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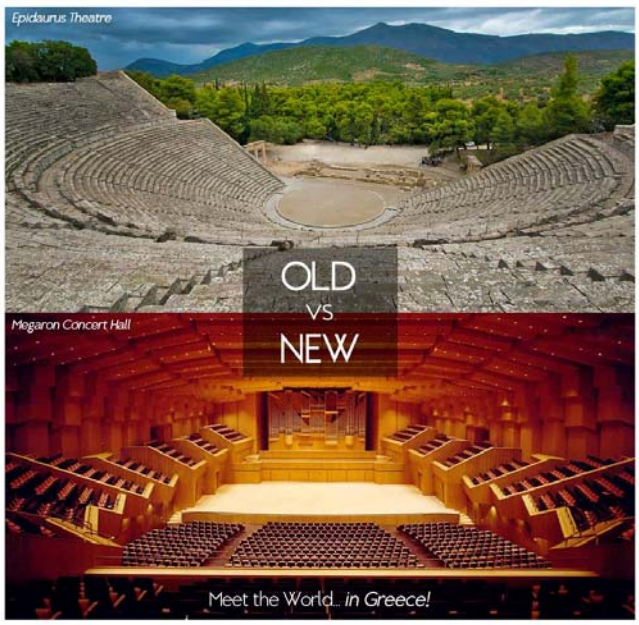


ΑΡΘΡΑ

THE COLLAPSE OF THE ANCIENT TEMPLE OF ZEUS AT OLYMPIA REVISITED

Argyris ALEXANDRIS[1], Ioannis PSYCHARIS[2] and Eleni PROTOPAPA[3]

[1] Dipl. Civ. Eng. MSc, DIC,
O.T.M. Consultants, Athens. otmate@otenet.gr

[2] Professor, School of Civil Eng.,
National Technical University of Athens.
ipsych@central.ntua.gr

[3] Dipl. Civ. Eng. MSc, DIC,
Ministry of Public Works, Div. Western Greece.
protal@windtools.gr

ABSTRACT

The temple of Zeus at Olympia in the renowned archaeological site of the Olympic Games, in SW Peloponnese, is a typical case of an ancient monument associated with claims of earthquake damage and destruction. The German archaeologists that initially excavated the site and studied the temple debris the last quarter of the 19th century, as well as later and recent investigators, postulate that the Temple although in ruinous condition, was utterly destroyed the 6th century AD by an earthquake. Recent sedimentological investigations suggest that a tsunami may also have contributed to the destruction and the subsequent burial of the temple with silt. The aim of this paper is to examine in a quantitative way the hypothesis that the last standing columns of the Temple of Zeus were overturned by the seismic shaking of a damaging earthquake and if so what was the likely intensity and characteristics of the strong ground motion at the site. On the basis of dynamic analyses of distinct element models of the columns, it is found that even exceptionally strong seismic shaking is unlikely to overturn them. The location of the fallen columns also differ significantly by the patterns revealed by the numerical analyses. On that basis the hypothesis that the columns were intentionally pulled down by ropes pulled by animals during the early Byzantine period, seems more likely and should be investigated more thoroughly.

INTRODUCTION

The general tendency of the scholars that studied the findings of early archaeological excavations and remains of ancient structures (temples, fortifications or palaces) in Greece, to frequently ascribe evidence of destruction to strong earthquakes without scrutiny, has been strongly criticized by later researchers, who emphasize the need to systematically re-examine such hypotheses. The development of modern analytical tools and laboratory techniques in a wide spectrum of scientific fields and the establishment of a consistent archaeoseismological methodology (Guidoboni et al., 2002) to evaluate and cross check the evidence, provide the necessary tools to undertake such endeavors. The benefit of such investigations is twofold: to clarify the conditions of damage and the final abandonment of important architectural complexes of the antiquity, and to provide data to probe into the seismic history of the examined sites with certain implications to our understanding of the regional seismic hazard.

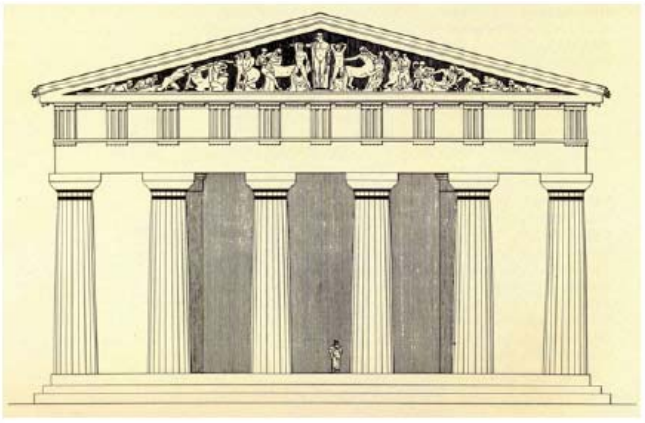
A typical example of such unverified claims for an "archaeological" earthquake is the Temple of Zeus at Olympia. The German archaeologists that initially excavated the site and studied the findings, as well as later investigators, from Dinsmoore (1940) to Younger and Rehac (2009), postulate that the Temple has been seriously damaged by strong earthquakes, and subsequently repaired in the mid 4th century B.C. and the 2nd century B.C. and was utterly destroyed by an earthquake the 6th century AD. A number of column drums, which can be observed today by the ordinary visitor of the site to lay on the ground in a domino-like fashion, form the basis of the hypothesis that at least some of the last surviving columns of the temple were overturned by a strong earthquake. Some recent researchers go beyond the traditional explanation and examine the possibility that the sanctuary of Zeus was inundated by a tsunami that reached the site the mid 6th century A.C. (Vott et al., 2011) which toppled (?) the last standing columns. They observe that the remains of the fallen columns (or at least some of them) "float" in high energy sediments probably deposited by the tsunami. The aim of this paper is to examine in a quantitative way the hypothesis that (at least) the last standing columns of the Temple of Zeus were overturned by the seismic shaking of a damaging earthquake and if so what was the likely intensity and characteristics of the strong ground motion.

THE TEMPLE OF ZEUS AT OLYMPIA

The Temple of Zeus was built from 470 to 456 BC within the sanctuary of Zeus at Olympia, under the direction of the Elean architect Libon. It was the largest Temple of the antiquity in the Peloponnese and later (circa 430 B.C.) it housed the renowned chryselephantine statue of Zeus, sculpted by Pheidias (figure 1). The peristyle of the temple consisted by 6 × 13 columns, about 10.43 m high and measured 27.5 × 64.1 m. The temple itself was over 20 m high (figure 1). Within the peristyle were the pronaos (front porch), cella (central room) and opisthodomos (rear porch) built by large limestone blocks. Two rows, each of 7 Doric columns, divided the cella into 3 aisles (see cross section in fig. 1). The platform (crepis), where the temple was standing, is 27.68 m by 64.12 m in size (figure 2) and has 3 unequal steps. The crepis was built on a foundation 2.50 m deep, presumably to reach competent ground. The temple was build by local shelly limestone covered with stucco. It stood at its place for almost a thousand years, saw moments of glory as it was the center of the Olympic festivities and suffered damages induced by natural disasters as well as warfare, invasions and looting.

The 3rd century AD saw the site suffer heavy damage either from earthquakes or man made interventions. The threat of invading tribes (Heruls) in 267 AD led to the erection of rough fortifications with robbed material from the monuments of the sanctuary. Despite the destruction observed in the monuments and the general decline of the sanctuary, the Olympic festival continued to be held until the last Olympiad in 393 AD. Apparently, after the suspension of the games the Temple of Zeus was abandoned and probably destroyed to a large extend around 426 AD following an edict by Theodosius II enforcing the ban on pagan festivals. The nearby workshop of Pheidias was turned into a Basilica and the site was inhabited by a Christian community which prospered during the 5th century AD until Justinian's plague. The two Earthquakes of the mid-6th century (522 and 551) known by historical sources that caused widespread damage to the Peloponnese are held responsible for the temple's complete destruction. Repeated floods of the nearby Kladeos river (Foundoulis et al., 2008), or flooding by a tsunami(es) according to Vott et al., (2011), ensured that the settlement was finally abandoned altogether in the early 6th Century. Over time the site was buried under accumulated alluvial deposits, up to 8 meters deep.

The exact site of ancient Olympia was re-discovered in 1766 by the English antiquarian Richard Chandler. The first excavation of the sanctuary at Olympia was not carried out



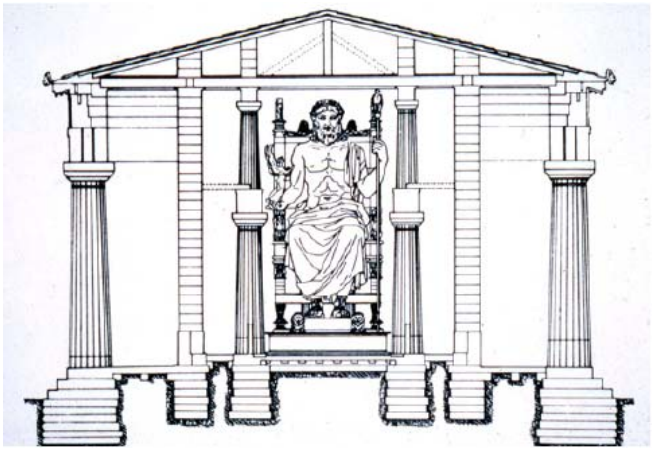


Figure 1 Reconstruction of the West façade of the temple of Zeus and of a cross section

until 1829, by the French "Expedition Scientifique de Moree" and the first systematic major excavation of Olympia began 50 years later in 1875, by the German archaeological school. During these excavations the temple of Zeus was fully uncovered by the sediments. Many columns of the southern flank were found on the ground in an impressive domino style arrangement of the drums, which was immediately interpreted by the archaeologists to be a result of an earthquake. On the basis of archaeological data they estimated that the final destruction of the temple, which was probably already in ruinous condition, took place in the mid or late sixth century AD. Figure 2 depicts the plan view of the ruins of the temple as found during the archaeological excavations of the last quarter of the 19th century and figures 3 and 4 photographs of the fallen columns during the archaeological excavations and at their present condition.

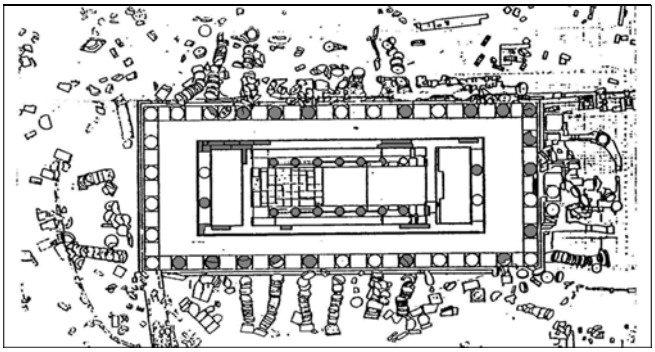


Figure 2. The ruins of the Temple of Zeus as discovered during the excavations of the last quarter of the 19th century undertaken by the German Archaeological School (Curtius and Adler 1892)

Figure 3 The fallen columns of the temple of Zeus as unearthed during the archaeological excavations of the last quarter of the 19th century (Curtius and Adler 1892).

Figure 4 The fallen columns of the temple of Zeus as they are preserved today.

SEISMOTECTONIC SETTING AND POTENTIAL EARTHQUAKE SOURCES

The tectonic activity which controls the seismic hazard in South-Western Greece is dominated by two mechanisms: thrusting along the western part of the Hellenic Arc and extension at the interior of the Arc. The first mechanism is associated with large but infrequent earthquakes, which may have affected the site from a distance, while the latter is associated by more frequent small to medium size events with a potential to affect the site from very short distances. Figure 5 depicts the major tectonic features of the Aegean arc and highlights the regions at the interior of the arc which undergo the most rapid extension, while figure 6 presents the major known active faults of the Peloponnese compiled by Lyon-Caen et al. (1986) and Lekkas et al., (1994). The site of ancient Olympia is situated within the Alphios river tectonic graben, a similar tectonic structure but significantly less active, to the Corinth gulf graben. The Alphios river graben is bounted by E-W and NE-SW trending normal faults. The length of these active faults does not exceed 25-30 km and the expected maximum earthquake magnitudes are limited to 6.0 to 6.4. The inset of figure 6 depicts the location of the Katakolo fault (KF) located at a distance of 12-15 km from the site of ancient Olympia which is the most active tectonic structure at the vicinity of the Olympia site (Lekkas et al., 1993). Offshore to the west lie the Hellenic trench where larger thrust faults are capable of producing stronger earthquakes of magnitude7.0-7.2. These faults are difficult to map and can only be traced by offshore geophysics and microearthquake surveys. Fault plane solutions of earthquakes along the arc as well as in the back arc area are presented on the map of figure 5. Intermediate depth earthquakes also occur on the subducting slab of the African plate underneath the Peloponnese. The 1962 Corinthos earthquake (M=6.8), the 1964 Messe-

nia earthquake (M=6.0), as well as the 2006 Kithira island earthquake (M=6.7) are good examples of such events. The intermediate depth earthquakes are characterized by an attenuation pattern and strong motion frequency content significantly different to the shallower events.

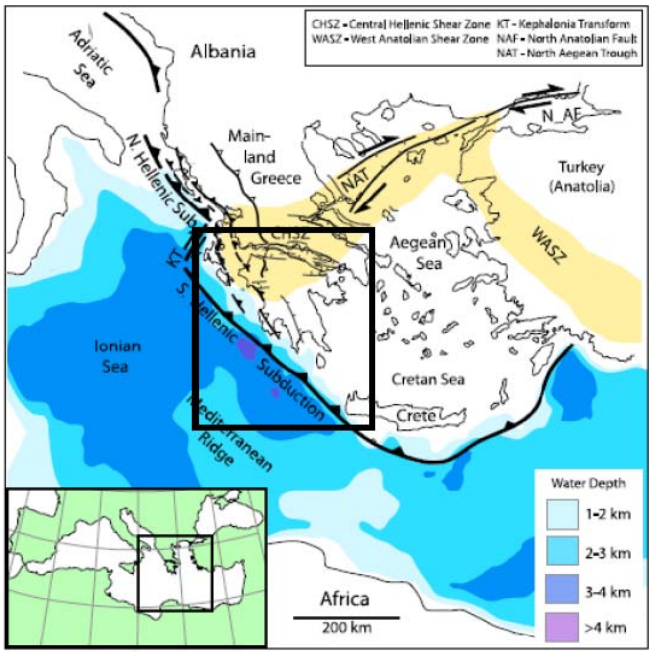


Figure 5. Tectonic setting for the Hellenic subduction zone Thick dark lines with solid barbs indicate active trenches, Orange shading indicate the zones of active oblique extension. (Royden and Papanikolaou 2011)

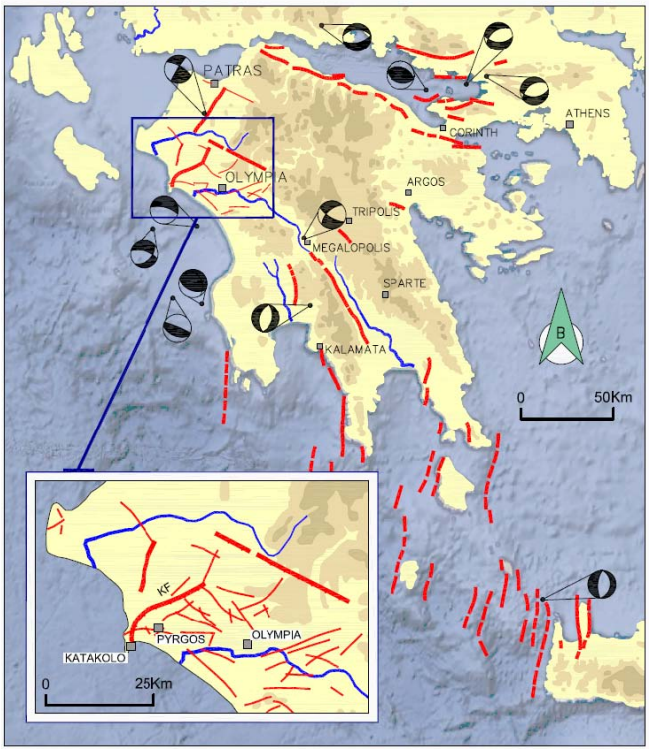


Figure 6. Active faults in the Peloponnese. The selected fault plane solutions depicted in the figure indicate the predominant tectonic stress field of the crust.

The focus of our research is the 6th century A.D. when the temple was completely destroyed and covered by sediments. As mentioned before, there is historical evidence for strong earthquakes that seriously damaged some cities of the Peloponnese during the 6th century A.D., but information is vague and confusing. During this period western Peloponnese is outside the important trade routes of the era and references by travelers and scholars are very scarce. An earthquake that damaged the city of Corinth in 521 (or 522), (Evangelatou–Notara 1988) is unlikely that had an effect in Olympia. However in 551 (or 552) according to the contemporary annalist Procopius of Caesaria damaging earthquakes occurred in the whole Greece and devastated many Greek towns (Chaeronea, Coroneia, Naupaktos and Patras) and numerous villages in Boeotia, Achaia and the Krissaean Gulf (Gulf of Itea). (Evangelatou–Notara 1987-1988, Guidoboni 1994) The extent of the earthquake damage reported by Procopius, along the entire length of the Corinth Gulf from Patras to Chaeronia, is impressive and it could only be explained by assuming a sequential reactivation of a chain of faults, which bound the southern coast of the Corinth Gulf, (shown in figure 6) occurring within a few weeks or a few months. In this case, the Olympia site would be outside the meisoseismal area of these earthquakes and damages to the temple of Zeus cannot be explained. The destruction of the temple could only be associated with these descriptions in the context of a large intermediate depth earthquake, occurring underneath the Peloponnese or an independent thrust fault event occurring offshore the western coast of the Peloponnese. In any case, the possibility that the temple was stricken by a small local earthquake, which was not associated to the earthquakes reported by Procopius, should also be considered.

On the basis of these considerations, possible earthquake scenarios for the Olympia site are: a) a near field normal fault event with a magnitude 6.0 to 6.4; b) a larger thrust fault earthquake event with a magnitude up to 7.0 to 7.2 but occurring at a longer distance; and c) an intermediate depth earthquake event of a magnitude up to 7.0-7.5 occurring deep underneath the site. Three characteristic strong motion records were selected to represent each of these scenarios: The Kalamata 1986 accelerogramm which was recorded at a close epicentral distance (R=10 km) to the Ms=5.8 normal fault earthquake, and stroke the city of Kalamata, situated 80 km south of Ancient Olympia; the 1979 Montenegro earthquake (Ms=7.2) recorded at the hotel Olympic, represents the thrust fault event, and the peculiar accelerogramm that was recorded at Bucharest during the 1977 Romanian (Vrancea) Earthquake of 1977 (M=7.0) represents the intermediate depth earthquake scenario. The possible seismic scenarios and the selected records are tabulated in table 1.

Table 1 Earthquake scenarios considered and records selected

Earthquake scenarios			Representative Record	
Earthquake magnitude M	Distance from the source (km)	Earthquake mechanism and source depth		
M=6.0-6.4	5-10 km	Normal or Strike Slip Shallow	**Kalamata 1986** (OTE Building) Ms=5.75, R=10 km	**PGA=0.27g PGV=32.3 cm/sec**
M=7.0-7.2	30 -50 km	Thrust Shallow	**Montenegro 1979** (Ulcinj-Hotel Olimpic) Ms=7.2, R= 24 km	**PGA=0.29g PGV=47.1 cm/sec**
M=7.0-7.5	40-80 km	Thrust Intermediate depth	**Bucharest 1973** (Building Res. Institute) Ms=7.05, R= 161 km	**PGA=0.20g PGV=73.1 cm/sec**

We deliberately selected records with a strong impulsive character, attributed to directivity effects, because it is well known from previous studies on the seismic response of ancient columns (e.g. Psycharis et al. 2000) that such structural systems are more vulnerable to long period pulses. The acceleration and velocity time histories of the strongest component of the selected records are presented in Figure 7 along with their response spectra. The earthquake records and the relevant metadata were taken by the Ambraseys et al., (2000) strong motion record collection.

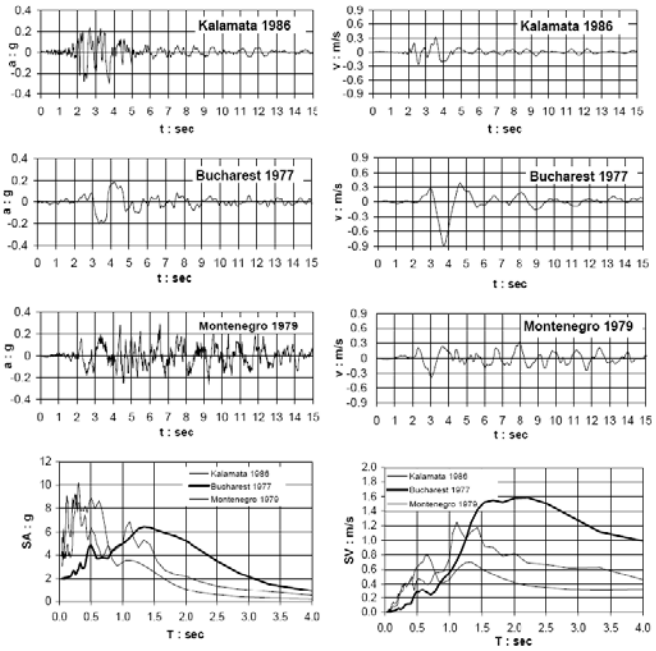


Figure 7. The stronger component of the three records used in the analyses and corresponding response spectra

STRUCTURAL RESPONSE

Ancient Greek and Roman Temple columns are constructed by a number of prismatic rock blocks (drums) that lie on top of each other without mortar or any other bonding material. There are only a few exceptional cases of monolithic columns. Under earthquake excitations the column blocks can slide or rock, accumulating permanent dislocations and in extreme cases overturn. Each column of the temple of Zeus was constructed by 14 drums of equal height. The columns were crowned by Doric capitals and on top of them the architrave blocks and entablature slabs were connecting the columns to a continuous colonnade supporting the roof. The typical column of the peristyle of the temple has base diameter 2.21 m and top diameter (below the capital) 1.70 m. The aspect ratio of the typical column of the flanks is H/D=4.73. The size and the proportions of the typical column of the temple of Zeus at Olympia are compared with the columns of other Doric style ancient temples in figure 8. It can be seen that the columns of the temple of Zeus at Olympia are slightly higher than the columns of the Athenian Parthenon and the columns of the temple of Zeus at Nemea, but they are significantly less slender and hence significantly more resistant to earthquake shaking.

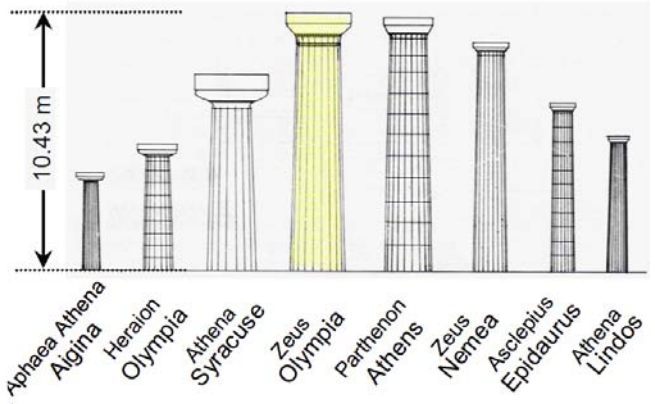


Figure 8. Comparison of a typical column of the temple of Zeus at Olympia with columns from other classical Doric temples (after Müller-Wiener 1988)

The earthquake response of single and multi drum columns is a complicated, highly non linear structural problem. The dynamics of a rocking block were investigated originally by Housner (1963) and subsequently by many other researchers, either by analytical or by numerical methods. Analytical solutions are limited only to the study of the transient response of two dimensional free standing blocks, subjected to trigonometric or other simple pulses (e.g. Makris and Rousos 2000, Jhang and Makris 2001, Dimitrakopoulos & DeJong 2012 and Voyagaki et al. 2013). However these solutions are valuable since they provide insights to the controlling parameters of the response and can provide an approximate estimates of the safety of more complex rocking structures.

