Arche Chartreuse Rhone, Isère, France

Αρ. 94 – ΣΕΠΤΕΜΒΡΙΟΣ 2016

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Τα Νέα

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Advice for Expert Witnesses

AGS members who are experienced in their chosen fields may be approached by parties involved in disputes to act as expert witnesses to provide their views on for, for example, issues of potential professional negligence, or in a forensic capacity. Their evidence can be crucial in determining the extent of the parties' liabilities. Such appointments can be a good source of income for members but are not without risk.

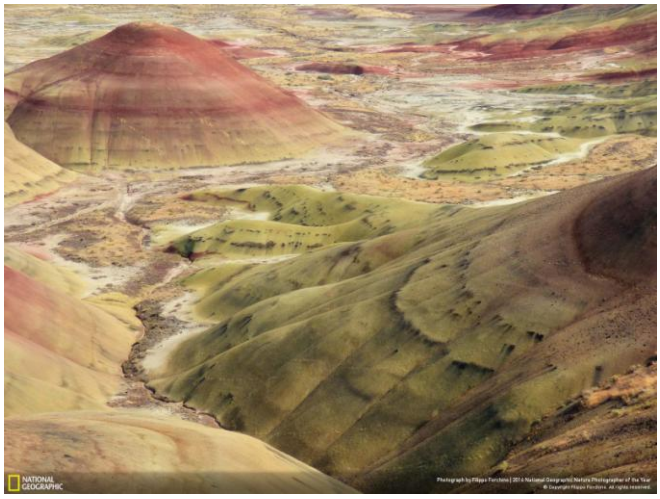
A recent BBC Panorama undercover investigation revealed evidence of expert witnesses who, perhaps too keen to secure the appointment, were prepared to produce reports setting out false defences for clients who had admitted their guilt. Although the dishonest behaviour shown by these expert witnesses was extreme and, one hopes, rare, it nevertheless serves as a useful reminder that an expert's duty is to give an honest and unbiased view of his client's performance or behaviour, for the benefit of the court. The breach of that duty was clear in these examples where the experts were willing to give false testimony. The vast majority of experts are, however, honestly trying to fulfil their duties to the best of their ability. This involves treading the sometimes fraught line between being of assistance to their clients, whilst also fulfilling their duty to the court

Experts are often called upon by their clients to provide technical advice on the merits of their case at an early stage, in order to help them and their legal team decide

(συνέχεια στην σελίδα 3)

ΠΕΡΙΕΧΟΜΕΝΑ

Ogoi island on lake Baykal, Russia



Painted Hills, John Day, Oregon, United States

(συνέχεια από την πρώτη σελίδα)

to pursue or defend a claim by way of litigation. At this stage, the expert is acting in an advisory capacity and owes duties to no one other than their client. The advisory report will be confidential and privileged, for the benefit of the client only and not intended for exchange with or for viewing by any other parties.1 The advisory report should address the technical strengths and weaknesses of the client's case, so that an informed view as to the position can be reached.

In the event that proceedings are commenced, the same expert is likely to be called upon to prepare a formal report for exchange with the other side. This will form the basis of the evidence on which the expert may be cross-examined if the matter goes to trial. When preparing this report, the expert must have regard to Part 35 of the Civil Procedure Rules ('CPR') and the associated Practice Direction. In particular, CPR 35.3 states:

(1) It is the duty of experts to help the court on matters within their expertise.

(2) This duty overrides any obligation to the person from whom experts have received instructions or by whom they are paid.

Problems can arise if the expert, having given over-optimistic or partisan advice at the advisory stage, subsequently radically alters their position at the litigation stage, either in their formal report or during an experts' meeting for example, making concessions that his client would not have expected. This could leave the expert open to a professional negligence action (as, following the Supreme Court judgment in Jones v Kaney2, experts are no longer immune from suit) whereby the client would seek to recover the wasted costs of litigation.

The expert should therefore ensure that the evidence is given careful and unbiased consideration at the advisory stage. Experts can sometimes come under some pressure from clients who feel strongly that they have done nothing wrong but it is important that the expert maintains their independent position in this situation, even if it is not what their clients want to hear – it is the job of the lawyer to advocate and the role of the expert to provide a technically sound opinion.

The expert may, of course, only have limited documents and information available when the advisory report is prepared and their views may change when further information and documents are disclosed. The expert should review their opinion as soon as any such evidence comes to light and keep their client informed of any changes in their views.

Detailed guidance for expert witnesses can be found in:

- Part 35 Civil Procedure Rules: https://www.justice.gov.uk/courts/procedurerules/civil/rules/part35
- Practice Direction to Part 35: https://www.justice.gov.uk/courts/procedurerules/civil/rules/part35/pd_part35
- Section 13 of the Technology and Construction Court Guide: https://www.justice.gov.uk/downloads/courts/tech-court/tec-con-court-guide.pdf

Prepared for the Members of the Association of Geotechnical and Geoenvironmental Specialists by Zita Mansi, BLM in December 2015.

Mont St. Michel, France

Near the chamonix glacier

Rivedoux, France

ΑΡΘΡΑ

Παρουσίαση άρθρων, στην συγγραφή των οποίων μετείχαν Έλληνες, στο XVI European Conference on Soil Mechanics and Geotechnical Engineering, Edinburgh, 13-17 September 2015 (κατ' αλφαβητική σειρά, στα ελληνικά, του ονόματος του πρώτου συγγραφέα).

Foundation motion filtered by piles: effect of soil inhomogeneity

Mouvement d'entrée sismique modifié par pieux: effet de nonhomogénéité du sol

E. Rovithis, R. Di Laora, and L. de Sanctis

ABSTRACT The effect of soil inhomogeneity on kinematic response of single flexural elastic piles to vertically-propagating seismic SH waves is explored. The system under consideration consists of a fixed-head long pile embedded in a viscoelastic soil layer underlain by a rigid bedrock; soil stiffness is assumed to increase linearly or constant. Both harmonic and real earthquake motions are employed to investigate soil-pile kinematic interaction in frequency and time domain. Pile response in inhomogeneous soil is analysed in terms of kinematic interaction coefficients relating pile-head to free-field soil lateral motion and compared to its homogeneous counterpart. The problem is tackled numerically by means of both rigorous elastodynamic Finite-Element analyses and Beam-on-Dynamic-Winkler-Foundation (BDWF) formulations. The role of model parameters such as pile diameter, rate at which soil stiffness increases with depth and average shear wave velocity Vs,30 referring to soil type C or D according to EC8 is elucidated. Results indicate that: (a) the horizontal displacement of fixed-head piles under harmonic excitation is essentially governed by a single dimensionless frequency parameter based on an average Winkler wave number incorporating pile-to-soil stiffness ratio, pile slenderness and soil inhomogeneity and (b) piles-induced filtering effect tends to increase by increasing the degree of soil inhomogeneity and pile diameter, revealing a substantially reduced seismic demand on the superstructure compared to that pertaining to the free-field motion. The above filtering action although neglected in seismic codes may of importance in pile design practice.

1 INTRODUCTION

Within seismic design of structures founded on piled foundations, it is assumed that the input motion at the foundation level of the structure is equal to the free field surface motion, thus neglecting possible piles induced filtering effects generated by pile-soil kinematic interaction. However, accumulated theoretical and experimental evidence demonstrates that piles may exert a significant filtering action, resulting in reduced seismic demand at the base of the structure compared to that associated with the free-field condition. A comprehensive review of the filtering mechanism has been presented by Gazetas & Mylonakis (1998) and Di Laora & de Sanctis (2013). The latter study proposes a reduction factor for acceleration design spectra, which can be easily computed from the shear wave velocity of the upper layer and the mechanical properties of piles; results of this work, however, were obtained for a two-layer soil model with constant stiffness in both the upper and lower stratum.

By contrast, the assumption of soil homogeneity may result in poor predictions of the natural vibrational characteristics and over-predictions of damping for compliance base structures (Mylonakis & Gazetas 2000). Furthermore, the increase in overburden stresses with depth combined with stress modifications due to pile installation will invariably result in soil profiles with stiffness varying with depth (possibly also in the radial sense). Referring to soil modulus increasing linearly with depth, the effect of soil in homogeneity on kinematic pile response was investigated in a number of publications. Kenai & Kassel (1991), as an example, showed that piles in inhomogeneous media filter to a greater extent the high frequency components of the seismic motion compared to a homogeneous medium. This observation was later verified by Fan et al. (1991) as part of a parametric Winkler analysis on kinematic pile response in homogeneous and no homogeneous media.

In this paper, the effect of soil in homogeneity on the elastic-dynamic response of a fixed-head pile is explored with reference to a continuously inhomogeneous layer over a rigid base. The variation of soil shear modulus with depth is described by a linear function referring to a Gibson-type of soil (Gibson 1974). The problem is tackled numerically by means of a BDWF model in conjunction with a layer transfer-matrix approach known as the Haskell-Thompson technique (Thompson 1950), complemented by a rigorous finite-element model of the soil-pile system. Pile-head-to-free-field kinematic interaction coefficients in terms of horizontal displacement and spectral acceleration ratios are derived under harmonic and seismic base motions, respectively. Pile-head response in inhomogeneous soil is compared to its counterpart in homogeneous soil conditions with the same *Vs,30* according to the criteria of soil classification indicated in EC8 (CEN 2003). The scope of the study is: (a) to elucidate the role of key parameters on kinematic soil-pile interaction in inhomogeneous soils; (b) to investigate the effect of soil inhomogeneity on structural response due to the filtering action exerted by piles.

