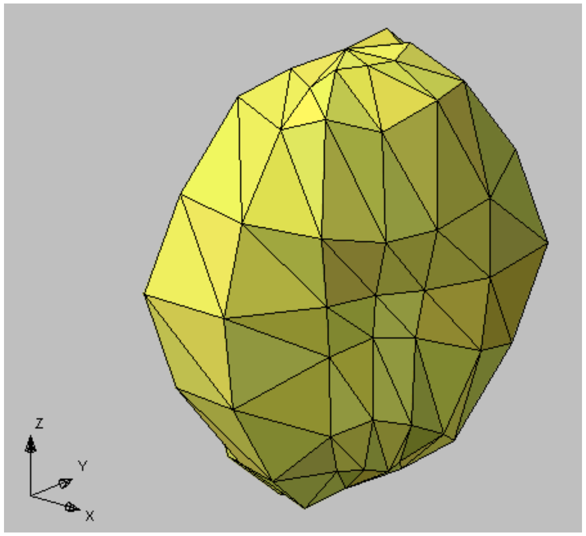




1-D fracture frequency distribution in 3-D on an equal-angle equatorial net



Fracture traces obtained from fracture generation on a vertical square window of size 15 m having strike same as the trend direction of borehole KAS02



Variation of directional hydraulic conductivity in 3-D space (scale: 1 cm = 2.1 x 10^{-7} m/s) – view along the direction having trend = 320º and downward plunge = 20º

INTRODUCTION AND COURSE OBJECTIVES

The first step in the procedure of discontinuity geometry modeling in a rock mass should be the identification of statistically homogeneous regions (structural regions). To model discontinuity geometry in 3-D for a statistically homogeneous region, it is necessary to know the number of fracture sets, and for each fracture set, the intensity, spacing, location, orientation, and size distributions. Discontinuity geometry parameters obtained by the field data are subject to errors due to sampling biases and represent only 1- or 2-D properties. Therefore, before inferring statistical distributions for these parameters, sampling biases should be corrected on field data. Principles of stereology need to be used in developing expressions for both corrections for sampling biases and inferring 3-D discontinuity geometry parameter values from either 1- or 2-D parameters.

Kulatilake et al. completed a software package named *FRACNTWK* (based on about 15 journal papers) to analyze discontinuity data obtained from boreholes, rock cores, scanlines and 2-D exposures such as rock outcrops, tunnel walls, tunnel roofs, etc. to perform fracture characterization and network modeling and to generate rock discontinuity systems in rock masses. This package provides procedures (a) to identify statistically homogeneous regions in a rock mass, (b) to identify discontinuity clusters in a statistically homogeneous region, (c) to apply corrections for sampling biases associated with orientation, spacing and trace length distributions of discontinuity clusters, (d) to obtain probability distributions for orientation, spacing, trace length and discontinuity size in 3D of discontinuity clusters, (e) to obtain a map of the discontinuity traces sampled through either scanline or area sampling surveys, (f) to estimate 1-D discontinuity frequency along mean normal vector directions of discontinuity clusters using discontinuity spacing data mapped from some other directions, (g) to estimate 1-D discontinuity frequency in any direction in the rock mass, (h) to estimate distributions for block size, number of blocks per unit volume and number of discontinuities per unit volume for the rock mass, (i) to estimate fracture tensor parameters for each discontinuity cluster as well as for the rock mass, (j) to generate discontinuities in 3-D for the rock mass and to obtain discontinuity trace predictions on vertical and horizontal exposures, and (k) to verify the used discontinuity system models.

This package has been used to perform fracture network modeling in 3-D incorporating corrections for sampling biases on fracture geometry parameters for several geo-engineering sites in the world. It has been used to build fracture networks to perform numerical discrete fracture fluid flow modeling in 2-D to study a ground water resources problem in Arizona, and in 3-D to study representative elementary volume behavior and estimate 3-D hydraulic conductivity tensor for a tunnel site in California. The package was also used to model the fracture system and then to conduct slope stability investigations for highway and mine sites. Most recently, it has been used to generate fractures in 3-D and then to estimate rock mass strength & deformability parameters for ASPO Hard Rock Laboratory, Sweden. The computer package has 26 calculation and 24 graphical programs.

Usually this short course is taught during a three-day period. **However, due to time constraints it will be taught as a two-day short course.** The objective of the short course is to cover the salient features on the following topics associated with rock fracture characterization and network modeling: **(1) Modeling of statistical homogeneity; (2) Modeling of fracture orientation; (3) Modeling of rock fracture size; (4) Modeling of fracture spacing and frequency; (5) Modeling of fracture 3-D intensity parameters; (6) Rock fracture tensor; (7) Discontinuity generation & validation and fracture network modeling for mechanical and hydraulic behavior of rock masses.** In addition, the features of the *FRACNTWK* package will be discussed including applications to real world problems on fracture characterization and network modeling.