In figure 9, on the basis of the safe-unsafe boundaries derived by Jhang and Makris (2001), we compare the safety of the "equivalent single blocks" of all the Doric style columns presented in figure 8, when subjected to a cosine and a sine pulse of a_g=0.5g and T_p=0.8 sec and a_g=0.3g and T_p=1.5 sec. The first case grossly represent the directivity pulse of a small earthquake at short site to source distances and the latter the directivity pulse of a larger earthquake at larger distances. It is observed that the larger columns (Zeus at Olympia, Zeus at Nemea, Athens Parthenon) are less likely to overturn because of their lower p values (where $p = \sqrt{3}g/(4R)$ and $R = \sqrt{b2 + h2}$ = half diagonal of the block-a measure of its size). Moreover, the relatively small aspect ratio of the columns of the temple of Zeus at Olympia classifies them among the most resistant between the columns shown in figure 8. On the basis of this comparison, under single strong motion pulses of duration longer than 1.5 sec and amplitude higher than 0.3g, most of the columns shown in figure 8 are likely to overturn if they behaved monolithically.

Despite the valuable insight provided by analytical treatment of the rocking response of rigid blocks, numerical analysis of such systems is more flexible and can handle complex 3 dimensional multi-block columns subjected to real earthquake excitations. The distinct element method in particular, which was selected here for our analyses, has been employed in the past (Psycharis et al. 1998, Psycharis et al. 2000, Psycharis 2007, Psycharis et al. 2013), to simulate the dynamic response of multi-drum column assemblies, with satisfactory results. Although the dynamic response of such systems is very sensitive to initial and boundary conditions, it has been acknowledged that distinct element models do capture the most significant aspects of real dynamic behavior, as compared by observed response during shaking table tests (Papantonopoulos et al. 2002, Papantonopoulos et al. 2009) does not suffer from compromises on reproducing the details of a real life multi block assemblies comprising ancient monuments. In the context of the present investigation, models of a single free standing column as well as a pair of columns coupled by an architrave (limestone slabs) were set up and analyzed by the commercially available distinct element code 3DEC (Itasca Consulting Group). The numerical models presented in figure 10 are used not only as a means to constrain the strong motion level necessary to overturn the columns, but also to investigate the mode of collapse and to predict the final location of the fallen column which can be compared directly to their position in the archaeological site. The modeling methodology and the material model parameters are similar to the ones presented by Psycharis (2007).

A series of 3-dimensonal dynamic analyses of the single column model, subjected to the earthquake records selected in the previous paragraph, was performed by gradually scaling them up until instability of the column is reached in order to bracket the strong motion intensity necessary to overturn the columns and to study the mode of rocking. Figure 11 summarizes the results of these numerical analyses, in the form of maximum response displacement of the capital versus the peak ground accelera-

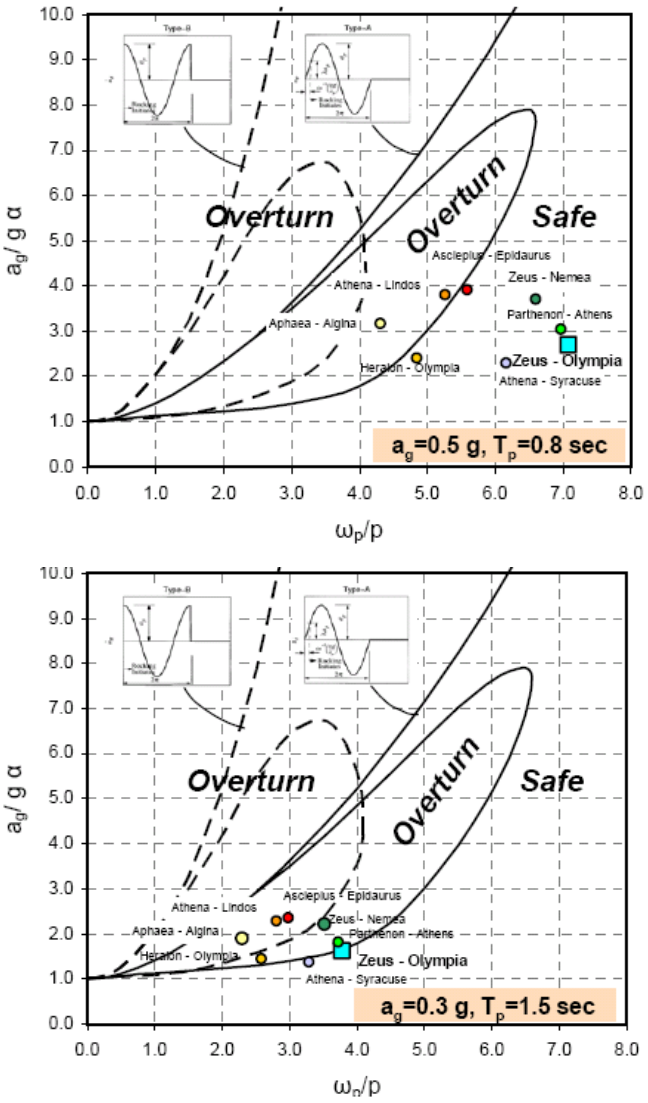


Figure 9. Safety against overturning for cycloidal pulses of single free standing blocks with the aspect ratios of the columns presented in figure 8. Upper chart: safety margins to a pulse (sine or cosine) with a_g=0.5g and T_p=0.8 sec. Lower chart safety margins to a pulse with a_g=0.3g and T_p=1.5 sec. The excitation amplitude of the cycloidal pulse is normalized to the overturning angle of the block under static conditions α=tan-1(b/h).

tion and peak ground velocity of the excitation. The free standing columns of the temple of Zeus overturn for a peak ground acceleration of 0.24 to 1.20 g, depending on the period of the directivity pulse contained in the record and for a peak ground velocity of 70-130 cm/sec. The peak ground velocity is better correlated to the maximum rotation of the column and is a better indicator of the overturning potential of the record as suggested also by other researchers in the field (Makris and Roussos 2000). The strong motion of a small local earthquake, like the Kalamata 1986 earthquake, is unlikely to overturn a free standing column, since the Kalamata record should be scaled up almost by a factor of 4.5(!) to overturn it. Likewise the Montenegro 1979 record should be scaled up by a factor of 1.8 to overturn a free standing column. On the other hand the Bucharest 1973 record represent a more realistic scenario, since it overturns the column almost without scaling. With respect to the mode of rocking, for all the examined records, the column generally rocks vigorously and looses its upper 5 to 10 drums, but with no exception a number of the lower drums remain in place, as shown in figure 12. It is stressed out at this point that in the archaeological site only the first drum was found in place on the temple platform (crepis). All the other column drums lay in a domino-like fashion aside the temple.

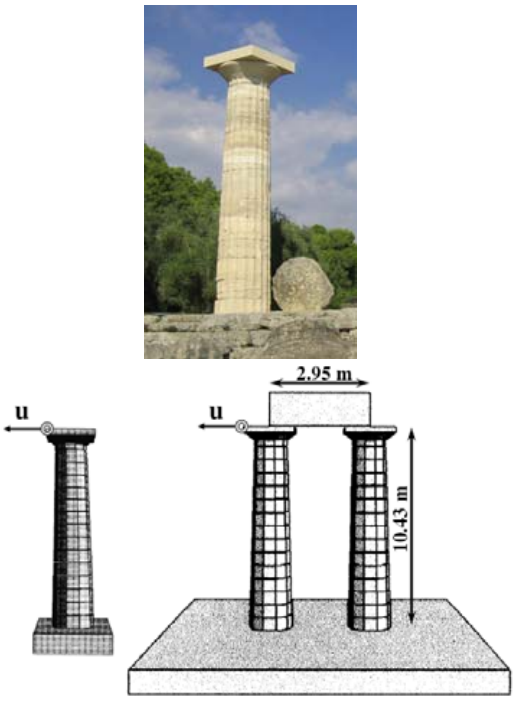


Figure 10. 3DEC single and two-column models used in the analyses. A recently restored column of the temple is shown on the photograph.

The mode of rocking of a couple of identical columns linked with rigid slabs (representing the architrave blocks) is more complex. The mode of rocking of the system is altered by the addition of the blocks on top of the columns due to the increased inertia. Analytical work presented by Makris and Vassiliou (2013) for a plane trilith rocking frame, shows that the addition of a beam on top of a couple of slender rigid blocks increases their in plane resistance to overturning. In the three dimensional space the induced asymmetry of the system also contribute to the increased dynamic resistance of the system. The two columns do not rock in phase and consequently the top beam starts to rotate in order to follow the asynchronously rocking columns. This mechanism cancels-out some high and medium frequency pulses and consumes energy by friction between the top beam and the columns. The instability of the system occurs with an out-of-plane overturning of one or both columns. The stability thresholds are for the two column model is significantly higher. The Bucharest 1973 record should be scaled up 1.6 times to overturn the two-column model, the Montenegro 1979 record, 2.0 times and the Kalamata record 6.0(!) times. When the strongest component of the accelerogramm is aligned to the colonnade axis the required scaling is even higher. Figures 13 and 14 present the mode of rocking of a two-column model subjected to the Bucharest 1973 and the Montenegro 1979 record. The mode of collapse does not change significantly when we rotate the two components of the record to align the stronger or the weaker one with the colonnade axis. However the stability is found to be significantly higher when the stronger component is parallel to the colonnade axis. In these figures it is also observed that only the upper drums of the columns and the capital fall over while a number of the lower drums remain in place. Figure 14 presents in plan view the likely location of the fallen debris of the two-column model. It is observed that due to the top beam rotation it is more likely the columns to reach the ground at an angle to the colonnade axis and less likely to overturn in a perpendicular direction. However the fallen drum patterns are different to the ones unearthed by the archaeologists

during the excavations of the site (compare figure 2 to figure 15).

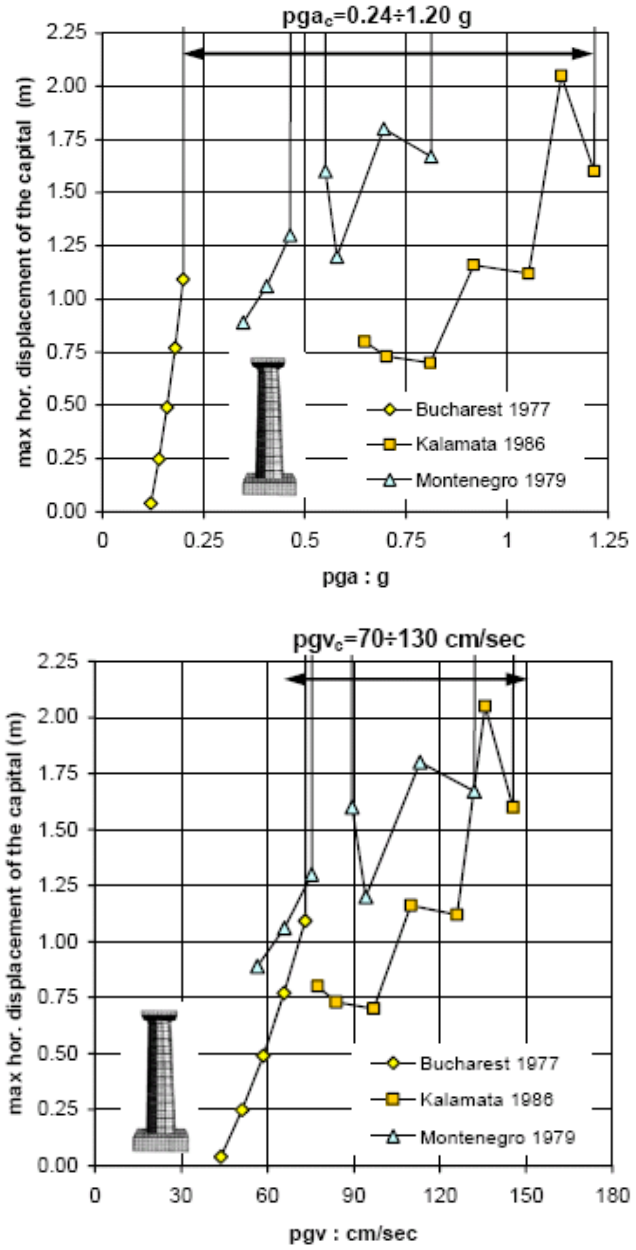


Figure 11. Maximum horizontal displacement registered at the top of a free standing column model versus pga and pgv of the scaled records.

7. DISCUSSION AND CONCLUSIONS

On the basis of the analyses presented previously, it seems that free standing columns or the colonnades of the peristyle of the temple of Zeus at Olympia are significantly resistant to ordinary strong ground motions and they could have toppled only by a strong earthquake shaking containing an exceptionally high amplitude long period pulse(s). Such pulses have been recorded in the near field of large earthquakes (M>6.5) but it is unlikely to be inherent in the strong motion of smaller local earthquakes, like the ones associated with the relatively short length faults mapped in the vicinity of the Olympia site. Intermediate depth earthquakes occurring underneath the Peloponnese or thrust fault events occurring offshore the western coast of Peloponnese are possible and more likely sources of such strong ground motions.

The careful examination of the temple debris poses further questions than provide answers. In all the analyses presented here, when the columns topple more than four of the lower column drums remain in place and only the upper part of the column falls over. This mode of failure revealed by the analyses is clearly not in agreement with the location of the fallen drums found on site.

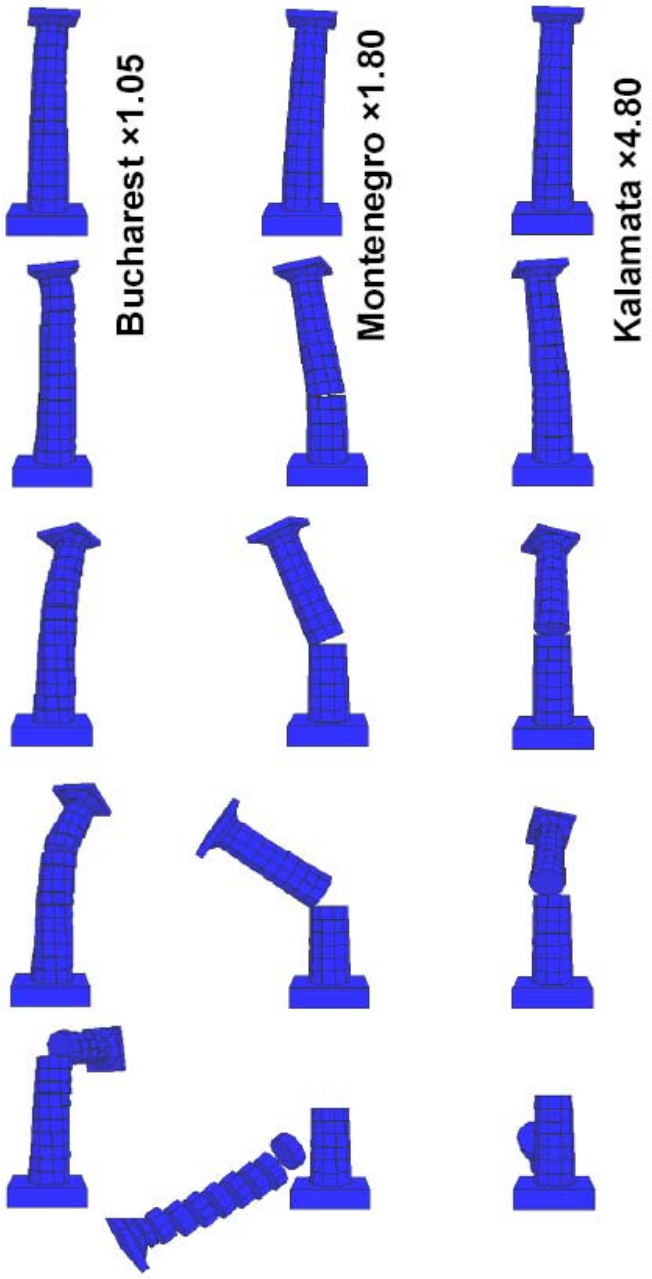


Figure 12.Rocking mode and overturning of a free standing column under the excitation of the three scaled records.

The radial arrangement of the fallen columns might suggest that either human action led the temple's final destruction, or that the preservation of the roof elements in their place when the earthquake stroke, produced such a pattern of fallen debris. In figure 2 it can be observed that six of the columns of the southern flank were found overturned straight to the south, while five of the columns of the northern flank have been toppled to the North. Moreover, two of the columns of the western flank are found overturned to the west and one of the columns of the East flank to the east. Not a single column was found overturned towards the interior of the peristyle. It might be postulated that the superstructure elements and the temple roof might pushed the columns in an outward direction and is responsible for this radial arrangement of the fallen columns. But where are the superstructure elements? The cella wall blocks, as well as almost all of the frieze blocks, were never

found on site, which means that either before or after the collapse of the temple the debris have been extensively robbed. A reasonable answer is that the blocks that were fit for second use were removed and used probably for other constructions and only the enormous cylindrical column drums, that was difficult to cut or move, were abandoned on site.

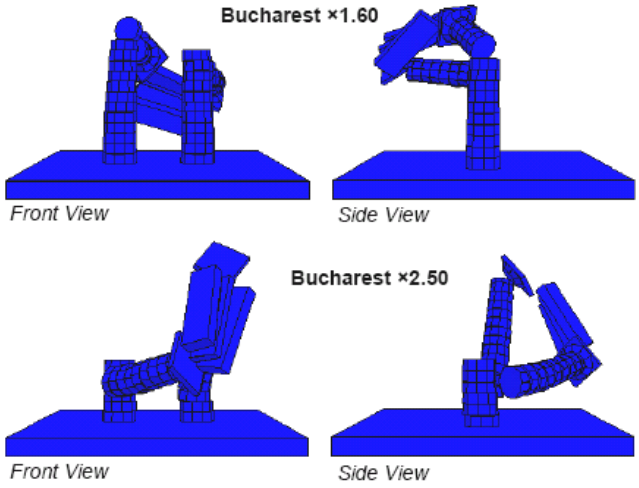


Figure 13. Snapshots of a two-column model subjected to the Bucharest (×1.6) record. The strongest component of the record is applied normal (left) and along (right) the axis of the colonnade

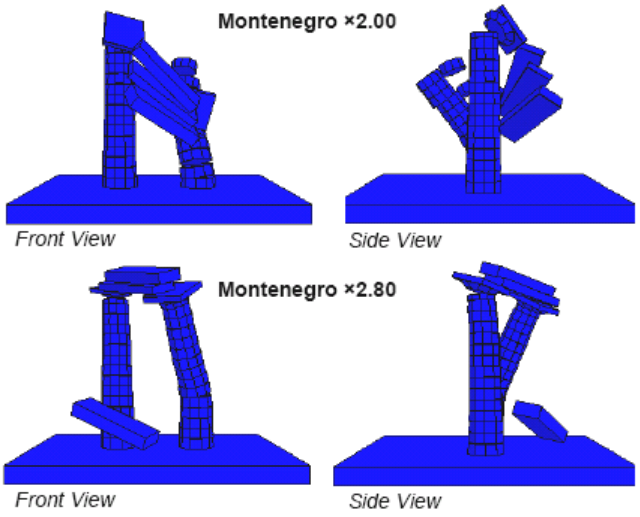


Figure 14. Snapshots of a two-column model subjected to the Bucharest (×1.6) record. The strongest component of the record is applied normal (left) and along (right) the axis of the colonnade.

But if it is not an earthquake that destroyed the temple what were the means and the methods that were used during the early Byzantine period to demolish such structures? Prof. S.Miller, who describes the gradual demolition of the temple of Zeus at Nemea (Miller S. 1986), notices that a simple method to topple the slender (but massive) columns of this temple, was to undermine them either by removing the stylobate blocks or by breaking the bottom drum. A seriously undermined surviving column is a living proof of this practice, also referred as tree-felling technique. A lively description of the methods used for the destruction of ancient temples in the late 4th century A.D. is also provided by Theodoret in his "Ecclesiastical History" (see also Talloen and Vercauteren 2011) where he describes the destruction of the Temple of Zeus at Apamea in Syria by Cynegius, the praetorian prefect of emperor Theodosius I in the East. "An initial attempt was made to pull down the temple but the stone was so hard and the columns so massive, and held together with iron and clamps, that the prefect despaired of pulling them down. Praying for divine assistance, he was visited the next morning by a simple laborer, who suggested that the foundation of three of the columns be undermined and replaced by timber beams, to which he then set fire. When their support had vanished the columns themselves fell down, and dragged the other twelve with them. The side of the temple which was connected with the columns was dragged down by the violence of their fall, and carried away with them".

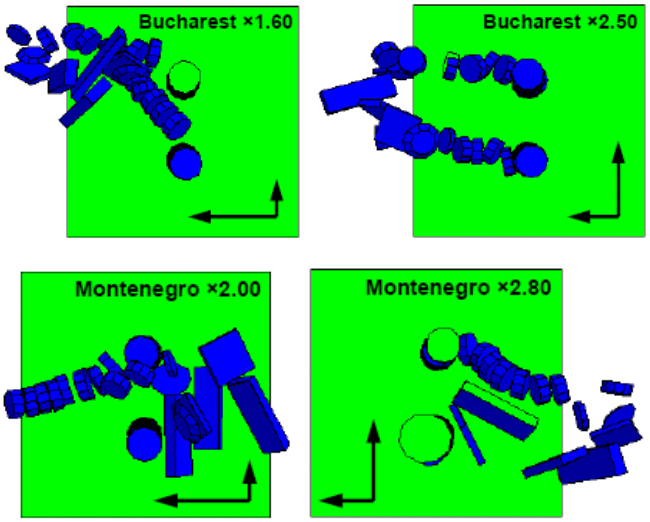


Figure 15. Final position of the collapsed columns for the Bucharest (up) and the Montenegro (down) records (from figures 13 and 14). The long arrow indicates the direction of the strongest component of the record.

By examining the fallen columns of the temple of Zeus, one can also observe that in 18 from the 34 columns of the peristyle the bottom drum (gray shaded in figure 2) was found in place, and that the crepidoma is also intact. Most drums of the fallen columns are also intact and hence we can safely conclude that the undermining technique was definitely not used in Olympia. The other method to overturn the columns is to pull them down by ropes and pack animals (figure 16). Given the size of the columns of the temple of Zeus at Olympia and their low aspect ratio it would be required a significant effort and resources for such an endeavor. Each column weights approximately 80 tons and with a slenderness ratio of 4.73 a horizontal force of 17 tons would be required under static conditions to overturn them. A single column would require at least 16 of the strongest horses and at least 10 strong oxes to apply such a force. The provision of the animals as well as the necessary ropes for such an operation would require a considerable preparation and organization.

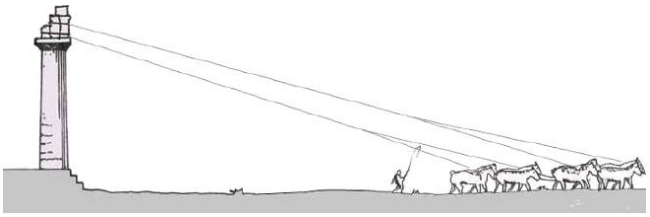


Figure 16. A possible method to pull down the columns using pack animals and ropes.

In conclusion, our analyses highlighted the resistance of columns with the size and proportions of those of the temple of Zeus at Olympia to earthquake shaking and their relative vulnerability to impulsive near fault motions. The toppled columns of the temple could be the imprint of

strong motions similar to the Bucharest or the Montenegro records, while smaller earthquakes are unlikely to produce such long period-high velocity pulses able to topple the columns. However the domino like pattern of many columns as well as the radial pattern of some of the columns around the temple is more difficult to explain by considering simple one or two-column models. A more complete structure (with some roof elements) might end up in the ground in a similar manner, but such a model has not been investigated in the present stage of research.

8. ACKNOWLEDGMENTS

We would like to acknowledge the contribution of archaeologist Athena Plaini to the investigation of the seismic history of the temple of Zeus. We also benefited considerably by stimulating discussions on the construction and preservation of ancient Greek temples, with Dr E.Toumbakari of the Greek Ministry of Culture. OTM S.A. generously supported the first author at various stages of this work through its R&D funding program.