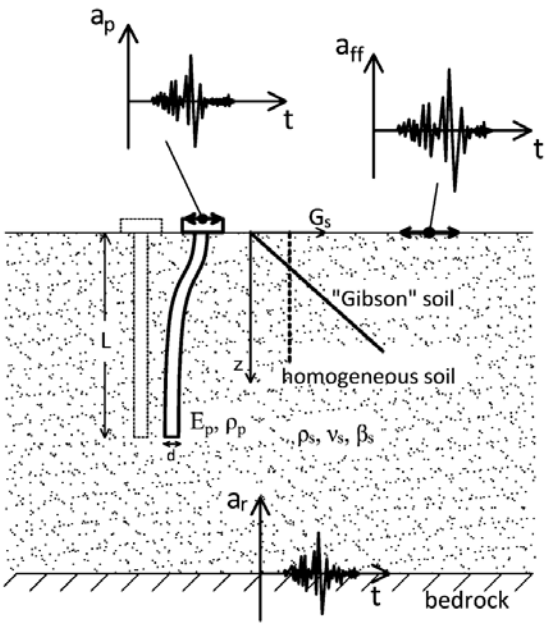


Figure 1. Problem under consideration: a single elastic fixed-head pile embedded in a inhomogeneous layer with linearly varying stiffness over rigid base.

2 PROBLEM STATEMENT

The system under consideration consists of a fixed-head pile embedded in a continuously inhomogeneous viscoelastic soil layer on a rigid base (Figure 1). The pile is modelled as a linearly elastic cylindrical solid beam of diameter d, length L, elastic modulus E_p and mass density ρ_p. Soil mass density, ρ_s, Poisson's ratio, ν_s, and hysteretic damping ratio, β_s, are considered constant with depth, whereas shear modulus $G_s(z)$ is assumed to increase according to the linear function:

$$G_s(z) = G_{sd}\frac{z}{d} \quad (1)$$

referring to a Gibson-type soil (Gibson 1974) with zero stiffness at the ground surface. G_{sd} is the shear modulus at the depth of one pile diameter ($z = d$). The above variation of soil stiffness can be considered representative of soft to moderately overconsolidated cohesive soil, where piles are frequently required to avoid a bearing capacity failure and/or to reduce foundation settlements (Viggiani et al. 2011). The case of a homogeneous medium with constant shear modulus along z (i.e. $G_s = G_{sd}$) is also explored. The pile-soil system is subjected to S-waves propagating vertically in the soil mass.

3 PILE-SOIL KINEMATIC INTERACTION: HARMONIC RESPONSE

3.1 Homogeneous soil

Following the early studies of Flores-Berrones & Whitman (1982) and Gazetas (1984), it may be shown that in a homogenous halfspace the ratio between the acceleration atop a fixed-head infinitely long pile, a_p, and that at the soil surface, a_{ff}, denoted in Figure 1 is given by:

$$I_u = \frac{a_p}{a_{ff}} = \frac{k_x + i\omega c_x}{E_p I_p (k^4 + 4\lambda^4)} \quad (2)$$

where (k_x+iωc_x) is the complex-valued dynamic impedance of the Winkler bed, E_pI_p is the pile flexural stiffness, k (= ω/V_s) is the soil wavenumber and λ is the Winkler wavenumber:

$$\lambda = \left[\frac{k_x + i\omega c_x}{4E_p I_p}\right]^{1/4} \quad (3)$$

Soil material damping can be incorporated in the solution by means of the corresponding principle of viscoelasticity using the standard substitution $V_s \rightarrow V_s^* = V_s\sqrt{(1+2i\xi)}$. Pertinent expressions for k_x and c_x referring to the spring and dashpot coefficient, respectively, have been reported in Roesset (1980), Dobry et al. (1982), Gazetas & Dobry (1984).

Upon introducing the dimensionless frequency $a_{o\lambda}$ (= $\omega/\lambda V_s$), the kinematic response coefficients I_u of Eq. 2 may be rewritten as (Anoyatis et al. 2013):

$$I_u = \left[1 + \frac{1}{4}a_{o\lambda}^4\right]^{-1} \quad (4)$$

3.2 Inhomogeneous soil

With reference to a continuously inhomogeneous soil, an average wavenumber μ (measured in units of 1/Length) may be defined as the mean value of λ (Eq. 3) within the active length L_a of the pile (Mylonakis 1995, Mylonakis and Roumbas 2001, Rovithis et al. 2013):

$$\mu = \frac{1}{L_a}\int_0^{L_a}\lambda(z)dz \quad (5)$$

where the active pile length L_a may be taken equal to 10 pile diameters, as an approximation, for typical values of pile-to-soil stiffness ratio. By treating μ and λ as real-valued functions (Gazetas & Dobry 1984) and assuming that the Winkler springs modulus $k_x(z)$ follows the same variation with depth as soil Young's modulus $E_s(z)$ does (Mylonakis & Roumbas 2001), the solution of the integral in Eq. 5 for the particular case of Gibson-soil type examined herein may be expressed as:

$$\mu = \frac{4}{5}\lambda_d\left(\frac{L_a}{d}\right)^{\frac{1}{4}} \quad (6)$$

where λ_d corresponds to the (static) wavenumber of a pile in a homogeneous layer with Young's modulus equal to E_{sd}:

$$\lambda_d = \left[\frac{k_d}{4E_p I_p}\right]^{1/4} \quad (7)$$

Concerning the identification of the key parameters governing the kinematic response of piles in inhomogeneous soils, the dimensionless frequency parameter (a_{eff}) defined by Di Laora & Rovithis (2014) as

$$a_{eff} = \frac{\omega}{\mu V_{s,av}} \quad (8)$$

is employed, where $V_{s,av}$ refers to an average shear wave velocity providing equal travel times between a homogeneous soil with $V_s = V_{s,av}$ and an inhomogeneous soil. For a Gibson soil type with zero stiffness at surface, $V_{s,av}$ is given by:

$$V_{s,av} = V_{sd}\left[\frac{z_{eff}}{d}\right]^{0.5} \quad (9)$$

where z_{eff} is an effective depth of soil contributing to kinematic pile-head response. Naturally, for a homogeneous soil a_{eff} is equal to $a_{o\lambda}$.

3.3 Parametric study

In order to investigate pile filtering effect, different soil-pile configurations were analyzed by considering a pile diameter d of 1 m or 1.5 m whereas the average shear wave velocity $V_{s,30}$ was set equal to 100 and 200 m/s, thus corresponding to soil type D and C according to EC8. The above $V_{s,30}$ values were considered for both the homogeneous soil and the Gibson soil, so as a total of eight soil-pile cases was analyzed (Table 1). In all cases, the pile's length and Young's modulus were set equal to 20 m and 30 GPa, respectively. The height of the soil layer was 30 m, whereas soil density (ρ_s) and Poisson ratio (ν_s) were set equal to 2 t/m3 and 0.2, respectively. Soil stiffness degradation with increasing shear strains under seismic motion was accounted for by taking the effective soil stiffness equal to 1/3 of the corresponding low-strain value, as suggested by EC8 recommendations.

Table 1. Soil-pile configurations examined within in the parametric study.

Case	d [m]	$V_{s,30}$ [m/s]	Stiffness distribution
1	1	100	uniform
2			proportional
3		200	uniform
4			proportional
5	1.5	100	uniform
6			proportional
7		200	uniform
8			proportional

In Figure 2, the above Winkler approximation in terms of kinematic interaction factor I_u is compared for each one of the examined soil-pile systems with rigorous finite-element results following the numerical procedure described in Di Laora & Rovithis (2014). The former were derived for z_{eff} equal to:

$$z_{eff} = \frac{1.25}{\mu} \qquad (10)$$

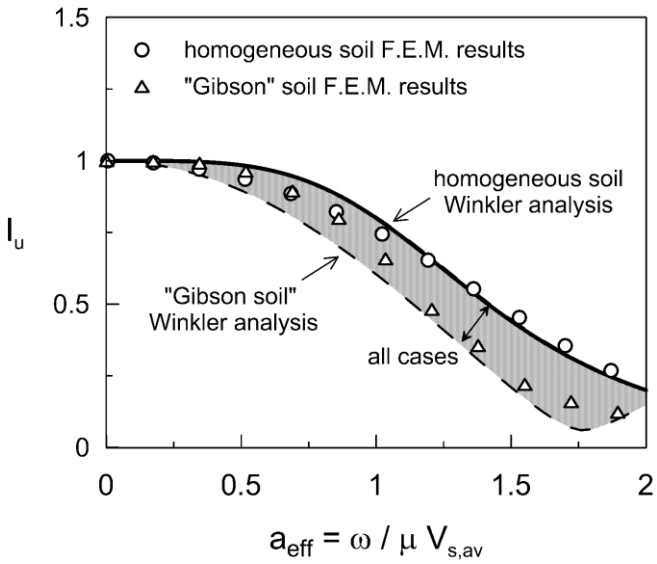


Figure 2. Pile-to-soil acceleration ratio for inhomogeneous soil conditions, as function of the dimensionless parameter a_{eff}.

