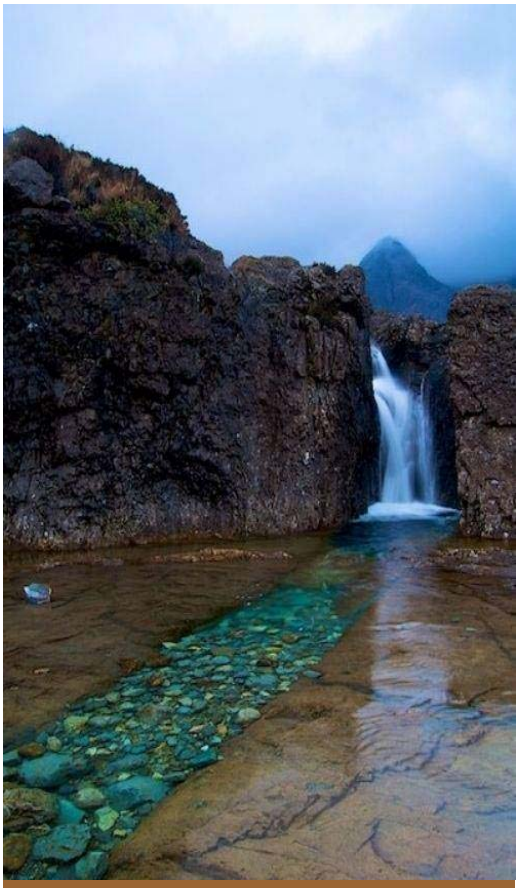

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Αρ. 79 – ΙΟΥΝΙΟΣ 2015

Professor Ralph B. Peck on Researchers and Practitioners in Geotechnical Engineering

Most technical professions, and ours is no exception, suffer from a split personality. One side seeks to advance the science, the other gains satisfaction from creating engineering works. Those with a scientific bent may feel a vague unease that their work may find little application. Those in practice may feel that the researchers have let them down by not pursuing investigations that clearly and promptly address their practical concerns. To the extent that these views prevail, the consequences are the extent that these views prevail predictable: researchers will take refuge in increasing esoteric investigations; practitioners will pay little attention to the research results. Reading learned journals will become less interesting and profitable to practitioners, scientifically oriented workers will find writing to each other, and practice will be governed by so-called "practical" matters alone.

You will recognize this to be an exaggerated scenario, but one with enough reality to be disturbing. One reason for this state of affairs is a woeful lack of communication between researchers and practitioners. Practical people – the developer of a skyscraper or shopping center, and his engineer, architect, or constructor – do not realize how valuable some research contributions could be. The researchers do not know what problems they could aid in solving. Here ia where a gathering such as the Ninth Asian Regional Conference could play a crucial role. It will be a conference on soil me-

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chanics and foundation engineering. It offers an unparalleled opportunity for practitioners to participate. If practitioners do not feel their problems and practical need are adequately addressed by the profession, here at the Conference they can make addressed by the profession, here at the Conference they can make their contributions and needs known. If they do not, they will have missed a real opportunity to encourage better, more practice-oriented research. They will also have lost an opportunity to discover useful research results of which they may have been unaware.

I hope the Conference will not only be attended by developers, designers, architects, and constructors, but that these participants will present papers and discussions. I hope the geotechnical engineers present will demonstrate how they bridge the gap between research and practice. I hope this will lead to an appreciation of what geotechnics and the geotechnical engineers can do to provide safer and more economical foundations.

Η επιστολή εστάλη στους συνέδρους του 9th Asian Regional Conference on Soil Mechanics and Foundation Engineering, 9-13 December 1991, Bangkok, Thailand.

ΑΡΘΡΑ

FIELD SUCTION AND VOLUMETRIC WATER CONTENT MEASUREMENTS IN SEMI-URBAN AREA NEAR ATHENS, GREECE

MESURES DE SUCCION ET DE TENEUR EN EAU VOLUMETRIQUE SUR UN TERRAIN DANS UNE ZONE SEMI-URBAINE PRES D'ATHENES EN GRÈCE

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ABSTRACT – A field array for measuring suction and volumetric water content was installed in shallow depth in silty sand with gravel at a semi-urban area close to Athens, Greece, a region with climate typical of central Greece and in general of areas around the Mediterranean sea. Suction and volumetric water content were monitored for approximately one month in August 2013. Measured values of suction reached 2.5 MPa and never dropped below 1.4 MPa. Daily fluctuation of suction was in the order of 300 kPa, not matched by similar fluctuation in volumetric water content given the nature of the soil the sensors were installed in. A complete wetting test at the surface revealed a time period of 11 days until prevailing suction and volumetric water content prior to wetting were obtained again.

RÉSUMÉ - Pour mesurer la succion et la teneur en eau volumétrique sur le terrain, un dispositif a été installé à faible profondeur dans un mélange de sable limoneux et de gravier dans une zone semi-urbaine proche d'Athènes, en Grèce. La succion et la teneur en eau volumétrique ont été suivies pendant environ un mois en Août 2013. Les valeurs de succion mesurées ont atteint 2.5 MPa et ne sont jamais tombées en dessous de 1,4 MPa. La fluctuation quotidienne de la succion était de l'ordre de 300 kPa, non compensée par une fluctuation correspondante de la teneur en eau volumétrique, compte tenu de la nature du sol dans lequel les capteurs ont été installés. Un essai de mouillage complet à la surface a indiqué une période de 11 jours jusqu'à ce que la succion dominante et la teneur en eau volumétrique retrouvent leurs valeurs avant le mouillage.

1. Introduction

Unsaturated soil mechanics have come a long way over the past decades. Simple or more complex constitutive laws up to the level of complete constitutive models describing even the full thermohydromechanical behaviour have been proposed; some relatively successful and others not. Similarly, numerous novel apparatus have been devised allowing practically all loading conditions tested in existing equipment for fully saturated soils to be tested for unsaturated soil under controlled suction. One therefore would expect unsaturated soil mechanics to have come a lot closer to becoming a tool for day to day practical applications in geotechnical engineering, especially in countries with drier climate. Still this is not the case. And if one has to inquire the reason for this, there are two answers: first, unsaturated soil mechanics remains one of the most difficult subjects in geotechnical engineering, and second, despite progress in experimental and analytical work, the subject still lags behind considerably when it comes to predicting expected field values for the controlling parameters and their possible change, especially relative to climatic changes. If one looks at other sub-disciplines of engineering, soil dynamics is a difficult subject with considerable progress in experimental research and constitutive laws, but it also has covered a lot of ground in terms of monitoring field values of ground acceleration during earthquakes or other dynamic loading conditions and their effect on structures, especially during failures. Similarly, engineering hydrology is also a difficult subject, again with considerable progress in experimental research and constitutive laws (mostly empirical though), but it also has covered a lot of ground in terms of monitoring field values of rainfall intensity and other meteorological parameters and their effect on structures, especially during failures. As a result in many countries there are design codes for earthquake or other dynamic loadings assisting geotechnical design and design codes for hydrological studies assisting design of hydraulic works, making thus both subjects come closer to everyday engineering practice. Although these two sub-disciplines of engineering may seem distant from unsaturated soil mechanics, their evolution into readily applicable to practice tools shows the way that unsaturated soil mechanics has to follow; and that is monitoring of field values of suction and other properties like volumetric water content etc and their correlation to climatic conditions, until a level of confidence in assuming or predicting properties used in design and their expected change is reached.

Spot measurements of suction have been used especially in order to understand occurred failures (for instance Krahn et al.,1989, for a failed embankment, or Blatz et al., 2004, for a failed cut) and can generally be found more often in the literature. Long-term monitoring reports are more scarce (for instance Tsaparas et al., 2003, Rahardjo et al. 2005 and 2013, Sorbino & Nicotera, 2013, Ng et al., 2003 and Zhan et al., 2007, for a semi-arid region, Springman et al., 2003, for a high-altitude cold region in the Alps). Long term measurements have also been measured in a totally different climate (close to London, UK) and in a totally different material like London clay (Smethurst et al., 2006). What is of great interest in the particular report is that even in a material as impermeable as London clay and in an area as humid as the greater area of London in the UK, suction values reported are as high as 440 kPa during the summer. Regarding vegetation influence, Biddle (1983) offers insight on patterns of soil drying and moisture deficit in the vicinity of trees, while as early as 1960, Bozozuk and Burn reported vertical ground movements near elm trees. More recently, Fredlund & Hung (2001) presented their work on predictions of volume changes in expansive soils as a result of vegetation and environmental changes. Nowadays research on the full soil-atmosphere interaction is well under way (for instance Cui et al., 2005, 2010, 2013, Blight 1997 & 2009) showing thus the way both in how to use recorded data of field suction and volumetric water content and how to relate these to climatic conditions. This list is by no means exhaustive, yet it includes reports of measurements from a diverse set of climatic conditions, applications, ranges of suction measured and materials that measurements took place in.

Adding to the effort of understanding field values of suction and volumetric water content and their changes, this paper presents the results of short duration monitoring in a semi-urban area in Artemida, Greece, close to Athens. Artemida is a seaside resort with typical Mediterranean climate and low annual rainfall typical of central Greece and Athens itself. The array was installed in the garden of a private property during August 2013, one of the driest, warmest and most windy months of the year for the particular area. The objective was to obtain an idea of the magnitude of expected suction and volumetric water content values at shallow depths. Additional objectives were the identification of trends of suction and volumetric water content changes, possible effects of watering patterns, and temporal responses to major changes like complete wetting. In order to obtain more information and have the ability to cross-check measurements, more types of sensors were installed. Also two arrays were placed, the main one containing most sensors where the complete wetting test took place, and a se-

cond one, called the reference array which was used only for reference of continuously acting climatic conditions after wetting took place at the main array. The results presented constitute an interesting addition to the list of references with field measurements of suction and volumetric water content from various locations around the world, especially given the magnitude of suctions measured.

2. Location of the field array and its set-up

The location of the field array was the seaside resort of Artemida in Attiki approximately 30 km to the east of Athens. The array was placed in the garden of a country house practically in a semi-urban area. Figure 1 shows the location of the site and a schematic view of the distance of plants

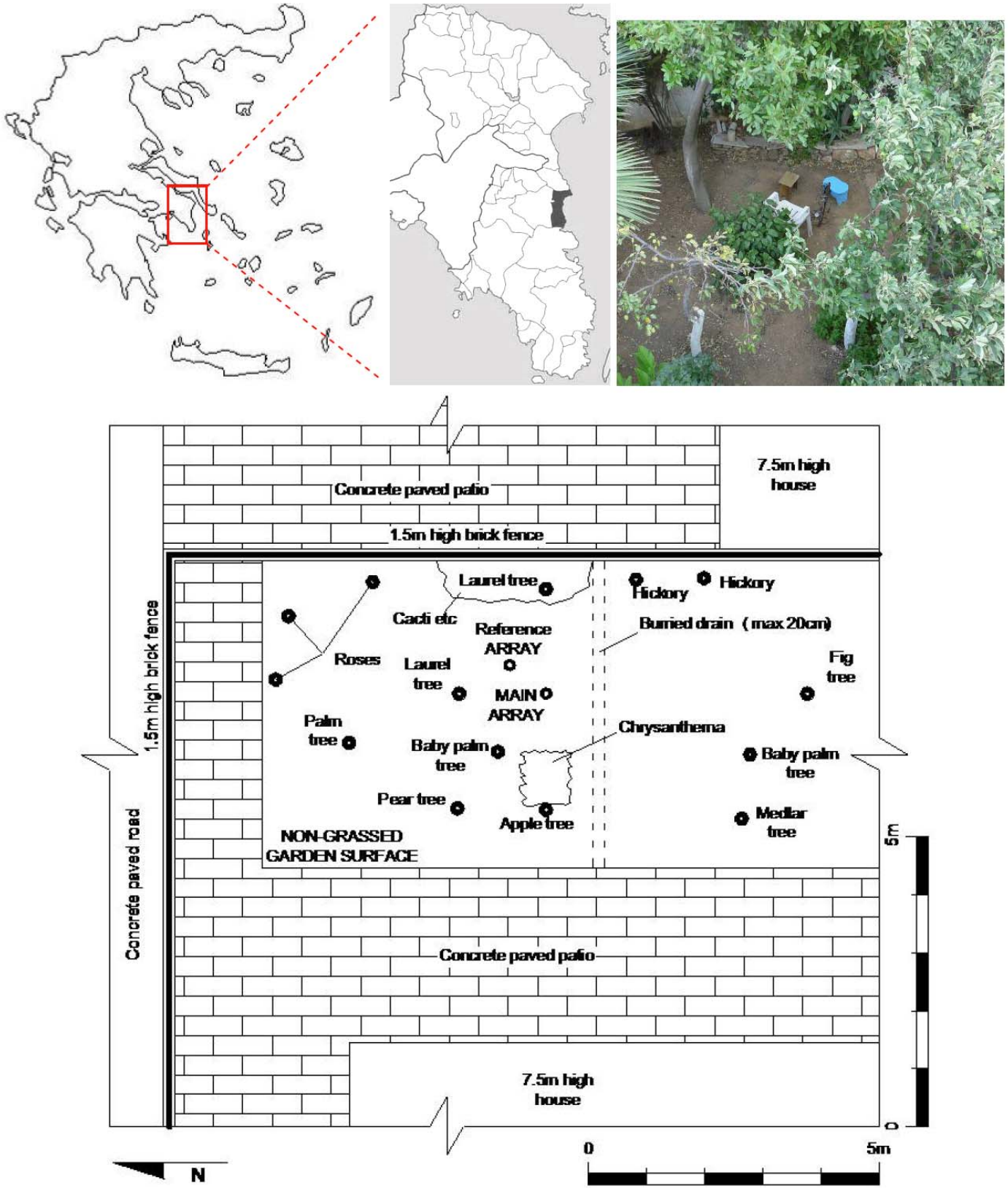

Figure 1. Artemida area in Greece (on local Attica map and map of Greece) with a layout of the specific location of the main and reference arrays showing close-by trees and flowers, paved areas, fences and buildings along with an actual photograph of the site.

and trees along with an actual photograph of the site. The garden is non-grassed with several types of trees and plants typical of Mediterranean environment. The garden has a general direction along the north-south axis with only a medium height fence stopping the prevailing in the area northern winds. It is surrounded by concrete paved patios and at close proximity there are two country houses, approximately 7.5m high. The building to the west shades the garden in the afternoon but the building to the east does not shade the area of the garden where the array was installed during the morning. The seashore is 500m to the east of the property. Watering of the garden was not automatic (typical of most properties of the kind in Greece) and takes place generally in the morning and in the afternoon but not on a regular pattern. The particular location in the garden was selected with the following criteria:

- It lies in the shade of trees during the whole day. This was essential so as to avoid exaggeration of measured suction due to direct sun heating of the ground surface.
- It lies at a distance from the root-dominated areas of the garden in order to avoid as much as possible the direct effect of transpiration.
- It lies as far away as possible from local spots of water ponding during.