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The 10-year Extended Landslip Preventive Measures Project in Hong Kong

Introduction

Hong Kong has a population of over 7 million. It has a small land area of about 1,100 km2, about 60% of which comprises hilly terrain. The scarcity of flat land had led to dense urban development on hillsides in the past. At the time of rapid economic expansions in the 1960s to 1970s, the little statutory control in regulating slope formation works had led to a large stock of substandard and potentially unstable slopes in the territory. Coupled with high seasonal rainfall, there were frequent landslides claiming many lives. In particular, two disastrous landslides occurred on 18 June 1972 making it the darkest day in the history of landslides in Hong Kong. One of these landslides involved the collapse of a 40 m high road embankment in a resettlement estate, killing 71 people. The other occurred on a steep hillside in a residential area. The debris demolished a 13-storey building, killing 67 people.

Since its establishment in 1977, the Geotechnical Engineering Office (GEO) has developed and operated a comprehensive Slope Safety System to manage the acute landslide problem in Hong Kong. One of the key components of this System was the implementation of the Landslip Preventive Measures Programme (LPMP) from 1977 to 2010 to systematically study and retrofit old substandard man-made slopes.

The Project

The LPMP had undergone various stages of evolution to cope with the growing demand and expectation of the public for slope safety. In the period 2000-2010, the GEO launched a project entitled "**10-year Extended LPM Project**" under the LPMP. The Project targeted to upgrade 2,500 substandard slopes. These were selected from a pool of 60,000 slopes and the most deserving ones were selected by means of a risk-based priority ranking system. The locations of the slopes are shown in Figure 1. The total expenditure of the Project was about US$ 1200 million.

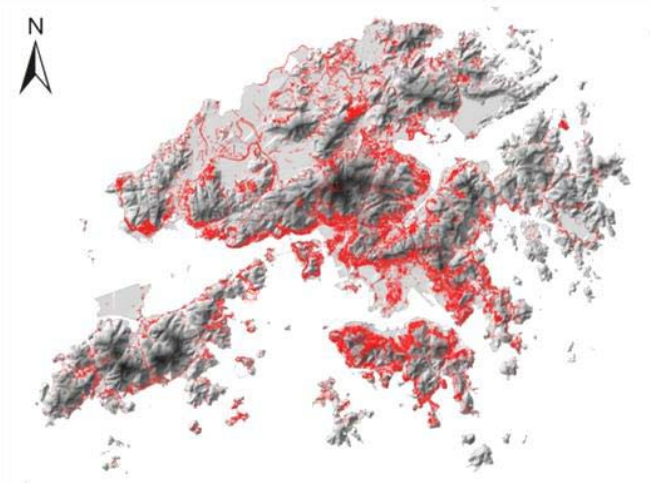

Figure 1. Location of Man-made Slopes in Hong Kong

Challenges of the Project

The Project involved upgrading a large number of slopes, the majority of which are located close to existing buildings and busy roads (Figure 2). There were over 150 active construction sites, scattered around the territory, at any one time throughout the project period. The scale and potential impact of the works called for close liaison with the stakeholders affected, effective project management, careful selection of design options, thorough planning of site logistics and good construction control. The increasing public expectation on aesthetically-pleasing slope appearance also posed a great challenge.

Figure 2. Slopes Close to Existing Developments and Busy Roads

Application of Innovative Ideas and Technology

The challenges of the Project were overcome through innovative application of technology, engineering skills and practices in the project delivery, as illustrated by the following examples.

Pioneering design options

Up to the late 1980's, substandard soil cut slopes in Hong Kong were commonly treated by trimming back to a gentle angle. However, it was recognized that there were uncertainties inherent in a slope design such as the geological model, selection of slip surfaces, groundwater conditions and shear strength of the groundmass. With growing number of sites with space limitation and occurrence of several massive failures of some of these "trimmed-back" slopes, a pioneering approach was adopted in the Project by using soil nailing as the common engineering solution for improving the stability of cut slopes. The soil nailing technique is simple and versatile, rendering it adaptable to the physical constraints usually encountered in typical slope sites. In addition, because soil nails are usually installed at close spacing, they can reduce the vulnerability of the slope to undetected weak geological zones and unfavourable relict joints by binding the soil together to form an integral mass. That means soil-nailed cut slopes are more robust and reliable. More than 2,000 cut slopes were upgraded by soil nailing under the Project, and the track record has been excellent in that no major failures have occurred on the soil-nailed cut slopes so far. In order to improve the soil nailing technology, studies comprising field tests, site trials, laboratory tests, numerical modeling and physical modeling were conducted, which culminated in the publication of a technical standard on soil nailing works (GEO 2008).

For some large slopes exceeding 100 m in height, novel schemes such as hand-dug caissons and drainage tunnels had been adopted respectively in addition to the typical stabilization measures (Figures 3 and 4).

Figure 3. Hand-dug Caissons

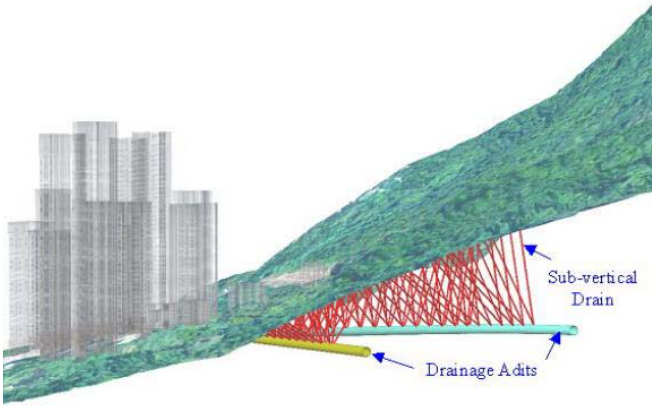

Figure 4. Drainage Tunnels

Loose fill slopes were traditionally stabilized by removing and recompacting the upper few metres of loose material. The construction involved extensive earthworks and clearance of the vegetation on the slopes. To minimize the disturbance to the environment, various innovative stabilization methods had been developed and tried out, including grouting, installation of displacement piles, pit-by-pit fill replacement and installation of soil nails. The latter two design options have proved to be effective in enhancing the stability of fill slopes and involve relatively simple works for common site settings in Hong Kong, and they have now become a common practice. The use of soil nails and concrete grillage to stabilize loose fill slopes is a cutting edge technology (Figure 5).

Figure 5. Use of Soil Nails to Stabilize Fill Slopes

Novel construction materials

To enhance the effectiveness and efficiency of the works, our project engineers always look for opportunities to apply novel construction materials. An example is the application of numerous novel proprietary products for greening of steep slopes that are protected by hard covers (Figure 6). This improved the appearance of the slopes. Another example is the trial use of carbon fibre soil nails, which is a lightweight and corrosion-free material.

Figure 6. Proprietary Products for Greening on Hard Surface

Innovative construction processes

Soil nail installation requires the erecting of a working platform. In the upgrading of slopes along some busy roads which could not be closed for more than a few hours a day, the erection of a permanent working platform was not pos-

sible. To overcome the site constraint, mobile platforms were used, which could be put in place quickly and removed at the end of work every day (Figure 7).

Figure 7. Mobile Platform for Soil Nailing Works

New technology for quality control

Like other buried works, it is difficult to verify the quality of soil nails once installed in the ground. The GEO pioneered the use of the time domain reflectometry (TDR) testing technique to check the length and grout integrity of installed soil nails (Cheung & Lo 2011). The TDR test is simple, economical and reliable. This provided additional assurance on the quality of soil nails.

Advances in Slope Engineering Practice

Besides the implementation of slope upgrading works, systematic landslide investigations were carried out as part of the 10-year Extended LPM Project, which have led to a better understanding of the nature of slope safety problems in Hong Kong. Through diagnosis of landslide incidents, areas for improvement in further enhancing the reliability and robustness of engineered slopes were identified. Guidance on improved slope engineering practice arising from the findings of landslide investigations was promulgated to the profession through the publication of GEO Reports, Geoguides and Technical Guidance Notes, all of which are available for free downloading from the departmental website www.cedd.gov.hk/eng/publications/geo/index.htlm.

Sustainability Considerations

Sustainability considerations from the environmental, social and economic perspectives were incorporated in all aspects of the Project.

Environmental perspective

An integrated management system complying with ISO 14001 was in place. Contractual provisions were also incorporated in works contracts requiring contractors to develop an environmental management plan at an early stage to identify the potential environmental impact of the works and propose necessary mitigation measures. Audits were regularly conducted to ensure compliance with the requirements.

A holistic approach in slope greening was adopted. Special emphasis was placed in making the appearance of the slopes, after the upgrading works, as natural as possible and blending with their surroundings. In this regard, existing vegetation on slopes would be preserved wherever possible. The surface of the upgraded slopes would be vegetated with native tree or shrub species for developing an eco-friendly environment (Figure 8).

(a) Before LPM Works

(b) After LPM Works

Figure 8. Landscape Treatment for an Upgraded Slope

Where a hard surfacing was required, landscape treatments would be applied to minimize the visual impact. Under the Project, more than two million trees and shrubs were planted. The slope greening efforts had not only won the general approval of the public but also recognition from professional bodies (Figure 9). The experience gained in the Project has helped establish good practices on slope greening and landscape treatment.

Social perspective

Due to close proximity of the works to urbanized areas, it was imperative to solicit supports from the local community to ensure smooth implementation of the Project. Public engagement activities in the form of public forums or meetings were conducted at an early stage, to collect feedback and views from the community affected by the works. Their views and opinions would be incorporated in the design and construction process as far as possible. Close partnering with the community helped earn people's trust, which is essential for smooth delivery of the Project.

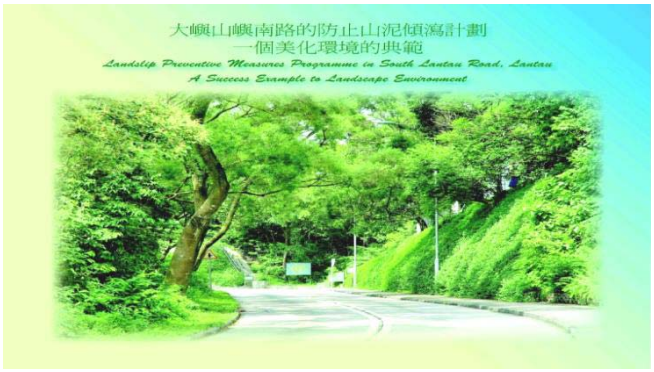

Figure 9. A Booklet Showing Successful Landscape Measures on Slopes (top) and Achievement in Slope Appearance Appreciated by Landscape Professionals (bottom)

Slope works are intrinsically dangerous due to the need to work at height, which is exacerbated by the steepness of the slopes, difficult access and lack of working space. The price of site accidents to the society was high. To address this problem, a number of safety initiatives had been incorporated in the Project, such as a "Pay for Safety Scheme" which comprised separate pre-priced payment items on safety provisions in all works contracts to encourage contractors to enhance site safety (Tang et al. 2007). To foster and sustain a safety culture, Site Safety Management Committee meetings with the top management of contractors were held regularly and surveillance safety inspections were frequently conducted. Through the concerted effort, the accident rate of the Project had remained low, being less than 0.3 accidents per 100,000 man-hours and with no fatal accident.

Economic perspective

The Project created about 18,000 jobs (in man-years) for professionals, technical staff and construction workers, providing stable employment. Training courses and experience sharing among the stakeholders were conducted regularly to facilitate skill development and technology transfer among the industry. Improvement in slope safety reduced disruption to the society and economic losses arising from landslides.

Project Planning and Delivery

Engagement of Consultants and Contractors

Due to the large amount of design and construction works involved, the GEO partnered with the geotechnical profession to provide leverage on their resources for project implementation. At peak production, there were more than 40 consultancy agreements and 40 works contracts. For quality assurance, a list of consultants and a list of contractors meeting specified financial, technical, and management criteria were established. Only those consultants and contractors on the lists would be engaged for the Project. Regular liaison meetings were held with the consultants and contractors to share experience and address general issues of concern. Almost all the consultancy agreements and work contracts were completed satisfactorily with little contractual dispute.

Financial management

The GEO exercised stringent financial management for the Project. Management meetings at different levels were regularly conducted to closely monitor the expenditure to avoid over or under spending. The annual fund allocation (budget) was generally around US$ 110 million. The Project was successfully completed within budget, with the annual expenditure kept within 95% to 99% of the allocation.

Programme management

In order to ensure that the overall project target would be met, milestone output in terms of number of slopes upgraded was set each year. The programme management team planned ahead, taking into account the lead time required for consultants selection, site investigation, design and construction. The output of the Project was monitored closely through regular management meetings at different levels. An information management system which records budget, nature and progress of the works at each slope site was developed to facilitate efficient programme management. Through the concerted efforts, the annual target output was achieved consistently throughout the 10-year project period. The Project was successfully completed in 2010. A total of 3,080 slopes were upgraded, which exceeded the target by more than 20%.

Contribution to the Well-being of People and Communities

Upon the completion of the Project in 2010, the landslide risk arising from slopes was assessed by state-of-the-art quantitative risk assessment to have been reduced to less than 50% of that in 2000. This is reflected by the substantial decrease in the number of people killed by landslides in recent years (Figure 10). The improvement in slope safety is also a pre-requisite to land development and infrastructure construction, and one of the key success factors enabling Hong Kong to develop into one of the most vibrant economies in the world.

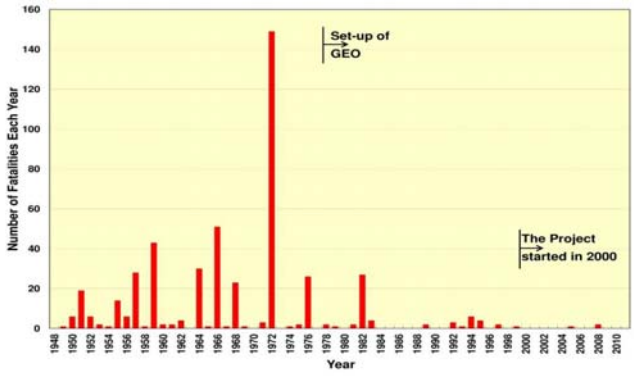

Figure 10. Landslide Fatalities in Hong Kong from 1948 to 2010

Epilogue

Despite the achievements of the LPM Project, there are still residual landslide risks which would pose a threat to the community of Hong Kong. Therefore, a long-term Landslip Prevention and Mitigation Programme (LPMitP) was rolled out by the GEO in 2010 to dovetail with the LPMP. Apart from man-made slopes, the Programme also mitigates landslide risk from natural terrain. A natural terrain hazard

study (NTHS) is carried out to formulate the geological and geomorphological model for the hillside and evaluate the hazards involved. Technical development work has been instrumental in formulating Quantitative Risk Assessment (QRA) and Design Event methodology for application to NTHS (Ng et al, 2003). Significant advances have also been made in the application of digital and remote sensing technologies, such as digital photogrammetry, Geographic Information System (GIS) and terrestrial and air-borne LiDAR, to enhance the capability and efficiency of NTHS (Wong, 2007).

The strategy of the LPMitP is to contain the remaining landslide risks to within an as low as reasonably practicable level through rolling enhancement of man-made slopes and systematic mitigation of natural terrain hazards.

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(1st runner up of the ISSMGE's Outstanding Geotechnical Project Award, Hong Kong Geotechnical Engineering Office, ISSMGE Bulletin: Volume 8, Issue 4, pp. 36-40)

ΝΕΕΣ ΚΛΟΠΕΣ ΣΤΟΝ ΤΟΜΕΑ ΓΕΩΤΕΧΝΙΚΗΣ ΕΜΠ

ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ
ΣΧΟΛΗ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
ΤΟΜΕΑΣ ΓΕΩΤΕΧΝΙΚΗΣ

Αθήνα 1 Οκτωβρίου 2014

Αρ. Πρωτ. 113

Αξιότιμον Πρύτανη ΕΜΠ
Καθηγητήν Ιωάννη Γκόλια

Κοιν.: **Καθηγητήν Σπυρίδωνα Μαυράκο**
Αντιπρύτανη ΕΜΠ
Καθηγητήν Δημήτριο Παπαντώνη
Αντιπρύτανη ΕΜΠ
Καθηγητήν Άγγελο Σιόλα
Αντιπρύτανη ΕΜΠ
Καθηγητήν Δ. Κουτσογιάννη
Κοσμήτορα Σχολής Πολιτικών Πολιτικών

Αγαπητέ κε Πρύτανη,

Δυστυχώς για τρίτη φορά εντός τριμήνου το Εργαστήριο Εδαφοδυναμικής διερήχθη !!

Ακόμη δυστυχέστερα, εκλάπησαν υπολογιστές και εργαλεία του εργαστηρίου τα οποία χρησιμοποιούνταν για το ευρωπαϊκό πρόγραμμα GIPIPE το οποίο πρέπει να παραδώσουμε στις 3 Νοεμβρίου 2014. Αντιλαμβάνεσθε το πρόβλημα.

Υπενθυμίζω ότι για τα ερευνητικά μας προγράμματα το ΕΜΠ έχει μέχρι σήμερα κάνει κρατήσεις περίπου *413.000 €*. Παρακαλώ ένα μικρό τμήμα των χρημάτων αυτών να δοθεί για να αγορασθούν και μας αποδωθούν όλα τα κλαπέντα (HY-laptops, κάμερες εργαστηρίου, εργαλεία εργαστηρίου, προβολέας power point). Νομίζω οτι αυτό θα ήταν η ελάχιστη υποχρέωση του Ιδρύματος.

Επιπλέον, ας επισκευασθούν/αναβαθμισθούν επιτέλους τα παράθυρα και οι είσοδοι του εργαστηρίου και των γραφείων μας. Οταν προ τριμήνου (εποχή που εσείς βεβαίως δεν είσασταν στην Διοίκηση του ΕΜΠ) είχε γίνει η πολλαπλή διάρρηξη εργαστηρίου και γραφείων μας, είχαμε εγγράφως (καί προφορικώς) ζητήσει την ενίσχυση των ασθενών αυτών εισόδων. Δυστυχώς εις μάτην.

Γνωρίζοντας οτι η θητεία σας μόλις τώρα άρχισε, παρακαλώ να δείξετε την απαραίτητη αποφασιστικότητα ώστε να τελειώσει πιά αυτή η κατασπατάληση υλικών, χρημάτων, χρόνου, και ψυχικής ηρεμίας μας.

Γ. Γκαζέτας

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΜΗΧΑΝΙΚΩΝ

Ο Καθηγητής Γιώργος Γκαζέτας τιμήθηκε με το "ISET Shamsher Prakash Award for Significant Contribution in Geotechnical Earthquake Engineering" για το έτος 2014

Ο Καθηγητής του Τομέα Γεωτεχνικής της Σχολής Πολιτικών Μηχανικών ΕΜΠ Γιώργος Γκαζέτας επελέγη για το πρώτο βραβείο του Ινδική Εταιρεία Αντισεισμικής Τεχνολογίας (ISET) για το 2014, για τις σημαντικές του συμβολές στη Γεωτεχνική Αντισεισμική Τεχνολογία. Η βράβευση περιλαμβάνει χρηματικό ποσό Rs.51000, συν «a Shawl and a Plaque", θα απονεμηθεί δε στο 15th Symposium on Earthquake Engineering της Ινδίας, την 11 Δεκεμβρίου 2014.

Prof. Shamsher Prakash, Honorary Fellow and former President of the Indian Society of Earthquake Technology (ISET) and Professor Emeritus, Department of Civil Engineering, Missouri University of Science and Technology, Rolla, MO 65409-0030, USA has instituted a 4-yearly "ISET Shamsher Prakash Award for Significant Contributions in Geotechnical Earthquake Engineering" to honour individuals for their outstanding contributions in Geotechnical Earthquake Engineering. The award consists of an award money of INR 51,000/-, plus a Shawl, and a plaque. This award was instituted on March 12, 2008 and has been given for the year 2010 to Prof. W.D. Liam Finn, Department of Civil Engineering, University of British Columbia, Vancouver, BC Canada.

ΠΡΟΣΦΟΡΑ ΕΡΓΑΣΙΑΣ ΣΕ ΓΕΩΜΗΧΑΝΙΚΟΥΣ

Our company is currently working on a hydropower project located in the Adjara region of Georgia. The site is approximately 1hour and 15mins drive from the Black Sea port of Batumi and this has an international flight connection each day to multiple airport hubs. The project is being developed by a Norwegian/Indian developer and is backed by the World Bank. Civil construction is by a Turkish contractor and the electromechanical contract is by Alstom India. The project involves three dams/weirs, two powerhouses and 37km of tunnels varying from 4m to 6.2m diameter. There is a vertical pressure shaft of around 250m depth. The tunnels are being constructed by drill and blast with tunnel drives up to 4.5km long although the majority are much shorter. Apart from enabling works, the construction has been underway for around 3 months, but there have initially been significant delays to the project due to land access issues. These are now resolved.

Mott MacDonald is the Owner's Engineer working for the client. For this role we are looking for a **tunneller or Engineering Geologist with ideally up to 3 year's experience** who would be prepared to work 12 hour shifts on a shift pattern (typically on average around 55 hours per week). The inspector would be responsible for supervising the quality of the tunnelling work including rock support installation, grouting, drilling etc and confirming that the contractor is building the works in accordance with the design. Training will be provided. Ideally the person would have knowledge of the Q system and very good English language skills.

We also have a position for an **Assistant Resident Engineer (Tunnels)** who would be a tunneller or Engineering Geologist **with between 5 and 10 year's experience**, preferably with some hard rock tunnel construction experience and familiar with the Q system, direction of tunnel rock support and very good English language skills. Work would be a 10 hour day 5.5 days per week.

A camp has been constructed by the contractor and accommodation is provided for the Owner's Engineer team. Food is provided in the site canteen.

If any of the positions for a 1 year contract in Georgia are of interest to you or others in your professional circles, I would be more than happy to receive your updated CV and provide you with additional information.

Thank you in advance and warm regards,

Mircea Nicolae VASILESCU
Project Manager
Mott MacDonald
246 Traian Street, 3rd Floor, Apartment 5, Zip code 024046, District 2, Bucharest, Romania
T: +40 (0)376 203 810 (Romania)
F: +40 (0)21 252 2737 (Romania)
M: +40 (0)755 055 176 (Romania)
W: www.mottmac.com
W: www.mottmac.ro

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

International Society for Soil Mechanics and Geotechnical Engineering

XVI ECSMGE 2015
13-17 September 2015 - Edinburgh

Dear Members of the Scientific Committee and Chairs / Secretaries of the European Member Societies

Having extended the deadline for paper submission to 17 October, I would be most grateful if you could remind your members of the need to complete and submit their papers in good time.

Best wishes and thank you in advance for our support.

Mike

Dr Mike Winter
mwinter@trl.co.uk
+44(0)7824303565
Head of Ground Engineering / Honorary Chief Scientist
Transport Research Laboratory (TRL)

present a more practical view of rock engineering for those who do not wish to or do not need to get involved in the detailed technical discussions presented in these notes.

The first two of these 30 minute videos have now been completed and can be viewed at the following links:

Lecture 1 – The Development of Rock Engineering - a brief historical overview with a few case histories.

Lecture 2 - The Art of Tunneling in Rock - a presentation of case histories on unusual tunnelling problems and solutions.

If you click on one of these links you will be asked to provide your name, email address and company before you are taken to the video site. This is to enable RocScience to get some background on the viewers and their geographical location in order to judge the reaction and to assist in their planning for future videos. I would, of course, like to receive your comments or criticisms since this will assist me in the preparation of additional videos. I have a list of about additional 6 topics that I would like to cover and I am currently working on three of these new videos which I hope to complete later this year.

Lecture 1 has just been released on the RocScience web site and it is planned that the general release of Lecture 2 will follow in June. This is just to give RocScience time to evaluate the response to these general releases. Hence, I would ask you to limit the distribution of the link to the second lecture until it has been released on the RocScience web site.