The agreement between FE results and Winkler solution is very satisfactory; in addition to this, Figure 2 clearly indicates that pile kinematic response is essentially governed by the dimensionless frequency a_{eff}, for both the homogeneous and the Gibson-type soil. It is worth noting that the homogeneous case is an upper bound of the kinematic interaction coefficient I_u whereas the Gibson soil is a lower one. In this manner, a narrow band of curves is identified, indicating the range within which the filtering effect is expected to fall at any value of the dimensionless parameter a_{eff}. The similarity of curves suggests that a_{eff} may be interpreted as the single dimensionless frequency parameter governing pile-head horizontal displacement under kinematic action. Upon implementing Eq.4, with $a_{o\lambda}$ replaced by a_{eff}, dynamic effects on I_u may thus be computed for inhomogeneous soils.

4 TRANSIENT RESPONSE

Transient response analyses were carried out via the commercial program ANSYS to derive acceleration spectral ratios between pile-head and free-field motion and thus investigate piles induced filtering effect under seismic motion. For this reason, a set of nine real earthquake recordings were specified as input motion at the base of the soil profile. The corresponding acceleration time histories normalized by the peak acceleration amplitude at the bedrock level are plotted in Figure 3. Further details on the selection of the above recordings may be found in Di Laora & de Sanctis (2013). Based on the transient response at the pile-head and the free-field surface, the corresponding response spectra were computed for each one of the selected earthquake motions. Then, mean spectral acceleration ratios ξ, defined as the average spectral value of pile-head motion, $S_{a,p,av}$, over the average spectral value of free-field motion, $S_{a,s,av}$, were derived for each of the soil-pile systems under examination. Results in terms of reduced spectral acceleration ratios are synthesized in Figure 4a and 4b, for the homogeneous and Gibson soil, respectively. Evidently, the filtering action exerted by the pile is more pronounced for increasing pile diameter and decreasing soil stiffness. The reduction of spectral acceleration is larger for the inhomogeneous soil, for which a substantial reduction of the seismic demand affecting the superstructure is observed compared to the pile filtering effect in the homogeneous soil.

Note for example that for a "Gibson" subsoil with $V_{s,30}$ = 100 m/s, which is representative of a very soft normally consolidated clay, the filtering action exerted by piles may reduce seismic action up to 60-80% for a supported structure with a natural period in the range of 0.1 - 0.5 sec. The above reduction is almost twice that of the homogeneous soil case.

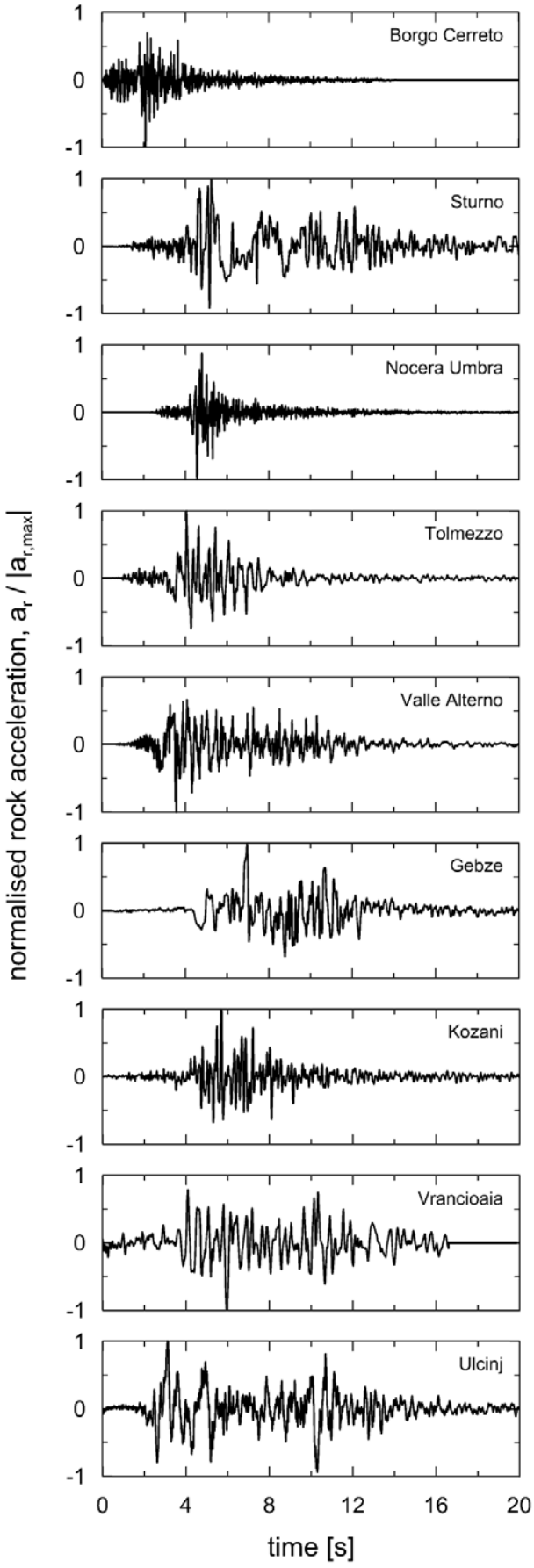


Figure 3. Earthquake recordings employed within the parametric study for transient kinematic response analysis.

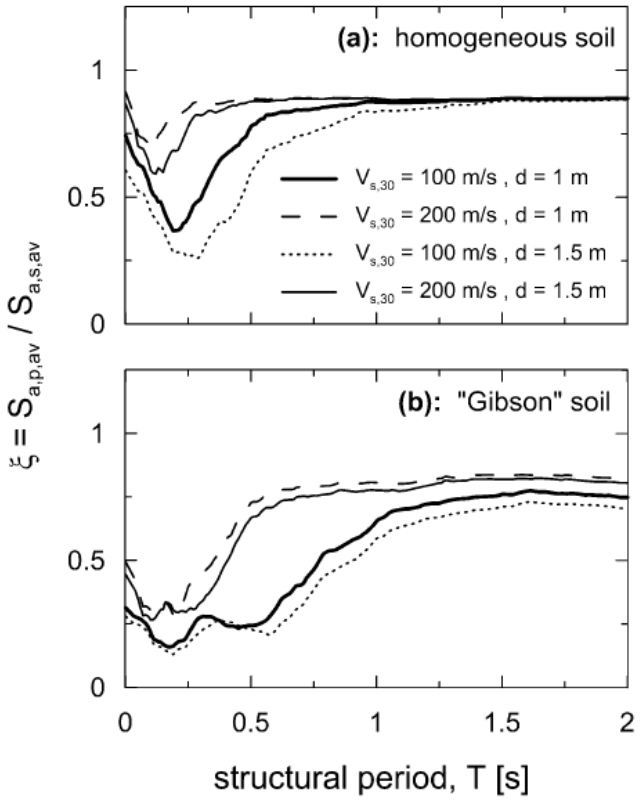


Figure 4. Spectral ratios for different configurations pile and soil configurations.

5 CONCLUSIONS

In the present work, filtering action exerted by fixed-head long piles on foundation motion in homogeneous and non-homogeneous soil has been investigated by means of analytical and numerical tools. Kinematic response factor in terms of displacements may be described in the frequency domain through a unique dimensionless parameter which encompasses frequency of excitation, pile diameter, pile-to-soil stiffness ratio and soil stiffness distribution. Owing to such novel normalization, pile-to-soil acceleration ratio may be estimated by a simple equation. The effect of pile filtering on superstructure has been also elucidated for non-homogeneous soil. It was found that pile filtering is more pronounced for piles with large diameters supporting stiff structures on soft soil. In addition, inhomogeneous soils lead to a drastic reduction of foundation motion compared to homogeneous soils with the same average stiffness. This reduction may reach 80% for structural periods up to 1 second.

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Numerical development of p-y curves for soft clays

Développement numérique des courbes p-y pour les argiles molles

K.P. Tzivakos and M.J. Kavvadas

ABSTRACT The paper presents a 3D numerical study (using the finite element code ABAQUS) of the undrained lateral response of a single, free-head pile under monotonic loading. Soil conditions simulating saturated normally consolidated clays are examined (linearly increasing shear strength with depth). The study first compares the results of several p-y curve methods from the literature (e.g. diagrams of lateral load versus horizontal displacement of the pile head and distributions of the horizontal displacement and bending moment along the pile) and shows that the differences are very significant. Due to these differences, the present study revisits the subject by performing parametric 3D finite element analyses with the objective to develop a new set of p-y curves for saturated normally consolidated clays under undrained lateral loading. Soil behavior is modeled by the Modified Cam-Clay (MCC) constitutive model to investigate the effects of normal compression line slope (λ) and critical state line slope (*M*) on the initial stiffness and the ultimate resistance of the p-y curves. Although the numerical model uses effective stresses, the loading was applied sufficiently rapidly to ensure practically undrained conditions. Interface elements are used along the periphery of the pile in order to simulate separation and slipping effects on the response. Based on the results of the finite element analyses, a new set of p-y curves for soft clays is proposed and the key parameters of the curves are determined.

1 INTRODUCTION

P-y curves are nowadays a common practice for the calculation of bending moment and horizontal displacement along laterally loaded piles. They are applicable as non-linear springs along a beam-on-nonlinear-Winkler-foundation (BNWF) simulation of the laterally loaded piles. P-y curves for static pile head lateral loading are investigated in the current paper, due to their importance for the formulation of p-y curves for cyclic or dynamic loading.