Medium of Instruction:
The medium of instruction will be English.

Who Should Attend:
Engineers, geologists and hydrologists who are involved in site characterization, analysis, design and construction activities

associated with geo-engineering systems which are in or on jointed rock masses will benefit from the short-course.

Time Schedule:

8:30—10:15	Lectures
10:15—10:30	Coffee/tea break
10:30—12:15	Lectures
12:15-- 13:15	Lunch
13:15-- 15:00	Lectures
15:00-- 15:15	Coffee/tea break
15:15-- 17:00	Lectures/computer demonstrations

Narrative Biography of Prof. Kulatilake:

Pinnaduwa H.S.W. Kulatilake, Ph.D., P.E., F.ASCE, is a Professor of Geological/Geotechnical Engineering at the University of Arizona. He has over 30 years of experience in rock mechanics, geotechnical engineering, and applications of probabilistic and numerical methods to geotechnical engineering. He has written over 150 papers and is a member of several technical committees. He has delivered 16 keynote lectures and 40 other invited lectures throughout the world on topics related to fracture network modeling, probabilistic geotechnics, mechanical properties of joints, rock slope stability and mechanical and hydraulic behaviour of rock masses. He is a research paper reviewer for 16 technical Journals and an editorial board member for Int. Jour. of Rock Mechanics & Mining Sciences and Int. Jour. of Geotechnical and Geological Engineering. He has taught short courses on stochastic fracture network modeling, rock slope stability analysis and Block theory in Sweden, Mexico, Austria, USA, Canada, Hong Kong, Poland, Finland, Australia, South Korea, Sri Lanka, Egypt, Iran and Chile. He served over 20 years either as the primary or the sole examiner for the geological engineering professional exam conducted by the Arizona State Board of Technical Registration. He was a Visiting Professor at the Royal Institute of Technology and Lulea University of Technology in Sweden as part of his sabbatical leave. Also, he was a Visiting Research Fellow at the Norwegian Geotechnical Institute, for another part of his sabbatical leave. Due to the contributions that he made on teaching, research, consulting and service activities, he was elected to the Fellow Rank of the American Society of Civil Engineers at the relatively young age of 45. In 2002, he received Distinguished Alumnus Award from the College of Engineering, Ohio State University and Outstanding Asian American Faculty Award from the University of Arizona in recognition of his achievements and contributions made to the advancement of his profession. In December 2005, Eurasian National University, Kazakhstan conferred him “Honorary Professorship”. In August 2007, he organized and ran a very successful International Conference on Soil & Rock Engineering in Sri Lanka. In January 2009, he organized and ran a successful, high quality International Conference on Rock Joints and Jointed Rock Masses in Tucson, Arizona.

Registration Conditions:

The course fee of US$ 750 must be paid in full by the registration deadline of February 15, 2010. The course fee includes course notes, lunch and refreshments for morning and afternoon tea/coffee breaks. The number of applicants for each course is limited and acceptance will be on a first come, first served basis. If the course is cancelled, then the full short course fee will be refunded. No refund will be given after February 20, 2010. Non-arrivals at the course will be liable to pay the full course fee and no refund will be given. However, substitutions will be allowed.

Registration Form
Short Course on Rock Fracture Geometry Network Modeling in 3-D, Tucson 2010

Name: ________________________________

Title: ________________________________

Organization: ____________________________

Mailing Address: ______________________

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Telephone Number: ______________________

Fax Number: ____________________________

E-mail address: __________________________

Registration Fee: **US $ 750**

I have read and agree to the conditions of entry as stipulated in this brochure.

Signature :__________________ Date: ________

Method of Payment:

Option 1: Approval to charge to a credit card. Send name on card, card number, expiry date (MM/YY) and card verification number (3 digit code on back of card or 4 digit code on front of card located above the credit card number) to fax number: US Code-520-529-7116. Please follow up with an e-mail to: kulatila@u.arizona.edu stating that you sent a fax (please do not send credit card information through e-mail).

Option 2: Make Cashier's check or money order payable in US funds, through a US bank to:
P.H.S.W. KULATILAKE and mail it to:

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Tucson, AZ 85721, USA

Option 3: Wire transfer: Name of the bank, Routing number & the account number will be provided later upon receiving the completed Registration form.