With best wishes,

Evert

Dr Evert Hoek
203 – 3200 Capilano Crescent
North Vancouver, BC
Canada V7R 4H7

Phone 1 604 988 3064
Cell 1 604 617 5363
Email ehoek@xsmail.com
Web www rocscience.com

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Επιστολή Evert Hoek

Dear Christos,

You may be aware that I have retired from active consulting and that I am now wokring on updating the "Practical Rock Engineering" notes that have been available on the RocScience web site

(http://www.rocscience.com/education/hoeks_corner)

for several years. Earlier this year I started working with RocScience on a new series of videos which are designed to

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Διάλεξη Carlos Santamarina

Η φετεινή ομιλία Terzaghi 2014 του καθηγητή Carlos Santamarina με τίτλο Energy Geotechnology: Enabling New Insights Into Soil Behavior είναι διαθέσιμη στο youtube:

https://www.youtube.com/watch?v=YQGdw_-mOyc

Μια προγενέστερη εκδοχή της ομιλίας ακούσαμε στις 16 (Αθήνα) και 17 (Θεσσαλονίκη) Σεπτεμβρίου 2013

(http://www.hssmge.gr/Santamarina,%202013.pdf).

Αν είσασταν στο ακροατήριο, αξίζει να την επικαιροποιήσετε. Αν έχετε περιορισμένο χρόνο, αφιερώστε 10 λεπτά στην ταξινόμηση εδαφών (52:00 - 1:02:00), ένα κομμάτι που έλειπε από την περυσινή ομιλία.

ΕΑΕΕ THE EUROPEAN ASSOCIATION FOR EARTHQUAKE ENGINEERING

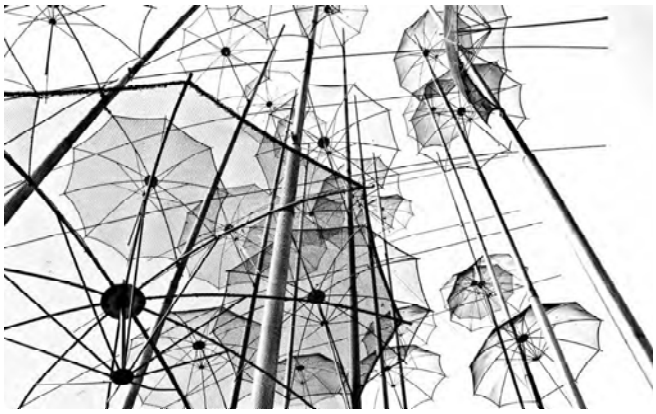
ETAM ΕΛΛΗΝΙΚΟ ΤΜΗΜΑ ΑΝΤΙΣΕΙΣΜΙΚΗΣ ΜΗΧΑΝΙΚΗΣ HELLENIC SOCIETY OF EARTHQUAKE ENGINEERING

16ο Ευρωπαϊκό Συνέδριο Σεισμικής Μηχανικής

Με ιδιαίτερη χαρά και ικανοποίηση ανακοινώνεται ότι το Ε.Τ.Α.Μ. ανέλαβε την διοργάνωση του επόμενου 16ου Ευρωπαϊκού Συνεδρίου Σεισμικής Μηχανικής που θα πραγματοποιηθει στην Θεσσαλονίκη το 2018. Η απόφαση της ανάθεσης ελήφθη στην Κωνσταντινούπολη στις 26 Αυγούστου 2014 κατά την συνεδρίαση της Εκτελεστικής Επιτροπής της Ευρωπαϊκής Ένωσης Αντισεισμικής Μηχανικής (European Association for Earthquake Engineering) που πραγματοποιήθηκε κατά την διάρκεια του 2ου Ευρωπαϊκού Συνεδρίου Σεισμικής Μηχανικής και Σεισμολογίας.

Σημειώνεται ότι η διοργάνωση αυτή, η οποία θα πραγματοποιηθεί στις 18-21 Ιουνίου 2018 στο Συνεδριακό Χώρο του Μεγάρου Μουσικής Θεσσαλονίκης, συμπίπτει με τη συμπλήρωση 40 ετών από τον σεισμό της 20/6/1978, γεγονός που αποτέλεσε κομβικό σημείο στην ιστορία της Αντισεισμικής Μηχανικής στη χώρα μας.

ECEE16 Thessaloniki 2018



Ο φάκελος υποψηφιότητας, ο οποίος κατατέθηκε από το Ε.Τ.Α.Μ. και επελέγη ομόφωνα από τους εθνικούς αντιπροσώπουν της ΕΑΕΕ, είναι διαθέσιμος στη διεύθυνση: http://issuu.com/milosisd/docs/thessaloniki_16ecee

Παράλληλα, ανακοινώνεται η σημαντική διάκριση δύο μελών του Ε.Τ.Α.Μ. του καθ. Ανδρέα Κάππου ο οποίος εξελέγει στη θέση του Γενικού Γραμματέα της Ευρωπαϊκής Ένωσης Αντισεισμικής Μηχανικής καθώς και του καθ. Κυριαζή Πιτιλάκη ο οποίος εξελέγει στη θέση του Αντιπροέδρου. Και οι δύο εκλογές υπήρξαν ομόφωνες.

Αναμένεται ότι οι ανωτέρω εξελίξεις θα ενισχύσουν περαιτέρω τον διαχρονικά ιδιαίτερο ρόλο της ελληνικής επιστημονικής κοινότητας στα τεκταινόμενα της αντισεισμικής μηχανικής διεθνώς. Στο πλαίσιο αυτό είναι εξόχως σημαντική η ενεργός συμμετοχή των μελών του Ε.Τ.Α.Μ. στις επικείμενες δράσεις του.

Brochure

Εκ μέρους του Δ.Σ. του Ε.Τ.Α.Μ.
Κυριαζής Πιτιλάκης, Πρόεδρος
Αναστάσιος Σέξτος, Γραμματέας

ISRM

7th ISRM Online Lecture
"Measurement and back analysis in rock engineering"
Prof. Shunsuke Sakurai

The lecture will be broadcast in November, at a date and time to be announced soon. The lecture will remain online so that those unable to attend at this time will be able to do it later. As usual, the attendees will be able to ask questions to the lecturer by e-mail during the subsequent 48 hours.

Professor Sakurai graduated in Civil Engineering from Kobe University, Japan, (B.E. in Civil Eng) in 1958, obtained the Master degree from the Kyoto University in 1960, and the PhD from the Michigan State University, USA, in 1966.

He worked in Department of Civil Engineering of Kobe University as Associate Professor from 1966 to 1973 and as Professor from 1973 to 1999, and then moved to Hiroshima Institute of Technology, Japan, as President from 1999 to 2003. He is now Professor Emeritus of both Kobe University and Hiroshima Institute of Technology.

In the ISRM, Professor Sakurai was Vice-President at Large from 1988 to 1991 and President from 1995 to 1999. In 2011 he was inducted as ISRM Fellow, the highest and most senior grade of membership of the ISRM. Professor Sakurai is currently Chairman of the ISRM Commission on Underground Nuclear Power Plants.

The previous ISRM Online Lectures were given by Prof. Wulf Schubert, Prof. John Hudson Dr. Pierre Dufaut, Prof. Eduardo Alonso. Dr John Read and Prof. Herbert Einstein. All the ISRM Online Lectures remain available on the ISRM

website in a dedicated webpage (http://www.isrm.net/gca/?id=1104).

Imperial College London

Linked In
The MSc Soil Mechanics group aims to keep in touch with alumni of the course and their activities.

Stavroula Kontoe Senior Lecturer at Imperial College London

Established in 1950 the MSc course cluster in Soil Mechanics remains the flagship in its subject. Distinctive features of this programme include strong links with industry, emphasis on fieldwork, laboratory testing using state-of-the-art facilities and numerical analysis using in-house state-of-the-art software, integration of teaching with sister course in Engineering Geology, and teaching by leading experts in the field of Soil Mechanics.

Our Department has been ranked top in the world for Civil Engineering in the 2013 QS University Rankings

The QS World University Rankings are widely regarded as the preeminent guide to the relative quality of universities from around the globe.

I am delighted to say that we have been ranked top in the world for Civil Engineering (up from 6th in 2012), followed by 2. Berkeley, 3. Tokyo, 4. Delft and 5. MIT. We are the only UK university to be ranked in the top 20 for Civil Engineering – Cambridge are 22nd, Oxford 28th and UCL 48th.

The full table is available at: http://www.topuniversities.com/university-rankings/university-subject-rankings/2013/engineering-civil-and-structural

This is a tremendous reward for the hard work of everyone in the Department and increases our visibility to potential staff, students, employers and research sponsors from around the world.

ΠΡΟΣΕΧΕΙΣ ΕΚΔΗΛΩΣΕΙΣ ΓΕΩΤΕΧΝΙΚΟΥ ΕΝΔΙΑΦΕΡΟΝΤΟΣ ΣΤΗΝ ΕΛΛΑΔΑ

5 – 7 Νοεμβρίου 2014, ΑΙΓΛΗ Ζαππείου, Αθήνα
http://www.7hcge2014.gr

Η Ελληνική Επιστημονική Εταιρεία Εδαφομηχανικής και Γεωτεχνικής Μηχανικής, στο πλαίσιο των δραστηριοτήτων της, διοργανώνει το 7ο Πανελλήνιο Συνέδριο Γεωτεχνικής Μηχανικής υπό την αιγίδα του Δήμου Αθηναίων και του Τεχνικού Επιμελητηρίου Ελλάδας. Στόχος του Συνεδρίου είναι να καταγράψει τις προόδους της γεωτεχνικής μηχανικής στην Ελλάδα του 21ου αιώνα όπως αντικατοπτρίζονται στα σημαντικά γεωτεχνικά αλλά και άλλα έργα (σιδηροδρομικά, οδοποιίας, λιμενικά, υδραυλικά, κτιριακά, περιβαλλοντικά) με σημαντικό γεωτεχνικό αντικείμενο, που έχουν μελετηθεί και κατασκευαστεί ή κατασκευάζονται, καθώς και στα αποτελέσματα της ερευνητικής δραστηριότητας των ελληνικών πολυτεχνείων και πολυτεχνικών σχολών. Επιδίωξη είναι οι εργασίες του Συνεδρίου να αναδείξουν πρωτότυπα στοιχεία συμβολής της γεωτεχνικής μηχανικής αλλά και να προβάλουν θεωρητικές και πειραματικές έρευνες σε εδαφικά, βραχώδη και ημιβραχώδη υλικά που βρήκαν ή μπορούν να βρουν εφαρμογή στην πράξη."

Θεματικές Ενότητες

1. Συμπεριφορά Εδαφών: Έρευνες Υπαίθρου και Εργαστηρίου
2. Συμπεριφορά Εδαφών: Προσομοιώματα
3. Επιφανειακές και Βαθειές Θεμελιώσεις
4. Αλληλεπίδραση Εδάφους - Κατασκευής
5. Πρανή - Κατολισθήσεις
6. Βαθειές Εκσκαφές - Αντιστηρίξεις
7. Σήραγγες
8. Βελτιώσεις Εδαφών
9. Φράγματα, Άοπλα Επιχώματα
10. Οπλισμένα Επιχώματα
11. Εφαρμογή Ευρωκωδίκων
12. Εφαρμογές Γεωσυνθετικών Υλικών
13. Εδαφοδυναμική / Τεχνική Σεισμολογία
14. Βραχομηχανική
15. Περιβαλλοντική Γεωτεχνική
16. Ενεργειακή Γεωτεχνική (energy geotechnics)
17. Πολιτιστική Κληρονομιά και Γεωτεχνική Μηχανική
18. Διδασκαλία και Μάθηση Γεωτεχνικής Μηχανικής

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

5th International Forum on Opto-electronic Sensor-based Monitoring in Geo-engineering (5th OSMG-2014), Oct 12-14, 2014, Nanjing, China, http://www.osmg2014.com

International Congress Tunnels and Underground Space risks & opportunities, 13-15 October 2014, Lyon, France, www.congres.aftes.asso.fr/en/content/invitation

HYDRO 2014 Building on Recent Development Progress, 13 to 15 October 2014, Villa Erba, Cernobbio, Italy, www.hydropower-dams.com/pdfs/hydro2014.pdf

ARMS 8 - 8th ISRM Rock Mechanics Symposium, 14-16 October 2014, Sapporo, Japan www.rocknet-japan.org/ARMS8/index.htm

Geostructures Asia, 14-16 October 2014, Singapore, http://truproductsafrica.com/EVENTS/GEOZ.pdf

9th International Conference on Structural Analysis of Historic Constructions, 14 – 17 October 2014, Mexico City, Mexico, www.linkedin.com/groups/SAHC-2014-Mexico-City-3930057.S.213150607

International Seminar GEOSYNTHETICS INDIA 2014 and Workshop on "Design of Geosynthetic Barriers", 15-17 October 2014, New Delhi, India, http://cbip.org/ExternalFile/Geo%20India%2014.pdf

6th International Conference on Protection of Structures Against Hazards, 16-17 October 2014, Tianjin, China, http://cipremier.com/page.php?764

2nd International Conference Innovations on Bridges and Soil - Bridge Interaction IBSBI 2014, Athens, 16 - 18 October, 2014, http://ibsbi2014.ntua.gr

1st International Conference on Volcanic Landscapes (VOLAND 2014), 16 - 18 October 2014, Santorini Island, Greece, voland@heliotopos.net

1st International Conference on Discrete Fracture Network Engineering, October 19 - 22, 2014, Vancouver, British Columbia, Canada, www.dfne2014.ca

Drill and Blast Africa 2014 - Optimising Drilling and Blasting Operations on the First Shot, 20 – 21 October 2014, Johannesburg, South Africa, enquiry@iqpc.co.za

12th International Conference Underground Infrastructure of Urban Areas, 22-23th October 2014, Wroclaw, Poland, http://www.uiua2011.pwr.wroc.pl

Η χρήση νέων τεχνολογιών στην πρόληψη και τη διαχείριση φυσικών καταστροφών - Ο ρόλος της πολιτικής προστασίας, 24 ÷ 26 Οκτωβρίου 2014, Ρόδος, http://saferhodes.blogspot.gr

AusRock 2014 - 3rd Australasian Ground Control in Mining Conference - an ISRM Specialized Conference, 5 – 6 November 2014, Sydney, Australia www.groundcontrol2014.ausimm.com.au

3rd ISRM International Young Scholars' Symposium on Rock mechanics - an ISRM Specialized Conference, 8 – 10 November 2014, Xi'an, China http://www.isrm.net/fotos/editor2/Nl26/sysrock2014_copy.pdf

JTC-1's First International Landslide Workshop on Physical Processes and Mechanisms of Precipitation-Induced Landslides

November 2014, Seoul, Korea
http://2014jtc-1workshop.org

JTC-1's first International Landslide Workshop will be held in Seoul in November 2014 and Prof. Su-Gon Lee is the chairman of the organizing committee of the workshop.

Every year several thousands of people are killed by precipitation-induced landslides, such as the one shown adjacent, which occurred in South Korea a few years ago. Fortunately, this one did not cause any loss of life.

In late November this year, JTC-1 (the joint technical committee on natural slopes and landslide set up by ISSMGE, ISRM and AIEG) will organise a workshop on precipitation-induced landslides. This will be held at the University of Seoul in South Korea from 24 to 26 November. It will be followed on 27 November by a forum on "slope safety preparedness for the effects of climate change" and a half day meeting that will examine recent fatal landslides in Asia. On 28 November there will be a one day field trip.

If colleague is interested in the workshop, please contact Prof. Su-Gon Lee: sglee@uos.ac.kr.

7th International Congress on Environmental Geotechnics, 10-14 November 2014, Melbourne, Australia, www.7iceg2014.com

Waterproof Membranes 2014, 17 - 19 November 2014, Bonn, Germany, http://www.amiplastics.com/events/event?Code=C628#4423

GEOMATE 2014 Fourth International Conference on Geotechnique, Construction Materials + Environment, 19 - 21 Nov. 2014, Brisbane, Australia, www.geomate.org

International Symposium "Geohazards" Science, Engineering & Management, 20-21 November 2014, Kathmandu, Nepal, www.ngeotechs.org/ngs/index.php/geohazards-2014

6ο Πανελλήνιο Συνέδριο
Διαχείριση και Βελτίωση Παρακτίων Ζωνών
24-27 Νοεμβρίου 2014, Αθήνα, Ίδρυμα Ευγενίδου
lhw@central.ntua.gr

Το Εργαστήριο Λιμενικών Έργων του Ε.Μ.Π., με την υποστήριξη δημοσίων και ιδιωτικών φορέων, διοργανώνει το Έκτο Πανελλήνιο Συνέδριογια τη **ΔΙΑΧΕΙΡΙΣΗ ΚΑΙ ΒΕΛΤΙΩΣΗ ΠΑΡΑΚΤΙΩΝ ΖΩΝΩΝ**. Το Συνέδριο θα πραγματοποιηθεί στην Αθήνα, στο Ίδρυμα Ευγενίδου, 24 – 27 Νοεμβρίου 2014.

Αντικείμενο του Συνεδρίου είναι η παρουσίαση των νεοτέρων εξελίξεων στο χώρο των επιστημών και των τεχνολογιών που σχετίζονται με τις παράκτιες ζώνες στην Ελλάδα και την Κύπρο, την έρευνα, τον σχεδιασμό, την προστασία, την μελέτη, την κατασκευή και την διαχείριση των παράκτιων έργων, καθώς επίσης και την εκτίμηση των περιβαλλοντικών επιπτώσεων στις παράκτιες ζώνες.

Στόχος του Συνεδρίου είναι η ενημέρωση, η ανταλλαγή απόψεων και η προώθηση της τεχνογνωσίας στον ευαίσθητο χώρο της παράκτιας ζώνης.

Το Συνέδριο απευθύνεται στους ερευνητές, μελετητές, κατασκευαστές, ΑΕΙ, δημόσιους φορείς, ΟΤΑ, Λιμενικά Ταμεία, περιβαλλοντικές οργανώσεις και υπηρεσίες που ενδιαφέρονται και ασχολούνται με τις παράκτιες ζώνες.

ΘΕΜΑΤΟΛΟΓΙΑ ΣΥΝΕΔΡΙΟΥ

- Παράκτιο φυσικό και ανθρωπογενές περιβάλλον
- Παράκτια γεωμορφολογία και κίνηση ιζήματος
- Νέες μέθοδοι και τεχνολογίες για την παρακολούθηση των παράκτιων ζωνών
- Επίδραση κλιματικών αλλαγών. Συνέπειες από την ανύψωση της θαλάσσιας στάθμης. Ακραία κλιματικά φαινόμενα
- Έργα προστασίας ακτών
- Χωροθέτηση παράκτιων έργων
- Ολοκληρωμένη διαχείριση παράκτιων ζωνών
- Θεσμικό πλαίσιο και νομοθεσία
- Οικονομική και κοινωνική πολιτική. Διεθνείς τάσεις
- Τουριστική εκμετάλλευση παράκτιας ζώνης
- Περιβαλλοντικές επιπτώσεις από την κατασκευή και λειτουργία παράκτιων έργων και την χρήση θαλάσσιων πόρων
- Παράκτια οικοσυστήματα
- Πολεοδομικός και χωροταξικός σχεδιασμός παράκτιων ζωνών
- Αρχιτεκτονική παρακτίου μετώπου
- Προγραμματιζόμενα μείζονα έργα στο θαλάσσιο μέτωπο

Οι επιθυμούντες να συμμετάσχουν στο Συνέδριο παρακαλούνται να απευθυνθούν στο:

Ε.Μ.Π.
Εργαστήριο Λιμενικών Έργων
(για το Έκτο Πανελλήνιο Συνέδριο
"ΔΙΑΧΕΙΡΙΣΗ ΚΑΙ ΒΕΛΤΙΩΣΗ ΠΑΡΑΚΤΙΩΝ ΖΩΝΩΝ")
Ηρώων Πολυτεχνείου 5
Ζωγράφου Τ.Κ. 157 80
στο fax 210 - 772 2368 ή e-mail : lhw@central.ntua.gr

7th International Conference on Scour and Erosion (ICSE-7), 2nd – 4th December 2014, Perth, Western Australia, http://www.2014icse.com

Underground Infrastructure & Deep Foundations UAE, 7-10 December 2014, Dubai, United Arab Emirates, enquiry@iqpc.ae

ARABIAN TUNNELLING
CONFERENCE & EXHIBITION

2nd Arabian Tunnelling Conference and Exhibition
Abu Dhabi, United Arab Emirates, 9-10 December 2014
www.atc2014.ae

In response to the need to learn more about Tunnels, Sustainability and Management, the Society of Engineers - AE, in collaboration with SOE-UAE Tunnelling Chapter and with the support of the International Tunnelling and Underground Space Association (ITA), will host the second edition of Arabian Tunnelling Conference and Exhibition.

Our scientifi c committee, which is chaired by HE Eng. Essa Al Maidoor, Director General of Dubai Health Authority and President of Society of Engineers – UAE, and includes engineers from multidisciplinary professionals, scientists and educators, has developed a program that will appeal to a broad range of professionals and trainees.

Themes

1 Planning & Designing of Underground Spaces
2 Innovations in Tunneling
3 Best Practice in Tunneling / case Studies
4 Smart Tunnels
5 Sustainable Tunnels
6 Managing Information & Communications Technology in Tunneling
7 Tunnels Efficiency
8 HVAC & Indoor Air Quality
9 Environmental Impact of Construction and operations in Tunnels
10 Managing Tunnels through Project Management
11 Contract Management in Tunneling
12 Risk Management in Tunneling Projects
13 Safety Aspects in Tunnels
14 Tunnels infrastructure Management

Contacts
Conference Secretariat
K.I.T. Group Middle East FZ LLC
PO BOX 77893
Abu Dhabi, UAE
T: + 971 2 401 2960
Email: atc2014@kit-group.org

Third Australasian Ground Control in Mining Conference 2014, Sydney, Australia, www.mining.unsw.edu.au/node/608

Proceedings of the Institution of Civil Engineers, Geotechnical Engineering, THEMED ISSUE 2015, Construction processes and installation effects, Editors: Benoît Jones, University of Warwick, UK and Stuart Haigh, University of Cambridge, UK, sarah.walker@ice.org.uk

IGS Chennai 2015 6th International Geotechnical Symposium on Disaster Mitigation in Special Geoenvironmental Conditions, January 21-23, 2015, IIT Mandras, Chennai, India, http://igschennai.in/6igschennai2015

Spritzbeton - Tagung 2015

Shotcrete Conference and Exhibition
January 29-30, 2015, Congress Centre Alpbach, Austria
http://www.spritzbeton-tagung.com

Prof. Wolfgang Kusterle and his team welcome you to the Conference and Exhibition Shotcrete 2015 at the Alpbach Conference Centre, Tyrol, Austria, January 29 and 30, 2015.

Knowledge and experience do not help, if they remain hidden. This platform has gathered shotcrete specialists for 25 years, in a surrounding field where the exchange easily takes place.

Secretariat
Agneta Kusterle
Dörreweg 6
A-6173 Oberperfuss
Tel +43 (0)650 8244610
e-mail: spritzbeton@kusterle.net

Geosynthetics 2015, February 15 – 18, 2015, Portland, Oregon, USA, http://geosyntheticsconference.com

12th Australia New Zealand Conference on Geomechanics (ANZ 2015), 22-25 February 2015, Wellington, New Zealand, http://www.anz2015.com

GeoProc2015: International Conference on Coupled THMC Processes in Geosystems
25-27 February 2015, Salt Lake City, USA
https://secureweb.inl.gov/geoproc2015

Focus Areas

- Unconventional Oil/Gas Development: Heavy oil, Shale oil, Tight gas, Shale gas, Oil shale, Gas hydrate, Coalbed methane, etc.
- Improved Oil Recovery: Thermal methods, Water and gas flooding, Chemical methods, etc.
- Geothermal Development: Enhanced Geothermal Systems (EGS), Supercritical systems, Hydrothermal, Thermal stimulation, etc.

Contact Information:

Hai Huang
Idaho National Laboratory
hai.huang@inl.gov
John McLennan
University of Utah
jmclennan@egi.utah.edu
Milind Deo
University of Utah
milind.deo@utah.edu
Robert Podgorney
Idaho National Laboratory
robert.podgorney@inl.gov

International Conference & Exhibition on Tunnelling & Underground Space 2015 (ICETUS 2015)
Sustainable Transportation in Underground Space Development
3rd – 5th March 2015, Kuala Lumpur, Malaysia
http://icetus2015.iemtc.com

Following the successful First and Second International Tunnelling and Trenchless Technology Conference held in Malaysia in 2006 and 2011 respectively, Tunnelling & Underground Space Technical Division of The Institution of Engineers, Malaysia (IEM) has decided to organise the third conference on 3rd – 5th March 2015. This coincides with the massive development of the Klang Valley Mass Rapid Transit (KVMRT) currently at construction stage and expected to be in advanced stage of completion in 2015.