P-y curve formulations consist of three parts: the initial small-strain stiffness, the yielding section of the curve and the ultimate lateral resistance. The scope of the present paper is the determination of such curves for soft, normally consolidated clays.

2 P-Y CURVES FOR SOFT CLAYS

There are various methodologies for the design of laterally loaded piles in cohesive soils using p-y curves (Matlock 1970, DNV 1977, Wu et al. 1998, Georgiadis & Georgiadis 2010). However, none of these is clearly applicable to clays with increasing undrained shear strength with depth. Figure 1 shows the differences among the p-y curves computed by the aforementioned methodologies.

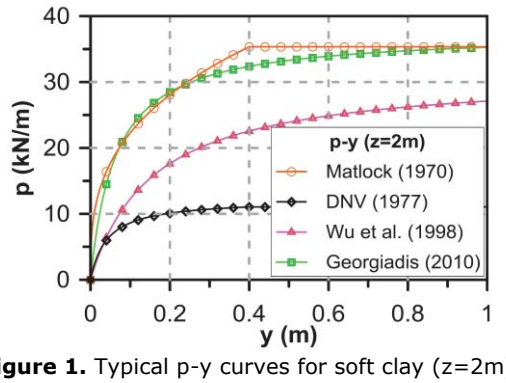

Figure 1. Typical p-y curves for soft clay (z=2m).

The observed variety of p-y curves for a specific soil type leads to the computation of different deformational values and internal forces along the pile for each case. The results of a 2D simulation of a laterally loaded pile in soft clay (Tzivakos & Kavvadas 2014) corroborate the previous statement (Figure 2). Therefore, the objective of the present study is to propose p-y curves for such soils through an advanced numerical simulation of the problem.

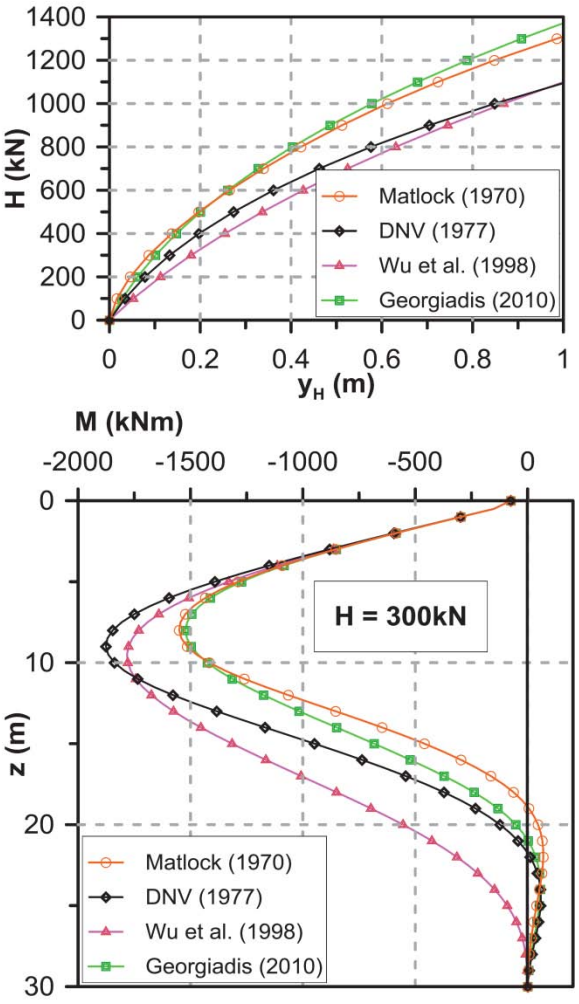

Figure 2. Pile head lateral load-horizontal displacement (up) and bending moment along the pile (down) for different p-y curves methodologies.

3 NUMERICAL SIMULATION

3.1 Soil and pile parameters

The investigation of the pile response is carried out for the case of undrained loading conditions, since this is considered critical. In this paper, the lateral response of fully saturated, soft, normally consolidated clays is simulated and investigated (OCR=1, S_r=100%) with undrained shear strength increasing with depth.

In order to develop more accurate p-y curves for this soil type, a more sophisticated constitutive law is used for the simulation of the clay, namely the modified Cam-Clay (MCC) model (Roscoe & Burland 1968). The slope of the critical state line of the clays taken into account by the present study ranges between *M*=0.98-1.42 (corresponding to friction angle φ=25-35deg according to Equation 1). The slope of the normal compression line ranges between λ=0.065-0.175 (λ = C_c / ln10, thus the corresponding range is C_c=0.15-0.40). The slope of the unloading-reloading line is considered equal to κ=(1/5)*λ, which is a generally realistic approach. Poisson's ratio ν=0.333 and k_o=0.50 are assigned to the soil. The clay permeability is assumed equal

to k=10-10 m/s, sufficiently low in order to achieve undrained loading conditions.

$$M = \frac{6 \cdot \sin\varphi}{3 - \sin\varphi} \quad (1)$$

The results presented herein are derived from numerical lateral loading tests of a free-head, reinforced concrete pile with length L=30m and diameter D=1m (Figure 3). Structural serviceability limit state design demands the elastic behavior of the pile. Therefore, the pile is considered elastic with Young's modulus E_p=30 GPa and Poisson's ratio v=0.20.

3.2 The 3D finite element model

A 3D finite element model is designed in the commercial code ABAQUS in order to simulate the single laterally loaded pile (Figure 3). Solid, 8-node, full integration pore pressure elements are used to model the soft clay, while 2-node beam elements acting in the three-dimensional space simulate the pile. The Modified Cam Clay constitutive model is assigned to the soil elements and effective stress analyses are carried out. The MCC yield surface assigned to each NC clay layer is increasing with depth, referring to equivalent undrained shear strength (Equation 2).

$$c_u = \frac{M}{2} p' \left(\frac{p'_m / p'}{2} \right)^{\left(1 - \frac{\kappa}{\lambda}\right)} \quad (2)$$

where *M* the slope of the critical state line, p'_m the reference size of yield locus, p' the mean effective stress and κ, λ the slope of the unloading-reloading and the normal compression line respectively.

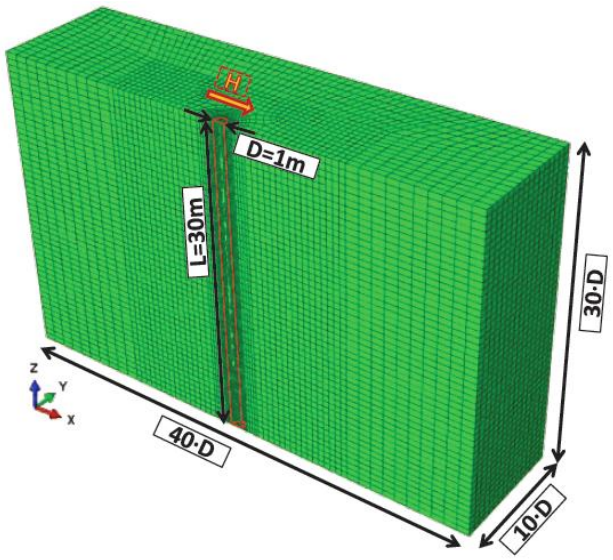

Figure 3. Boundaries and geometry of the laterally loaded pile 3D finite element model through Simulia ABAQUS 6.12.

Special attention is drawn to ensure undrained soil conditions during the coupled analyses. The loading of the model pile must be sufficiently rapid compared to the permeability of the clay for undrained soil response to occur. Diagrams of volumetric strain against vertical strain are plotted for representative soil elements around the pile depicting no volume change of the laterally loaded soil. Thus, the desired undrained loading conditions are achieved.

The surface interaction between the pile and the surrounding soil in the shear direction is simulated according to the Coulomb friction law, allowing for relative slippage of the pile against the soil if the ultimate shear strength of the interface is reached. The p-y curves proposed in the current paper are for rough pile-soil surface interaction, namely interface ultimate shear strength equal to the in situ undrained shear strength (c_u) of the clay. Referring to the normal stress interaction between the pile and the surrounding soil, possible separation is taken into account. The lateral soil pressure p of the numerical p-y curves is calculated from the contact forces acting on the aforementioned surface interaction.

3.3 Application of lateral load

The natural lateral loading of a pile involves a concentrated load H on the pile head (Figure 3). However, this approach leads to failure of the clay around the pile up to a specific depth. The observation of two different failure mechanisms of the soft clay surrounding the pile, led to an alternative application of the lateral load. More specifically, a wedge failure mechanism is observed above a depth of (5÷6)·D, while a plain strain mechanism develops below this depth. In order to reach the ultimate lateral resistance of the clay at depths greater than this failure mechanism transition depth, a uniform horizontal displacement is applied along the pile. Thus, both shallow and deep NC clay reaches failure and the ultimate lateral resistance can be estimated for all depths.

Figure 4 depicts the satisfactory similarity between p-y curves obtained from finite element analyses with a pile loaded by a horizontal concentrated load H on pile head and the ones with the uniform horizontal displacement along the pile. Therefore, the p-y curves proposed for both shallow and great clay depths derive from FEA with uniform horizontal displacement imposed along the pile.