In order to gather as much information as possible, different types of sensors were installed. In anticipation of a follow-up wetting test at the specific location of the first array, a second array was installed for reference of the measured properties during the wetting test. The first array is called the "Main Array" and the second is called the "Reference Array". The list of sensors installed is presented in Table 1. The reference array was installed after the first measurements on the main array and so only the sensors capable of measuring the dominant values of suction and volumetric water content were installed.

Once the specific location in the garden was selected, a shallow excavation was made for sensors installation. Figure 2a shows the shallow excavation with small roots coming out of the excavation walls. Sensors were installed at a depth between 25 and 30cm (Fig. 2b ad 2c). Once sensors were installed with good contact with the surrounding soil the excavation was backfilled with material from the excavation with the surface slightly moist in order to form a low conical surface. After equilibrium was achieved, a complete wetting test was decided. In anticipation of the need to understand when the sensors in the main array would have come again in equilibrium, a reference array was installed at a small distance only with the GS3 sensor for volumetric water content measurement and the MPS2 sensor for suction measurement (Fig. 2e). For the wetting test a plastic ring covered with aluminum foil was placed around the main array for controlling the water used for the wetting test (Fig. 2f).

Table 1. List of sensors installed in the Artemida main and reference arrays.

Measured property	Main array	Reference array
Suction	MPS2 porous block (Decagon Devices, USA)	MPS2 porous block (Decagon Devices, USA)
	Gypsum block (Soilmoisture Equipment Corp., USA)	
	Jetfill tensiometer (Soilmoisture Equipment Corp., USA)	
Volumetric water content	GS3 (Decagon Devices, USA)	GS3 (Decagon Devices, USA)
	ThetaProbe ML2 (Delta-T Devices, UK)	

3. Properties of the material the sensors were installed in

The material the sensors were installed in is a silty sand with gravel and only traces of clay. Classification tests were performed on three samples taken during excavation of the main and the reference array location in order to remove the sensors from the ground. Gravel was mostly fine gravel with traces of coarse gravel amounting to 22% on average.

Sand was on average 46% practically evenly shared between fractions of fine, medium and coarse sand. The fines were on average 32% and the clay content was found to be only 2.5-3.0% using the hydrometer test. Specific gravity was 2.68 and organic content 2.5-3.0%. The material is non-plastic. Classification according to USCS is SM. At the time of sensors removal that samples were taken, gravimetric content of all samples was found to be 4% on average, with values ranging between 1.5 and 6.0%. Using the sand-cone method the dry unit weight was found to be 14 kN/m^3.

4. Meteorological conditions in the area of the array

A meteorological station is located approximately at a distance of 2 km from the location of the arrays. The station lies at the same altitude, distance from the sea and is exposed in the same direction of prevailing winds as the location of the arrays. Monthly average temperature and wind speed are shown in Fig. 3a and monthly average relative humidity and precipitation are shown in Fig. 3b (annual precipitation is 320 mm). August is the second warmest month of the year at close distance from July which is the warmest. It is also the month with the strongest winds and the second lowest relative humidity with negligible precipitation (average daily less than 0.1mm/day and monthly average in the order of 2 mm). The daily averages of basic meteorological data for the duration of the field suction measurements and the month before are shown in Figure 4 both for 2013 and the four previous years. Daily average temperature is shown in Fig. 4a, daily average relative humidity is shown in Fig. 4b, and daily average wind speed in shown in Fig. 4c. August 2013 was practically in the middle of the range of temperature (and slightly below that, Fig. 4a), had systematically the lowest humidity (Fig. 4b) and the second strongest winds (Fig. 4c). This daily average wind picture is also followed by very strong wind gust during that particular month (Fig. 4d). These characteristics of the particular month the field measurements of suction were made mean that the suctions measured are most probably slightly higher than what should be expected on average, given that the relative humidity was lower than average, the wind speed higher than average and the temperature practically the average for the particular month. Similarly the volumetric water content measured in the field should be assumed lower than what should be expected on average for the particular period of the year. Examination of the records from close-by meteorological stations, reveals similar weather observations.

Figure 2. a) Shallow excavation for the main array, b) first set of sensors installed as part of the main array (top: MPS-2, middle: GS-3, bottom: Gypsum Block), c) second set of sensors installed as part of the main array (left: Theta Probe, right: Jetfill Tensiometer), d) the main array completed and backfilled with cables and Jetfill Teniometer coming out of the ground surface, e) shallow excavation for the reference array with MPS-2 and GS-3 sensors, f) completed arrays, the main one on the right and the reference one on the left.

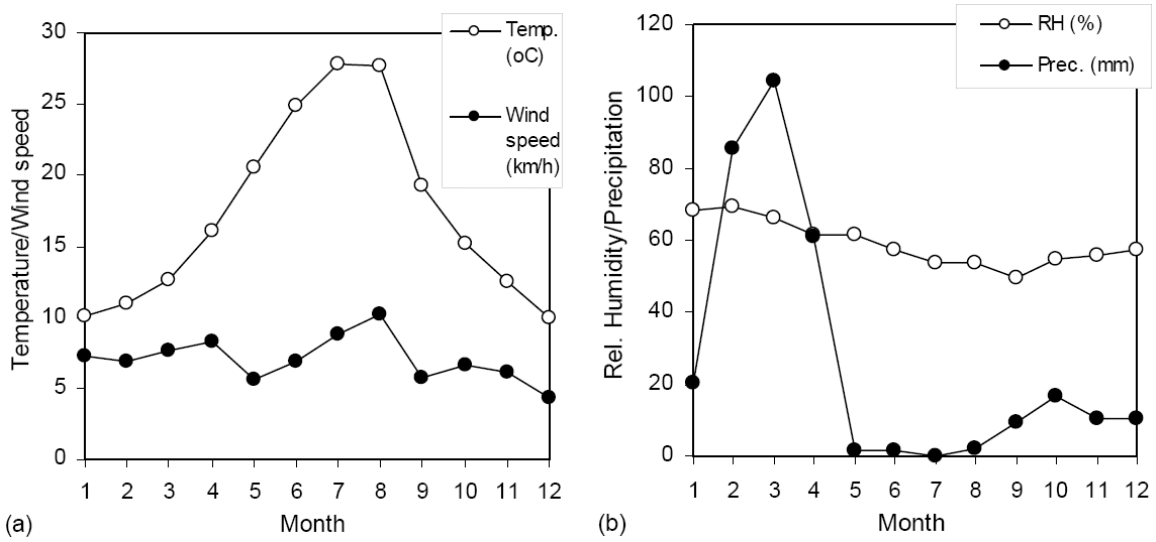

Figure 3. Basic meteorological data for the area of the arrays: a) monthly average temperature and wind speed, and b) monthly average relative humidity and precipitation.

5. Field measurements of suction and volumetric water content

Once measurements started it was observed that suctions were so high that they caused the tensiometer to empty very quickly. After several attempts to refill it, that instrument was abandoned temporarily so that continuous filling and subsequent loss of water through the ceramic tip would not disturb in-situ values of suction and volumetric water content. Similarly, readings from the Gypsum block came very close to the lowest measurement range of the instrument yielding large uncertainties of the estimated suctions. Fig. 5a presents basic meteorological data during August 2013 taken every 5 minutes. Fig. 5b presents suction measurements from MPS2 sensors in the main and reference arrays, estimated suction from the gypsum block and measurements from the Jetfill tensiometer after the wetting test. Maximum suction measured reached and slightly passed 2.5 MPa. As the MPS2 sensor in the main array was installed in wet condition, equilibrium with this so high suction in-situ was achieved approximately 3 days after installation, after which the sensor kept monitoring daily suction fluctuation (in the order of 300 kPa). The gypsum block response was 3 times slower than that of the MPS2. When the wetting test began, the MPS2 sensor responded within 40 minutes with a dramatic drop in the measured suction from 2 MPa to 13 kPa. The tensiometer was filled again and suction was recorded from that instrument too. Once supply of water at the ground surface stopped, suction started increasing again and the measurements from the tensiometer, the Gypsum block and the MPS2 sensor are presented in Fig. 5c. MPS2 and tensiometer readings are in good agreement except for the very low range of suction, for which the MPS2 seems not to be sensitive enough to read them. The Gypsum block –on the basis of the general calibration curve provided- overestimated suction.

The two types of sensors used for measuring volumetric water content showed significant differences (Fig. 5d); the GS3 sensor measuring initially approximately twice as much as the ThetaProbe sensor, a difference later falling to 30% higher until the wetting test. This could be due to small variations in the locations of each sensor within the array. This is further supported by the fact that at the peak of the volumetric water content value after wetting, the two sensors had a difference only of 5.7% (GS3 39.1% & Theta Probe 37.0%). Still, the GS3 kept recording higher values of volumetric water content during the whole period of the subsequent drying in the order of 50% even after values stabilized.

Regarding the comparison between the readings in the main array and in the reference array, suction in the main array came to equilibrium at approximately 20% lower values than in the reference array, and volumetric water content in the main array came to equilibrium at approximately a two times higher value (average between the two types of sensors) than in the reference array. If only similar sensors are compared between the main and the reference array (GS3) then equilibrium volumetric water content after wetting in the main array is 75% higher than in the reference array. It should be pointed out that no signs of collapse were observed during or after the wetting test.

6. Conclusions

A field array for measuring suction and volumetric water content was installed in shallow depth at a semi-urban area close to Athens, Greece. Suction and volumetric water content were monitored for approximately one month in August 2013. Measured values of suction reached 2.5 MPa and never dropped below 1.4 MPa. Daily fluctuation of suction was in the order of 300 kPa, not matched by similar fluctuation in volumetric water content given the nature of the soil the sensors were installed in. A complete wetting test at the surface revealed a time period of 11 days until prevailing suction and volumetric water content prior to wetting were obtained again.

7. Acknowledgements

Meteorological data used in the paper from weather station IATTIKIA14 (Artemida, Attica) were obtained from Weather Underground (www.wunderground.com) after the kind permission of the owners of the site.

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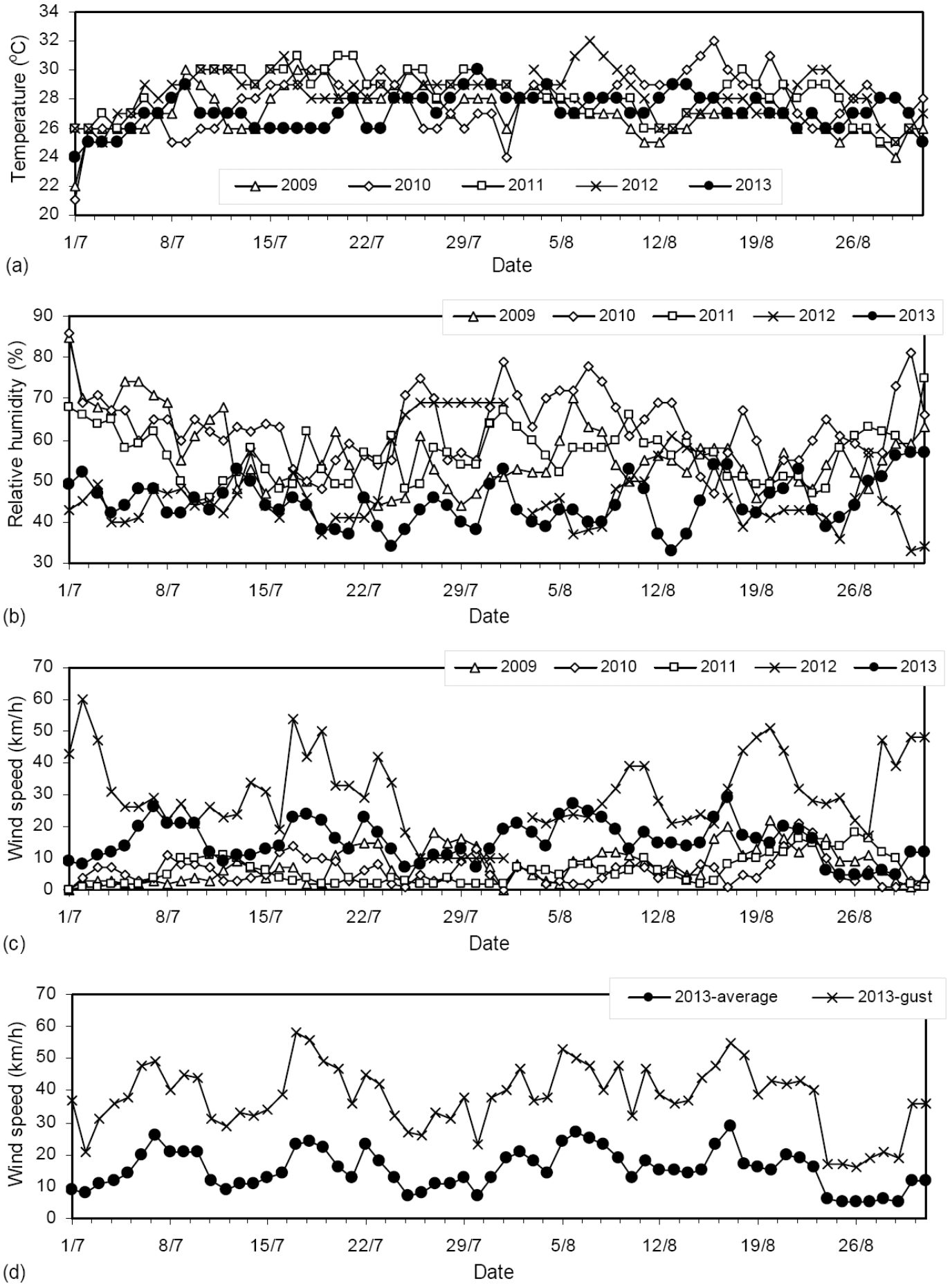

Figure 4. Basic meteorological data for the area where the arrays were installed prior and during the period of suction and volumetric water content measurements for five consecutive years: a) daily average temperature, b) daily average relative humidity, c) daily average wind speed, and d) daily average wind speed and wind gust only for 2013.