The IEM together with its co-organisers and supporters welcome you to register your interest/ booking to participate in the conference in any capacity such as: speaker(s), exhibitor(s), participant(s), sponsor(s) and accompanying person(s).

The Conference covers:

- Tunnelling projects – this includes past and present projects;
- Collaboration among researchers, governments, developers, consultants, contractors and specialist tunnel & trenchless contractors;
- Standards, legal, social, economic, safety & risk management and related topics on the use of underground space.

This conference is aimed at providing a forum for practicing professionals – engineers, consultants, contractors, technologists, researchers, academicians, manufacturers and

suppliers to share their experiences, research, studies and views so as to contribute to the advancement of Sustainable Tunnelling and Trenchless Technology in general and particularly in Asia. A wide range of high quality scientific and technical papers of International or Regional significance on Tunnelling and Trenchless Technology is expected on the following topics:

- Tunnelling to include process, operation, ventilation and maintenance.
- Trenchless Technology such as micro-tunnelling, pipe jacking, directional drilling and rehabilitation.
- Related areas such as detection, inspection services, robotic development, sewer, services and structural aspects.
- Safety health environmental quality and legal aspects.
- Machine development and designs, latest models presentation from manufacturers of tunnelling and related machines.
- Geotechnical aspects with particular references to tunnelling and trenchless technology.
- Research and recent development and progress related to tunnelling & trenchless technology.

A Special Session will be dedicated to the Klang Valley Mass Rapid Transit (KVMRT) Project.

The KVMRT project involves the construction of a rail-based public transport network which, together with the existing light rail transit (LRT), monorail, KTM Komuter, ERL and KLIA Transit systems forms the backbone of the Greater Kuala Lumpur/Klang Valley region. The project was approved by the Government in December 2010. The first KVMRT line to be implemented will be the 51km Sungai Buloh-Kajang line. Construction of the line was officially launched in July 2011 and expected to be operational by 2017.

The KVMRT project was initially proposed to the Government by a private-sector consortium in early 2010. The proposal was for the construction of three KVMRT lines The Government conducted a study on the proposal and approved the implementation of the Sungai Buloh-Kajang line first. The Government decided to implement the other two lines after further studies are done on the proposed alignment in conjunction with the Greater Kuala Lumpur/Klang Valley Land Public Transport Masterplan.

The project consists of underground construction in the Kuala Lumpur City areas bounded by the North and South Portals and the elevated structures in the outskirt of Kuala Lumpur.

Contacts Us

IEM TRAINING CENTRE SDN BHD (127273-K)
(Wholly owned subsidiary of The Institution of Engineers, Malaysia)
Address
No. 33, 1st Floor
Jalan 52/18, Seksyen 52
46200 Petaling Jaya
Selangor Darul Ehsan
Contact Number
Tel: +60-3-7958 6851
Fax: +60-3-7958 2851
E: icetus2015@iemtc.com

AFRICA 2015 - Water Storage and Hydropower Development for Africa, 10 to 12 March 2015, Marrakesh, Morocco
http://www.hydropower-dams.com/AFRICA-2015.php?c_id=89

UN World Conference on Disaster Risk Reduction
2015 Sendai Japan

Third United Nations World Conference on Disaster Risk Reduction

14 -18 March 2015, Sendai City Miyagi Prefecture Japan
http://www.wcdrr.org

The Third UN World Conference on Disaster Risk Reduction will be composed of three main segments of discussions: an Intergovernmental Segment, a Multi-Stakeholder Segment and a Public Forum.

The Inter-Governmental Segment will be composed of three main elements: a High-Level Dialogue, Ministerial Roundtables and an Official Plenary Session.

A High-Level Dialogue on "Global Partnership in Addressing Emerging Risks in a post-2015 Global Agenda" that will focus on the development of a global strategy and global partnership to address emerging risks in a post-2015 framework for disaster risk reduction. The High Level Dialogue will also aim at building alignment and mutual reinforcement between the post-2015 framework for disaster risk reduction, the post-2015 development agenda with the Sustainable Development Goals (SDGs) and climate change agreements.

Ministerial Roundtables will focus on commitments for implementation. They will develop further the priorities highlighted by the High Level Segment and build formal commitments by Governments and Ministers from a selected range of sectors (Planning, Finance, Development, Education, Health etc.). The Ministerial Roundtables are expected to support the Global Partnership for Disaster Risk Reduction and Resilience implementation. They will benefit from professional moderators who will guide the discussions and capture the essence of the commitments made and the implementation steps proposed by Governments.

An Official Plenary Session with statements running through the five day-conference.

Dialogues with Major Groups will provide an opportunity to interested stakeholders from the disaster risk reduction community to interact and exchange views on the draft text of a post-2015 framework for disaster risk reduction with the World Conference co-Chairs.

The Multi-Stakeholder Segment is an interactive part of the conference in which accredited stakeholders are welcome to contribute to the official discussions. The Multi-Stakeholder Segment include four components: a) Working Sessions, b) Ignite Stage, c) Study Tours and d) Excursions.

Working sessions will focus on implementation practice including the development of concrete and result-oriented implementation plans and the forging of innovative partnerships around key priority areas in support of the Global Partnership's implementation. They will take into considera-

tion the voluntary commitments and announcements made by Governments and stakeholders in support of a post-2015 framework for disaster risk reduction.

Some Working Sessions will report on progress based on experience in implementing the five priorities of the Hyogo Framework for Action (HFA) and the continuous work planned in support of a post-2015 framework for disaster risk reduction. A few others will focus on implementation based on emerging risks and new priorities identified through the consultations on a post-2015 framework for disaster risk reduction. Other sessions will present commitments for implementation by a wide range of stakeholders and focus on the identification of major commitments and priority areas to help accelerate disaster risk reduction implementation under a post-2015 framework for disaster risk reduction, as highlighted through global advocacy campaigns.

Ignite Stage

The Ignite Stage is a space for short presentations maximum 15 minutes on a disaster risk reduction topic, project or initiative. The Ignite Stage aims at providing opportunities to a broader array of topics not included in the official sessions and discussions to be briefly presented and acknowledged by the World Conference audience.

Study Tours

Study tours will be arranged around the Tohoku Region to learn about the Great East Japan Earthquake and ongoing efforts at reconstruction. Exact details will be announced in October 2014. Accredited Conference participants will be able to attend for free.

Excursions

Excursions will be organized for Conference participants and their spouses after the conference for general sightseeing (including disaster-affected areas).

The Public Forum is a significant part of the World Conference and promotes a shared responsibility of reducing risk and building resilience. The Public Forum will be held over a number of venues during the period of the conference and is open to conference participants and the general public.

Segments of the Public Forum open for application

- Side Events (such as symposiums, seminars and workshops)
- Exhibition Booths
- Poster Exhibitions

Contact us at wcdrr2015@un.org if you need more details.

16th African Regional Conference on Soil Mechanics and Geotechnical Engineering, April 27 to 30, 2015 in Hammamet, Tunisia, http://www.cramsg2015.org

ISP7-PRESSIO2015 1 to 2 May 2015, Hammamet, Tunisia, http://www.cramsg2015.org/isp7-pressio2015

13th ISRM International Congress on Rock Mechanics Innovations in Applied and Theoretical Rock Mechanics 10–13 May 2015, Montreal, Canada, www.isrm2015.com

Shale and Rock Mechanics as Applied to Slopes, Tunnels, Mines and Hydrocarbon Extraction, Special One day Symposium, May 12, 2015, Montreal, Quebec, Canada, www.isrm2015.com/Page/PageContent/ShaleSymposium

World Tunnel Congress 2015 and 41st ITA General Assembly : Promoting Tunnelling in South East European (SEE) Region, 22 - 28 May 2015, Dubrovnik, Croatia, http://wtc15.com

83rd ICOLD Annual Meeting & Congress Hydropower' 15, June 2015, Stavanger, Norway, www.icoldnorway2015.org

ISFOG 2015 3rd International Symposium on Frontiers in Offshore Geotechnics, Oslo, Norway, 10-12 June 2015, www.isfog2015.no

DMT 15 The 3rd International Conference on the Flat Dilatometer, Rome 15-17 June 2015, www.dmt15.com

ICGE 2015 International Conference in Geotechnical Engineering – Colombo-2015, 10 - 11 August 2015, Colombo, Colombo, Sri Lanka, http://www.slgs.lk/?p=564

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

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

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

EUROCK 15 ISRM European Regional Symposium & 64th Geomechanics Colloquy, 7 – 9 October 2015, Salzburg, Austria, www.oegg.at/eurock-2015

Environmental Connection Conference, February 15–18, 2015, Portland, Oregon, USA, http://www.ieca.org/conference/annual/ec.asp

European Conference in Geo-Environment and Construction, October/November 2015, Tirana, Albania, Prof. Dr. Luljeta Bozo, lulibozo@gmail.com; luljeta_bozo@univer-sitetipolis.edu.al

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

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

Roads have long played an integral part in the life, cultural exchange, and economic development of mankind. Especially in the automobile age, roads greatly contributed to the rapid global development and the rise of modern civilization.

The core value of roads is to enable safe and quick transportation of people and goods. Road travel today increasingly involves advanced environmental and information telecommunications technologies, and integration of roads in their environment is more than ever required. Sustainability of the road transport system has become key for the social and economic benefits of our communities.

The roads of the future are expected to create new spaces with the adjoining land, generate energy using sunlight and geothermal heat, and create a new culture and social functions to satisfy all kinds of needs.

Now is the time for experts in road transportation to explore new roles of roads and facilitate their advancement by recognizing the enormous potential of roads and supporting the values that may lead to various advanced technologies.

The 25th World Road Congress Seoul 2015 will establish concepts and discuss strategies to create new values in road transportation based on the four strategic themes of the World Road Association (PIARC) : Management and Performance; Access and Mobility; Safety; and Infrastructure.

Main Sessions

- Strategic Direction Sessions
- Technical Committee Sessions
- The Special Sessions

The Technical Committee Sessions will include:

- a brief summary of activities carried out during the period of 2012-2015, highlighting the main productions. The session does not aim to make an exhaustive presentation of all activities carried out by the Technical Committee over the last four-year period, but rather to emphasize the essential outcome (PIARC technical reports in particular), and the progress achieved in the various areas studied by the Technical Committee;

- a discussion, introduced by the introductory report, on a topic linked to the state-of-the-art in the specific field of the Technical Committee. This discussion is intended to be prospective;

- a discussion on the future directions of Technical Committees based on the discussion at the Strategic Direction Sessions, the suggestions made by the outgoing Technical Committee and the outcome of the above mentioned discussion.

As an additional input to the preparation of sessions, Chairpersons of Technical Committees can make an international call for individual papers.

Technical Committee Sessions, in accordance with the four Strategic Themes

ST1 Management and Performance

TC 1.1 Performance of Transport Administrations
TC 1.2 Financing
TC 1.3 Climate Change and Sustainability
TC 1.4 Road Transport System Economics and Social Development
TC 1.5 Risk Management

ST2 Access and Mobility

TC 2.1 Road Network Operations
TC 2.2 Improved Mobility in Urban Areas
TC 2.3 Freight Transport
TC 2.4 Winter Service
TC 2.5 Rural Road Systems and Accessibility to Rural Areas

ST3 Safety

TC 3.1 National Road Safety Policies and Programs
TC 3.2 Design and Operations of Safer Road Infrastructure
TC 3.3 Road Tunnels Operations
TF1 Road Saftey Manual Task Force
TF2 Security Task Force

ST4 Infrastructure

TC 4.1 Management of Road Assets
TC 4.2 Road Pavements
TC 4.3 Road Bridges
TC 4.4 Earthworks and Unpaved Roads

The Special Sessions are designed to consolidate PIARC's relationships with other international and regional organizations active in the field of road and road transport.

These sessions should address topical issues which are different from those dealt with by Technical Committees and Strategic Direction Sessions.

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively - *papers that fall outside this scope will not be considered:*

1. Evolution of road and transport administrations
2. Accountability
3. Fighting corruption
4. Road financing and funding
5. Circular economy
6. Climate change mitigation and adaptation - The role of transport authorities
7. Environmental commitments
8. Ex ante appraisal of transport projects
9. Ex post evaluations of infrastructure projects
10. Risk management
11. Low cost solutions for road networks monitoring
12. ITS Architectures oriented to services for road networks operations and improvement of mobility
13. Information to users and system efficiency for maximized acceptability
14. Motorcyclists in urban areas
15. How to better enforce the dedicated lanes use?
16. Commuting from home to work in large cities
17. Evolution of heavy commercial vehicle design and regulation
18. Challenges of urban freight
19. Infrastructure assessment and monitoring against heavy traffic loads
20. Winter service strategies and climate change
21. Multimodality and climatic adversity in winter
22. Advanced technologies and management of winter crisis
23. Rural roads
24. Road safety investments and planning
25. Transportation safety and land use
26. Safety of vulnerable road users
27. Systemic safety approach to combat driver distraction and fatigue
28. Sustainable road tunnels operations
29. Safety measures for people with reduced mobility in road tunnels
30. Road tunnels in multi-modal systems
31. Management of road assets
32. Road pavements
33. Road bridges
34. Optimal use of local materials

35. Slope and foundation drainage and storm water management
36. Maintenance techniques for unpaved roads in developing countries

Contact Information

Organizing Committee of the 25th World Road Congress Seoul 2015
805, Daewangpangyo-ro, Sujeong-gu,
Seongnam-si, Gyeonggi-do,
SEOUL 461-703 KOREA
Tel. +82 2 3490 1053
info@piarcseoul2015.org
www.piarcseoul2015.org

World Road Association (PIARC)
La Grande Arche-Paroi nord, niveau 2
92055 LA DEFENSE Cedex (France)
Tel. +33 1 47 96 81 21
info@piarc.org
www.piarc.org

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

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

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

2015 6th International Conference Recent Advances in Geotechnical Engineering and Soiul 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

The Southern African Rock Engineering Symposium, organized by the International society for rock mechanics will take place on 5th January 2016 in Cape Town, South Africa. The conference will cover areas like Interdisciplinary Course Encompasses the Fields of Rock Mechanics, Structural Geology, Earthquake Seismology and Petroleum Engineering to Address a Wide Range of Geomechanical Problems That Arise During the Exploitation of Oil and Gas Reservoirs.

Contact Person: William Joughin
SRK Consulting SA. PTY LDA
Tel. +27-11-441-1214
wjoughin@srk.co.za

GeoAmericas 2016
3RD PAN-AMERICAN CONFERENCE ON GEOSYNTHETICS
11-14 APRIL 2016 • MIAMI BEACH • USA

NAGSDirector05@gmail.com

ITA - AITES
WTC 2016
The World Tunnel Congress
Including NAT2016
SAN FRANCISCO

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

Contact

John Hayden
Deputy Executive Director
Public Affairs and Government Relations
12999 E. Adam Aircraft Cir
Englewood, CO 80112
Tel. (303) 948-4250
Email hayden@smenet.org
Website www.smenet.org

ISRM

Southern African Rock Engineering Symposium - an ISRM Regional Symposium
May 2016, Cape Town, South Africa

Contact Person: William Joughin
Telephone: +27-11-441-1214
E-mail: wjoughin@srk.co.za

84th ICOLD Annual Meeting
16-20 May 2016, Johannesburg, South Africa
www.sancold.org.za/index.php/activities/icold-annual-meeting-2016

The ICOLD General Assembly held in Seattle in August 2013, approved that the ICOLD Annual Meeting in 2016 be held in South Africa. SANCOLD is very excited about this matter and is hard at work organising an exciting event with a substantial technical content. We hope to provide the delegates and accompanying persons with insights in our African country and region with its huge range of cultural, scenic and touristic interests.

The Program for the week has been aligned with the developments arising from Seattle 2013.

ICOLD has some 28 Technical Committees which will meet for 1 ½ days. The meeting on the Monday afternoon is intended to be in the form of a "workshop" for new Committees and a feedback and review workshop for those Committees coming to end of their term of office.

Symposium

The theme of the Symposium on Wednesday 18 May will be *"Appropriate technology of dams in developing countries".* The Call for Papers will be issued in about March 2015. The Symposium may require some parallel sessions, depending on the number of papers to be presented. The papers and presentations will be supplied to the delegates in electronic form for ease of transport.

Workshops

These were introduced in 2013 in Seattle to increase the technical content of the week and to encourage increased attendance. The attendance in Seattle was a record high for an Annual Meeting. The USA showcased various aspects of their dam engineering sector. South Africa and its neighbours have particular water problems such as an arid region with small rivers, high variability of flows and developing economies. Some potential topics for the Workshops are:

- Inter-basin transfer;
- RCC (South Africa built the first rollcrete gravity arch dam);
- System analysis;
- International and regional co-operation in shared rivers;
- Tailings dams;
- Labour-intensive construction of dams;
- Flood management in arid regions;
- Dam safety and dam rehabilitation.

SANCOLD may also call upon some of the ICOLD Technical Committees to provide inputs for the series of Workshops. The Workshops will be held on the Thursday and Friday.

SANCOLD SECRETARY
Secretary: Dr Paul Roberts
Telephone: +27 12 460 9100
Fax: +27 12 336 8561
E-mail Address: secretary@sancold.org.za

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

The Finnish National Group of ISRM and the Finnish Association of Civil Engineers RIL invite you to the 7th International Symposium on In-Situ Rock Stress to be held during 10–12 May 2016 in the beautiful city of Tampere, Finland. There have been six previous International Symposia on the rock stress topic, starting in 1976 in Sydney, Australia, and with the most recent one being held in Sendai, Japan, in 2013.

This 7th Symposium will be a natural continuation of the in-situ rock stress topic, which is of great importance to most rock engineering projects. In spite of the numerous research and development projects that have been undertaken in the subject of rock stresses, a great deal remains to be achieved in order to confi dently establish the stress fi eld and its variation at a particular site, plus the alteration to the stress fi eld as construction proceeds. We now have much improved stress measurement methods and associated 3-D computer programs—and the development is moving fast.

Accordingly, we hope to welcome all interested rock stress practitioners, modellers, designers and contractors to this 2016 rock stress symposium in Finland. We are sure that the 7th Symposium will contain much new material and will be an excellent forum for presenting your work, keeping up to date with developments, and networking.

This symposium encompasses all aspects of rock stresses such as

- Rock stress measurements with different methods
- Interpretation and analysis of results
- Case studies (nuclear waste disposal, mining, civil engineering)
- Regional stress fields
- Seismicity and rock stress
- New, innovated stress measurement methods
- Rock structures and rock stress
- Stress modeling

Abstract submission will open in February 2015.

Finland is an excellent venue for the Symposium because of the large amount of rock engineering construction and the fact that rock stresses play an important role in the design of Finnish rock engineering projects—even in the shallow underground facilities. Although the high horizontal stresses can be utilized in stabilizing rock caverns, such high stresses can cause rock damage around the rock facilities, so understanding the stress fi eld and designing accordingly is one of the keys to success.

Technical excursions and fi eld trips are being planned. Details are provided on the symposium web page.

Contact Person: Erik Johansson
erik.johansson@rs2016.org
Finnish ISRM Group and Finnish Association of Civil Engineers - RIL

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

Contact

Telephone: 0086 27 87198913
Fax: 0086 27 87198413
E-mail: xtfeng@whrsm.ac.cn

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

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

On behalf of the International Society for Rock Mechanics (ISRM), Turkish National Society for Rock Mechanics cordially invites the international community to attend the EUROCK 2016 Symposium. The symposium will be held between 29 and 31 August 2016 in Cappadocia (Turkey) which is one of the seven sites included in the World Heritage List by UNESCO and also a natural and historical rock engineering laboratory.

The theme of the symposium is "Rock Mechanics & Rock Engineering: From Past to the Future". The symposium intends to cover all aspects of rock mechanics and rock engineering from theories to engineering practices, emphasizing the future direction of rock engineering technologies. This event will be an excellent opportunity to promote the exchange of knowledge and experiences in various areas of the rock mechanics and rock engineering, as well as to visit many historical sites including old and modern rock structures caved in the soft tuffs of Cappadocia. The venue of the symposium, Ürgüp-Nevşehir, is located in the heart of the Cappadocia Region with convenient access to restaurants, hotels, historical sites and national museums. We believe that you will also enjoy participating to post-symposium excursions in the Cappadocia Region and İstanbul.

Themes

- Fundamental rock mechanics
- Rock properties, experimental rock mechanics and physical modelling
- Analytical and numerical methods in rock mechanics and rock engineering
- Stability of slopes in civil and mining engineering
- Design methodologies and analysis
- Rock dynamics
- Rock mechanics and rock engineering at historical sites and monuments
- Underground excavations in civil and mining engineering
- Coupled processes in rock mass for underground storage and waste disposal
- Rock mass characterization
- Petroleum geomechanics
- Instrumentation-monitoring in rock engineering and back analysis
- Risk management
- New frontiers (GPS, Extraterrestrial Rock Mechanics, Methane Hydrate Exploitation, CO_2 sequestration, earthquake prediction)

Contact

Prof. Reşat Ulusay
Hacettepe University, Faculty of Engineering,
Department of Geological Engineering,
Applied Geology Division,
06800 Beytepe, Ankara, TURKEY
Telephone: +90 312 2977767
Fax: +90 312 2992034
resat@hacettepe.edu.tr

3rd ICTG
International Conference
on Transportation Geotechnics

4 - 7 September 2016, Guimaraes, Portugal
www.spgeotecnia.pt/cpgt

The Transportation Geotechnics International Conference series began under the auspices of ISSMGE-TC 3 and was initiated in 2008 at the University of Nottingham, UK, as an International event designed to address the growing requirements of infrastructure for societies. The 2nd International Conference on Transportation Geotechnics took place in 2012, at Sapporo, Japan, under the ISSMGE-TC202 that follows the TC-3 activities for the period 2009-2013. To continue the successful of these conferences and the output of ISSMGE-TC-202, the 3rd was scheduled for 2016, at Guimarães, Portugal. Following the previous one, the challenges addressed by this conference will include a better understanding of the interactions of geotechnics on roads, rails, airports, harbours and other ground transportation infrastructure with the goal of providing safe, economic, environmental, reliable and sustainable infrastructures. The 3rd ICTG will be composed of workshops and several types of sessions, as well as a technical exhibition, to better disseminations of findings and best practices. A special attention will be paid to the publication of all the peer review papers, some of them in specialised international journals. On behalf of the organizing committee I am honoured to invite you to the 3rd ICTG in the City of Guimarães, UNESCO World Heritage (September 4-7, 2016).

Contact person: Prof. A. Gomes Correia (Chair)
Address: University of Minho, School of Engineering
Campus de Azurém
4800-058, Guimarães, Portugal
Phone: +351253510200, +351253510218
Fax: +351253510217
E-mail: 3ictrgeo2016@civil.uminho.pt, agc@civil.uminho.pt

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

eguler@boun.edu.tr

ARMS 9
9th Asian Rock Mechanics Symposium
ISRM Regional Symposium
October 2016, Bali, Indonesia
rkw@mining.itb.ac.id

Contact Person: Dr Ridho Wattimena
Indonesian Rock Mechanics Society (IRMS)
Telephone: +22 250 2239

6th Asian Regional Conference on Geosynthetics
8-11 November 2016, New Delhi, India
uday@cbip.org

The International Geosynthetic Society's Indian Chapter invites you to this exciting conference in New Delhi, India, on 8-11 November 2016.

India – the land of opportunities India is a fast-developing economy requiring large-scale infrastructures. The liberalisation of the economy has further facilitated planning and execution of many large scale-infrastructure, including roads, railways, power and water resources, which will further promote applications of Geosynthetics for infrastructural works. For India's XII Plan (2012-2017), spending on infrastructure is estimated to be USD 01 trillion, which is expected to grow for infrastructure activities for the XIII Plan (2017-2022).

The 6th Asian Regional Conference will be a step toward providing opportunity for exchange of experiences, practices and collaborations to facilitate flow of appropriate technology to enable successful implementation of infrastructure projects.