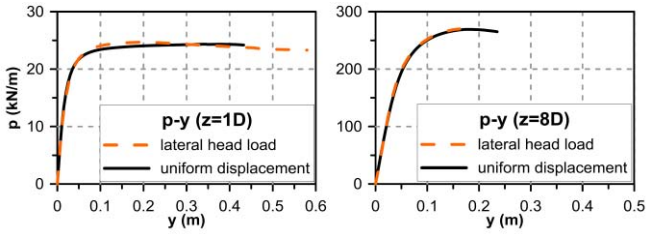

Figure 4. Comparison of p-y curves calculated for concentrated lateral load H on pile head and uniform horizontal displacement along the pile, at the depth of 1D (left) and 8D (right).

4 PROPOSED P-Y CURVES

4.1 Form of the p-y curves

The current section deals with the analytical form proposed for the p-y curves for NC clays. It is widely observed in literature that the mathematical form of the proposed p-y curves is a hyperbola, easily transformed into a linear equation for the calculation of the ultimate lateral resistance p_u and the initial stiffness K_i of the curve (Equation 3).

$$p = \frac{y}{\frac{1}{K_i} + \frac{y}{p_u}} \quad \rightarrow \quad \frac{y}{p} = \frac{1}{p_u} \cdot y + \frac{1}{K_i} \quad (3)$$

However, it is observed through the present study that the hyperbola form consistently overestimates stiffness and ultimate lateral resistance after a specific depth, as depicted in Figure 5.

Thus, a new exponential form of p-y curves for soft, normally consolidated clays is proposed in the current paper (Equation 4).

$$\frac{p}{p_u} = 1 - \exp\left(-\frac{a \cdot y}{y_u}\right) \quad (4)$$

where p_u is the ultimate lateral soil resistance, y_u is the horizontal displacement of the pile at which p_u is observed and a is a parameter controlling the exponential transition from the initial part of the curve to the plateau.

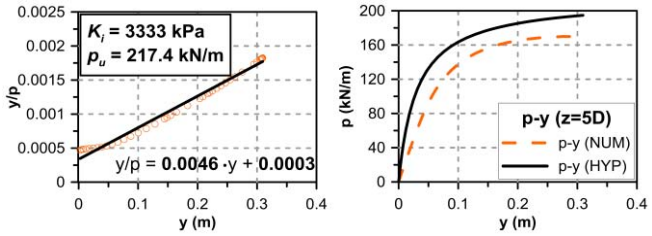

Figure 5. Simulation of the numerical curve at z=5D through the hyperbola p-y form.

There is one unique a value that leads to a best-fit exponential curve of the numerical p-y curve derived from the FEA output. This a value is derived through a curve fitting process, using the regression procedure. In order to carry out this procedure, certain assumptions needed to be taken into account on the determination of p_u and y_u from the numerical output. The ultimate lateral soil resistance p_u is assumed equal to the clay lateral pressure at which $dp=p_{i+1}-p_i<0.5\%$. It is considered rational to assume that y_u is equal to the value of horizontal displacement, at which p_u is reached by the clay.

4.2 Determination of p-y parameters

In order to determine the p_u, y_u and a parameters of the proposed p-y curves per depth, a thorough curve fitting process is carried out. The p-y curves derived from the FEA coincide satisfactorily with the ones proposed after the aforementioned process.

Equations (5), (6) and (7) summarize the determination of the p-y parameters required, where o and c_r indexes refer to ground level and asymptote values – below a critical depth – respectively.

$$\frac{p_u}{c_u \cdot D} = 8 + (N_{p,cr} - 8) \cdot \left[1 - \exp\left(-0.5 \cdot \frac{z}{D}\right)\right] \quad (5)$$

$$\frac{y_u}{D} = 0.05 + (N_{y,cr} - 0.05) \cdot \left[1 - \exp\left(-0.5 \cdot \frac{z}{D}\right)\right] \quad (6)$$

$$a = a_o + (a_{cr} - a_o) \cdot \left[1 - \exp\left(-0.25 \cdot \frac{z}{D}\right)\right] \quad (7)$$

It is observed that the N_i and the a_i terms of the aforementioned equations vary with the MCC compressibility parameter λ – rational for a NC clayey soil. Thus, Equations (8) to (11) are proposed corresponding to the curves of Figure 6 for the overall determination of the p-y curve.

$$N_{p,cr} = -2.04 \cdot \ln(\lambda) + 6.45 \quad (8)$$

$$N_{y,cr} = 0.82 \cdot \lambda + 0.03 \quad (9)$$

$$\alpha_o = -2.55 \cdot \ln(\lambda) - 0.04 \quad (10)$$

$$\alpha_{cr} = -6.42 \cdot \lambda + 3.91 \quad (11)$$

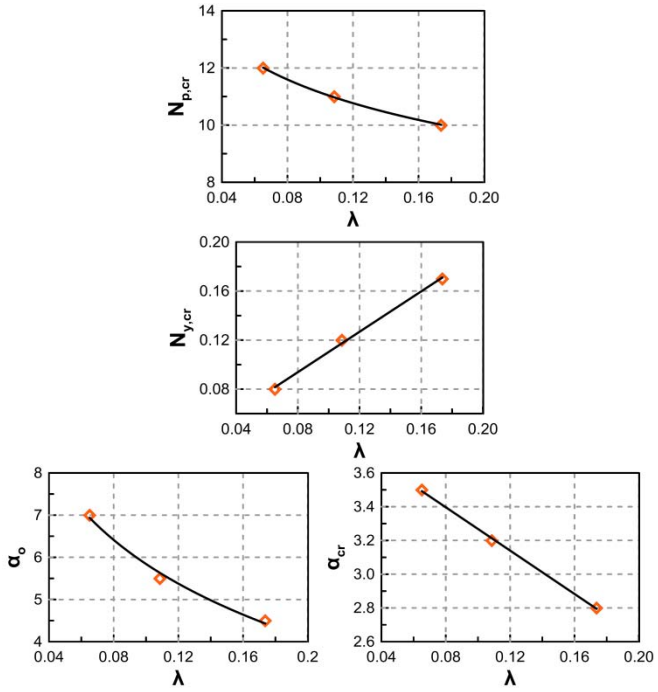

Figure 6. N_i and a_i parameters fitting with compressibility index λ.

In order to clarify the distribution of the parameters calculated by Equations (5), (6) and (7) with depth, certain functions of these parameters are depicted in Figure 7 for λ=0.13 and M=1.07 (corresponding to C_c=0.30 and φ=27deg).

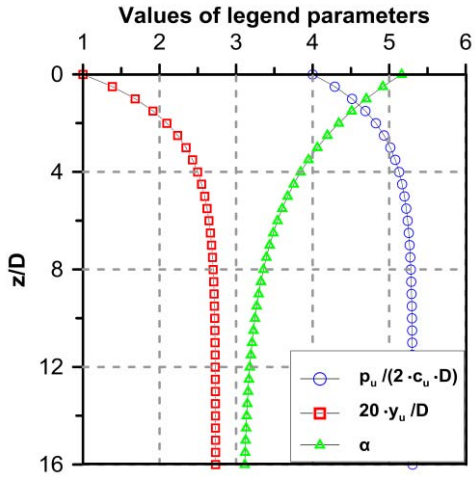

Figure 7. Common diagram of p_u, y_u and a functions (see Equations (5) to (11)) with depth for λ=0.13 and M=1.07.

4.3 Verification of the proposed p-y curves

The proposed p-y curves of paragraph 4.2 are verified through a particular 3D FEA of a laterally loaded pile – with concentrated load H on pile head – in a NC clay with λ=0.13 and M=1.07 (corresponding to C_c=0.30 and φ=27deg). The p-y curves derived from the aforementioned analysis are compared to the ones proposed by the present study and the agreement between the two curves is satisfactory for all the depths examined (Figure 8).

5 EFFECT ON PILE RESPONSE

The general idea of the p-y curves is to simulate the lateral response of the soil through nonlinear springs, applied along the laterally loaded pile. This concept is realized in the current section through a 2D finite element simulation of the

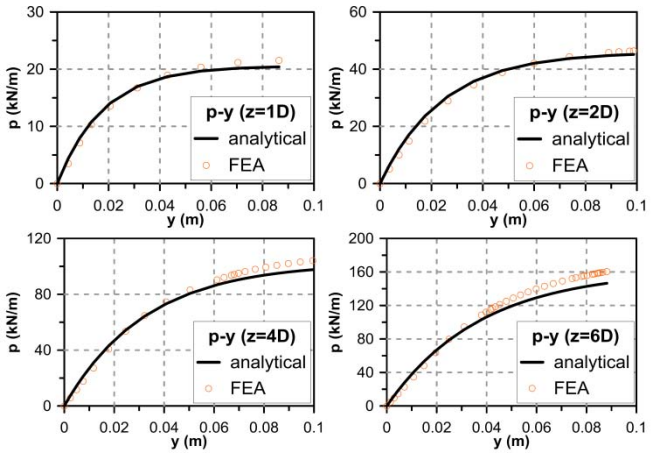

Figure 8. Comparison of the proposed p-y curves to the ones derived from a FEA with random λ and *M* values for depths z=1, 2, 4 and 6D.

pile (see paragraph 3.1) in order to observe the effect of the proposed p-y curves on the pile response. Typical NC clay parameters are chosen for the soil, namely λ=0.13 and *M*=1.07 (corresponding to C_c=0.30 and φ=27deg) and a concentrated lateral load H=2000kN is applied on the pile head in load increments of 100kN each. Thus, diagrams of the pile head lateral load-horizontal displacement, the horizontal displacement and the bending moment along the pile are depicted in Figure 9 and Figure 10 respectively. For comparison purposes to the existing p-y curves methodologies for soft clays, the corresponding pile response derived from these curves is also depicted in the aforementioned diagrams.