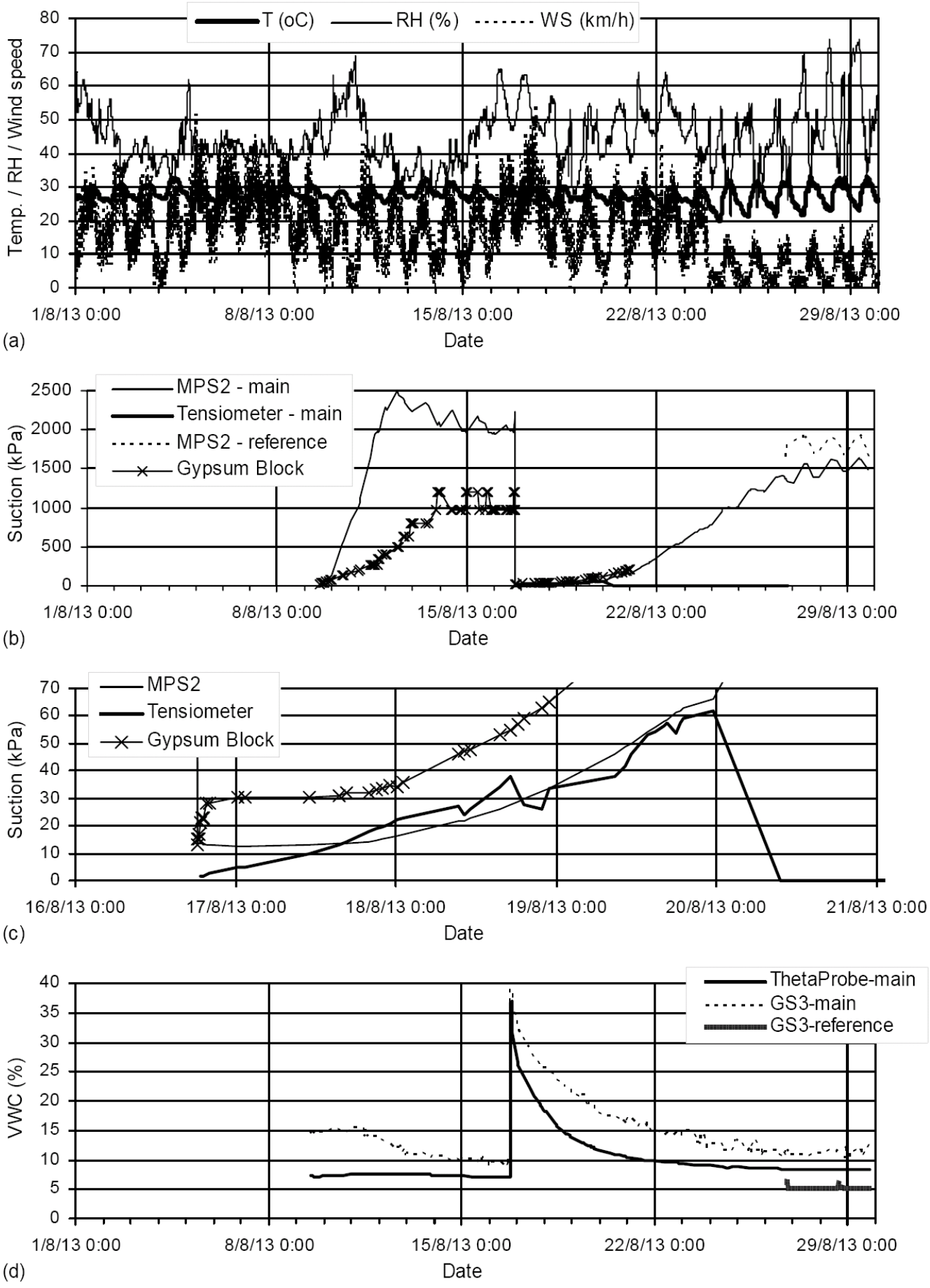

Figure 5. a) Basic meteorological data for the area where the arrays were installed for August 2013, b) suction measurements (full scale), c) suction measurements (reduced scale), and d) volumetric water content measurements.

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(Bardanis, M., "Field suction and volumetric water content measurements in semi-urban area near Athens, Greece", proc. Int. Symp. Shrink-swell processes in soils - Climate and constructions, 18-19 June 2015, Marne-la-Vallee, France, pp. 463-472)

Το άρθρο παρουσιάστηκε από το Αναπληρωματικό Μέλος της Εκτελεστικής Επιτροπής της ΕΕΕΕΓΜ στο International Symposium on Shrink-Swell Processes in Soils - Climate and Construct-ions και έγινε μεταξύ 18 και 19 Ιουνίου 2015 στις εγκαταστάσεις του γαλλικού ερευνητικού κέντρου IFSTTAR στο Marne-la-Vallee λίγο έξω από το Παρίσι. Είχε περί τους 100 συνέδρους και παρουσιάστηκαν τα αποτελέσματα των ερευνητικών προγραμμάτων που έχουν εκπονηθεί υπό την αιγίδα του IFSTTAR τα τελευταία χρόνια στη Γαλλία στο αντικείμενο της επιρροής της διόγκωσης και της συρρίκνωσης των εδαφών στις κατασκευές όπως αυτές προκύπτουν λόγω κλιματολογικών μεταβολών, καθώς και διάφορες διεθνείς ερευνητικές προσπάθειες στο αντικείμενο αυτό.

A Faultline Runs Through It

EXPOSING THE HIDDEN DANGERS OF DAM-INDUCED EARTHQUAKES

Besides posing a major risk to dams, scientists are increasingly certain that earthquakes can be triggered by the dams themselves. Globally, scientists believe that there are over 100 instances, strewn over six continents, of dam reservoirs inducing earthquakes. The most serious case could be the magnitude-7.9 Sichuan earthquake in China in May 2008, which some experts believe may have been induced by the Zipingpu Dam.

WHAT CAUSES RESERVOIRS TO TRIGGER EARTHQUAKES?

Reservoir-Induced Seismicity, or RIS, is thought to occur in two ways: (1) by the added weight of a reservoir and (2) by the water that seeps into cracks underground or along a fault. In the first case, the filling of a reservoir with millions, even billions, of tons of water can add stress to faults, causing them to rupture. In the second case, water seeps into the rock and changes the fluid pressure in micro-cracks and fissures in the ground under and near a reservoir.The load effect of the first case is immediate, while the pore pressure effect is delayed because it requires the flow of the water through rock.This delay can cause some reservoirs to begin triggering earthquakes years after the first impounding. While it is well established within the scientific community that large dams can trigger earthquakes, attention to this problem has stagnated since the 1960s and 1970s, when interest in RIS was at its peak.Only with the news coverage in 2009 that linked the filling of the Zipingpu Dam to the devastating Sichuan earthquake in May of the previous year has the topic once more gained public and scientific attention.

Despite years of research on both specific and global RIS cases, the scientific explanation for RIS is still not certain.No single model can explain all the earthquakes that occur across diverse geological settings or predict when and where RIS may occur, especially given the lack of seismological data—or lack of access to the data if it does exist. Seismologists do agree, however, on the following:

- Depth of the water in the reservoir is the most important factor in RIS.
- The volume of the water also plays a significant role in triggering an earthquake.Other factors include the type of local geology and the region's historic seismic stress patterns.
- Reservoirs can increase the frequency of earthquakes in areas with a previously low occurrence of seismic activity.
- An increased rate of activity in RIS cases occurs within 10-15 kilometers of impounded reservoirs.
- The effect of RIS can be rapid (following the initial filling of the reservoir) or delayed (occurring later in the life of the reservoir).Minor cases of RIS can occur immediately during the filling periods.

DEBUNKING COMMON RIS MYTHS

Despite the uncertainties, seismologists already know enough about the impact of reservoirs on underground rocks to produce probabilities of earthquake risk.Many who study RIS also recommend abiding by the precautionary principle rather than risking a major catastrophe.One of the world's top experts on RIS, Leonardo Seeber, a seismologist with Columbia University's Lamont-Doherty Earth Observatory, stated soon after the news coverage of Zipingpu Dam,"My position is that earthquake hazard needs to be put on the table for a comprehensive evaluation and informed public decision.My experience, however, is that it is often minimized or neglected when public support for a project is sought."What follows is a set of common arguments usually made by RIS skeptics, with responses in light of recent scientific research:

No convincing correlation has yet been demonstrated between earthquakes and reservoirs.

In a number of cases, such as Koyna in India (1967) and Xinfengjiang Dam in China (1962), careful RIS studies show a strong cause-and-effect relationship.While most scientists agree that reservoirs cannot in themselves produce enough seismic energy to generate an earthquake, many areas of the earth's crust are already close to the breaking point, and a reservoir could bring forward an earthquake by hundreds or even thousands of years. Despite some resistance in the engineering community to accept the significance of RIS, groups like the International Commission on Large Dams (considered the most important trade organization of dam builders) recommend that RIS should be considered for reservoirs deeper than 100 meters.

If the natural seismicity is low, the danger of RIS is also low.

While historically unstable regions are more likely to experience RIS, previously inactive areas have also experienced RIS.One example is the Killari reservoir in India, which may have triggered the magnitude 6.1 (or M6.1 on the Richter scale) Latur earthquake that leveled 20 villages and killed 10,000 people. It is important to not only pay attention to earthquake-prone regions that lack adequate earthquake preparedness, but also to non-earthquake prone regions, which often lack any sort of earthquake preparedness guidelines.

No dam has yet failed disastrously because of RIS, so the danger is grossly exaggerated.

Both Koyna and Xinfengjiang came close to failure during RIS events, and both would have unleashed large fatal flood waves. However, while dams may (or may not) be built to withstand RIS, the surrounding cities and villages often are not.As the Killari and Sichuan earthquakes have shown, dam-induced tremors may have killed thousands of people even if the dams did not break.

Clarence Allen, a seismologist from the California Institute of Technology, wrote back in 1982,"The unhappy current state of affairs is that our degree of understanding of reservoir induced earthquakes is so minimal that almost no new reservoir anywhere in the world can be declared free of this possible danger." He called for any new dam that would impound water to depths exceeding 80-100 meters to be designed with the assumption that a M6.5 earthquake could occur nearby. Since this statement, many new cases may be proving his prediction true, including the M7.9 Sichuan earthquake.

THE NEXT BIG ONE

Many of the high dams planned and under construction around the world are in areas of significant RIS risk. For instance, hundreds of new large dams are planned for the Himalayas, one of the most seismically active areas on earth. Other seismic hotspots with major dam-building programs include Iran, Turkey, Mozambique, Patagonia,Mexico, and Central America. In southwest China, despite the strong link between the reservoir activity at Zipingpu Dam and the subsequent earthquake, new dams are continuously being built in seismically active areas to the west and northwest of the quake zone.After the Sichuan quake, 62 experts in geology, water management and environmental protection appealed to the Chinese authorities to temporarily suspend the approval of large dams in geologically unstable areas in southwest China and assess the risks of RIS in this region.

Major RIS Cases Worldwide

Region	Name of Dam	Country	Height (m)	Year of Impounding	Year of Largest Quake	Magnitude
Asia/ Pacific	Koyna	India	103	1962	1967	6.3
	Xinfengjiang	China	105	1959	1962	6.1
	Killari	India	75	1991	1993	6.1
	Srinagarind	Thailand	140	1977	1983	5.9
	Charvak	Uzbekistan	148	1971	1977	5.3
	Nurek	Tajikistan	317	1963	1972	4.6
	Karun III	Iran	205	2005	2006	4.3
Africa	Kariba	Zambia/Zimbabwe	128	1958	1963	6.2
	Aswan	Egypt	111	1964	1981	5.6
	Akosombo	Ghana	134	1964	1964	4.7
North America	Oroville	USA	236	1967	1975	5.7
	Hoover	USA	221	1935	1939	5.0
	Manicouagan 3	Canada	108	1975	1975	4.1
South America	Porto Colombia/Volta Grande	Brazil	40/56	1973-74	1974	4.2
	Capivara	Brazil	59	1976	1976	3.7
	Carmo do Cajura	Brazil	22	1954	1972	3.7
Europe	Kremasta	Greece	160	1965	1966	6.2
	Monteynard	France	155	1962	1963	4.9
	Canelles	Spain	150	1960	1962	4.7

INCREASING KNOWLEDGE AND IMPROVING SAFETY MEASURES

Currently, RIS is a neglected and under-funded field of research. However, in light of the potentially disastrous consequences of RIS, governments must increase their support for research and monitoring stations of dams worldwide. Under the precautionary principle, the onus is on developers to acknowledge that dam construction increases the probability of earthquakes. Prior to any dam construction, developers and governments must conduct open and transparent analyses of the RIS issue, including checking the local history of RIS in other regions with similar geologic environments as the proposed dam site. Earthquake hazard assessments done as part of the dam design process must also include the probability of RIS and recognize that RIS would raise the local earthquake hazard by many times.

Where dams are permitted to proceed, dam builders should monitor seismicity during impoundment, change or possibly reverse filling procedures if RIS starts, and model the changes in pore pressure and mechanics underground to understand why RIS is occurring.Throughout the entire dam-building process, full RIS disclosure must be made to stakeholders so that negotiations can take place on a fully informed basis.

FOR MORE INFORMATION: Visit
www.internationalrivers.org/en/node/3845

JOIN US! Join International Rivers today and become part of the global movement to protect rivers and rights. Sign up at http://www.internationalrivers.org/support

(http://www.internationalrivers.org/files/attached-files/ris_final_lorez2.pdf)

Earthquakes Triggered by Dams

Earthquakes can be induced by dams. Globally, there are over 100 identified cases of earthquakes that scientists believe were triggered by reservoirs (see Gupta 2002, http://www.sciencedirect.com/science/article/pii/S0012825202000636). The most serious case may be the 7.9-magnitude Sichuan earthquake in May 2008, which killed an estimated 80,000 people and has been linked to the construction of the Zipingpu Dam.

How Do Dams Trigger Earthquakes?

In a paper prepared for the World Commission on Dams, Dr. V. P Jauhari wrote the following about this phenomenon, known as Reservoir-Induced Seismicity (RIS): "The most widely accepted explanation of how dams cause earthquakes is related to the extra water pressure created in the micro-cracks and fissures in the ground under and near a reservoir. When the pressure of the water in the rocks in

creases, it acts to lubricate faults which are already under tectonic strain, but are prevented from slipping by the friction of the rock surfaces."