Conference Themes Geosynthetics for Infrastructure Development

Sub-themes

- Roads and Railways
- Hydraulic Applications
- Ground Improvement and Slope Stability
- Erosion Control
- Environmental Applications
- Natural Fibre Geotextiles
- Geosynthetic Testing

11th International Conference on Geosynthetics
(11ICG)
16 - 20 Sep 2018, Seoul South Korea
csyoo@skku.edu

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Νέες sinkholes
Τεράστιες τρύπες που άνοιξαν τα τελευταία χρόνια σε διάφορα μέρη της Γης

Winter Park – Φλόριντα

Είναι θαύμα που κανείς δεν έχασε τη ζωή του ή τραυματίστηκε στον εν λόγω κρατήρα, ο οποίος άφησε στο πέρασμά του μόνο οικονομική καταστροφή, κάπου 4 εκατ. δολάρια. Ο δήμος έβγαλε βέβαια πολλά από την πώληση αναμνηστικών t-shirts(!), κάτι ήταν κι αυτό μέσα στην καταστροφή…

Daisetta – Τέξας

Με περισσότερα από 270 μέτρα διάμετρο και πάνω από 80 μέτρα βάθος, η τρύπα αυτή απείλησε τη ζωή της μικρής πόλης με περισσότερους του ενός τρόπους, τον θάνατο δηλαδή των κατοίκων. Έφερε τον οικονομικό όλεθρο στην πόλη, ενώ το κωμοκοτραγικό κερασάκι στην τούρτα ήταν ο αλιγάτορας που μετακόμισε σύντομα στη φωλιά της…

Σαν Ντιέγκο, Καλιφόρνια

Το οδόστρωμα υποχωρεί και αφήνει πίσω του το εντυπωσιακά τρομακτικό αυτό σκηνικό. Ο δρόμος παρέμεινε κλειστός για περισσότερους από 5 μήνες το 1998, αναγκάζοντας τους αυτοκινητιστές σε τεράστιες παρακάμψεις.

Σαν Φρανσίσκο, Καλιφόρνια

Σφοδρές βροχοπτώσεις το 1995 έκαναν το έδαφος να υποχωρήσει, καταλήγοντας σε έναν κρατήρα διαμέτρου 70 μέτρων και βάθους 12 μέτρων. Παρά το γεγονός ότι κατάπιε κατοικίες, δεν σκοτώθηκε κανείς, αφήνοντας βέβαια τις δημοτικές αρχές να παλεύουν με τα συντρίμμια και την καταστροφή για μήνες…

St. Jude – Κεμπέκ

Τέσσερα σπίτια βυθίστηκαν στη γη και τα σωστικά συνεργεία που έσωσαν τελικά τους ενοίκους αναγκάστηκαν να δουλέψουν μέσα στα συνεχώς κινούμενα συντρίμμια…

Picher – Οκλαχόμα

Άλλοτε ένα από τα παραγωγικότερα ορυχεία μολύβδου και ψευδαργύρου των ΗΠΑ και πόλη-φάντασμα σήμερα, η εκτεταμένη εξόρυξη κατέστρεψε τη γεωλογία της πόλης και σύντομα γιγαντιαίοι κρατήρες άρχισαν να κάνουν απροσδόκητα την εμφάνισή τους, ερημώνοντας το Picher. Η συγκεκριμένη τρύπα του 2008 παραμένει ωστόσο η εντυπωσιακότερη…

Shenzhen – Kiva

Πέντε άνθρωποι έχασαν τη ζωή τους το 2013 όταν καταποντίστηκε το έδαφος σε μια τρύπα πλάτους 10 μέτρων. Αρκετοί άνθρωποι έχασαν το έδαφος κάτω από τα πόδια τους και οι υπεράνθρωπες προσπάθειες των σωστικών συνεργείων περιόρισαν τον φόρο σε ανθρώπινο αίμα…

Η Ατλαντίδα της Ερήμου

Άλλοτε φρούριο απόρθητο και λαμπρό εμπορικό κέντρο της περιοχής, η απομακρυσμένη πόλη Ουμπάρ, στη σημερινή Σαουδική Αραβία, εξαφανίστηκε μια ωραία πρωία από τον χάρτη, βυθιζόμενη μέσα στους αμμόλοφους. Και μάλιστα ήταν τα υπόγεια κοιτάσματα νερού που την έστειλαν στον χαμό, αυτά ακριβώς που την είχαν μετατρέψει σε όαση μέσα στο αφιλόξενο περιβάλλον της ερήμου. Ήταν στη δεκαετία του 1980 όταν την ανακάλυψαν οι αρχαιολόγοι, με τη βοήθεια δορυφόρου της NASA, εντοπίζοντας μάλιστα αρκετούς δρόμους που οδηγούσαν στα απομεινάρια της άλλοτε πολύβουης αρχαίας πόλης.

Σεπτεμβρίου 27, 2014

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

Το τέρας της λίμνης
Περιοχές των Άλπεων κινδυνεύουν από... τσουνάμι

Πέντε μεγάλα τσουνάμι εκτιμάται ότι έχουν συμβεί τα τελευταία 4.000 χρόνια στην αλπική λίμνη της Λουκέρνης

Η Ελβετία δεν βρέχεται από θάλασσα, περιέργως όμως ότι κινδυνεύει από τσουνάμι: οι περιοχές γύρω από τις λίμνες της Γενεύης και της Λουκέρνης απειλούνται από γιγάντια κύματα σε περίπτωση κατολίσθησης ή κατάρρευσης του πυθμένα, προειδοποιούν οι γεωλόγοι.

Οι πρώτες ενδείξεις για τον κίνδυνο τσουνάμι στις αλπικές λίμνες ήρθαν πριν από δύο χρόνια, όταν η λιμνογεωλόγος Κατρίνα Κρέμερ ανακάλυψε σε ιζήματα ενδείξεις για ένα μεγάλο τσουνάμι στη λίμνη της Γενεύης το 563 μ.Χ. Όπως εξηγεί το Nature.com, η πλαγιά ενός βουνού κατέρρευσε και έπεσε στα νερά, σηκώνοντας κύματα 8 μέτρων που εξαφάνισαν την παλιά πόλη της Γενεύης στην άλλη άκρη της λίμνης.

Έκτοτε, οι ενδείξεις όλο και πληθαίνουν. Σύμφωνα με μελέτη που παρουσίασε η Κρέμερ στις 18 Αυγούστου, σε συνέδριο της Διεθνούς Ένωσης Ιζηματολόγων στη Γενεύη, συνολικά πέντε μεγάλα τσουνάμι είναι πιθανό να έχουν συμβεί στη λίμνη της Γενεύης τα τελευταία 4.000 χρόνια. Άλλα προκλήθηκαν από κατολισθήσεις, άλλα από την κατάρρευση των υποβρύχιων πλαγιών που συγκεντρώνουν τα ιζήματα του ποταμού Ροδανού.

Τσουνάμι εκτιμάται εξάλλου ότι έπληξαν δύο φορές την αλπική λίμνη του Κόμο στην Ιταλία, τον 6ο και τον 12ο αιώνα μ.Χ., ενώ δύο ακόμα τσουνάμι πιστεύεται ότι συνέβησαν στη λίμνη της Λουκέρνης τον 170 αιώνα.

Πιο πρόσφατα, το 1822, εκδηλώθηκε τσουνάμι στην αλπική λίμνη Μπουρζέ στης γαλλικές Άλπεις.

Με τις ανησυχητικές ενδείξεις να συσσωρεύονται, το καντόνι του Νίντβαλντεν στην Ελβετία αναγνώρισε επίσημα τον κίνδυνο στη λίμνη της Λουκέρνης και καταστρώνει τώρα σχέδιο για την απομάκρυνση του πληθυσμού στην περίπτωση τσουνάμι.

Οι Άλπεις δεν είναι ιδιαίτερα σεισμογόνος περιοχή, πλήττονται όμως από σεισμούς των 6 βαθμών περίπου μια φορά ανά χίλια χρόνια.

Στη λίμνη της Λουκέρνης, ένας τέτοιος σεισμός θα μπορούσε να προκαλέσει κατολίσθηση στην υποβρύχια πλαγιά όπου συσσωρεύονται ιζήματα.

Οι αρχές του Νίντβαλντεν περιμένουν τώρα από τους επιστήμονες να παρουσιάσουν χάρτες με τις περιοχές που θα κατακλύζονταν από νερά.

Και, εκτός από τις αρμόδιες αρχές, ο κίνδυνος ίσως αρχίσει τώρα να λαμβάνεται υπόψη και από τις ασφαλιστικές εταιρείες.

(Newsroom ΔΟΛ, 03 Σεπ. 2014, http://news.in.gr/science-technology/article/?aid=1231344703)

Picking Up Good Vibrations from Napa Post-Quake Report

An earthquake-detection system under development by the University of California's Berkeley Seismological Laboratory proved its mettle on Aug. 24 by issuing a warning 10 seconds before a magnitude-6 temblor struck south of Napa, Calif. The alert could have gone out 2.5 seconds sooner if the ShakeAlert system, based on Japan's primary-wave detection system, were funded, and the lab were able to install more sensors, says a lab spokesperson.

UC Berkeley's early-warning system detects more benign fast-moving shock waves (yellow) in advance of slower vibrations, which cause more damage (red).

"It was definitely a great proof-positive that the system works just like we'd hoped," says Jennifer Strauss, the lab's external relations officer. "One of the things the Napa quake did show us is you need to make sure there are enough sensors," says Strauss.

Bay Area Rapid Transit is testing the alert system and received eight seconds' warning, but none of its trains were running when the quake hit at 3:30 a.m.

California State Legislature unanimously passed Senate Bill No. 135 last year, which calls for the development of a comprehensive statewide earthquake early-warning system to alert Californians in advance of dangerous shaking. But funding has not yet been found.

"It's an unfunded mandate, stipulating that we can't use general funds for the system," says Strauss. "Both Mexico and Japan built their early-warning systems after massive damaging earthquakes. This is the chance for California to build one before such a damaging quake."

Schools Undamaged

The epicenter of the American Canyon quake was at the heart of the Napa school district's 30 campuses. Subsequently, three architectural and engineering teams assessed "every room in every school" and observed no structural damage following the quake, says Mark Quattrocchi, principal of Kwok Quattrocchi Architects and one of the survey team members. "There was not even a single panel of cracked drywall," he says.

The schools performed so well because they are built or retrofitted according to much stricter seismic codes than commercial and residential buildings.

"There was no structural damage to any school in the district, even the ones built to older codes in the 1940s, 1950s and 1960s," says Quattrocchi. "Part of this is because seismic upgrades at the schools are treated the same as building an entirely new facility," he adds.

Schools fared well for three reasons: seismic building codes that are more stringent than those for commercial buildings, methodical reviews by the Division of the State Architect and "full-time" state inspection on school construction sites, Quattrocchi says.

A 2006 California Seismic Safety Commission report—the most recently published data on unreinforced masonry buildings in the state—says approximately 70% of California's 26,000 brick buildings have been demolished or retrofitted. About 8,000 brick buildings remain at risk, the report said.

In Napa, city inspectors remained at work tagging structures on the second round of damage evaluations. "As of 1 p.m., there are 1,053 structures in the city that have been tagged—153 are on the red-tag list and around 900 are on the yellow-tag list," the City of Napa reports. "It is possible these numbers will rise as more structures receive their second inspection and interiors are seen."

Ronald O. Hamburger, a senior principal with seismic structural engineer Simpson Gumpertz & Heger, says buildings in general fared well. "Overall, the performance of buildings in the Bay Area is a tribute to the effectiveness of building codes in general and seismic retrofit techniques," he says. Except for unreinforced or poorly retrofitted masonry buildings and older houses not bolted to their foundations, "buildings did very well, despite ground accelerations, locally in Napa, that approached design levels. In part this was due to the relatively short duration (10 seconds of strong motion) of this earthquake, but also, at least in part, it is a tribute to the effectiveness of western U.S. design practices."

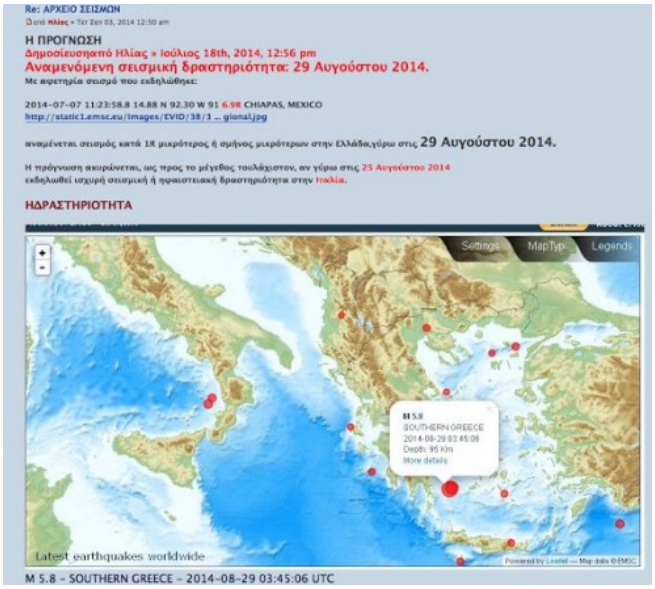
(Luke Abaffy and Nicholas Zeman with Nadine M. Post / Engineering News-Record, 09/03/2014, http://enr.construction.com/infrastructure/environment/2014/0908-picking-up-good-vibrations-from-napa-post-quake-report.asp)

Αποτυχημένη πρόβλεψη σεισμού
Ο Τσιάπας προβλέπει σεισμό στην Ελλάδα τον Σεπτέμβριο!

Ο σεισμολόγος Ηλίας Τσιάπας είχε προβλέψει με ακρίβεια – σύμφωνα με την γνωστή του θεωρία – τους δύο τελευταίους σεισμούς σε Χαλκιδική και Σπάρτη.

Σήμερα, εάν επισκεφτεί κάποιος το site του, θα διαπιστώσει πως γράφει για σεισμό στην Ελλάδα στις 20 Σεπτεμβρίου, ωστόσο σημειώνει πως η συγκεκριμένη πρόγνωση μπορεί να ακυρωθεί εφόσον στις 16 Σεπτεμβρίου εκδηλωθεί ισχυρή σεισμική ή ηφαιστειακή δραστηριότητα στην Ιταλία!. Δείτε παρακάτω την σχετική ανάρτηση:

Δείτε επίσης τις προβλέψεις του για Σπάρτη και Χαλκιδική:



(sfairika.gr / pentapostagma.gr, Σεπτεμβρίου 5, 2014)

Αναμενόμενη σεισμική δραστηριότητα: 20 Σεπτεμβρίου 2014

Με αφετηρία σεισμό που εκδηλώθηκε: 2014-07-29 10:46:15.2 17.82 N 95.53 W 89 6.3R VERACRUZ, MEXICO http://static1.emsc.eu/Images/EVID/39/3 ... gional.jpg αναμένεται σεισμός ανάλογου μεγέθους ή σμήνος μικρότερων στην Ελλάδα, γύρω στις **20 Σεπτεμβρίου 2014** (http://www.tsiapas.gr/forumgr/viewtopic.php?f=14&t=59)

Η πρόγνωση ακυρώνεται, ως προς το μέγεθος τουλάχιστον, αν γύρω στις **16 Σεπτεμβρίου 2014** εκδηλωθεί ισχυρή σεισμική ή ηφαιστειακή δραστηριότητα στην **Ιταλία**.

Σύμφωνα με την θεωρία του Ηλία Τσιάπα:

Πρόγνωση σεισμών

Α. Τα συστατικά που προκαλούν σεισμούς και εκρήξεις ηφαιστείων κινούνται από Δυσμάς προς Ανατολάς. Από στατιστικές μελέτες, έχοντας σαν αφετηρία ένα σεισμό, γνωρίζουμε:

- τη διαδρομή που θα ακολουθήσουν προς Ανατολάς,
- τις προεξοχές ή τους κρατήρες ηφαιστείων που θα συναντήσουν στη πορεία τους,
- το χρόνο που απαιτείται για να φτάσουν σ'αυτές και
- το μέγεθος που θα έχει ο αναμενόμενος σεισμός στις συγκεκριμένες προεξοχές - περιοχές.

Για τον Ελλαδικό χώρο παίρνουμε ως αφετηρία τους σεισμούς που γίνονται στη Κεντρική Αμερική από 0º μέχρι 40º και λίγο βορειότερα ή νοτιότερα ανάλογα με την εποχή (κλονισμός και - έλξεις Σελήνης - Ηλίου). Οι διαδρομές που ακολουθούν τα συστατικά περνούν κάτω από το φλοιό της Αμερικανικής ηπείρου, του Ατλαντικού ωκεανού, συγκλίνουν στο Γιβραλτάρ και στη συνέχεια κατευθύνονται κυρίως προς Ιταλία ή Ελλάδα σε 50 ή 53 ημέρες περίπου από την αφετηρία αντίστοιχα και δευτερευόντως σε άλλες χώρες της Μεσογείου και Βαλκανικής, όπου θα προκαλέσουν εκρήξεις ηφαιστείων (Αίτνα ή Στρόμπολι στην Ιταλία) ή νέους σεισμούς ανάλογου μεγέθους (ή σμήνος μεσαίου μεγέθους σεισμούς).

Μετά την Ελλάδα συνεχίζουν τη πορεία τους προς Ανατολάς.

Β. Για τον ακριβέστερο προσδιορισμό του επικέντρου χρησιμοποιούμε το πλέον αξιόπιστο πρόδρομο φαινόμενο την αύξηση της θερμοκρασίας του φλοιού, που εντοπίζεται σε ένα κώνο με κορυφή το υπόκεντρο και κέντρο βάσης το επίκεντρο του αναμενόμενου σεισμού. Με ένα δίκτυο θερμομέτρων συνδεδεμένα μέσω γεωτρήσεων με τον υπόγειο υδροφόρο ορίζοντα ή δορυφορικά παρακολουθούμε την αύξηση της θερμοκρασίας, η οποία συμβαίνει λίγες μέρες πριν την εκδήλωση ενός σεισμού. Έτσι γνωρίζουμε που βρίσκεται εγκλωβισμένη συγκεκριμένη ποσότητα υγρών και με τη διαφυγή τους Ανατολικά θα εκδηλωθεί σεισμός.

Με την πρώτη μέθοδο γνωρίζουμε τον χρόνο, το μέγεθος και με σχετική προσέγγιση το επίκεντρο και η δεύτερη συμβάλει στο ακριβέστερο προσδιορισμό του επικέντρου. Με το συνδυασμό των δύο αυτών μεθόδων προβλέπονται με ακρίβεια οι σεισμοί. Ας σημειωθεί ότι η πρόγνωση παύει να ισχύει αν εκδηλωθεί έκρηξη ηφαιστείου, που βρίσκεται μεταξύ της περιοχής που εκδηλώθηκε ο σεισμός που παίρνουμε ως αφετηρία και της περιοχής όπου αναμένουμε να εκδηλωθεί ο νέος σεισμός.

Η συχνότητα και το μέγεθος των σεισμών σε παγκόσμια κλίμακα μειώνεται όταν υπάρχει έντονη ηφαιστειακή δραστηριότητα και αντίστροφα.

Περισσότερα για την θεωρία του Ηλιά Τσιάπα στον ιστότοπο http://www.tsiapas.gr.

Ήπειροι από πάγο

Ευρώπη: Τεκτονική δραστηριότητα ανιχνεύθηκε για πρώτη φορά εκτός Γης

Η Ευρώπη, ένα μεγάλο φεγγάρι του Δία που κρύβει έναν βαθύ ωκεανό κάτω από ένα κάλυμμα πάγου, είναι το πρώτο σώμα εκτός της Γης στο οποίο ανιχνεύονται ενδείξεις τεκτονικής δραστηριότητας -ενδείξεις που αναπτερώνουν τις ελπίδες για ανακάλυψη μικροβιακής ζωής, και ίσως επιταχύνουν τις προσπάθειες της NASA για την εξερεύνηση αυτού του αινιγματικού κόσμου.

Ο παγωμένος φλοιός της Ευρώπης φαίνεται ότι ανακυκλώνεται διαρκώς λόγω της τεκτονικής δραστηριότητας (Φωτογραφία: NASA/JPL-Caltech)

Οι τεκτονικές πλάκες της Γης είναι γιγάντιες φέτες στερεού φλοιού που επιπλέουν στο υποκείμενο, ημίρρευστο στρώμα του μανδύα. Το ίδιο φαινόμενο δείχνει να διαμορφώνει και την επιφάνεια της Ευρώπης, μόνο που σε αυτή την περίπτωση πρόκειται για γιγάντιες πλάκες πάγου που επιπλέουν είτε σε έναν υπόγειο ωκεανό είτε σε ένα στρώμα θερμότερου, πιο εύπλαστου πάγου.

Προηγούμενες μελέτες είχαν δείξει ότι η επιφάνεια της Ευρώπης είναι σχετικά νέα και ότι οι τεράστιες ρωγμές που διατρέχουν την επιφάνεια του φεγγαριού επιτρέπουν στο υπόγειο νερό να ανέβει στην επιφάνεια και να μετατραπεί σε φρέσκο πάγο. Μέχρι σήμερα, όμως, παρέμενε ασαφές πώς ο πάγος ανακυκλώνεται και ανανεώνει το κάλυμμα πάγου.

Ερευνητές του Πανεπιστημίου του Άινταχο και του Πανεπιστημίου «Τζονς Χόπκινς» αναφέρουν ότι βρήκαν την απάντηση σε εικόνες της αποστολής Galileo, η οποία μελέτησε το σύστημα του Δία από το 1995 έως το 2003.

Εξετάζοντας το παγκόσμιο παζλ που σχηματίζουν οι πλάκες πάγου στην επιφάνεια, η ερευνητική ομάδα εντόπισε ένα κομμάτι πάγου, περίπου στο μέγεθος του Ισραήλ, το οποίο είχε με κάποιο τρόπο εξαφανιστεί.

Σύμφωνα με το τεκτονικό μοντέλο που προτείνουν οι ερευνητές με **δημοσίευσή τους** στο Nature Geoscience (Evidence for subduction in the ice shell of Europa, http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo2245.html), μεγάλες πλάκες πάγου στην Ευρώπη χάνονται γλιστρώντας κάτω από γειτονικές πλάκες -ένα φαινόμενο ανάλογο με την υποβύθιση των τεκτονικών πλακών στη Γη κατά μήκος μεγάλων ρηγμάτων.

Η ανακάλυψη ενισχύει τώρα τις υποψίες για την ύπαρξη μικροβιακής ζωής στο παγωμένο φεγγάρι, καθώς η τεκτονική δραστηριότητα συνδέει τον υπόγειο ωκεανό με το υπερκείμενο στρώμα πάγου και επιτρέπει σε θρεπτικά συστατικά, ίσως και σε μικρόβια, να ανεβαίνουν από τα βάθη στην επιφάνεια και το αντίστροφο.

Είναι η δεύτερη σημαντική ανακάλυψη στην Ευρώπη σε διάστημα λίγων μηνών, έπειτα από τον **εντοπισμό γιγάντιων πιδάκων νερού** (http://news.in.gr/science-technology/article/?aid=1231280389) στο νότιο πόλο του δορυφόρου.

Οι ανακαλύψεις ίσως επιταχύνουν τώρα τα σχέδια εξερεύνησης της Ευρώπης. Η NASA εξετάζει εδώ και χρόνια το ενδεχόμενο μιας αποστολής στο μυστηριώδες φεγγάρι, θέτοντας

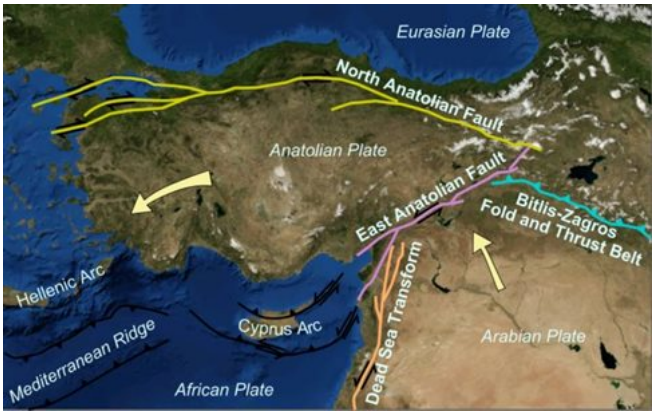
όμως το μάλλον χαμηλό όριο του ενός δισεκατομμυρίου δολαρίων για το κόστος της αποστολής.