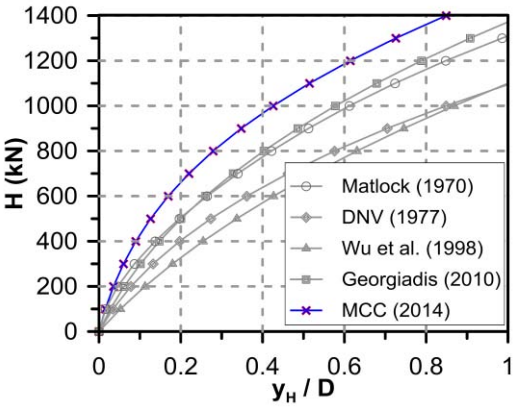

Figure 9. Pile head lateral load-horizontal displacement curve.

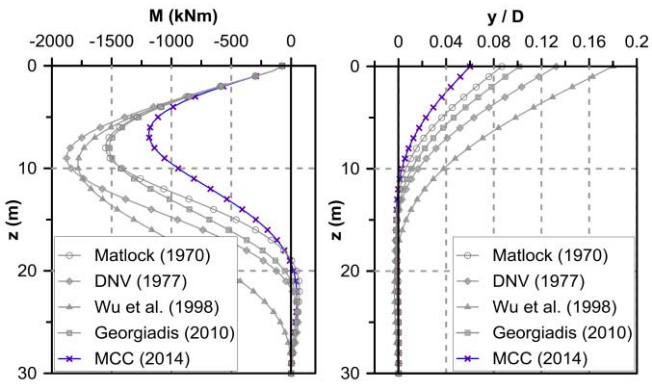

Figure 10. Distribution of bending moment (left) and horizontal displacement (right) along the pile.

It is clearly observed that all existing methodologies are conservative in terms of deformations and internal forces along the laterally loaded pile - compared to the proposed p-y curves methodology. Even for relatively low values of the applied load H (namely 300kN), a minimum difference of 30% is observed between the values calculated by the existing p-y curves and the proposed ones.

6 CONCLUSIONS

The problem of a single, free-head laterally loaded pile in NC clays under undrained conditions is studied through 3D effective stress finite element analyses, using the MCC constitutive law. Based on the results of the analyses, a new relationship is proposed for the p-y curves simulating the undrained lateral response of the pile-soil system. It is observed that existing methodologies potentially applicable to soft clays do not take into account the increasing undrained shear strength of NC soil with depth. Therefore, they provide a conservative calculation of deformations and internal forces along the pile. The proposed p-y curves lead to a stiffer response of the pile, possibly attributed to the nonlinear stress-strain curve of the MCC constitutive law simulating the soil.

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Buried pipelines subjected to normal fault: simulation vs experiment

Pipelines enterrées soumis à faille normale : analyse par rapport à l'expérience

A. Tsatsis, I. Anastasopoulos and G. Gazetas

ABSTRACT Buried pipelines often cross tectonically active areas capable of producing large earthquakes and large ground deformations. Based on the observed damage mechanisms of buried pipelines during past earthquakes, faulting-induced ground deformations prove the most detrimental for their safety. Motivated by this, this paper presents a finite element methodology to simulate the response of a pipeline subjected to normal faulting, accounting for the nonlinear behavior of the pipe, the complex behavior of the soil and the rupture propagation through it, as well as the interaction between the pipe and the soil. The numerical methodology is validated against 1g small scale experiments conducted at the Laboratory of Soil Mechanics of NTUA. The good agreement between the predictions of the numerical model and the results of the experiment give confidence to our numerical tools.

1 INTRODUCTION

Permanent ground-induced actions due to earthquakes, such as fault movements, landslides, liquefaction-induced lateral spreading are responsible for the majority of seismic damages in oil and gas buried steel pipelines. Therefore, substantial effort is dedicated by the research community in the last decades to unravel the behavior of buried pipelines subjected to excessive ground deformation.

Several methods to address this problem have been introduced. Early works on this issue are based on simplified analytical models that use beam-on elastic foundation and elastic beam theories. Newmark and Hall (1975) were the first to use such a method to analyze the response of a pipeline subjected to large fault displacement. The most recent contribution to the simplified analytical method comes from Trifonov and Cherniy (2010). With the introduction of finite element methodology, an alternative approach has been introduced based on the numerical treatment of the problem. In numerical models, a pipeline is modeled with beam elements, while the pipe – soil interaction is modeled with springs (e.g. Takada et al. 1998; Calvetti et al. 2004). With the evolution of the computational capabilities, the numerical tools also evolved leading to the 3D simulation of the problem, with the soil being modeled with inelastic continuum elements (e.g. Vazouras et al. 2010). Modern numerical models are more rigorous, being able to capture the nonlinear behavior of the pipe, the pipe-soil interaction and second order effects due to large displacements.

This paper introduces a new 3D finite element methodology to realistically simulate the phenomenon of a continuous buried pipeline subjected to permanent ground displacement due to normal faulting. The numerical methodology aims to simulate the behavior of the soil stratum subjected to slip deformations at its base (bedrock), the pipe response subjected to deformations of the surrounding soil due to faulting and the interaction between the two. To gain confidence in our numerical tools, the methodology is extensively validated against a series of 1g small scale experiments conducted at the Laboratory of Soil Mechanics of NTUA. From the ensemble of the experiments conducted in the framework of this experimental series, one is selected and presented in this paper.

2 EXPERIMENTAL EQUIPMENT

2.1 The Fault Rupture Box

The present experimental series has been conducted utilizing the Fault-Rupture Box of the NTUA Laboratory of Soil Mechanics (Figure 1). This custom-built apparatus has been designed to simulate quasistatic fault rupture propagation and Fault Rupture–Soil–Structure Interaction. It comprises a stationary and a movable part, which can move downwards or upwards to simulate normal or reverse fault conditions. The movable part is connected to a servomechanical screw-jack actuator, which can generate a maximum stroke of 200 mm. The dip angle a can be adjusted from 45° to 90° (for this experimental series, a = 45°). The internal longitudinal dimension of the Fault Rupture Box is 2.65 m, its depth is 0.9 m, while the out-of-plane dimension is 0.9 m.

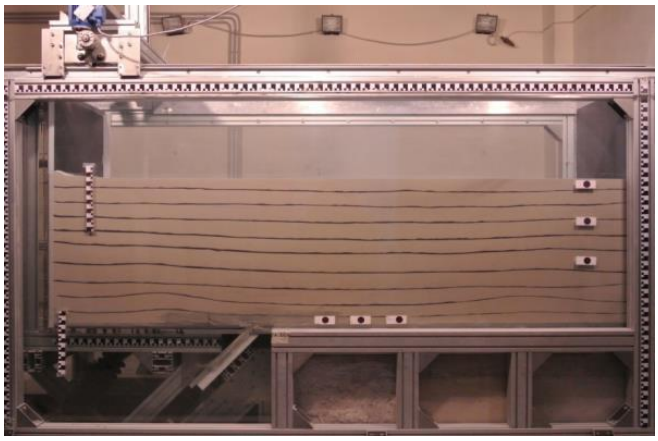


Figure 1. The Fault Rupture Box and its dimensions.

2.2 The soil material

Dry Longstone sand, an industrially produced fine and uniform quartz sand with d_{50} = 0.15 mm and uniformity coefficient $C_u = d_{60}/d_{10}$ = 1.42, was used in the experiments. The void ratios at the loosest and densest state have been measured as e_{max} = 0.995 and e_{min} = 0.614, and the specific weight of the solids as G_s = 2.64. Material and strength characteristics of the sand, as derived through a series of laboratory tests, have been documented by Anastasopoulos et al., (2010). During this experimental series the relative density of the sand was selected D_r = 90 %.

2.3 The pipe models

The pipe models were selected from a range of commercially available pipes. Pipes of various diameters were tested, yet for the purposes of this paper only the smaller available pipe of diameter D = 10 mm is presented. Commercially available small diameter pipes typically do not have large D/t ratios, hence the thickness of the pipe is t = 1 mm. The pipe models are made of *Aluminum 6036*. In order to accurately obtain the stress – strain relation for the pipe material, samples from the pipes were subjected to uniaxial tensile test. From the measured stress–strain curve, first yielding occurs at εyield = 0.0018.

2.4 Instrumentation

In order to record the pipe response within the soil, strains along the pipe were measured using 12 strain gauges. The strain gauges were 10 mm long, with resistance of 120 Ω and were temperature compensated. The gauges were placed at characteristic locations along the crown of the pipe. Each strain gauge was coated with scotch tape to protect the gauges from being dragged along by the moving soil around the pipe. Laser displacement transducers were used to measure the displacement distribution along the surface of the soil.