Given that every dam site has unique geological characteristics, it is not possible to accurately predict when and where earthquakes will occur. However, the International Commission on Large Dams recommends that RIS should be considered for reservoirs deeper than 100 meters.

What Are Some Characteristics of RIS?

A leading scholar on this topic, Harsh K. Gupta, summarized his findings on RIS worldwide in 2002:

- Depth of the reservoir is the most important factor, but the volume of water also plays a significant role in triggering earthquakes.
- RIS can be immediately noticed during filling periods of reservoirs.
- RIS can happen immediately after the filling of a reservoir or after a certain time lag.

Many dams are being built in seismically active regions, including the Himalayas, Southwest China, Iran, Turkey, and Chile (see map). International Rivers calls for a moratorium on the construction of high dams in earthquake-prone areas.

More information:

Case Studies

- Zipingpu Dam (2008)
- Kariba Dam (1963-1983)
- Google map of other RIS sites worldwide

News Articles

- Possible Link Between Dam and China Quake, *The New York Times*
- Reservoir Linked to Deadly Quake in India - Killari Reservoir Could Have Induced Latur Earthquake, *Science News*

Blogs and Commentary

- China Earthquake a Dam-Induced Disaster? *International Rivers*
- Top 5 Ways to Cause a Man-Made Earthquake, *Wired*
- Debunking the Debunkers: Dams Really Can Trigger Quakes, *International Rivers*

Other Publications

- Kerr, R. and Stone, R. (2009), "A Human Trigger for the Great Quake of Sichuan?."*Science* 323: 322
- Gupta, H.K. (2002), "A review of recent studies of triggered earthquakes by artificial water reservoirs with special emphasis on earthquakes in Koyna, India." *Earth-Science Reviews*58: 279-310
- Chen, L.Y. and Talwanim P. (1998), "Reservoir-induced Seismicity in China." *Pure and Applied Geophysics* 153: 133 - 149
- Assumpção, M. et al. (2002), "Reservoir-Induced Seismicty in Brazil." *Pure and Applied Geophysics* 159 (1-3): 597-617
- Dam-induced seismicity (Chapter from *Silenced Rivers* by Patrick McCully)
- A Faultline Runs Through It, International Rivers Fact Sheet

Latest additions:

- Experts Expect More Earthquakes in China's Dam-Choked South
- A Faultline Runs Through It: Exposing the Hidden Dangers of Dam-Induced Earthquakes

(http://www.internationalrivers.org/earthquakes-triggered-by-dams)

Dams & Earthquakes

People involved in the design, construction and operation of large dams are normally particularly sensitive to earthquakes.

This is because of four factors:

- Dams are often built in active earthquake areas
- Reservoirs can trigger earthquakes
- Some water supply structures are susceptible to earthquake motion.

  Embankments and outlet towers respond to earthquake vibrations. Shaking an unstable slope that has been weakened after saturation by rises in ground water levels may produce a landslide into the reservoir.
- The consequence of a dam or water supply failure is high.

  The effects of a dam failure on people and structures downstream are dramatic and obvious. A more likely example of earthquake damage would be loss of control of the water supply.

Why are Dams Often Built in Active Earthquake Areas?

- Dams are usually built in valleys
- Valleys exist because active erosion is taking place
- Active erosion implies there has been recent uplift
- Under compressional tectonic force, reverse or thrust faults produce uplift
- Reverse or thrust faults dip under the upthrown block
- Therefore, many dams have an active fault dipping under them

Reservoir Triggered Earthquakes

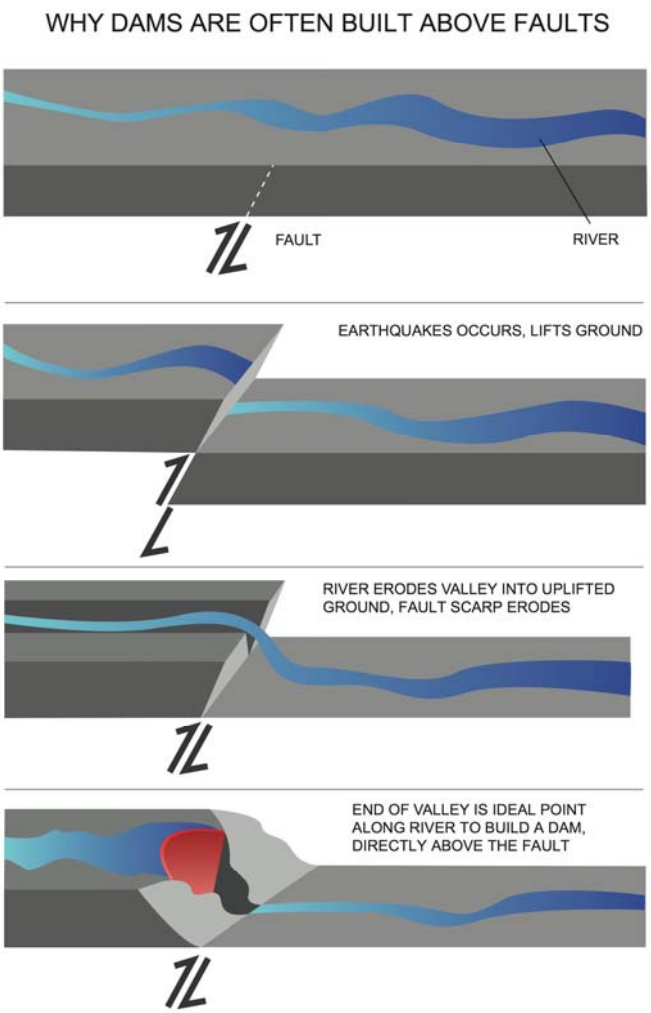
Large new reservoirs can trigger earthquakes. This is due to either:

- change in stress because of the weight of water, or more commonly by
- increased groundwater pore pressure decreasing the effective strength of the rock under the reservoir.

For triggered earthquakes to occur, both mechanisms require that the area is already under considerable tectonic stress.

Reservoir triggered earthquakes are often referred to as reservoir induced seismicity (RIS), but use of the term "in-

duced" is now becoming unfashionable. To many people it implies that the reservoir caused the earthquake. The energy released in a reservoir triggered earthquake is normal tectonic strain energy that has been prematurely released because of the reservoir.



Water Pore Pressure

Ground water plays a large part in earthquake activity. Fluid injection into wells in USA, Japan and elsewhere has triggered small earthquakes.

Water pore pressure reduces the normal stress within a rock while not changing the shear stress. Under any circumstances, an increase in water pore pressure means that a failure is more likely. The critical value of shearing stress may be made arbitrarily low by increasing the pore pressure.

Pore pressure can increase in two ways:

- Due to the decrease in pore volume caused by compaction under the weight of the reservoir. This occurs while the reservoir is being filled.
- Due to diffusion of reservoir water through permeable rock under the reservoir. The rate of flow depends on the permeability of the rock, so this effect is not instantaneous. The increase in pore pressure takes more time depending on the distance from the reservoir. It may take years for the pore pressure to increase at depths of kilometres beneath a reservoir.

Examples of Reservoir Triggered Earthquakes

World

- Koyna, India, 1967, M 6.7
- Xinfengjiang, China, 1962, M 6.2

Australia

- Warragamba, NSW, 1973, ML 5.5
- Thomson, Victoria, 1996, ML 5.1

Duration of Reservoir Triggered Seismicity

Reservoir induced seismicity is a transitory phenomenon which will occur either immediately after filling of the reservoir, or after a delay of a few years. If there is a delay, this depends on the permeability of the rock beneath the reservoir.

Once stress and pore pressure fields have stabilised at new values, reservoir induced seismicity will cease. Earthquake hazard will then revert to similar levels that would have existed if the reservoir had not been filled.

Even for those reservoirs that show a correlation between earthquake activity and water level, reservoir induced seismicity does not continue indefinitely as it is limited by the available tectonic energy.

Depth of Reservoir Triggered Seismicity

Depths of reservoir induced earthquakes, especially those occurring immediately after filling of the reservoir, are normally very shallow. If detailed seismograph coverage is available, then depths within one to three kilometres of the surface are common.

Induced earthquakes at reservoirs that have experienced delayed triggering may be much deeper, perhaps as deep as ten to twenty kilometres. These may occur ten to twenty years after filling of the reservoir.

Prediction of Reservoir Triggered Seismicity

It is not easy to predict whether a new reservoir will experience reservoir induced seismicity, because the two most important factors – the state of stress and the rock strength at earthquake depths – cannot be measured directly.

This is the same reason why prediction of normal (non-induced) earthquakes is normally unsuccessful.

(Seismology Research Centre, Australia, http://www.src.com.au/earthquakes/seismology-101/dams-earthquakes/)

Major Dam-Triggered Earthquakes

Kariba Dam on the Zambezi, 2007 (Photo: Rhys Jones)

SICHUAN, CHINA: ZIPINGPU DAM, 2008, M7.9

The Sichuan earthquake in May 2008 killed an estimated 80,000 people, ruptured almost 300 kilometers of fault, and damaged as many as 2,380 dams, including the 156-meter-high Zipingpu Dam. Zipingpu was filled in 2004 to a weight of 315 million metric tons. According to Christian Klose of Columbia University's Lamont-Doherty Earth Observatory, the added weight of the reservoir both weakened the fault and increased the stress tending to rupture the fault. The effect was 25 times that of a year's worth of natural stress loading from plate tectonic motions.

Fan Xiao, a chief engineer with the Sichuan Geology and Mineral Bureau, had warned about Zipingpu's seismic risks since before the dam was completed. After the disaster, he stated, "We cannot rule out the possibility that building the Zipingpu Dam induced the earthquake because the epicenter is so close to the dam." In addition, the greatest danger of triggering an earthquake is when the water level is rapidly falling, which is exactly what had happened at Zipingpu a week before the earthquake. Given the strong link between the dam and the earthquake, Fan says, "The main lesson is that in building these kinds of projects we need to give more consideration to scientific planning and not simply consider the electricity or water or the economic interests."

KOYNA, INDIA: WARNA RESERVOIR, 1967, M6.3

Prior to the Sichuan earthquake, one of the largest and most damaging earthquakes with strong evidence of reservoir triggering was in 1967 in Koynanagar, India. The M6.3 quake killed around 180 people and injured 1,500 more. Following its impoundment in 1962, some 35,000 tremors were recorded in the reservoir area. As at the Zipingpu and Oroville dams, the major burst of seismicity did not occur upon initial filling at Koyna, but several years later following rapid seasonal refilling. The 103-meter dam and its powerhouse were seriously damaged by the quake.

KARIBA, ZIMBABWE/ZAMBIA: KARIBA DAM, 1963, M6.2

The 128-meter-high Kariba Dam is one of Africa's biggest. Operated by the Zambezi River Authority on behalf of Zimbabwe and Zambia, it has from its earliest days been a cause for concern on a number of safety issues, including RIS. The reservoir is located in a seismically active area, at the southern end of the Rift Valley. The total mass of Kariba's reservoir is 180 billion metric tons. The filling in the 1960s of what was then the world's largest reservoir was followed by considerable seismic activity, 20 of the quakes larger than M5 and one that was M6.2 during the year that the reservoir was filled.

OROVILLE, US: OROVILLE DAM, 1975, M5.7

The earthquakes at Oroville Dam may be the best studied RIS sequence in the world. Oroville, the tallest earthen dam in the US, was built on an active fault line in the 1950s. In the 1970s, the area experienced an unusual series of earthquakes, including the biggest one (M5.7) in 1975, which occurred 12 kilometers south of the reservoir. The dam impounds 4,364 cubic kilometers of water, and was built on a fault previously thought inactive. Prior to the earthquake, the reservoir level was drawn down to its lowest level since filling. The US Geological Survey (USGS) subsequently a found strong link between the quakes and the refilling of the reservoir.

(Την ιδέα για την παράθεση των παραπάνω πληροφοριών για την αύξηση της σεισμικής επικινδυνότητας μιας περιοχής έδωσε η σχετική αναφορά στο Τεύχος 124, Ιουνίου 2015 του ηλεκτρονικού περιοδικού GeoEngineering με θέμα How Do Dams Trigger Earthquakes?).

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

The ISRM held its Council meeting in Montréal, Canada, on 10 May

The ISRM held its Council meeting in Montréal, Canada, on 10 May, in conjunction with the 13th ISRM International Congress on Rock Mechanics, organised by the Canadian ISRM National Group. 49 out of the 59 National Groups were either present or represented.

The Council was also attended by Past Presidents Professors Walter Wittke, Ted Brown, Charles Fairhurst, Shunsuke Sakurai, Nielen van der Merwe and John Hudson, chairmen of several ISRM Commissions and candidates to the new Board.

In this unique occasion a group photo was taken of the Past Presidents, the 2011-2015 Board members and the members of the newly elected Board.

Membership

The ISRM has 7,797 individual members and 147 corporate members, belonging to 59 National Groups. Bulgaria, Romania, Zimbabwe and Iceland joined the Society since the last meeting. This represents an increase of 20% in the number of individual members and corporate members, and an increase of 23% in the number of the National Groups since the last Congress in 2011. 40% of the members come from Europe and 32% from Asia, which has been the fastest growing region in the recent years.

Election of the Board of the ISRM for 2015-2019

Following the election of Dr Eda Freitas de Quadros from Brazil for ISRM President 2015-2019 two years ago, the Council elected in Montréal the six Regional Vice Presidents: Mr William Joughin (South Africa) for Africa, Prof. Seokwon Jeon (Korea) for Asia, Mr Stuart Read (New Zealand) for Australasia, Prof. Charlie Li (Norway) for Europe, Prof. Doug Stead (Canada) for North America and Prof. Sérgio Fontoura (Brazil) for South America.

The newly elected Board met immediately after the Council to elect Mr William Joughin as the 1st Vice President, to appoint Dr Petr Konicek (Czech Republic), Prof. He Manchao (China) and Prof. Nirikazu Shimizu (Japan) as Vice Presidents at Large and to reappoint Dr Luís Lamas as Secretary General.