Το αμερικανικό Κογκρέσο έχει εκδηλώσει ενδιαφέρον για τη μελέτη της Ευρώπης, και μέχρι τις 17 Οκτωβρίου η NASA δέχεται ιδέες για τα επιστημονικά όργανα που θα μπορούσε να περιλαμβάνει η φιλόδοξη αποστολή.

Θα περάσουν πάντως χρόνια μέχρι να οριστικοποιηθεί ο σχεδιασμός του εγχειρήματος και να μάθουμε περισσότερα για αυτόν τον παγωμένο αλλά πιθανώς φιλόξενο κόσμο.

(Βαγγέλης Πρατικάκης / Newsroom ΔΟΛ, 08 Σεπ. 2014, http://news.in.gr/science-technology/article/?aid=1231345783)

Η ανησυχία μεγαλώνει «Στην Κωνσταντινούπολη ο επόμενος μεγάλος σεισμός» στο Ρήγμα της Ανατολίας



Η κίτρινη γραμμή σημειώνει το Βόρειο Ρήγμα της Ανατολίας. Τα βέλη δείχνουν την κίνηση της Ευρασιατικής κα της Αραβικής τεκτονικής πλάκας.

Μετρήσεις των μετατοπίσεων του εδάφους την τελευταία 20ετία δείχνουν ότι ο επόμενος μεγάλος σεισμός στο Βόρειο Ρήγμα της Ανατολίας, το οποίο διατρέχει τη βόρεια Τουρκία και καταλήγει στο Αιγαίο, είναι πιθανό να συμβεί στη Θαλασσα του Μαρμαρά, περίπου 8 χιλιόμετρα δυτικά της Κωνσταντινούπολης, εκτιμούν ερευνητές στην Τουρκία και το MIT.

Η μελέτη, η οποία **δημοσιεύεται** στην έγκριτη επιθεώρηση Geophysical Research Letters, ουσιαστικά επιβεβαιώνει τις υποψίες πολλών επιστημόνων ότι η Κωνσταντινούπολη θα είναι το επίκεντρο του επόμενου μεγάλου σεισμού στην περιοχή, αναφέρουν οι ερευνητές σε **ανακοίνωσή τους**.

Το Βόρειο Ρήγμα της Ανατολίας, μια από τις πιο σεισμογόνες περιοχές του πλανήτη, είναι το όριο που χωρίζει την Ευρασιατική τεκτονική πλάκα από την πλάκα της Ανατολίας, η οποία περιλαμβάνει το μεγαλύτερο μέρος της Εγγύς Ανατολής.

Ερευνητές του MIT και διαφόρων τουρκικών ιδρυμάτων, ανάμεσά τους το Τεχνικό Πανεπιστήμιο της Κωνσταντινούπολης και το Παρατηρητήριο του Καντίλι, επίσης στην Κωνσταντινούπολη, ανέλυσαν καταγραφές από 100 δέκτες GPS που μετρούν τις μετατοπίσεις του ρήγματος τα τελευταία 20 χρόνια. Για τη Θάλασσα του Μαρμαρά, όπου η μέτρηση της μετατόπισης του βυθού είναι τεχνικά δύσκολη, οι ερευνητές χρησιμοποίησαν μαθηματικά μοντέλα.

Η ανάλυση έδειξε ότι το μεγαλύτερο μέρος του Βόρειου Ρήγματος της Ανατολίας μετατοπίζεται οριζόντια κατά 25 χιλιοστά το χρόνο. Η μετατόπιση αυτή συμβαίνει είτε ομαλά και αθόρυβα, όταν οι δύο πλευρές του ρήγματος γλιστρούν η μία δίπλα στην άλλη, ή στη διάρκεια σεισμών, οπότε η ενέργεια του ρήγματος εκτονώνεται απότομα.

Τις τελευταίες δεκαετίες, συσσωρευμένη ενέργεια έχει εκτονωθεί σε μια σειρά σεισμών-ντόμινο από τα ανατολικά προς τα δυτικά -ο τελευταίος εκδηλώθηκε το 1999 στη Νικομήδεια, στα ανατολικά της Κωνσταντινούπολης.

Στη Θάλασσα του Μαρμαρά, όμως, και συγκεκριμένα στην περιοχή των Πριγκιπονήσων δυτικά της Κωνσταντινούπολης, ο βυθός δεν έχει μετατοπιστεί όσο θα έπρεπε: από τον τελευταίο σεισμό που εκδηλώθηκε στην περιοχή πριν από 250 χρόνια, ο βυθός θα έπρεπε να είχε μετακινηθεί κατά 2,4 έως 3,0 μέτρα, κάτι που δεν έχει συμβεί, καθώς τα πετρώματα στις δύο πλευρές του ρήγματος έχουν «κολλήσει» και συσσωρεύουν τάση.

Η συσσωρευμένη ενέργεια θα μπορούσε θεωρητικά να εκτονωθεί σε μια σειρά πολλών ασθενών σεισμών, ωστόσο οι ερευνητές θεωρούν πιθανότερο το ενδεχόμενο ενός ισχυρού σεισμού, μεγέθους της τάξης των 7 βαθμών.

Ένας τέτοιος σεισμός θα μετατόπιζε το έδαφος απότομα έως και κατά 3 μέτρα και δεν μπορεί παρά να προκαλούσε εκτεταμένες ζημιές στην Κωνσταντινούπολη, όπου «πολλά κτήρια είναι παλιά και δεν πληρούν τις σύγχρονες προδιαγραφές».

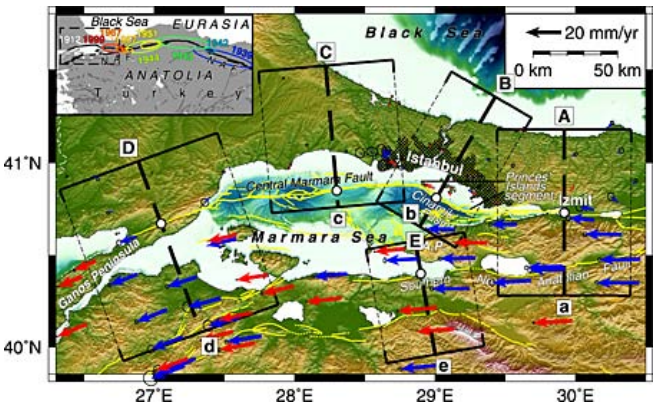
Το πότε θα χτυπήσει ο Εγκέλαδος παραμένει βέβαια άγνωστο.

(Newsroom ΔΟΛ, 11 Σεπ. 2014, http://news.in.gr/science-technology/article/?aid=1231346776)

Istanbul's earthquake hot spots: Geodetic constraints on strain accumulation along faults in the Marmara seismic gap

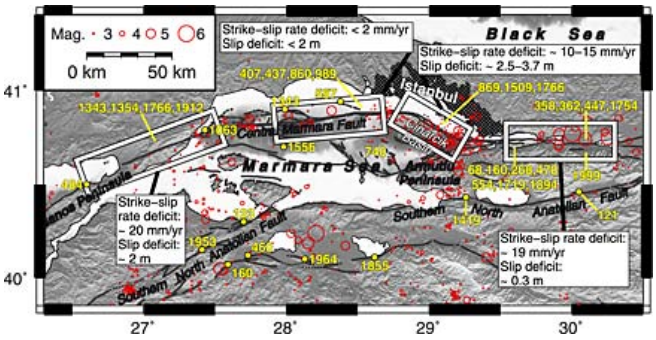
S. Ergintav, R. E. Reilinger, R. Çakmak, M. Floyd, Z. Çak r, U. Doğan, R. W. King, S. McClusky and H. Özener

Abstract



During the past century, a series of predominantly westward migrating $M > 7$ earthquakes broke an ~1000 km section of the North Anatolian Fault (NAF). The only major remaining "seismic gap" along the fault is under the Sea of Marmara (Main Marmara Fault (MMF)). We use 20 years of GPS observations to estimate strain accumulation on fault segments in the Marmara Sea seismic gap. We report the first direct observations of strain accumulation on the Princes' Islands segment of the MMF, constraining the slip deficit rate to 10–15 mm/yr. In contrast, the central segment of the MMF that was thought to be the most likely

location for the anticipated gap-filling earthquakes shows no evidence of strain accumulation, suggesting that fault motion is accommodated by fault creep. We conclude that the Princes' Islands segment is most likely to generate the next $M > 7$ earthquake along the Sea of Marmara segment of the NAF.



(Geophysical Research Letters, 22 Aug 2014, http://onlinelibrary.wiley.com/doi/10.1002/2014GL060985/abstract)

Seismic gap may be filled by an earthquake near Istanbul

After tracking seismic shifts, researchers say a major quake may occur off the coast of Istanbul.

This map of Turkey shows the artists' interpretation of the North Anatolian Fault (blue line) and the possible site of an earthquake (white lines) that could strike beneath the Sea of Marmara.

When a segment of a major fault line goes quiet, it can mean one of two things: The "seismic gap" may simply be inactive — the result of two tectonic plates placidly gliding past each other — or the segment may be a source of potential earthquakes, quietly building tension over decades until an inevitable seismic release.

Researchers from MIT and Turkey have found evidence for both types of behavior on different segments of the North Anatolian Fault — one of the most energetic earthquake zones in the world. The fault, similar in scale to California's San Andreas Fault, stretches for about 745 miles across northern Turkey and into the Aegean Sea.

The researchers analyzed 20 years of GPS data along the fault, and determined that the next large earthquake to strike the region will likely occur along a seismic gap beneath the Sea of Marmara, some five miles west of Istanbul. In contrast, the western segment of the seismic gap appears to be moving without producing large earthquakes.

"Istanbul is a large city, and many of the buildings are very old and not built to the highest modern standards compared to, say, southern California," says Michael Floyd, a research scientist in MIT's Department of Earth, Atmospheric and Planetary Sciences. "From an earthquake scientist's perspective, this is a hotspot for potential seismic hazards."

Although it's impossible to pinpoint when such a quake might occur, Floyd says this one could be powerful — on the order of a magnitude 7 temblor, or stronger.

"When people talk about when the next quake will be, what they're really asking is, 'When will it be, to within a few hours, so that I can evacuate?' But earthquakes can't be predicted that way," Floyd says. "Ultimately, for people's safety, we encourage them to be prepared. To be prepared, they need to know what to prepare for — that's where our work can contribute"

Floyd and his colleagues, including Semih Ergintav of the Kandilli Observatory and Earthquake Research Institute in Istanbul and MIT research scientist Robert Reilinger, have published their seismic analysis in the journal *Geophysical Research Letters*.

In recent decades, major earthquakes have occurred along the North Anatolian Fault in a roughly domino-like fashion, breaking sequentially from east to west. The most recent quake occurred in 1999 in the city of Izmit, just east of Istanbul. The initial shock, which lasted less than a minute, killed thousands. As Istanbul sits at the fault's western end, many scientists have thought the city will be near the epicenter of the next major quake.

To get an idea of exactly where the fault may fracture next, the MIT and Turkish researchers used GPS data to measure the region's ground movement over the last 20 years. The group took data along the fault from about 100 GPS locations, including stations where data are collected continuously and sites where instruments are episodically set up over small markers on the ground, the positions of which can be recorded over time as the Earth slowly shifts.

"By continuously tracking, we can tell which parts of the Earth's crust are moving relative to other parts, and we can see that this fault has relative motion across it at about the rate at which your fingernail grows," Floyd says.

From their ground data, the researchers estimate that, for the most part, the North Anatolian Fault must move at about 25 millimeters — or one inch — per year, sliding quietly or slipping in a series of earthquakes.

As there's currently no way to track the Earth's movement offshore, the group also used fault models to estimate the motion off the Turkish coast. The team identified a segment of the fault under the Sea of Marmara, west of Istanbul, that is essentially stuck, with the "missing" slip accumulating at 10 to 15 millimeters per year. This section — called the Princes' Island segment, for a nearby tourist destination — last experienced an earthquake 250 years ago.

Floyd and colleagues calculate that the Princes' Island segment should have slipped about 8 to 11 feet — but it hasn't. Instead, strain has likely been building along the segment for the last 250 years. If this tension were to break the fault in one cataclysmic earthquake, the Earth could shift by as much as 11 feet within seconds.

That gives very little warning for nearby Istanbul, says Marco Bohnhoff, a professor at the German Research Center for Geosciences in Potsdam, Germany.

"The nucleation point is pretty close to the city center, which makes early warning time pretty short — between two to six seconds," says Bohnhoff, who has studied seis-

mic patterns in the region. "Since the international airport is located in an area where ground motion would be high, it would be difficult to get in emergency troops, and unfortunately 90 percent of buildings in Istanbul do not fulfill building codes, and might not resist the expected earthquake."

Although such accumulated strain may be released in a series of smaller, less hazardous rumbles, Floyd says that given the historical pattern of major quakes along the North Anatolian Fault, it would be reasonable to expect a large earthquake off the coast of Istanbul within the next few decades.

"Earthquakes are not regular or predictable," Floyd says. "They're far more random over the long run, and you can go many lifetimes without experiencing one. But it only takes one to affect many lives. In a location like Istanbul that is known to be subject to large earthquakes, it comes back to the message: Always be prepared."

(Jennifer Chu / MIT News Office, September 11, 2014, http://newsoffice.mit.edu/2014/seismic-gap-earthquake-istanbul-0911)

A Day in Pompeii

Δείτε ένα εκπληκτικό animation video όπου δείχνει πώς καταστράφηκε και εξαφανίστηκε μέσα σε λίγες μέρες μία από της πιο όμορφες πόλεις της αρχαίας Ρώμης.

Η απεικόνιση είναι τόσο καλή που νομίζεις ότι όντως βρίσκεσαι εκεί την ώρα της καταστροφής!

A Day in Pompeii, a Melbourne Winter Masterpieces exhibition, was held at Melbourne Museum from 26 June to 25 October 2009. Over 330,000 people visited the exhibition -- an average of more than 2,700 per day -- making it the most popular traveling exhibition ever staged by an Australian museum.

Zero One created the animation for an immersive 3D theatre installation which gave visitors a chance to feel the same drama and terror of the town's citizens long ago, and witness how a series of eruptions wiped out Pompeii over 48 hours.

This video is available in full HD stereo. Please get in touch with Zero One through their website for licensing information for exhibitions, television and other media or to discuss 3D Visualisation solutions. Copyright 2010 Zero One Animation and Melbourne Museum.

https://www.youtube.com/watch?v=dY_3gqKq0Bc#t=68

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

Giant hole appears at 'the end of the world' in Siberia

A mysterious crater has appeared at the "end of the world" in Siberia, leaving a pit 80m wide and so deep it has not yet been measured.

Researchers are being dispatched to investigate the hole, which has confounded scientists with its dramatic appearance.

Some have speculated it could have been made by a meteorite striking earth, an underground explosion, or is a sinkhole caused by collapsing rock, the *Siberian Times* reported.

One imaginative online commenter claimed it could even be evidence "of the arrival of a UFO craft" to the planet.

The area's name, Yamal, translates as the "end of the world" and the remote peninsula reaches into the Arctic Ocean.

It holds some of Russia's largest gas reserves and the crater appeared less than 20 miles from the biggest gas field, Bovanenkovo.

The dark colour of the crater's sides was said in a Zvezda TV report to indicate "temperature processes" or burning.

Whatever caused it, it is large enough to comfortably fit several military helicopters in the entrance.

Experts from the Centre for the Study of the Arctic and the Cryosphere Institute of the Russian Academy of Sciences will take samples of soil, air and water.

A spokesman for the Russian Emergencies Ministry's Yamal branch ruled out a meteorite but said it was too early to say what cause the crater.

Initial reports about the phenomenon were dismissed as fakes but evidence has proved its existence for the last two years.

Anna Kurchatova, from the Sub-Arctic Scientific Research Centre, told the *Siberian Times* global warming could be a cause.

She believes the hole was formed by a mixture of water, salt and gas, igniting an underground explosion.

The gas had accumulated in ice mixed with sand beneath the surface of what was a sea 10,000 years ago, and ignited when the permafrost melted "like popping a champagne bottle", she claimed.

If her analysis is correct, another explosion could have worrying implications for the many underground gas pipelines running through the region.

The nearby Bovanenkovo field is of central importance to gas supplies from Siberia to the world.

Yamal is also known for its huge reindeer herds, which are managed by the indigenous Nenets.

(Lizzie Dearden / The Independent, Wednesday 16 July 2014, http://www.independent.co.uk/news/world/europe/giant-hole-appears-at-the-end-of-the-world-in-siberia-9609728.html)

How the 'mysterious holes' formed in the Yamal peninsula

Noted scientists tell RIR that the holes found on the Yamal Peninsula that have sparked so much interest on the internet have no known analogues on land, but could indicate a serious degradation of the permafrost, with global implications.

Any such holes known to science have only previously been discovered at the bottom of the Arctic seas. However, according to Doctor of Technical Sciences Vasily Bogoyavlensky from the Institute of Oil and Gas Issues at the Russian Academy of Sciences, even these have virtually never been studied.

In a practical sense this means that, in the absence of fundamental research, scientists will not know the conditions in which these holes can form and the regions in which they can form.

If they are sufficiently analogous to the holes in the Kara, Pechora, Barents and other seas (these are known by the scientific term 'pockmarks') and are formed as a result of natural gas explosions, then this could pose a significant threat.

"If this is the case then it could cause ships to sink, which has happened on more than one occasion abroad," explained Bogoyavlensky. "In 1995 the Russian vessel *Bravenit* almost sank in the Pechora Sea as a result of an underwater gas explosion that occurred while a shallow engineering shaft was being drilled."

The unique Kungur ice cave, one of the largest karst caves in European Russia, is located in the Filippovka village, 100 kilometers off the city of Perm. Pictured: Grotto with an underground lake. Source: Igor Kataev / RIA Novosti

According to the scientist, the Arctic seabed has, as far as can be told, the same geological structure as that found on the Yamal Peninsula, with one exception: The ground is covered with a thick layer of permafrost, which is all but absent from the northern seas.

"The majority of what is now the Arctic seabed 10-15,000 years ago was land with permafrost formations. Apart from that, this huge area was covered by a powerful glacier, part of which survives to this day in Greenland," Bogoyavlensky added."

"A significant part of the Paleo-permafrost zone in the Barents and Kara seas has been melting up until the present day. In some areas, the frozen ground has been retained, particularly close to the shore. There is frozen ground in the Kara Sea but this is breaking down."

Since there are hundreds and thousands of pockmarks on the seabed, this could indicate that further degradation of the permafrost would lead to new holes appearing in the future.

The permafrost is a huge reservoir of greenhouse gases, and specifically of methane, which is causing the atmosphere to warm up.

Since the permafrost occupies such an enormous area, the thawing of the permafrost as well as other processes have a direct effect on the global climate. According to forecasts conducted by United Nations experts, this in turn could lead to a rise in global sea levels of a meter within this century.

A lake is going to form

Doctor of Geological and Minerological Sciences Marina Leibman (of the Earth Cryosphere Institute of the Siberian Branch of the Russian Academy of Sciences) supports this gas theory**.**

A permafrost expert with more than 40 years' experience, Marina was one of the first to arrive at the mysterious hole close to Bovanenkovo – one of the largest gas deposits in Russia.

"For me the biggest surprise was that the location appeared untouched by any kind of human activity. My first thoughts were that this hole was the result of an accident that occurred whilst drilling for natural gas," Leibman explained to RIR.

Scientists did not risk venturing down into the hole: There was a very high risk of it collapsing, but they did lower a video camera down to the bottom.

There is a small lake at the bottom of the hole, formed of dirty water. As the temperature is above freezing, but the walls are frozen, this water, which is mixed with clay, is draining down the walls and collecting at the bottom.

According to Leibman it could take 2-3 years for the hole to fill with water and become a lake.

By all accounts, the hole could have been formed as a result of an increase in temperature in the local climate. Does this mean that the topography of the Yamal Peninsula is suited to these cavities?

"It is not the case of course that the entire topography is suitable, since specific conditions need to come together in one location for this to happen. This is linked to the type of rocks found near the surface. It depends on the geological cross-section, on the gas content within the rocks, and the amount of ice," the scientist said.

Leibman explained that if the ice content is high, and the density of ice is half that of rock, processes begin to work to redistribute matter in the soil, adding that the gas would need to be at a depth accessible to warmth seeping down into the rock from above.

"It would take several decades for the present rise in temperature to reach down to a depth of 100 m. I think that the temperature wave would have travelled 20 m underground by 2012. In the location where the hole formed the soil had thawed to a depth of 73 cm."

As Leibman noted, there is a similar hole at Taymyr in northern Siberia, and in theory this could also happen in Chukotka (in the Russian Far East) but there is no reason to expect new holes to appear south of 69-70º in northern latitudes.

"Around 10,000 years ago it was warmer than it is now, so the permafrost had melted in more southerly latitudes. The permafrost at these latitudes is not solid any more, but is isolated, and interrupted by river valleys and under deep lakes. Whatever needs to escape [this refers to methane - RIR] has already escaped long ago. There is no longer any need for the gas to fracture the permafrost since it can escape via the rocks, which have thawed out," Leibman explained.

(Gleb Fedorov / RIR, August 6, 2014, http://in.rbth.com/economics/2014/08/06/how_the_mysterious_holes_formed_in_the_yamal_peninsula_37237.html)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Denmark bridge collapse blocks motorway

Denmark's main route running north from Copenhagen, the Helsingør motorway, was blocked in both directions after a bridge, which had only just been built, collapsed on Saturday night.

One engineering expert, Christos Georgakis from the Technical University of Denmark, described it as unacceptable, saying such a mishap should not happen in a country like Denmark.

(euronews, 28.09.2014, http://www.euronews.com/2014/09/28/denmark-bridge-collapse-blocks-motorway)

Τι κρύβεται κάτω από τη Γη : Απίστευτες φωτογραφίες μέσα σε σπηλιά λάβας εκατοντάδες μέτρα υπόγεια

Με διατάσεις πάνω από δύο μίλια και εκατοντάδες πόδια υπόγεια, βρίσκονται αυτά τα εντυπωσιακά δίκτυα σπηλαίων που έχουν θαφτεί κάτω από την Ουάσιγκτον στις ΗΠΑ.

Οι θεαματικές σωλήνες εμφανίζουν ένα καλειδοσκόπιο χρωμάτων – που σχηματίζεται πάνω από **8.000 χρόνια πριν** από τη λάβα που ρέει στα στοίβαγμα μέσα στο βαθύ φαράγγι.

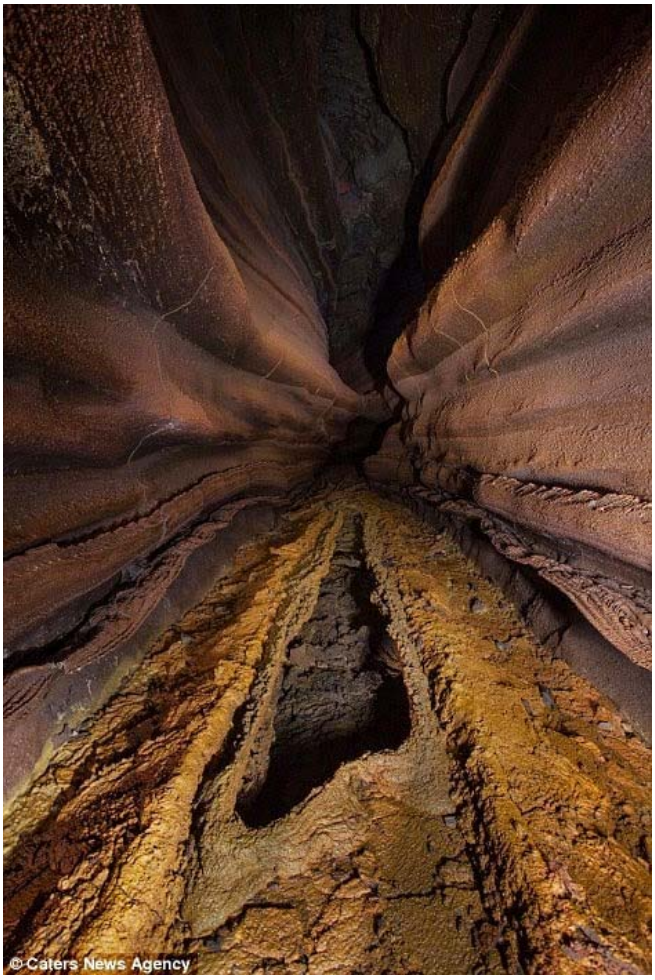
Ο φωτογράφος Josh Hydeman, διερεύνησε τον εκπληκτικό σχηματισμό, ο οποίος είναι **325ft κάτω από το έδαφος**, μαζί με τους συντρόφους του Eric Guth, Garry Petrie και Jason Γεωργίου.