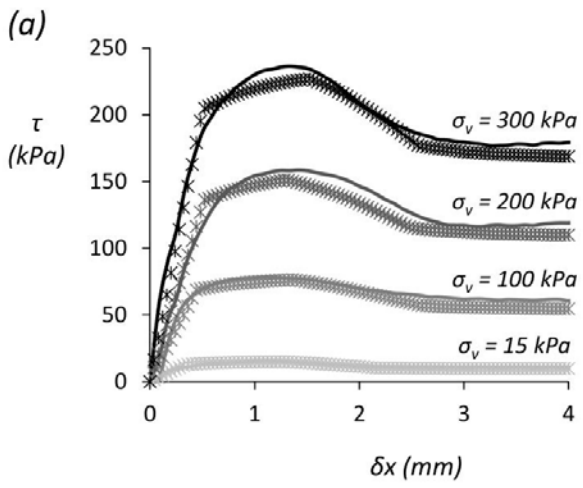
3 NUMERICAL METHODOLOGY

The simultaneous modeling of the rupture propagation through the whole depth of the soil deposit within the Fault Rupture Box and of the interaction between the pipe and

the surrounding soil poses a substantial obstacle. The dimensions of the pipe cross-section (diameter D = 10 mm) calls for small elements, of the order of dFE = 1 mm, in order to accurately capture its response. On the other hand, the dimensions of the Fault Rupture Box are several orders of magnitude larger (*length* x *width* x *height* = 2650 x 900 x 650 mm), rendering the simultaneous simulation of the pipe and the soil within the rupture box impossible. To overcome this obstacle, the problem is decoupled. First, the rupture propagation is analyzed through the whole soil deposit considering free field conditions (i.e. without the presence of the pipe). Taking advantage of the plane strain conditions of the fault rupture propagation phenomenon, this analysis is conducted in 2D. Subsequently, the pipe – soil interaction problem is analyzed; due to the demand for small elements only a soil prism around the pipe is regarded. Yet, the dimensions of this prism are adequately large to avoid any effect of the boundaries on the pipe response and on the accurate simulation of the pipe – soil interaction. The displacement history during the fault rupture propagation computed from the free field analysis is imposed at the boundaries of this prism. The proposed decouple analysis methodology tactically assumes that the presence of the pipe does not affect the evolution of the fault rupture propagation at the global level – a reasonable assumption. This can be justified through the small relative stiffness of the pipe compared to that of the displacing soil mass of the hanging wall. Moreover, ensuring that the boundaries of the 3D model are adequately far from the pipe (distance at least 10 times the pipe diameter), allows any potential interaction between the pipe and the surrounding soil at the immediate vicinity of the pipe to take place.

4 FREE FIELD RUPTURE PROPAGATION

Tectonic faulting takes place at bedrock, which is typically at a large depth, and propagates towards the ground surface through the soil. During such fault rupture propagation, the rupture path and the consequent displacement pattern may be substantially altered by the overlying soil strata (e.g., Bray et al., 1994). To realistically account for the soil behavior an appropriate constitutive model for the soil behavior is needed, that incorporates the localization of shearing within a narrow shear band. Thus, an elastoplastic Mohr–Coulomb constitutive model with isotropic strain softening is utilized to simulate soil behavior (Anastasopoulos et al., 2007). Shearing of a soil element from a fault is quite similar to the shearing of a specimen subjected to direct shear testing. Therefore, the constitutive model parameters are calibrated through direct shear test results. Figure 2a presents the comparison between the laboratory direct shear tests and the results of the constitutive model utilized in the analysis for various magnitudes of vertical effective stress.



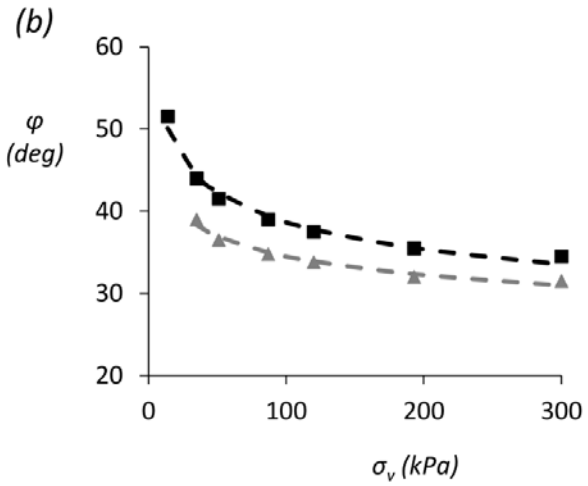


Figure 2. (a) Application of the soil constitutive model: comparison between laboratory direct shear tests and results of finite element modelling of these tests. (b) Dependence of the peak and post-peak friction angle on stress level.

In addition, since the experiments were conducted at small scale without using a centrifuge, small scale effects are expected to make an effect. In particular, the computed peak and residual internal friction angle of the sand was found to increase as the vertical effective stress decreases, as revealed from the direct shear test results (Figure 2b), a dependence that was accounted for in the analysis.

Figure 3 presents the results of the numerical analysis in terms of mesh deformations and the associated shear strain localization compared to the observed deformation during the experiment for various magnitudes of vertical fault offset h. To facilitate comparison, the shear band formed during the experiment is highlighted with dashed lines. The analysis is in good accordance with the Fault Rupture Box test as far as the evolution of the phenomenon is concerned. Initially, a practically vertical shearing path is detected within the soil mass. As the bedrock offset increases the primary rupture is gradually formed and it propagates towards the surface. For h = 15 mm it reaches the surface. Further increase in the fault offset leads to the formation of a secondary antithetic rupture. For bedrock offset h = 25 mm, the analysis successfully predicts the emergence of the secondary antithetic rupture all at the surface. Figure 4 presents the prediction of the surface displacement profiles according to the numerical analysis compared to the measured surface displacements during the experiment. The comparison between the analysis and the experiment proves that the numerical analysis realistically captures the soil behavior.

5 PIPE–SOIL INTERACTION

In the ensuing, the numerical methodology focuses on the pipe – soil interaction. The pipe and a soil prism around it are modeled in 3D, and the computed displacements from the free field analysis are imposed as input at the boundaries of this prism. The pipe is placed at depth z = 0.55 m from the surface. This was made to realistically model the interaction forces between the pipe and soil. This means that the pipe to soil stiffness, and strength ratios are consistent with a case of common practice. Suppose we have a steel pipe buried at depth 1 – 1.5 m – a rather common case in practice. Since these experiments are conducted in 1 g (and not in a centrifuge), the pipe must be placed at the same depth to achieve analogous interaction forces. However, with the simultaneous reduction of the pipe stiffness (aluminum instead of steel pipe), the pipe can be placed at smaller depth (z = 0.55 m).

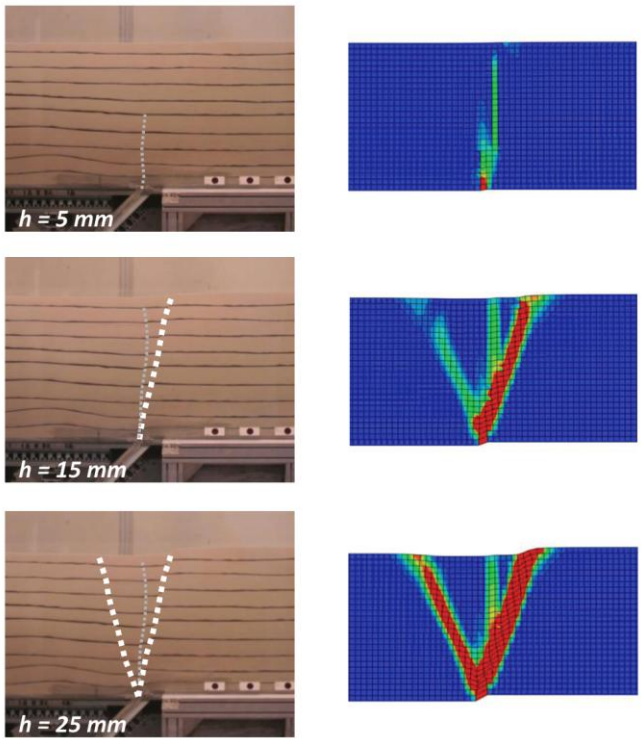


Figure 3. Simulation of normal fault rupture propagation: Comparison between the numerical prediction and the results of the experiment for various magnitudes of fault offset (h = vertical component of the bedrock displacement).

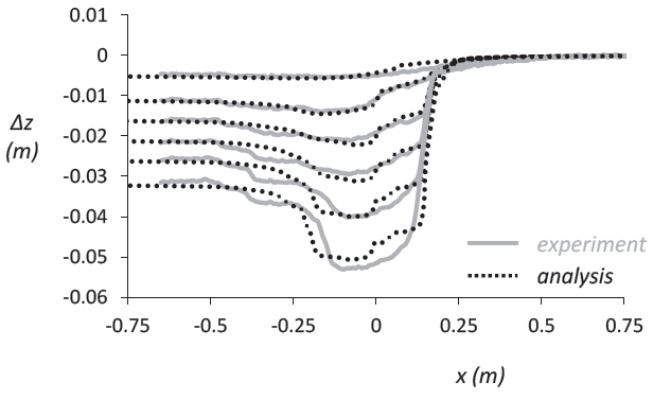


Figure 4. Comparison between the numerical prediction and the results of the experiment in terms of vertical displacements along the surface.

Figure 5 presents the deformed mesh for vertical fault offset h = 20 mm. Figure 6 presents the comparison of the predicted strain distribution at the top centerline of the pipe according to the numerical analysis compared to the measure strain distribution for various magnitudes of fault offset. The numerical methodology succeeds in predicting the maximum strains as well as the distribution of strains along the pipe, hence, both the stressing of the pipe as well as the deflection due to faulting is accurately predicted.