Main achievements of the ISRM Board 2011-2015

The 13th Congress of the ISRM took place in May in Montréal, Canada. At its conclusion, the 2011-2015 Board's term of office has ended. So, it is time now to look back on the past four years and consider what has been achieved. The ISRM Board 2011-2015 was very active and has implemented a large number of modernization initiatives, which resulted in a considerable development of the Society. Some are mentioned here:

- Creation of the Technical Oversight Committee to oversee and assess the work of the ISRM Commissions.
- Creation of the ISRM Education Fund to support education and activities for young members and in developing countries.
- Creation of the ISRM Online Lectures Series, broadcast from the website: 9 online lectures were given by invited experts.
- Creation of a Multi-lingual Glossary, available on the website, which started with 11 languages.
- Creation of two new awards: the Outstanding Technical Commission Award and the Best Performing National Group Award.
- Creation of the ISRM Book Series, published by CRC Press, with Commissions' products and new progress in rock mechanics and engineering. 16 books have already been selected and one has been launched. ISRM members are entitled a 40% discount.
- Compilation of a 5-volume compendium on rock mechanics and engineering, to be published in 2016 by CRC Press, introducing the progresses of rock mechanics and engineering during the last 20 years.
- Expansion of the ISRM digital library: ISRM individual and corporate members can download at no cost up to 100 or 250 papers per year, respectively, from previous ISRM sponsored symposia.
- Approval of 20 new ISRM Suggested Methods drafted by the Commission on Testing Methods. Six new proposals were received.
- Publication of the "Orange Book" by Springer with the ISRM Suggested Methods 2007-2014. ISRM members are entitled a 75% discount.
- Approval of an agreement with CRC Press, which gives to ISRM members a 30% discount on the books they publish.
- Organization of three meetings between Board and young ISRM members.
- Participation in two students' nights organized during ISRM sponsored conferences with support from the Young Members Presidential Group.
- Organisation, for the first time, of the Rockbowl game with six teams representing different countries.

- Display of the ISRM 50th Anniversary Historical Exhibition in several National Groups.
- Organization of three ISRM Franklin Lectures, given by professionals in their mid career.
- Organisation of an international forum at the occasion of the meeting of the Federation of the International Geo-engineering Societies (FedIGS), to enhance multidisciplinary interaction among societies.
- Invitation of an expert from the International Geosynthetics Society (IGS) to give a keynote at the ISRM Congress 2015.
- Development of a new and more dynamic homepage.
- Support given to the Vice Presidents to visit different countries to stimulate their participation in the ISRM with the President's Budget.
- Approval by Council of By-Law no.11 and of 4 new Guidelines.
- Increase in the recognition of the prestigious Rocha Medal, demonstrated by the high number of applications.
- Sponsorship of 20 workshops and short curses, and of 16 symposia.
- Growth of the Society: National Groups 23% (from 48 to 59); individual members 20% (from 6514 to 7797) and corporate members (20% (from 123 to 147).
- Improvement of the sound financial situation of the ISRM.

Xia-Ting Feng, ISRM President 2011-2015

ISRM Online Rock Mechanics Glossary: 13 languages now available

Following an initiative of the ISRM Board, supported by the Chinese National Group, a Glossary with rock mechanics terminology in different languages has been compiled during the past few months and is available on the ISRM website.

An initial list of 1000 English rock mechanics terms were selected. five new languages have recently been added to the eight original ones. Currently the following languages are available: Chinese, English, Finnish, German, Korean, Italian, Japanese, Persian, Portuguese, Russian, Slovenian, Spanish and Turkish. Translations in other languages are arriving to the Secretariat and they will be added.

A dedicated platform was implemented on the website for the Rock Mechanics Glossary. To search, choose the original language and insert the term. If a correspondence is found, click on the adequate term to see its translation in the available languages.

Follow this link to test the glossary and leave your feedback https://www.isrm.net/gca/?id=1189.

Select the original language: Japanese Search the term: ダイラタンシー SEARCH

Click to go back to a new search

Language	Translation
English	dilatancy
Chinese	膨胀，膨胀性, 扩容
Finnish	dilataatio, laajeneminen
German	Dilatanz
Italian	dilatanza
Japanese	ダイラタンシー
Korean	체적팽창
Persian	انبساط پذیری
Portuguese	dilatância
Russian	дилатансия
Slovenian	razmikanje
Spanish	dilatancia
Turkish	hacimsel genişleme

International Geosynthetics Society

Young Members Committee

1. Introduction

The International Geosynthetics Society (IGS) was founded in 1983, by a group of geotechnical engineers and textile specialists. The Society brings together individual and corporate members from all parts of the world, who are involved in the design, manufacture, sale, use or testing of geotextiles, geomembranes, related products and associated technologies, or who teach or conduct research about such products.

The aims of the IGS are:

- To collect and disseminate knowledge on all matters relevant to geotextiles, geomembranes and related products, e.g. by promoting seminars, conferences, etc.
- To promote advancement of the state of the art of geotextiles, geomembranes and related products and of their applications, e.g. by encouraging, through its members, the harmonization of test methods, equipment and criteria.
- To improve communication and understanding regarding such products, e.g. between designers, manufacturers and users and especially between the textile and civil engineering communities

The IGS has 43 chapters globally, over 3,000 individual members over 500 student members and including 161 corporate members.

2. Formation of Young members of the IGS

Part of the IGS structure includes task forces where young member's activities and interests are managed. This task force is led by Dr Nathalie Touze-Foltz, the Chair of IGS Young Members Operational Committee. Dr Touze-Foltz facilitated the launch of the Young members committee at Eurogeo 5 conference in Valencia, Spain in September 2012, by giving the student awards recipients from various regions at that conference an opportunity to be part of the first Young IGS Members (YMC) committee.

The criteria was that you had to be under 35 years old and have an interest in Geosynthetics through either as being a member through your regional chapter or a student member with IGS directly.

The aim of this committee was to involve young members at an early stage of their studies or careers in activities and/or tasks of the IGS through their respective regional sub-committees (Americas, Europe and Africa and Australasia).

Furthermore, it was also aimed at creating a mentorship platform, developing and pursuing new ideas for young members as the IGS sees them the next generation.

The aims of the YMC are:

- To promote young members participation at all levels possible within the IGS structures, including but not limited to council committees, task forces, technical committees and at regional chapter levels.
- Develop and maintain a membership list for all young IGS members in all regions and actively manage the participation in IGS activities and events.
- Create and develop a social media platform for awareness and communication such as Facebook, Wikipedia, and LinkedIn to which geosynthetics education, events and activities can be communicated on.
- Develop a network to support the students/ young members at university level and the transition into the world of employment, by connecting them to corporate members of the IGS for possible employment opportunities or further research work opportunities.
- Assistance in technical tasks within the IGS such as translation of IGS official terminology and glossaries list into various languages as such French, Spanish, Portuguese and Italian, amongst other tasks.
- Organisation of interaction/networking sessions with the Geosynthetics industry, and other young member associations in the Engineering sphere to stimulate activate awareness of the group.

2.1 Structure of Young Members Committee (YMC)

Since the formation of the YMC in September 2012, the YMC was formed into three regions, Africa and Europe, Americas (North and South) and Asia-Pacific regions. After the first official meeting in November 2013, the young members decided to merge all the various YMC regions into one committee. This was done because the formation of the YMC was fairly new we wanted to ensure that its growth is integrated evenly amongst all regions. This allowed for active participation from all YMC regions based on the small numbers of members that were currently involved.

2.2 YMC Success Story

The first success story of the YMC came in September 2013, where the committee worked very hard at ensuring a successful young members conference at the 10ICG Berlin conference. The conference organisers worked with the YMC in organising a young members technical paper presentation were over 40 young members submitted papers from across the globe, however only 10 papers could be selected and presented due to time and allocation constraints.

The YMC further held a strategic planning session at the conference with the following aims;

1. Report back to other members on task and activities completed to date.
2. Discussion on the framework and constitution of the young members.
3. Drawing up areas where YMC need to work on in the next year in all regions. With emphasis on a technical agenda to work together with the IGS technical committees.
4. Stimulate more interest of young members to be actively involved especially in North America and Asia Pacific region, with the aim of forming committees in these regions.
5. Engage with IGS committee on areas were YMC need support and assistance in.
6. Networking session between young members from both IGS and Geotechnical Engineers Association.
7. Formation of partnership with other young member associations such as ISSMGE YMPG

YMC are continually working hard and aim to host a young member's conference in 2018 in conjunction with a regional IGS conference. We certainly are keen and welcome more young members on board. Should you have any further questions or requests on how you can become a member in your region, please send me an email at inyirenda@gseworld.com

The YMC have a social media presence, both in the form of a Facebook page and a twitter account. Please follow us at.

https://www.facebook.com/YoungIGS
www.twitter.com/IgsYoung
http://www.geosyntheticssociety.org

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

Για τις παλαιότερες καταχωρήσεις περισσότερες πληροφορίες μπορούν να αναζητηθούν στα προηγούμενα τεύχη του «περιοδικού» και στις παρατιθέμενες ιστοσελίδες.

Numerical Analysis in Geotechnics, 20 August 2015, Hanoi, Vietnam, nag2015secretariat@gmail.com

Subsea Tunnels, 2-3 September 2015, Seoul, Korea www.tu-seoul2015.org

SICAT 2015 - Symposium on Innovation and Challenges in Asian Tunnelling 2015, 2 to 3 September 2015, Singapore, tucss@cma.sg, www.tucss.org.sg.

China Shale Gas 2015 - an ISRM Specialized Conference, 6-8 September 2015, Wuhan, China, http://english.whrsm.cas.cn/ic/ic/201405/t20140509_120692.html

"Underground Construction" Conference, 8-9 September 2015, Krakow, Poland, www.inzynieria.com

13th International Benchmark on the Numerical Analysis of Dams, 9 - 11 September 2015, Lausanne | Switzerland http://icold2015bmw.epfl.ch

International Symposium on Geohazards and Geomechanics 10-11 September, 2015, Coventry, U.K., www.warwick.ac.uk/isgg2015

24th European Young Geotechnical Engineers Conference in Durham, UK, 11-12 September, 2015, https://www.dur.ac.uk/conference.booking/details/?id=419

16th European Conference on Soil Mechanics and Geotechnical Engineering "Geotechnical Engineering for Infrastructure and Development", 13 - 17 September 2015, Edinburgh, UK, www.xvi-ecsmge-2015.org.uk

GEO-EXPO 2015 Scientific and Expert Conference in Zenica, Bosnia and Herzegovina
18 - 19 September 2015, Zenica, Bosnia and Herzegovina
www.geotehnika.ba

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2015 Cutting Edge "Urban Tunneling", September 21-23, 2015, Denver, USA, www.ucaofsmecuttingedge.comwww.ucaofsmecuttingedge.com

Workshop on Volcanic Rocks & Soils, 24 - 25 September 2015, Isle of Ischia, Italy, www.associazionegeotecnica.it

The 7th International Symposium on Roller Compacted Concrete (RCC) Dams, Chengdu, China, Sept. 24th-25th, 2015, www.chincold.org.cn

Athens 2015 International Landfill Mining Conference, September 24-25, 2015, Athens, http://www.erasmus.gr/microsites/1050/welcome-address

TranSoilCold 2015 - The 2nd International Symposium on Transportation Soil Engineering in Cold Regions, September 24-26, 2015, Novosibirsk, Russia, http://transoilcold2015.stu.ru/index.htm

International Conference on Landslides and Slope Stability (SLOPE 2015), September 27-30, 2015, Bali, Indonesia, www.slope2015.com

Sardinia 2015 International Waste Management and Landfill Symposium, 5-9 October 2015, Santa Margherita di Pula, Italy, www.sardiniasymposium.it

GE Basements and Underground Structures Conference 2015, 6 - 7 October 2015, London, UK, http://basements.geplus.co.uk

EUROCK 15 ISRM European Regional Symposium & 64th Geomechanics Colloquy, 7 – 9 October 2015, Salzburg, Austria, www.eurock2015.com

Shotcrete for Underground Support XII New Developments in Rock Engineering, TBM tunnelling, Deep Excavation and Underground Space Technology, October 11-13, 2015, Singapore, www.engconf.org/conferences/civil-and-environmental-engineering/shot-crete-for-underground-support-xii

5th International Symposium on Geotechnical Safety and Risk (ISGSR 2015), 13-16 October 2015, Rotterdam, The Netherlands www.isgsr2015.org

International Workshop on Tsunamis in the World: from Source Understanding to Risk Mitigation, 14 to 16 October, 2015, Heraklion, Greece, www.gein.noa.gr/itw2015

LTBD2015 3rd International Workshop on Long-Term Behaviour and Environmentally Friendly Rehabilitation Technologies of Dams Hohai University, Nanjing, October 17-19, 2015, LTBD2015@gmail.com

COST TUI208 International Workshop Civil Engineering Applications of Ground Penetrating Radar, 19–20 October 2015, Athens, Greece, http://pavnet.civil.ntua.gr

HYDRO 2015, 26-28 October 2015, Bordeaux, France, www.hydropower-dams.com/pdfs/hydro2015.pdf

International Conference on Engineering Geology in New Millennium, 26-31 October 2015, New Delhi, India, http://isegindia.org/pdfs/1st%20circular-international-IAEG.pdf

6th International Conference on Earthquake Geotechnical Engineering, 2-4 November 2015, Christchurch, New Zealand, www.6icege.com

SEOUL 2015 - 25th World Road Congress Roads and Mobility – Creating New Value from Transport, 2–6 November, 2015, Seoul, Republic of Korea, http://www.aipcrseoul2015.org

4ο Πανελλήνιο Συνέδριο Αναστηλώσεων, Νοέμβριος 2015, Θεσσαλονίκη, www.etepam.gr.

The 15th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, 9-13 November 2015, Fukuoka, Japan, http://www.15arc.org

Tunnels and Underground Construction 2015, 11-13 November 2015, Žilina, Slovak Republic, www.tps2015.sk

15th Pan-American Conference on Soil Mechanics and Geotechnical Engineering, 15 - 18 November 2015, Buenos Aires, Argentina, http://conferencesba2015.com.ar

GEOMATE, 16 -18 November 2015, Osaka, Japan, www.geomate.org

VIII South American Congress on Rocks Mechanics, 15 - 18 November 2015, Buenos Aires, Argentina, http://conferencesba2015.com.ar

Sixth International Conference on Deformation Characteristics of Geomaterials IS Buenos Aires 2015, November 15th to 18th 2015, www.saig.org.ar/ISDCG2015

JTC-1 TR3 Forum
Slope Safety Preparedness for Effects of Climate Change
18 and 19 November 2015 Naples, Italy
www.cmcc.it/events/workshop-slope-safety-preparedness-for-effects-of-climate-changes

This Forum provides a platform for JTC-1 members and other collaborators who are participants of the TR3 project on 'Slope Safety Preparedness for Effects of Climate Change' to present their country reports. The country reports cover the state-of-the-art on the projected results of advanced modelling of climate change and impact of extreme weather events, the corresponding implications on slope safety, and the range of possible landslide risk management strategies and actions that are called for in combating, or adapting to, climate change effects. This Forum offers a unique opportunity for reviewing and consolidating the state of practice in relation to slope safety preparedness for climate change effects, knowledge sharing and transfer, strategic discussion of pertinent issues, and reaching consensus on the key issues of concern, the major gaps in current knowledge and the way forward for enhanced and more robust landslide risk management.