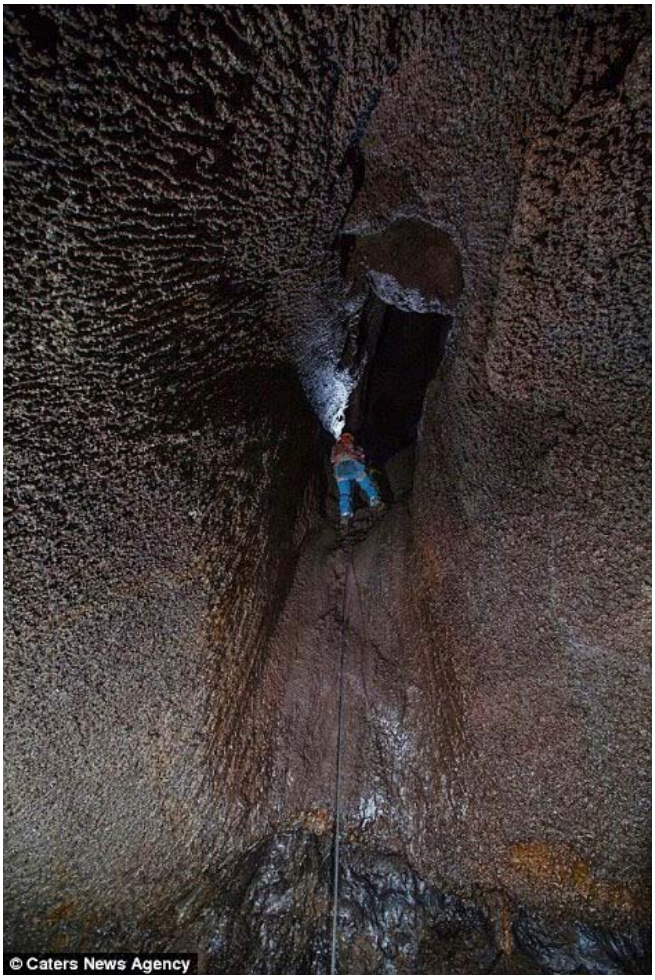
Η έμπειρη ομάδα δήλωσε ότι ήταν αρκετά ικανή για να αναλάβει το δίκτυο των σπηλαίων – αλλά παραδέχθηκε ότι για έναν άπειρο εξερευνητή, η διαδρομή θα ήταν θανατηφόρα.

«**Η σπηλιά πρωτοχαρτογραφήθηκε το 1993**»

Είναι μια εξαιρετικά μοναδική σπηλιά λάβας, καθώς οι περισσότερες αποτελούνται από ένα επίπεδο ή ένα σωλήνα, αλλά η συγκεκριμένη έχει πέντε και είναι πολύχρωμη, και αρκετά φωτεινή.

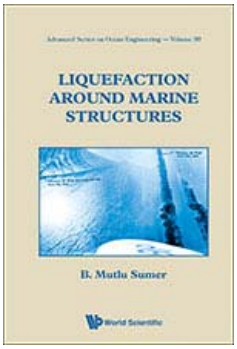
«Το σπήλαιο έχει τους κινδύνους του. Υπάρχουν μέρη που πρέπει να ανεβείτε στο βράχο, που είναι ασταθή και υπάρχουν πολλοί λάκκοι που θα πρέπει να πλοηγηθείτε χρησιμοποιώντας τεχνικές με σχοινί, όπου σε έναν άπειρο εξερευνητή θα μπορούσε σίγουρα να αποβεί μοιραίο.»





Σεπτεμβρίου 30, 2014

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Liquefaction Around Marine Structures
(With CD-ROM)

B Mutlu Sumer

Advanced Series on Ocean Engineering: Volume 39

This book, whose primary aim is to describe liquefaction processes and their implications for marine structures such as pipelines, sea outfalls, quay walls and caisson breakwaters, discusses the subject of soil liqeufaction in the marine environment.

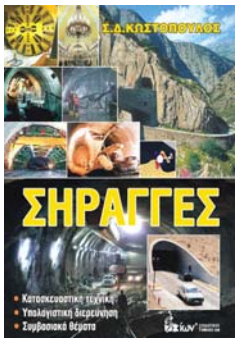
In addition, the physics of liquefaction (including examples illustrating the catastrophic consequences of soil liquefaction with regard to marine structures) are described, and the mathematical modelling of liqeufaction is treated in detail. Also, carefully selected numerical examples support the discussion of assessing liquefaction potential, and benchmark cases such as buried gas pipelines and their floatation, caisson breakwaters, cover stones and their interaction with liquefied soil along with counter measures are investigated.

Contents:

- Introduction and Physics of Liquefaction
- Biot Equations and Their Solutions
- Residual Liquefaction
- Momentary Liquefaction
- Floatation of Buried Pipelines
- Sinking of Pipelines and Marine Objects
- Liquefaction Under Standing Waves
- Liquefaction at Gravity Structures
- Stability of Rock Berms in Liquefied Soil
- Impact of Seismic-Induced Liquefaction
- Counter Measures

Readership: Professionals and researchers in the area of coastal, ocean and marine civil engineering; graduate and post graduate students.

(World Scientific, May 2014)



Σήραγγες

Κατασκευαστική Τεχνική. Υπολογιστική Διερεύνηση. Συμβασιακά Θέματα.

Κωστόπουλος Δ. Σπύρος

Το παρόν πόνημα πραγματεύεται το δυσκολότερο ίσως είδος γεωτεχνικής κατασκευής, τις σήραγγες. Τα υπόγεια αυτά έργα, εκ της φύσεώς των και μόνον, συμφύονται στον μέγιστο βαθμό με το απρόβλεπτο, γεωλογικού κυρίως χαρακτήρα, ώστε η γεω-γνώση να παίζει τον πλέον σημαντικό ρόλο. Οι Μηχανικοί όμως, ερχόμενοι αντιμέτωποι με την ατέλειωτη ποικιλότητα και πολυπλοκότητα της φύσης, κατάφεραν και πάλι να μεγαλουργήσουν διαχρονικά, από το περίφημο Ευπαλίνειο όρυγμα της Σάμου έως την περιώνυμη σήραγγα Seikan της Ιαπωνίας του σήμερα. Οι σήραγγες - και δη οι διανοιγόμενες στις οποίες και εστιάζεται το ενδιαφέρον του βιβλίου αυτού είναι έργα υποδομής, άρα αναπτυξιακά, και υπερτερούν εν γένει των επίγειων οδεύσεων-τουλάχιστον από περιβαλλοντική θεώρηση.

Θεωρήθηκε σκόπιμο η ύλη του βιβλίου να διαχωρισθεί σε τέσσερα μόνον εκτενή Κεφάλαια ακολουθούμενα από επτά Παραρτήματα.

Το πρώτο Κεφάλαιο, ως ευρεία εισαγωγή, παρουσιάζει τα βασικά ζητήματα που σχετίζονται με την υλοποίηση σηράγγων: το σκεπτικό της επιλογής των ως λύσης έναντι μίας υπέργειας χάραξης (με έμφαση στον σεβασμό του περιβάλλοντος), την Τεχνική Γεωλογία που τις διέπει, την αναγκαία γεωλογική επισκόπηση και την συμπαρομαρτούσα γεωτεχνική διασκόπηση-διΐχνευση της υποδεχόμενης μία σήραγγα γεωμάζας, τις αρχές γεωτεχνικού σχεδιασμού, όσο και τα συστήματα κατάταξης της "βραχομάζας" ως μέσα πρωτόλειας διαστασιολόγησης του έργου.

Η κατασκευαστική τεχνική των σηράγγων αναπτύσσεται in extenso στο δεύτερο Κεφάλαιο του πονήματος, όπου παρουσιάζονται διεξοδικά η εκσκαψιμότητα της γεωμάζας και οι μέθοδοι υπόγειας διάνοιξης και υποστήριξης: μηχανική ανόρυξη, εκρηκτικά, ολομέτωπη ή τμηματική εκσκαφή, ηλώσεις και βλήτρα, εκτοξευόμενο σκυρόδεμα, μεταλλικά πλαίσια, προκατασκευασμένοι δακτύλιοι κ.ά. Ιδιαίτερη έμφαση δίδεται στην ποιοτική αποκωδικοποίηση των μηχανισμών αστάθειας τόσο χωρίς όσο και υπό την παρουσίαν υπόγειων νερών (και την διευθέτησή των), αλλά και την εμφάνιση «δύσκολων» γεωτεχνικών συνθηκών από κατασκευαστικής πλευράς, στοιχείων που θα οδηγήσουν τον αναγνώστη στην κατ' ιδίαν αξιολόγηση των αναλυτικών μεθόδων προσομοίωσης των φαινομένων αυτών.

Η υπολογιστική διερεύνηση των σηράγγων αναπτύσσεται στο τρίτο Κεφάλαιο του παρόντος πονήματος. Προκειμένου να επιτευχθεί ο τελικός στόχος του όλου εγχειρήματος, δηλαδή μία τελική ισορροπία σε οιαδήποτε διατομή του έργου, θα πρέπει να κατακτηθούν από τον Μηχανικό (Μελετητή και Ανάδοχο) οι μηχανισμοί αλληλεπίδρασης μεταξύ της απαιτούμενης "υποστήριξης" (ακαμψία), της ενεχόμενης γεωμάζας (μικρο και μακροχρόνιες μηχανικές ιδιότητες), καθώς και των χρονικώς εξαρτώμενων τασικών αναδιανομών που προκύπτουν από την διαδικασία διάνοιξης (εκσκαφή + υποστήριξη).

Το τέταρτο και τελευταίο Κεφάλαιο του παρόντος πονήματος αφιερώνεται στην "συμβασιολογία". Διευκρινίζονται οι έννοιες του κινδύνου, της διακινδύνευσης, της ασφάλειας, της ποιότητας, του κόστους των σηράγγων, η σχέση ποιότητας-κόστους, οι τρόποι δημοπράτησης, ο ρόλος των "ειδικών συμβούλων", και η (υποχρεωτική πλέον) ασφάλιση των έρ-

γων. Ιδιαίτερη έμφαση δίδεται στην λεπτομερή περιγραφή της "Πρότυπης Γεωτεχνικής Έκθεσης" (Geotechnical Baseline Report).

ΣΥΝΟΠΤΙΚΑ ΠΕΡΙΕΧΟΜΕΝΑ

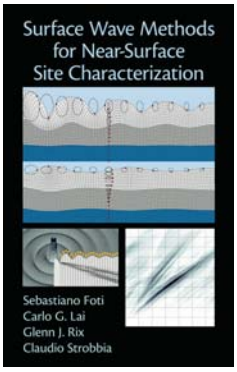
ΚΕΦΑΛΑΙΑ

1: Ευρεία Εισαγωγή
2: Κατασκευαστική τεχνική
3: Υπολογιστική διερεύνηση των σηράγγων
4: Συμβασιακά θέματα

ΠΑΡΑΡΤΗΜΑΤΑ

Α: Βαθμονόμηση της βραχομάζας
Β: Ασυνέχειες - Γραφική απεικόνιση της αστάθειας
Γ: Θερμική επεξεργασία των γεωσχηματισμών
Δ: Μηχανική όρυξη των σηράγγων
Ε: Ανατινάξεις
ΣΤ: Τεχνολογίες υποστήριξης
Ζ: Αναλυτικές διερευνήσεις

(Εκδοτικός Όμιλος ΙΩΝ, 24.07.2014)



Surface Wave Methods for Near-Surface Site Characterization

S. Foti, C. G. Lai, G. J. Rix & C. Strobbia

This book provides a unified treatment of surface wave propagation, signal processing, inverse theory, and the testing protocols that form the basis of modern surface wave methods. The use of these tests has increased dramatically since the 1980s, but they are too often performed and interpreted in a variety of ways that are confusing. This book answers the pressing need for a guide to the basic principles as well as outlining a set of reliable, dependable, and accepted practices.

Features

• Authoritative reference as well as guide to the basics
• Illustrated with case studies
• Provides guidance to relevant software

Contents

Overview of surface wave methods.
Linear wave propagation in vertically inhomogeneous continua.
Measurement of surface waves.
Dispersion analysis.
Attenuation analysis.
Inversion.
Case histories.
Advanced surface wave methods.
References.
Index.

(CRC Press / Taylor & Francis Group, August 2014)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

International Society for Rock Mechanics

ISRM newsletter

http://www.isrm.net/adm/newsletter/ver_html.php?id_newsletter=101&ver=1

Κυκλοφόρησε το Τεύχος 27 (Σεπτεμβρίου 2014) με τα παρακάτω περιεχόμενα:

- Welcome to ARMS8 in Sapporo Japan, 14-16 October - The 2014 ISRM International Symposium
- 13th International ISRM Congress, May 2015, Montreal, Canada
- The ISRM Orange Book was published and will be lauched in October during the ARMS8 in Sapporo, Japan
- New frontpage of the ISRM website
- "Measurement and back analysis in rock engineering" - the 7th ISRM online lecture by Prof. Sakurai
- Prof. Marek Kwasniewsky passed away
- VIII South American Congress on Rocks Mechanics, 15-18 November 2015, Buenos Aires, Argentina
- "Rock Mechanics Based on an Anisotropic Jointed Rock Model" a new book by ISRM Past-President Prof. Walter Wittke
- ISRM Rocha Medal 2016 - nominations to be received by 31 December 2014
- AusRock 2014: 3rd Australasian Ground Control in Mining Conference, Sydney, 5-6 November 2014
- 3rd ISRM International Young Scholars' Symposium on Rock Mechanics, Xi'an, 8-11 November 2014
- Workshop on Volcanic Rocks & Soils, 24-25 September 2015, Isle of Ischia, Italy
- 7th International Symposium on In-Situ Rock Stress, Tampere, Finland, May 10-12, 2016
- ISRM sponsored meetings
- ISRM Conference on Soft Rocks was held in Beijing, China
- VI Brazilian Symposium of Rock Mechanics (SBMR2014) was held in Goiania, Brazil
- South American ISRM National Groups met in Brazil on 11 September 2014
- 2nd International Conference on Information Technology in Geo-Engineering (ICITG 2014) was held in Durham, UK. 21-22 July 2014

International Journal of Geoengineering Case Histories

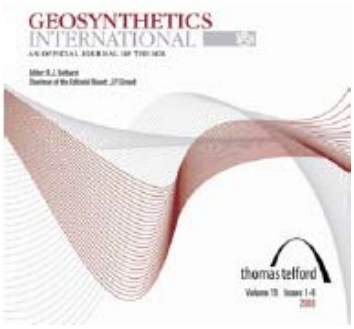
Vol. 3, Issue 1
http://casehistories.geoengineer.org/volume/volume3/issue2/IJGCH_3_2_1.html

Bengt H. Fellenius «Discussion of: Ground Improvement Using Preloading with Prefabricated Vertical Drains».

geo engineer

www.geoengineer.org

Κυκλοφόρησε το Τεύχος #115 του **Newsletter του Geoengineer.org** (Σεπτεμβρίου 2014) 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).



Geosynthetics International

www.thomastelford.com/journals

Κυκλοφόρησαν τα τεύχη αρ. 4 και 5 του 21ου τόμου (Ιουλίου και Αυγούστου 2014) του περιοδικού **Geosynthetics International** με τα ακόλουθα περιεχόμενα:

Τεύχος 4

W. Kongkitkul, T. Chantachot ans F. Tatsuoka "Simulation of geosynthetic load–strain–time behaviour by the non-linear three-component model"

E.C.G. Santos, E.M. Palmeira and R.J. Bathurst "Performance of two geosynthetic reinforced walls with recycled

construction waste backfill and constructed on collapsible ground"

F.H.M. Portelinha, J.G. Zornberg and V. Pimentel "Field performance of retaining walls reinforced with woven and non-woven geotextiles"

A. Rosete, P. Mendonça Lopes, M. Pinho-Lopes and M.L. Lopes "Tensile and hydraulic properties of geosynthetics after mechanical damage and abrasion laboratory tests"

Τεύχος 5

F. Xu and J.-C. Chai "Lateral displacement of PVD-improved deposit under embankment loading"

V.K. Midha, S.Suresh Kumar and A. Sharma "Performance of transesterified jute rolled erosion-control products"

M.G.A. Guimarães, D.C. Urashima and D.M. Vidal "Dewatering of sludge from a water treatment plant in geotextile closed systems"

L. Miao, F. Wang, J. Han and W. Lv "Benefits of geosynthetic reinforcement in widening of embankments subjected to foundation differential settlement"

Find the download of the articles at:
http://www.icevirtuallibrary.com/content/issue/gein/21/4
http://www.icevirtuallibrary.com/content/issue/gein/21/5
For the IGS members to have FREE access to the papers they MUST log in through the IGS website.

Geotextiles & Geomembranes

www.geosyntheticssociety.org/journals.htm

Κυκλοφόρησε το τεύχος αρ. 5 του 42ου τόμου (Οκτωβρίου 2014) του περιοδικού **Geotextiles & Geomembranes** με τα ακόλουθα περιεχόμενα:

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Tingfa Liu, Liming Hu "Organic acid transport through a partially saturated liner system beneath a landfill", Pages 428-436

Jinchun Chai, Suksun Horpibulsuk, Shuilong Shen, John P. Carter "Consolidation analysis of clayey deposits under vacuum pressure with horizontal drains", Pages 437-444

R. Kerry Rowe, Lauren.E. Ashe, W. Andy Take, R.W.I. Brachman "Factors affecting the down-slope erosion of bentonite in a GCL", Pages 445-456

P. Voottipruex, D.T. Bergado, L.G. Lam, T. Hino "Back-analyses of flow parameters of PVD improved soft Bangkok clay with and without vacuum preloading from settlement data and numerical simulations", Pages 457-467

Moustafa I. Awad, Burak F. Tanyu "Laboratory evaluation of governing mechanism of frictionally connected MSEW face and implications on design", Pages 468-478

Chia-Nan Liu, Kuo-Hsin Yang, Minh Duc Nguyen "Behavior of geogrid–reinforced sand and effect of reinforcement anchorage in large-scale plane strain compression", Pages 479-493

M.R. Abdi, A.R. Zandieh "Experimental and numerical analysis of large scale pull out tests conducted on clays reinforced with geogrids encapsulated with coarse material", Pages 494-504

S.H. Lajevardi, L. Briançon, D. Dias "Experimental studies of the geosynthetic anchorage – Effect of geometric parameters and efficiency of anchorages", Pages 505-514

Yufeng Gao, Shangchuan Yang, Yongxin Wu, Dayong Li, Fei Zhang "Evaluation of oblique pullout resistance of reinforcements in soil wall subjected to seismic loads", Pages 515-524

Romain Girout, Matthieu Blanc, Daniel Dias, Luc Thorel "Numerical analysis of a geosynthetic-reinforced piled load transfer platform – Validation on centrifuge test", Pages 525-539

R. Kerry Rowe, A.M.R. Ewais "Antioxidant depletion from five geomembranes of same resin but of different thicknesses immersed in leachate", Pages 540-554

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Technical Note

Masoud Mirmohammad Sadeghi, Farhad Hassan Beigi "Dynamic behavior of reinforced clayey sand under cyclic loading", Pages 564-572

Corrigendum

Yan Zhuang, Kangyu Wang Corrigendum to "A simplified model to analyze the reinforced piled embankments" [Geotext. Geomemb. 42 (2014) 154–165], Page 573

ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ ΕΕΕΕΓΜ (2012 – 2015)

Πρόεδρος	:	Χρήστος ΤΣΑΤΣΑΝΙΦΟΣ, Δρ. Πολιτικός Μηχανικός, ΠΑΝΓΑΙΑ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Ε.Π.Ε. president@hssmge.gr, editor@hssmge.gr, ctsatsanifos@pangaea.gr
Α' Αντιπρόεδρος	:	Παναγιώτης ΒΕΤΤΑΣ, Πολιτικός Μηχανικός, ΟΜΙΛΟΣ ΤΕΧΝΙΚΩΝ ΜΕΛΕΤΩΝ Α.Ε. otmate@otenet.gr
Β' Αντιπρόεδρος	:	Μιχάλης ΠΑΧΑΚΗΣ, Πολιτικός Μηχανικός mpax46@otenet.gr
Γενικός Γραμματέας	:	Μαρίνα ΠΑΝΤΑΖΙΔΟΥ, Δρ. Πολιτικός Μηχανικός, Αναπληρώτρια Καθηγήτρια Ε.Μ.Π. secretary@hssmge.gr, mpanta@central.ntua.gr
Ταμίας	:	Γιώργος ΝΤΟΥΛΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΜΗΧΑΝΙΚΗ Α.Ε.- ΓΕΩΤΕΧΝΙΚΕΣ ΜΕΛΕΤΕΣ Α.Ε. gdoulis@edafomichaniki.gr
Έφορος	:	Γιώργος ΜΠΕΛΟΚΑΣ, Δρ. Πολιτικός Μηχανικός, Επίκουρος Καθηγητής ΤΕΙ Αθήνας gbelokas@teiath.gr, gbelokas@gmail.com
Μέλη	:	Ανδρέας ΑΝΑΓΝΩΣΤΟΠΟΥΛΟΣ, Δρ. Πολιτικός Μηχανικός, Ομότιμος Καθηγητής ΕΜΠ aanagn@central.ntua.grn
		Μανώλης ΒΟΥΖΑΡΑΣ, Πολιτικός Μηχανικός e.vouzaras@gmail.com
		Μιχάλης ΚΑΒΒΑΔΑΣ, Δρ. Πολιτκός Μηχανικός, Αναπληρωτής Καθηγητής ΕΜΠ kavvadas@central.ntua.gr
Αναπληρωματικά Μέλη	:	Χρήστος ΑΝΑΓΝΩΣΤΟΠΟΥΛΟΣ, Δρ. Πολιτικός Μηχανικός, Καθηγητής Πολυτεχνικής Σχολής ΑΠΘ anag@civil.auth.gr, canagnostopoulos778@gmail.com
		Σπύρος ΚΑΒΟΥΝΙΔΗΣ, Δρ. Πολιτικός Μηχανικός, ΕΔΑΦΟΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Α.Ε. scavounidis@edafos.gr
		Δημήτρης ΚΟΥΜΟΥΛΟΣ, Δρ. Πολιτικός Μηχανικός, ΚΑΣΤΩΡ Ε.Π.Ε. coumoulos@castorltd.gr
		Μιχάλης ΜΠΑΡΔΑΝΗΣ, Πολιτικός Μηχανικός, ΕΔΑΦΟΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Α.Ε. mbardanis@edafos.gr, lab@edafos.gr

ΕΕΕΕΓΜ
Τομέας Γεωτεχνικής
ΣΧΟΛΗ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
ΕΘΝΙΚΟΥ ΜΕΤΣΟΒΙΟΥ ΠΟΛΥΤΕΧΝΕΙΟΥ
Πολυτεχνειούπολη Ζωγράφου
15780 ΖΩΓΡΑΦΟΥ

Τηλ. 210.7723434
Τοτ. 210.7723428
Ηλ-Δι. secretariat@hssmge.gr ,
geotech@central.ntua.gr
Ιστοσελίδα www.hssmge.org (υπό κατασκευή)

«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» Εκδότης: Χρήστος Τσατσανίφος, τηλ. 210.6929484, τοτ. 210.6928137, ηλ-δι. pangaea@otenet.gr, ctsatsanifos@pangaea.gr, editor@hssmge.gr

«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» «αναρτώνται» και στην ιστοσελίδα www.hssmge.gr