2013 SNU & KSRM Short Course "Crustal Rock Stress"

Short Course Introduction

Date:	26 Aug. - 28 Aug. 2013
Field Trip (optional)	29 Aug 2013 (Pohang EGS geothermal drilling site)
Venue:	Seoul National University
Instructor:	Prof Ove Stephansson & Dr Arno Zang (GFZ, Germany)
Organized by	Rock Mechanics and Rock Engineering Laboratory, Seoul National University
Supported by	Korean Society for Rock Mechancis (KSRM)

Course Material

Book: “Stress Field of the Earth’s Crust” by Arno Zang and Ove Stephansson Springer Netherlands (2010)

Description

Knowledge of rock stress is fundamental to understanding faulting mechanisms, earthquake triggering and landslide initiation. Its application spans designing stable underground excavations and productive oil fields, improving mining methods and geothermal energy extraction as well as securing deep geological disposal of nuclear waste or CO2 sequestration. The short course "Crustal Rock Stress" will provide interested geoscientists and rock engineers with a solid background in quantitative Rock Stress Analysis including Definition, Terminology, Measurements, Case Studies and Applications.
The participants will get familiar with leading edge technology in rock stress estimation along with classical measurement methods. With selected case studies, an insight into the various practical applications of the acquired knowledge will be provided, enabling the participants to deploy it in their present and future practical work and research.
During the course two of the main instructors, Professors Ove Stephansson and Arno Zang from GFZ Potsdam, Germany, will give a personal guidance through the content of their recent textbook and supplementary movie material on stress field of the Eearth’s crust. The participants will become familiar with the newest strategies, methods and techniques of rock stress analysis. They will learn to optimize exploration and modern geotechnical measurement programs and how to apply in their various fields of expertise.
An optional field trip is organized to pay a one-day visit to Pohang EGS drilling site. Located at the south east ofKorea, Pohang is the location for the first EGS site in Korea, and drilling of 2.25 km depth is completed as of the end of 2012. By the time we visit in Aug 2013, the drilling of over 4 km will have been completed with full set of microseismic monitoring system. For further information on this site, please refer to www.kegs.kr.

Target Audience and Expectations

The course is designed for graduate students and experienced practitioners in geology, engineering geology, mining and civil engineering who wish to use rock stress in their work and research. There is no need to be a rock stress specialist to register but remark this course is not intended for people desiring to make their first steps. Key objectives are to provide participants with the primordial theoretical background and information on the range of analyzing techniques available, with emphasis on their usage and limitations, liberally illustrated with case studies. Ample opportunity for discussion between course participants and course instructors will be available. With the acquired new knowledge, participants should be better able to employ rock stress approaches to make better informed decisions about engineering geology problems and solutions.

Registration Fee (US$)

	Member of ISRM / KSRM	Non-member	Student
Before 31 Jul	550	650	350
After 1 Aug	650	750	

※ The fee includes participation at course, coffee and three lunches and one dinner. All the participants will be given the free copy of the book 'Stress Field of the Earth's Crust' by Zang and Stephansson ($99, Springer, 2010). The field trip is optional and the cost will be charged separatedly. The cost for this field trip is expected to be in the range of $100 - $150 depending upon the type of transportation (express train or airplane). A separate guide will be provided on an individual basis.

Accomodation Info

• Accommodation with reasonable room rates (< 100 US$/night) can be arranged at SNU Hoam Faculty House Hotel (http://www.hoam.ac.kr/english/) upon request.
• Contact person: Hanna Kim, Seoul National University, kyhn1123@snu.ac.kr)

Contact person

• Prof Ove Stephansson ove@gfz-potsdam.de
• Dr Arno Zang zang@gfz-potsdam.de
• Prof Ki-Bok Min kbmin@snu.ac.kr
• Teaching Assistant Hanna Kim kyhn1123@snu.ac.kr

SEOUL NATIONAL UNVERSITY
ROCK MECHANICS &
ROCK ENGINEERING LABORATORY

2013 SNU & KSRM Short Course "Crustal Rock Stress" Registration

PARTICIPANT INFORMATION

Organization Name			
Title	First Name	Last Name	
Division/Position			Tel
Address			Fax
			Email
City		State	
Postal Code		Country	

REGISTRATION SELECTION

Selection	Cost (Paid before Jul 31, US$)	Cost (Paid after Aug 1, US$)
Member of ISRM/KSRM	☐ $550	☐ $650
Non-member	☐ $650	☐ $750
Student	☐ $350	☐ $350

ACCOMODATION INFO

- Accommodation with reasonable room rates (< 100 US$/night) can be arranged at SNU Hoam Faculty House Hotel upon request. (http://www.hoam.ac.kr/english/)
- Contact person: Hanna Kim, Seoul National University, kyhn1123@snu.ac.kr

PAYMENT / BILLING METHOD

VISA / MASTERCARD (Enter information below)

NOTES / TERMS

- Registrations will be accepted in the order in which payment is recevied.