Apart from disseminating the above mentioned country reports, the Forum will also endeavour to come up with a summary position paper on this important subject area targeting the geotechnical profession at large, together with a strategic statement targeting policy-makers, government administrators and the like, on behalf of JTC-1. Discussion on the above targeted deliverables will be led by a Steering Group, which comprises Professor Luciano Picarelli (JTC-1 Chairman), Dr Suzanne Lacasse (Norwegian Geotechnical Institute) and Ir Ken Ho (Hong Kong Geotechnical Engineering Office). A protocol on continued knowledge sharing and transfer on this subject area by the participants of TR3 project will also be explored.

For further information, please contact Dr Wing Sun via e-mail: hwsun@cedd.gov.hk

For registration and conference logistics, please contact

Prof Luciano Picarelli via e-mail: picarell@unina.it,
Prof Luca Comegna via e-mail: luca.comegna@unina2.it, or
Dr Guido Rianna via e-mail: G.Rianna@cira.it

TBM DiGs Tunnel Boring Machines in Difficult Grounds, 18-20 November 2015, Singapore, www.tbmdigs.org

Arabian Tunnelling Conference & Exhibition: Innovative Underground Infrastructure - And Opportunities, 23-25 November 2015, Dubai, UAE, www.atcita.com

Geo-Environment and Construction, 26-28 November 2015, Tirana, Albania, Prof. Dr. Luljeta Bozo, lulibozo@gmail.com; luljeta_bozo@universitetipolis.edu.al

ICSGE 2015 - The International Conference on Soft Ground Engineering, 3-4 December 2015, Singapore, www.geoss.sg/icsge2015

The 1st International Conference on Geo-Energy and Geo-Environment (GeGe2015) 4th and 5th December 2015, Hong Kong, http://gege2015.ust.hk

2015 6th International Conference Recent Advances in Geotechnical Engineering and Soil Dynamics, December 7-11, 2015, New Delhi (NCR), India, wason2009@gmail.com; wasonfeq@iitr.ernet.in, sharmamukat@gmail.com; mukutfeq@iitr.ernet.in, gvramanaiitdelhi@gmail.com, ajaycbri@gmail.com

Southern African Rock Engineering Symposium an ISRM Regional Symposium, 5 January 2016, Cape Town, South Africa, http://10times.com/southern-african-rock

ASIA 2016 - Sixth International Conference on Water Resources and Hydropower Development in Asia, 1-3 March 2016, Vientiane, Lao PDR, www.hydropower-dams.com/pdfs/asia20161.pdf

GeoAmericas 2016 3rd Panamerican Conference on Geosynthetics, 11 – 14 April 2016, Miami Beach, USA, www.geoamericas2016.org

International Symposium on Submerged Floating Tunnels and Underwater Structures (SUFTUS-2016), 20-22 April 2016, Chongqing, China, www.cmct.cn/suftus

World Tunnel Congress 2016 "Uniting the Industry", April 22-28, 2016, San Francisco, USA, http://www.wtc2016.us

International Symposium "Design of piles in Europe - How did EC7 change daily practice?", 28-29 April 2016, Leuven, Belgium, www.etc3.be/symposium2016

7th In-Situ Rock Stress Symposium 2016 - An ISRM Specialised Conference, 10-12 May 2016, Tampere, Finland, www.rs2016.org

84th ICOLD Annual Meeting, 16-20 May 2016, Johannesburg, South Africa, www.icold2016.org

2nd International Conference on
Rock Dynamics and Applications (RocDyn-2)
18 – 20 May 2016, Suzhou, China
http://rocdyn.org

Following the success of the First International Conference on Rock Dynamics and Applications (RocDyn-1) in Lausanne Switzerland in June 2013, the Second International Conference on Rock Dynamics and Applications (RocDyn-2) will be held in Suzhou China in May 2016. RocDyn-2 will be organised by the Institute of Rock and Soil Mechanics of Chinese Academy of Sciences, together with 4 other universities around the World.

Rock dynamics covers a huge scope of research to understand the dynamic behaviour of rock materials, rock joints and rock masses, including the initiation and the propagation of stress waves, the responses and the failures of rocks under the dynamic and static loads. It has wide applications in civil, mining, hydropower, petroleum engineering, including the new rock engineering applications such as shale gas, hot rock geothermal energy, and earthquake hazard management.

With extensive research conducted worldwide and increasing engineering projects applying rock dynamics, RocDyn-2 is organised to address scientific research as well as engineering applications.

RocDyn-2 organisers would like to welcome scientists, engineers and students involving in rock dynamic research and engineering practice to join us in Suzhou, to share our knowledge, to cooperate on researches, to advance rock dynamics and engineering applications.

Theme

RocDyn-2 is a specialised conference devoting to the discussion on rock dynamics and engineering applications. RocDyn-2 plans to highlight the current scientific research activities and engineering application challenges. The technical presentations will cover all the aspects related to rock dynamics and engineering applications, including, but not limited to the following topics:

- Mathematical and analytical methods;
- Micromechanics constitutive relations;
- Fracture dynamics;
- Rate dependent properties and behaviour;
- Continuum and discontinuum dynamic numerical modelling;
- Laboratory testing and observation;
- Field measurements techniques;
- Instrumentation and monitoring of dynamic response;
- Multi-scale and multi-physics modelling;
- Earthquake and induced seismology;
- Explosion and blasting control;
- Landslide and slope safety;
- Rock block movement and impact structure design;
- Rock fragmentation and excavation;
- Support of rock tunnels and built structures under dynamic loads.

For all queries regarding RocDyn-2, please contact:
RocDyn-2 Conference Secretariat
Email: contact@rocdyn.org
Post Address: RocDyn-2 Conference
c/o Institute of Rock and Soil Mechanics
Chinese Academy of Sciences
Xiaohongshan, Wuhan 430071
CHINA

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13th International Conference Underground Construction Prague 2016 and 3rd Eastern European Tunnelling Conference (EETC 2016), 23 to 25 May 2016, Prague, Czech Republic, www.ucprague.com

GEOSAFE: 1st International Symposium on Reducing Risks in Site Investigation, Modelling and Construction for Rock Engineering - an ISRM Specialized Conference, 25 – 27 May 2016, Xi'an, China, www.geosafe2016.org/dct/page/1

14th International Conference of the Geological Society of Greece, 25-27 May, Thessaloniki, Greece, www.ege2016.gr

NGM 2016 - The Nordic Geotechnical Meeting, 25 - 28 May 2016, Reykjavik, Iceland, www.ngm2016.com

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International Mini Symposium Chubu (IMS-Chubu)
New concepts and new developments in soil mechanics and geotechnical engineering
26 - 28 May 2016, Nagoya, Aichi, Japan
www.jiban.or.jp/index.php?option=com_content&view=article&id=1737:2016052628&catid=16:2008-09-10-05-02-09&Itemid

This time, Chubu Branch of Japanese Geotechnical Society (JGS) takes the responsibility for organizing the International Mini Symposium CHUBU (IMS-CHUBU) in Nagoya, Aichi, Japan. As it is known that Chubu Branch is regarded as one of the most active groups in all-Japan in the research activities of geotechnical engineering, we are very proud to be able to organize this mini symposium. Size of the symposium is not a main concern, because the most important thing is that all the high-level research achievements can be presented in a compact conference and all the participants can listen to other's presentation. By attending this mini symposium, the participants can not only share their knowledge but also can enhance the communication and friendship, which is a very important way to make contribution to the next generation of soil mechanics.

The topics of the symposium cover a wide range of new concepts and new developments in soil mechanics and geotechnical engineering in recent years. We cordially invite those researchers, especially the young who devote ceaselessly to the relevant researches, to attend the symposium and share the view with other researchers.

The symposium is organized by Chubu Branch of JGS under the auspices of international affair of JGS as an all-Japan international event. We sincerely thank the assistance, the encouragement and the enthusiasm from both the domestic and international colleagues who support the symposium. We hope that through this symposium, we can not only share the knowledge, but also can enhance the friendship and add wonderful memory.

Conference Topics

(1) Constitutive modeling and numerical analysis
(2) Geomaterials

(3) Geo-disaster
(4) Geo-environment
(5) Soil-structure interaction
(6) Ground improvement
(7) Build back better
(8) Any new topics in geotechnical engineering

Contact Details

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19SEAGC – 2AGSSEAC Young Geotechnical Engineers Conference, 30th May 2016, Petaling Jaya, Selangor, Malaysia, seagc2016@gmail.com

19th Southeast Asian Geotechnical Conference & 2nd AGSSEA Conference Deep Excavation and Ground Improvement, 31 May – 3 June 2016, Subang Jaya, Malaysia, seagc2016@gmail.com

ISSMGE TC211 Conference Session within the framework of the 19th Southeast Asian Geotechnical Conference "GROUND IMPROVEMENT works: Recent advances in R&D, design and QC/QA"

ISL 2016 12th International Symposium on Landslides Experience, Theory, Practice, Napoli, June 12th-19th, 2016, www.isl2016.it

4th GeoChina International Conference Sustainable Civil Infrastructures: Innovative Technologies for Severe Weathers and Climate Changes, July 25-27, 2016, Shandong, China, http://geochina2016.geoconf.org

6th International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics August 1-6, 2016, Greater Noida (NCR), India, www.6icragee.com

EUROC 2016 - ISRM European Regional Symposium Rock Mechanics & Rock Engineering: From Past to the Future, 29-31 August 2016, Ürgüp-Nevşehir, Cappadocia, Turkey http://eurock2016.org

3rd ICTG – 3rd International Conference on Transportation Geotechnics 4 - 7 September 2016, Guimaraes, Portugal, www.civil.uminho.pt/3rd-ICTG2016

IAS'5 5th International Conference on Geotechnical and Geophysical Site Characterisation, 5-9 September 2016, Gold Coast, Queensland, Australia http://www.isc5.com.au

SAHC 2016 - 10th international Conference on Structural Analysis of Historical Constructions 13-15 September 2016, Leuven, Belgium, www.sahc2016.be

13 Baltic States Geotechnical Conference Historical Experiences and Challenges of Geotechnical Problems in Baltic Sea Region, 15 - 17 September 2016, Vilnius, Lithuania, http://www.13bsgc.lt

EuroGeo 6 – European Regional Conference on Geosynthetics, 25 – 29 Sep 2016, Istanbul, Turkey, www.eurogeo6.org

ARMS 9, 9th Asian Rock Mechanics Symposium, ISRM Regional Symposium, 18-20 October 2016, Bali, Indonesia, http://arms9.com

GeoAsia 6 - 6th Asian Regional Conference on Geosynthetics 8-11 November 2016, New Delhi, India, http://seags.ait.asia/news-announcements/11704

Recent Advances in Rock Engineering
16-18 November 2016, Bangalore, India
www.rare2016.in

With rapid urbanization and the need for excavations in rock in urban setting, design of excavations and foundations faces problems due to proximity to critical structures, environmental issues and complex geotectonic field. Detailed and accurate field information is essential for estimating reliable design parameters under such circumstances, and strata monitoring plays a critical role in correcting and calibrating the model. Recent trends in instrumentation, particularly remote and smart monitoring with diagnostic alert features, have added an important dimension in the design and development of rock engineering practices. Even post-failure investigations to plan proper restorative measures have got a new impetus with these advances.

In the backdrop of these developments, the National Institute of Rock Mechanics is organizing an international conference on rock mechanics, titled "Recent Advances in Rock Engineering", RARE-2016, as a Specialized Conference of the International Society for Rock Mechanics. The Conference will be for three days during 16th to 18th November, 2016, at Bengaluru (earlier Bangalore), the beautiful and pleasant city in southern India and the IT Capital of India.

The Conference will address the problems and challenges posed in excavation of openings in rock for mining engineering, civil engineering & infrastructure development projects, and will discuss solutions to overcome these problems. Past experiences will be shared, and application of new technologies will be explored.

The Conference will focus on the developments and innovations made in recent years in the field of rock engineering, with special emphasis on field measurements, instrumentation and data collection, to understand the behavior of excavations in rock. The main theme of the Conference is Recent Advances in Rock Engineering; the specialized theme is Instrumentation and Field Measurements.

Conference Topics

Developments in Testing & Field Investigations

- Rock mass characterization
- Geophysical probing techniques
- Stress regime around excavations
- Mechanical properties of rocks
- Instrumentation, and strata behavior monitoring

Advances in Excavation & Design Methods

- Rock blasting & other excavation techniques
- Numerical modeling and back analysis
- Rock reinforcement and ground improvement

- Foundation stability
- Tunnelling methods
- Surface excavations

Challenges in Rock Mechanics

- Deep mining
- Landslides and other natural hazards
- Reservoir geomechanics
- Underground space utilization
- Other peripheral issues

For more information registration@rare2016.in

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AfriRock 2017, 1st African Regional Rock Mechanics Symposium, 12 – 17 February 2017, Cape Town, South Africa, www.saimm.co.za/saimm-events/upcoming-events

World Tunnel Congress 2017
Surface problems – Underground solutions
9 to 16 June 2017, Bergen, Norway
www.wtc2017.no

"Surface problems – Underground solutions" is more than a slogan; for ITA-AITES and its members it is a challenge and commitment to contribute to sustainable development. The challenges are numerous and the availability of space for necessary infrastructure ends up being the key to good solutions. The underground is at present only marginally utilized. The potential for extended and improved utilization is enormous.

EUROCK 2017
13-15 June 2017, Ostrava, Czech Republic

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19th International Conference on Soil Mechanics and Geotechnical Engineering, 17 - 22 September 2017, Seoul, Korea, www.icsmge2017.org

GeoAfrica 2017
3rd African Regional Conference on Geosynthetics
9 – 13 October 2017, Morocco

11th International Conference on Geosynthetics (11ICG)
16 - 20 Sep 2018, Seoul South Korea
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10th Asian Rock mechanics Symposium - ARMS10
October 2018, Singapore

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AFTES International Congress
"The value is Underground"
13-16 November 2017, Paris, France

World Tunnel Congress 2018
20-26 April 2018, Dubai, United Arab Emirates

14th ISRM International Congress
2019, Foz de Iguaçu, Brazil

Contact Person: Prof. Sergio A. B. da Fontoura
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ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Blasts test foundations for high-speed rail bridge over Highway 99

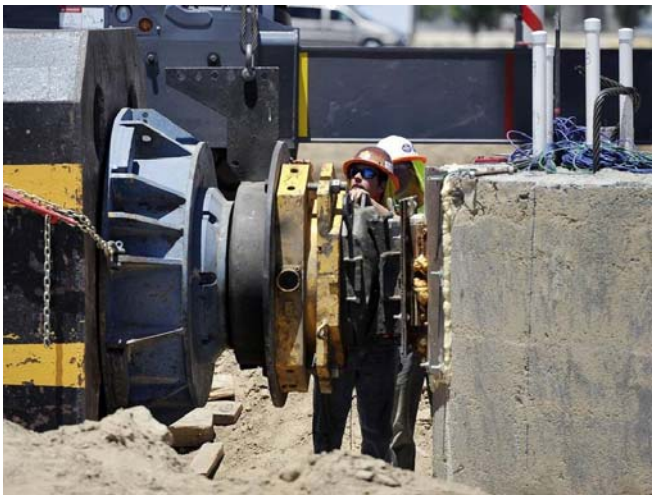
Engineers and contractors for California's high-speed rail authority had quite a blast Thursday - four of them, actually.

Using increasing amounts of an explosive called nitrocellulose, they conducted four stress tests on a concrete piling festooned with sensors and buried 80 feet deep in the earth near Highway 99 at the south end of Fresno. The testing was part of engineering work for a 3,700-foot-long elevated bridge to carry high-speed trains over Cedar Avenue and the freeway.

Dust flies as media record High Speed Rail Authority officials and crews conduct a load test on a piling near Cedar and North avenues south of Fresno Thursday afternoon, June 18, 2015. The test was the fourth and final for the day on the 80-foot-deep piling where a bridge will eventually cross over Highway 99.

The Fresno Bee

An explosion sends 280,000 lbs of force against a piling as High Speed Rail Authority officials and crews conducted a load test on a piling near Cedar and North avenues south of Fresno.



Detonation of a nitrous cellulose mixture is prepared during a load test on a piling near Cedar and North avenues south of Fresno.

The countdown begins as High Speed Rail Authority officials and crews ready a load test on a piling near Cedar and North Avenues south of Fresno Thursday afternoon, June 18, 2015.

Each blast propelled a piston ram into the side of the piling to simulate the lateral stresses that an earthquake might inflict on a bridge foundation.

The goal of the test was to try to batter the concrete to its breaking point. But Bobby Pentorali, a construction project engineer for the rail authority, said the tests are intended more to measure the properties of the soil rather than the piling itself.

"Those properties will guide us when we design the foundations for the larger viaduct structure that will cross right here over Cedar Avenue and above Highway 99," he said. "The soil is what holds the piling, and when we put these large loads on it, how much it moves and strains depends on the properties of the soil."

More than 40 pilings will eventually be needed to support the elevated bridge, Pentorali added.

"These expensive tests actually pencil out when we have so many of these piles to build," he said.

The testing happened in a vacant field at the intersection of Cedar and North avenues, just east of Highway 99. The fourth, and most powerful, of the blasts happened shortly before 1:30 p.m. Crews with subcontractor Becho Inc. said the final test generated about 1,400 tons of force against the exposed top of the concrete pillar.

The thrust of the day's final blast forced a massive set of steel weights — which formed the cylinder that held the ram — backwards about 20 feet. Think of it like the recoil of a gun, but on a much-magnified scale and a heck of a lot louder.

Similar tests were carried out last summer in Madera near the Fresno River, where construction got underway this week on a viaduct that will span the river, Highway 145 and Raymond Road near the BNSF Railway freight tracks. Such testing also occurred several months ago on the south side of the San Joaquin River near Highway 99 for a bridge over the Union Pacific Railroad tracks and Golden State Boulevard near the Fresno-Madera county line.

All three bridges are part of the authority's Construction Package 1, a 29-mile stretch of the rail line from the northeast edge of Madera to the south end of Fresno.

(Tim Sheehan / Sheehan News – The Fresno Bee, June 18, 2015, http://www.fresnobee.com/news/local/high-speed-rail/article24923296.html)

A cloud-based database of UK geological and geotechnical data and 3D ground models could soon become a reality.

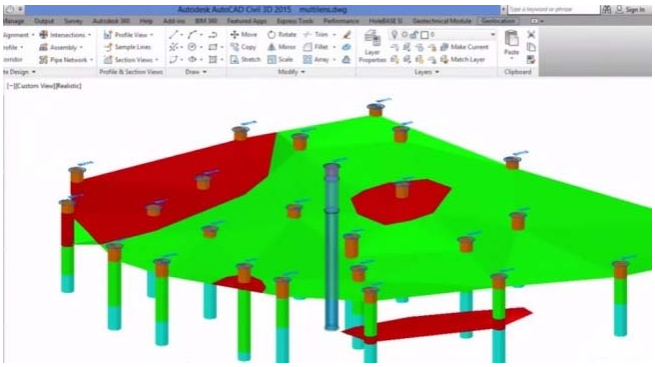
Thanks to new research led by Keynetix and support by our partners the British Geological Survey (BGS), Atkins and Autodesk

"Unforeseen ground conditions continue to be a major cause of project delays and construction programme overruns," explained Gary Morin, Technical Director, Keynetix, who is leading the research team (view the video https://www.youtube.com/watch?v=I7m5UXD1vek).

"A big problem is the limited availability of high quality geotechnical data, which is stored mainly in project archives. If this was publically-available, construction teams could access better data, site investigations would be more focused and ground risk reduced, saving time and money.

"Including 3D interpretative models in the cloud will also make it possible to plan investigations in 3D. An added benefit is that the use of geotechnical data in Building Information Modelling should also grow."

Kate Royse, Director of Environmental Modelling at BGS, said: "This project will lead to a step-change in how the BGS delivers its data and models to the geotechnical engineering and construction sectors. It builds on an increasingly open and accessible wealth of information in the BGS National Geoscience Data Centre."



This two year, £540,000 BIM for the subsurface project is funded by Innovate UK under its Digitising the Construction Industry initiative started in April 2015 and expected to run for 2 years.

The project is funded by Innovate UK under its Digitising the Construction Industry initiative. As well as Keynetix and BGS, the project team includes consultant Atkins and Building Information Modelling (BIM) pioneer Autodesk.

"We have a very strong research team," Morin confirmed. "It combines Keynetix' expertise in developing HoleBASE SI and the Extension for Civils 3D; BGS' world-leading knowledge of 3D modelling; Atkins' experience in the practical application of both data and ground models; plus Autodesk's background in developing BIM."

Holger Kessler, Team Leader for the modelling systems development, said: "BGS has been at the forefront of geological data management, visualisation and delivery for some time. What makes this project special is that it will provide us with direct links to geologists and engineers on the ground. We are very excited about the potential positive impact on the construction process."

One of the biggest sticking points of incorporating geotechnical data in BIM is that many geotechnical teams are reluctant to share interpreted data with the wider project team, because they are worried it will be misused.

We hope this research will help alleviate those concerns, improving collaboration and data sharing. This will lead to a more complete understanding of the ground, resulting in more informed decision-making throughout the lifetime of a project.

Results of the research are expected in 2017, with regular updates on progress published over the next two years. For more information on the project, visit: the BIM for the Subsurface project page or contact Gary Morin via the contact form at http://www.keynetix.com/bimforthesubsurface/.

(http://www.keynetix.com/holebasesi/keynetix-and-bgs-to-develop-bim-for-the-subsurface/

http://www.keynetix.com/bimforthesubsurface/

Geoengineer.org, 10 June 2015, http://www.geoengineer.org/news-center/news/item/1209-keynetix-leads-bim-for-the-subsurface-project-expected-to-

be-completed-in-2017?utm_source=GeoNewsletter+%23124%2C+June+2015&utm_campaign=Geo-Newsletter-%23124-June-2015&utm_medium=email)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

New Nature Reserve Made In Crossrail

Crossrail Sustainability: The journey of London clay

CROSSRAIL'S FINAL SHIPMENT OF EARTH ARRIVES AT WALLASEA ISLAND

- Excavated material from Crossrail's tunnels and stations being used to create RSPB nature reserve at Wallasea Island, Essex
- 1528 shipments have delivered 3 million tonnes of excavated material
- Nearly 80% of material transported by rail and water, removing approximately 150,000 lorries from London
- Partnership with RSPB is a key part of Crossrail's sustainability strategy

The last shipment of excavated material donated by Crossrail to one of Europe's largest nature reserves has arrived at Wallasea Island in Essex.

https://www.youtube.com/watch?v=k_6nQVCnI88

In a landmark partnership with the Royal Society for the Protection of Birds (RSPB), 3 million tonnes of material excavated from deep below the capital is being used to create a flagship wetland nature reserve twice the size the City of London, and one of the UK's most innovative flood defence systems.

The delivery marks an important countdown for Crossrail and the RSPB. With over 40km out of 42km tunnels complete, Crossrail is on track to link all its rail tunnels with the big east/west breakthrough at Farringdon. At Wallasea, the last load of excavated material will be used to complete the first area of the reserve and allow the sea wall to be breached and controlled flooding to take place this summer.

Mike Clarke, the RSPB's Chief Executive said: "Wallasea Island is the biggest wetland creation project the RSPB has embarked upon and one of the most significant across Europe to date. As well providing the material that makes this project possible, Crossrail has demonstrated a bold and inspired vision for the way in which industry and conservation sectors can work together for the benefit of people and wildlife.

"As the pressures on our natural world continue to grow, it is crucial that we recognise a world class economy and a world class environment go hand in hand. We hope that our partnership with Crossrail will inspire many more ground-breaking projects in future."

Andrew Wolstenholme, Crossrail Chief Executive said: "Crossrail is delighted to be involved in delivering this major new wetland at Wallasea. This trailblazing partnership with the RSPB is a key part of Crossrail's sustainability strategy and shows that by working together, the construction industry and environmental groups can benefit both the economy and the environment."

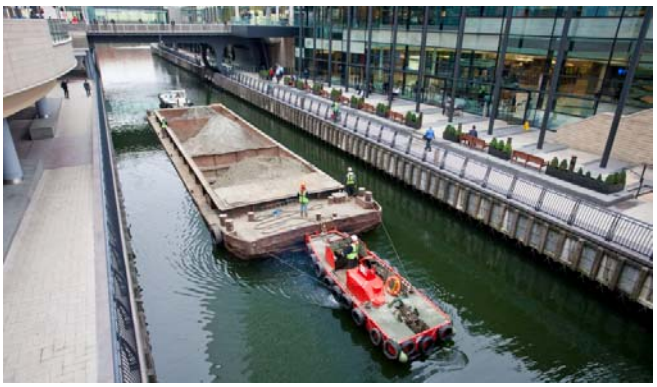
A total of over 6 million tonnes of material will be excavated by the Crossrail project – enough to fill Wembley stadium 3 times. 99% of the material has been reused or recycled with half being donated to the RSPB for Wallasea and the remainder used for agricultural land and recreational facilities.

Nearly 80% of Crossrail's excavated material has been transported by train and ship on a tonne per kilometre basis, removing 150,000 lorries off the streets of London.

Excavated material from Crossrail's stations was transported to the Docklands Transfer Site at Barking Riverside before being shipped to Wallasea. Material from Crossrail's western tunnels was transported by rail from Westbourne Park to Northfleet in Kent before being shipped to Wallasea.

The Wallasea Island Wild Coast Project is using excavated material from Crossrail's tunnels to re-profile the land to allow for a mosaic of lagoons and raised islands once the sea wall is breached later this year. It will transform 670 hectares of farmland back into coastal marshland as it was 400 years ago. It will provide a thriving wetland for tens of thousands of migratory birds and help to combat future impacts of climate change on people and wildlife including coastal flooding.

The RSPB will require more than 10 million tonnes of excavated material to create the reserve and is currently seeking partners to provide the remaining 7 million tonnes.



In 2008 Crossrail agreed a deal with RSPB to provide material excavated from beneath London to create a huge wildlife reserve in Essex. By September 2009, Crossrail signs a Memorandum of Understanding (MoU) with the Port of London Authority (PLA) to confirm its commitment to use barges and ships along the Thames to move its excavated materials.

(Andrew Dempsey/Crossrail, Thursday 23rd April 2015, http://www.crossrail.co.uk/news/articles/crossrails-final-shipment-of-earth-arrives-at-wallasea-island,

GeoEngineer, Friday, 05 June 2015, http://www.geoengineer.org/news-center/news/item/1205-new-nature-reserve-made-in-crossrail?utm_source=GeoNewsletter+%23124%2C+June+2015&utm_campaign=Geo-Newsletter-%23124-June-2015&utm_medium=email)

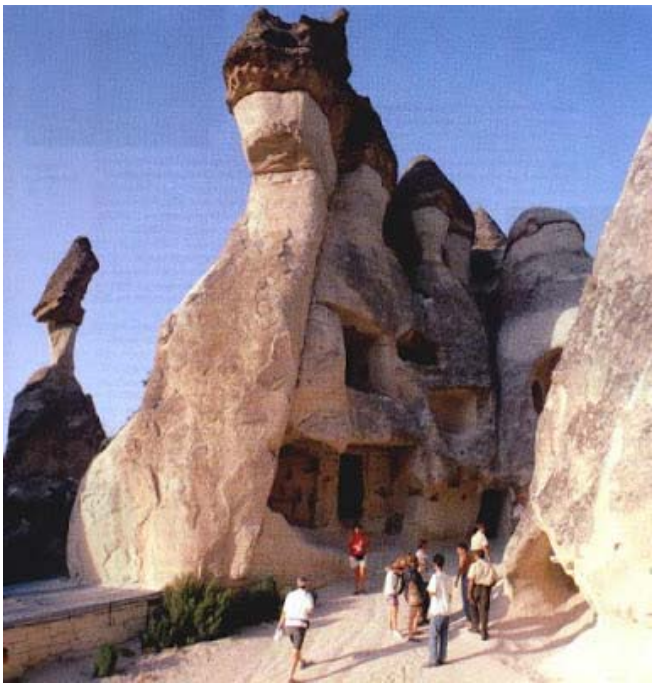
ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Καππαδοκία:
Η μεγαλύτερη υπόγεια πόλη στον κόσμο

Την Τρίτη, 23 Ιουνίου, εκπρόσωπος της UNESCO Ashish Kothari, πραγματοποίησε επίσκεψη προκειμένου να επιθεωρήσει τη μεγαλύτερη υπόγεια πόλη του κόσμου που ανακαλύφθηκε στην Κεντρική Ανατολία, στην Καππαδοκία, γύρω από το φρούριο Νεβσεχίρ.