Signature **Date**

Credit Card Information

Card Number - - -	Expiration Date /	3-Digit Security Code

SNU Short Course "Crustal Rock Stress"
Tel: +82.2.880.7232 | Fax: +82.2.877.0925 | Email: kyhn1123@snu.ac.kr
http://rockeng.snu.ac.kr

2013 SNU & KSRM Short Course "Crustal Rock Stress"

Aug. 26 (Mon)	Rock Stress Basics	
		Instructor
9:00 - 10:30	Introduction to Rock Stress, Stress Field of the Earth's Crust, Rock Stress Terminology	OS
	Coffee break	
11:00 - 12:30	Stress Definition, Rock Fracture I (Introduction, Strength, Failure Criteria)	AZ
	Lunch	
14:00 - 15:30	Rock Fracture II (Nucleation, Linear and Non-linear Fracture Mechanics)	AZ
15:30 - 16:15	Borehole breakouts and application to rock stress	OS
	Coffee break	
16:45 - 17:15	Crustal Stress Models	AZ
17:15 - 18:00	Lessons learned and discussion	
18:30 - 20:00	Dinner	

Aug. 27 (Tue)	Measuring Rock Stress	
		Instructor
9:00 - 10:30	Borehole Methods, Strain Relief Methods, Undercoring (Movie M6.1 M6.2)	OS
	Coffee break	
11:00 - 12:30	Hydraulic Methods (Hydraulic Fracturing, HTPF, Sleeve Fracturing, Movie M7.1)	OS
	Lunch	
13:30 - 15:00	Core-based methods, KTB ultra deep borehole, anelastic strain recovery and Kaiser effect	AZ
	Coffee break	
15:30 - 16:30	Hydraulic fracturing stress measurements in Korea	SB
16:30 - 17:30	Visit to SNU, Rock Testing Laboratory, demonstration of equipments (Rock Mechanics Test, Hydraulic fracturing & overcoring stress measurement equipments)	KBM & SB
17:30 - 18:00	Lessons learned and discussion	

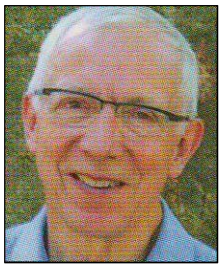
Aug. 28 (Wed)	Interpreting Rock Stress Data	
		Instructor
9:00 - 10:30	Interpretation of local stress data with examples from Forsmark, Olkiluoto, SAFOD, and Korea	OS
	Coffee break	
11:00 - 12:30	World Stress Map (WSM)	OS
	Lunch	
13:30 - 15:00	Quantitative World Stress Map (Q-WSM)	AZ
	Coffee break	OS
15:00 - 15:30	Importance of stress data for geothermal projects and results from PFC modelling of induced seismicity in EGS	AZ & OS Jeoung Seok Yoon
15:30 - 16:30	General Discussion and application of Rock Stress in Science and Civil and Mining & Petroleum Engineering	
16:30 - 17:30	Epilogue and Conclusion	OS & AZ
17:15 - 17:45	Closure of the Compact Course	KBM

Aug. 29 (Thu)	Visit to Pohang EGS Project site
9:00 - 19:00	Will be advised later. It takes around 4-5 hours from Seoul to Pohang by car.

Instructor : OS=*Ove Stephansson* , AZ=*Arno Zang, SB=Seongho Bae, and KBM=Ki-Bok Min*

2013 SNU & KSRM Short Course "Crustal Rock Stress"

Prof. Ove Stephansson



Visiting professor at GFZ German Research Centre for Geosciences and Emeritus Professor of Engineering Geology, Royal lnstitute of Technology (KTH), Stockholm; PhD and docent at University of Uppsala

Research interests: rock stress and its measurement; rock fracture mechanics; rock mechanics modeling, rock engineering. Most of his career was at Luleå University of Technology and KTH with visiting professorships at Colorado School of Mines and Helsinki University of Technology and post-doc at CSIRO, Mineral Physics, Australia

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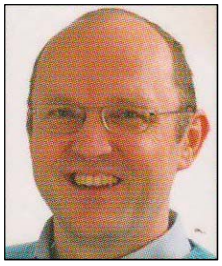

Permanent staff geophysicist at GFZ German Research Centre for Geosciences and Privatdozent at University of Potsdam; Dr. phil. nat. from Goethe—University Frankfurt/Main, Dr. rer. nat. habil. from Potsdam University

Research interests: rock physics and experimental fracture mechanics: crack growth; crustal stress and scaling in Earths Sciences. Most of his career was at GFZ Potsdam, with visiting scholar at CIRES Boulder, Colorado, member of KTB stress task group, post-doc at State University of New York at Stony Brook.

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