Ο εκπρόσωπος της UNESCO συζήτησε για τις συνεχιζόμενες εργασίες καθαρισμού του χώρου με αξιωματούχους του Δήμου Νεβσεχίρ και λάμβανε ταυτόχρονα πολλές φωτογραφίες των ιστορικών θησαυρών, καθώς περιόδευε στην υπόγεια πόλη.

Η Καππαδοκία είναι μια ιστορική περιοχή και δημοφιλής τουριστικός προορισμός στην Τουρκία, δεχόμενη περίπου 3 εκατομμύρια επισκέπτες ετησίως.



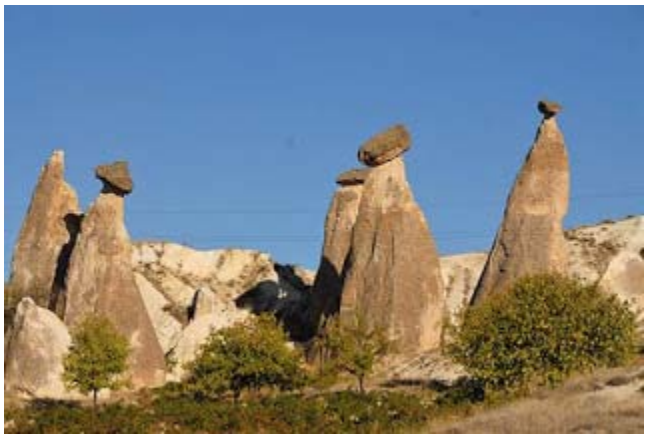
Η περιοχή είναι γνωστή για τους φυσικούς και βραχώδεις σχηματισμούς της, έχει ευρύχωρα σπήλαια, αρχαίες εκκλησίες λαξευμένες στους βράχους και υπόγειες πόλεις.

Η περιήγηση του Ashish Kothari κράτησε περίπου μία ώρα, και κατά τη διάρκειά της, πληροφορήθηκε από τους εκπροσώπους του δήμου για τα μελλοντικά σχέδια στην περιοχή που βαθμολογείται ως 3η προστατευόμενη αρχαιολογική ζώνη.

Η αρχαία υπόγεια πόλη

Οι επιστήμονες ανακοίνωσαν ότι η νέα υπόγεια πόλη στην Καππαδοκία, που ανακαλύφθηκε πρόσφατα, αποτελείται από ένα δίκτυο από σήραγγες που εκτείνονται σε μια απόσταση 7 χιλιομέτρων και εκεί δημιουργήθηκαν σπίτια, εκκλησίες και μυστικοί τάφοι.

Η υπόγεια πόλη δημιουργήθηκε πριν από 5.000 χρόνια και ανακαλύφθηκε όταν οικοδόμοι της περιοχής με εκσκαφές έπεσαν, τυχαία, επάνω σε ένα δίκτυο από στοές.



Ο υπόγειος οικισμός είναι χτισμένος σε διάφορα επίπεδα και περιλαμβάνει υπόγειους κατοικημένους χώρους, κουζίνες, κελάρια κρασιού, παρεκκλήσια και κλίμακες που οδηγούν στην επιφάνεια της γης.

Η υπόγεια αυτή πόλη μοιάζει με άλλη υπόγεια πόλη στο Ντερίνκουγιου, που βρίσκεται σε κοντινή απόσταση που ανακαλύφθηκε το 1963.

Στο Ντερίνκουγιου ζούσαν μέχρι 20 χιλιάδες κάτοικοι στην υπόγεια πόλη που έχει 11 επίπεδα.

Στο Ντερίνκουγιου και στο Νεβσεχίρ οι υπόγειες πόλεις χτίστηκαν από τους κατοίκους τους για να προστατευθούν από τους εισβολείς.

Τα προκαταρκτικά αποτελέσματα των επιστημόνων έδειξαν ότι οι υπόγειοι διάδρομοι στο Νεβσεχίρ φθάνουν σε βάθος 113 μέτρων.

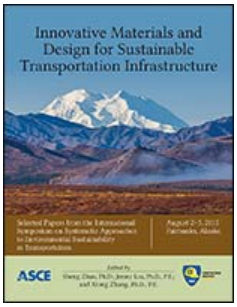
Εκατομμύρια χρόνια πριν, η ηφαιστειακή δραστηριότητα στην περιοχή της Καππαδοκίας, κάλυψε τα εδάφη με διάφορα στρώματα ηφαιστειακής τέφρας. Η διάβρωση δημιούργησε ένα ασυνήθιστο τοπίο που αποτελείται από πετρώματα και θεαματικές κορυφές που ονομάζονται «καμινάδες της νεράϊδας».

Οι βράχοι που δημιουργήθηκαν από 'ηφαιστειακή τέφρα', είναι πολύ μαλακοί και εύπλαστοι και είναι ένα ιδανικό οικοδομικό υλικό.

Η ιδέα της οικοδόμησης των υπόγειων οικισμών προέρχεται από την προ-βυζαντινή εποχή καθώς οι ειρηνικοί κάτοικοι προσπάθησαν να βρουν τρόπους να προστατευθούν από τις επιδρομές των Περσών, των Αράβων και των Σελτζούκων Τούρκων.

(Γιῶργος Ἐχέδωρος / ΜΙΚΡΕΣ ΕΚΔΟΣΕΙΣ, 24.6.15, http://www.mikres-ekdoseis.gr/2015/06/blog-post_24.html)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Innovative Materials and Design for Sustainable Transportation Infrastructure

Edited by Sheng Zhao, Jenny Liu and Xiong Zhang

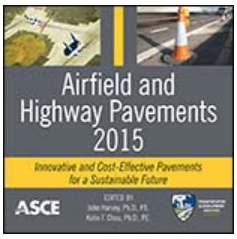
Selected papers presented at the International Symposium on Systematic Approaches to Environmental Sustainability in Transportation held in Fairbanks, Alaska, August 2-5, 2015. Sponsored by the Construction Institute of ASCE.

Innovative Materials and Design for Sustainable Transportation Infrastructure contains 37 peer-reviewed papers on innovations and advances in sustainable pavement materials.

Topics include: asphalt and concrete pavement; recycled and reusable materials; geo-materials; soil stabilization; ground improvement; and sustainable design in underground spaces.

This collection will be of interest to practitioners and researchers in transportation and infrastructure construction.

(ASCE Press, 2015)



Airfield and Highway Pavements 2015

Innovative and Cost-Effective Pavements for a Sustainable Future

Edited by John Harvey and Katie F. Chou

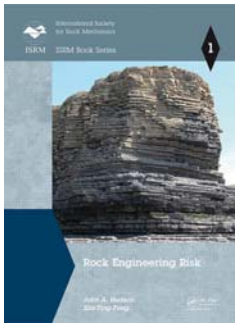
Proceedings of the International Airfield and Highway Pavements Conference 2015, held in Miami, Florida, June 7-10, 2015. Sponsored by the Transportation & Development Institute of ASCE.

This collection contains 78 peer-reviewed papers on the application of new sustainable technologies and practices for airfield and highway pavements. Papers cover the design, construction, evaluation, preservation, repair, rehabilitation, and recycling of all types of pavement materials used for highways and airfields. They describe examples of current practice and present the latest results from research and development of cutting-edge pavement materials and methods.

Topics include: recent studies from the Federal Aviation Administration's research and development efforts and the Federal Highway Administration's Strategic Highway Research Program 2 (SHRP2); modeling and analysis; accelerated pavement testing; instrumentation; and cost analysis. The design and management of pavements in Latin America is examined, along with large projects in the Miami/Fort Lauderdale area.

This collection will be of interest to civil engineers and allied professionals involved in design, construction, management, and research with pavement materials for transportation purposes.

(ASCE Press, 2015)



Rock Engineering Risk

John A. Hudson, Xia-Ting Feng

This book provides a new, necessary and valuable approach to the consideration of risk in underground engineering projects constructed within rock masses. There are Chapters on uncertainty and risk, rock engineering systems, rock fractures and rock stress, the design of a repository for radioactive waste, plus two major case examples relating to the headrace tunnels and caverns for a hydroelectric project. These Chapters highlight in detail the authors' new rock engineering risk approach, especially how monitoring during construction can significantly reduce the construction risks. The book is particularly timely given the current increasing emphasis on geo-engineering safety, accountability and sustainability—which requires stricter attention to risk and greater reliability than ever before.

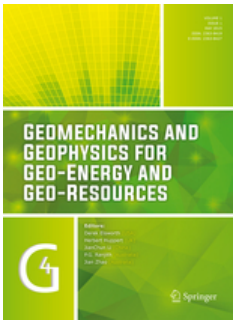
Written by two eminent authors, the two most recent past-Presidents of the International Society for Rock Mechanics (ISRM), this modern and well-illustrated guide on Rock Engineering Risk complements the authors' previous 2011 book on Rock Engineering Design, also published by CRC Press. The book will benefit engineers, contractors, clients, researchers, lecturers and advanced students who are concerned with rock engineering projects in civil, mining, geological and construction engineering worldwide.

Features

- Clearly explains basic material so that readers from different backgrounds will be able to understand the content
- Emphasizes the linking of uncertainty and risk analysis concepts to practical rock engineering projects
- Features illustrative examples of risks in major rock engineering projects and how these were minimised
- Uses risk analysis protocols to enable the reader to assess the risks involved in any rock engineering project
- Disseminates knowledge generated by the 4-year work of the ISRM Design Methodology Commission

Click here to visit the ISRM Book Series web page. ISRM members are entitled a 40% discount on the ISRM Book Series and a 30% discount on all CRC Press books. Contact the Secretariat to obtain the discount codes.

(CRC Press, May 5, 2015)



Geomechanics and Geophysics for Geo-Energy and Geo-Resources

Editors-in-Chief: D. Elsworth; H. Huppert; J. Li; P.G. Ranjith; J.Zhao

Springer will start a new journal titled "Geomechanics and Geophysics for Geo-Energy and Geo-Resources" in 2015. The journal publishes original research, new development and case studies in the field of geomechanics and geophysics with special application to energy and resources in the subsurface Earth. Papers published in 2015 and 2016 will be freely available on line.

For further information on the G4 journal
http://www.springer.com/engineering/civil+engineering/journal/40948

A source of original research, new developments and case studies spanning the fields of geomechanics and geophysics, with special application to Earth's subsurface

- Offers research, new developments and case studies spanning the fields of geomechanics and geophysics
- Includes theory and analysis, lab and field experiments, numerical methods and modeling, engineering applications and technology development
- Covers geothermal energy, unconventional oil and gas, geological disposal of energy wastes, carbon sequestration and much more

This journal offers original research, new developments, and case studies in geomechanics and geophysics, focused on energy and resources in Earth's subsurface. Covers theory, experimental results, numerical methods, modeling, engineering, technology and more.

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

http://issmge2014.ust.hk/~issmge/jun2015/1.Research_highlights.pdf

Κυκλοφόρησε το Τεύχος 3 του 9ου Τόμου του ISSMGE Bulletin (Ιουνίου 2015) με τα παρακάτω περιεχόμενα:

- Research Highlights : Texas A&M University
- Report from Past ISSMGE President : Federation of International Geo-Engineering Societies (FedIGS)
- Report from Member Society : Chinese Taipei Geotechnical Society (CTGS) – Re-run of 47th Terzaghi Lecture
- Major Project : Innovative Foundation Design for Happy Valley Underground Stormwater Storage Scheme, Hong Kong
- TC Corner : TC106 Unsaturated Soils
- Young Members' Arena : Geothermal Energy for Heating and Cooling: Full-Scale Testing and Numerical Modelling
- Major Project – Design and Construction of a Cement Stabilised-Shored Reinforced Soil Wall
- Young Members' Arena : The International Geosynthetic Society (IGS)
- Conference Report : The 3rd International Conference and Exhibition on Tunneling and Underground Space 2015 (ICETUS2015)
- Hot News : JTC-1 TR3 Forum
- Event Diary
- Corporate Associates
- Foundation Donors

www.geoengineer.org

Κυκλοφόρησε το Τεύχος #124 του **Newsletter του Geoengineer.org** (Ιουνίου 2015) με πολλές χρήσιμες πληροφορίες για όλα τα θέματα της γεωμηχανικής. Υπενθυμίζεται ότι το Newsletter εκδίδεται από τον συνάδελφο και μέλος της ΕΕΕΕΓΜ Δημήτρη Ζέκκο (secretariat@geoengineer.org).

No.30, June 2015
www.isrm.net/adm/newsletter/ver_html.php?id_newsletter=111&ver=1

Κυκλοφόρησε το Τεύχος 30 (Ιουνίου 2015) με τα παρακάτω περιεχόμενα:

- President's inaugural message
- Main achievements of the ISRM Board 2011-2015
- The ISRM held its Council meeting in Montréal, Canada
- New ISRM Fellows were inducted during the ISRM Congress 2015
- New ISRM awards to recognize the best National Groups and Commissions
- Rocha Medal 2016: winners were selected
- 13th Congress of the ISRM took place in Montréal, May 2015
- 10th ISRM online lecture by Prof. Jean Sulem, 13 July
- ISRM Online Rock Mechanics Glossary: 13 languages now available
- The 1st book of the ISRM book series was published
- New Journal related to Rock Mechanics
- 2016 ISRM International Symposium call for abstracts
- ISRM Symposium EUROCK2015 and 64th Geomechanics Colloquium
- VIII South American Congress on Rocks Mechanics, November 2015, Buenos Aires
- China Shale Gas 2015, Wuhan, China, September 2015
- Update on the Workshop on Volcanic Rocks & Soils, September 2015, Isle of Ischia, Italy
- 7th International Symposium on In-Situ Rock Stress: Submit your abstract by August 3
- Geosafe 2016 to be held in Xi'an, May 2016
- 2nd International Conference on Rock Dynamics
- ISRM Sponsored Meetings

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2012 – 2015)

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