6 CONCLUSIONS

This paper presents a new 3D finite element methodology to simulate pipeline response subjected to normal faulting. The numerical methodology can successfully capture the soil response and the fault rupture propagation, the pipe response and the interaction between the pipe and the surrounding soil. It decouples the phenomenon, analyzing first the fault rupture propagation assuming that the pipe does not affect the evolution of the rupture at global level. Subsequently, the pipe – soil interaction problem is analyzed; the computed displacement time histories are applied to the boundaries of the local, more detailed model (i.e., having a much finer mesh), comprising the pipeline and the surrounding soil. The proposed methodology was validated against 1g small scale experiments conducted at the Laboratory of Soil Mechanics of NTUA. The results of the numerical models compare very well to the response of the pipe during the experiments. The agreement between the numerical and the experimental results give confidence to the numerical tools.

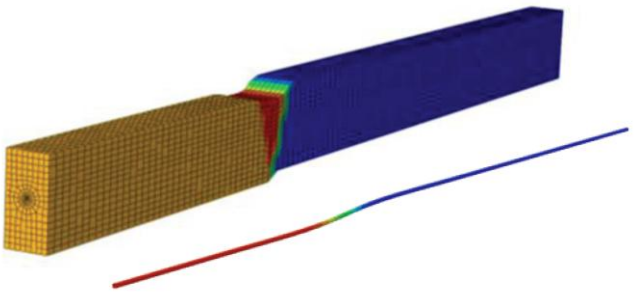


Figure 5. Deformed mesh of the pipe-soil interaction model with superimposed displacement contours for h = 20 mm.

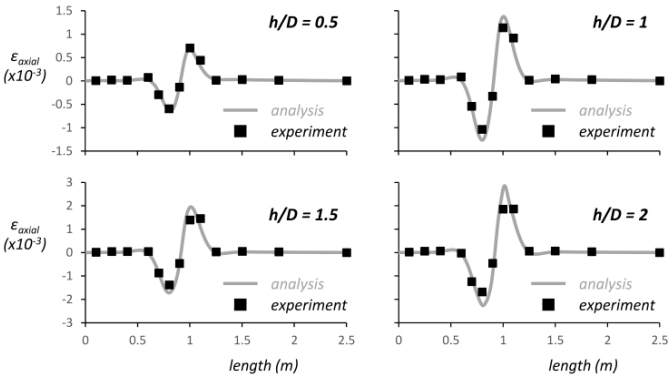


Figure 6. Comparison between the numerical model prediction and the results of the experiment in terms of strain distribution along the top centerline of the pipe for various magnitudes of fault offset.

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Seismic faulting and palaeo-liquefaction in an ancient harbor

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Remains of a 2300 years-old mole have been identified at Palairos, SW Greece mainland. This mole is submerged a few meters due to tectonic effects and global sea-level rise, and has an unusual Z-type shape: its main axis seems to be laterally shifted by several meters (Fig. 1) with no signs of a substantial vertical deformation. Hence the question arising is whether this shape reflects an original construction (for example a mole built above certain shoals), or a post-construction deformation? Clearly, the area is prone to earthquakes and to strike slip faulting tending to produce lateral (strike-slip) displacements, but the apparent offset in Fig 1 is too large to have been produced by tectonic deformation associated with the faults expected in the area.

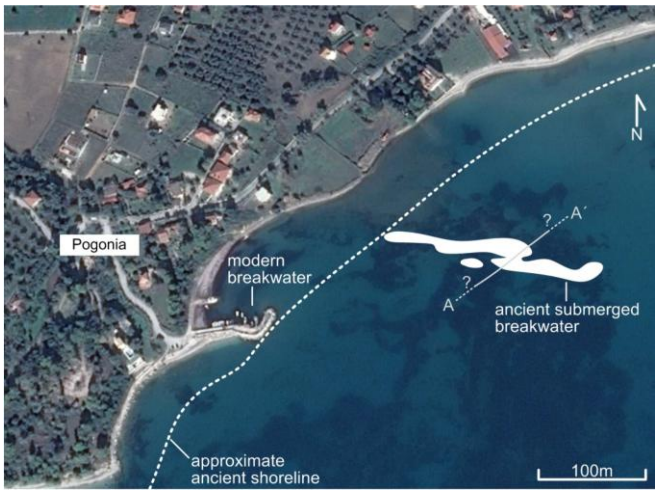

Figure 1. The Palairos mole superimposed on Google Map Imagery (after Stiros and Saltogianni, 2016). The unusual shape of the mole is explained as a combined result of seismic tectonic faulting and of seismic sliding on sediments liquefied during the first part of the earthquake. Several other possible explanations were examined, but they were discarded.

PROPOSED SCENARIO In order to provide a plausible explanation for the shape of the ancient mole, we examined all possible scenarios which may explain its present-day pattern: original construction, uneven erosion, tectonic offset, sliding, etc. Still, all these explanation seemed unlikely. For example gravitational sliding would shift the east part of the mole to the east, towards the deep part of the gulf, not towards SW.

Only the following scenario was likely:

(i) A strike slip fault crossing the ancient structure reactivated during an earthquake of rather medium size (magnitude around 6 in the Richer scale) and produced minor tectonic offset (<1m) in the mole.

(ii) The first part of the seismic motion (strong motion) produced liquefaction of the fine sediments underlying the mole.

(iii) Because of the liquefied foundations, during the continuing strong seismic motion the lateral motion was amplified, and at the end of the earthquake the overall offset was far exceeding the original tectonic motion.

Hence an unusual combination of a tectonic displacements and of surficial movement led to a permanent lateral motion about one order of magnitude larger than the original tectonic/seismic motion.

FEASIBILITY OF THE PROPOSED SCENARIO

This scenario is reasonable because

(1) Strike slip faults, relatively strong earthquakes, seismic ground deformation and liquefaction are frequent in the wider region.

(2) During an earthquake dynamic seismic displacements next or close to a strike slip fault are NOT characterized by oscillatory movements, but by displacements essentially in one direction, parallel to the fault.

(3) Liquefaction is observed at the early parts of an earthquake and its effect is that sediments lose their strength and behave like a viscous liquid (sometimes producing mud volcanoes etc.). Liquefied strata can produce large scale dislocations, even without earthquakes ("static liquefaction"), such as sliding on ice. A superb example of such a motion is the failure at a quay at Barcelona some years ago: some parts slid nearly horizontally by up to 90 (ninety) meters!

For a detailed study and documentation:

Stiros, S., Saltogianni, V. (2016). Deformation of the ancient mole of Palairos (Western Greece) by faulting and liquefaction, Marine Geology, 380, 106-112 (doi: 10.1016/ j.margeo.2016.08.001)

The mapping and the archaeological study of the mole were reported in:

Murray, W.M. (1985). The ancient harbour of Palairos. In: Raban, A. (Ed.), Harbour Archaeology. Proc. First Int. Works. Ancient Mediterranean Harbours. British Archaeological Reports International Series, 257, 67–80.

ΠΑΡΟΥΣΙΑΣΗ ΔΙΔΑΚΤΟΡΙΚΩΝ ΔΙΑΤΡΙΒΩΝ ΣΤΗΝ ΓΕΩΤΕΧΝΙΚΗ ΜΗΧΑΝΙΚΗ

Καταστατική Προσομοίωση της Μηχανικής Συμπεριφοράς Μη Κορεσμένων Εδαφών

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Επιβλέπων: Μιχάλης Καββαδάς,
Αναπληρωτής Καθηγητής ΕΜΠ

Εθνικό Μετσόβιο Πολυτεχνείο
Σχολή Πολιτικών Μηχανικών / Τομέας Γεωτεχνικής

Περίληψη

Ο κύριος σκοπός της διδακτορικής διατριβής ήταν η ανάπτυξη ενός καταστατικού προσομοιώματος για μη κορεσμένα εδάφη, η τεκμηρίωσή του και η εισαγωγή του στο πρόγραμμα πεπερασμένων στοιχείων Simulia Abaqus. Ο μερικός κορεσμός σε πρακτικό επίπεδο αφορά κυρίως φυσικά ή συμπυκνωμένα εδάφη με κοινό τους χαρακτηριστικό την ανισοτροπία της μηχανικής τους συμπεριφοράς. Για τον λόγο αυτό επιλέχθηκε στο προτεινόμενο καταστατικό προσομοίωμα να συμπεριληφθεί η δυνατότητα πρόβλεψης της ανισοτροπίας, με αποτέλεσμα το τελικό παραδοτέο να αποτελεί ένα **νέο καταστατικό προσομοίωμα για ανισότροπα στερεοποιημένα, μη κορεσμένα εδαφικά υλικά, με δυνατότητα εξωτερικής ενσωμάτωσης στον κώδικα πεπερασμένων στοιχείων Simulia Abaqus**.

Τα **κυριότερα χαρακτηριστικά** του προτεινόμενου καταστατικού προσομοιώματος συνοψίζονται ως εξής:

- Χρησιμοποιεί το στρεβλό ελλειψοειδές του Kavvadas (1982) ως την επιφάνεια πλαστικής διαρροής ανισότροπα στερεοποιημένων εδαφικών υλικών.

- Ενσωματώνει έναν μη συσχετισμένο νόμο ροής, η διατύπωση του οποίου βασίζεται στην ενσωμάτωση μίας επιφάνειας πλαστικού δυναμικού, όμοιου σχήματος και διαφορετικού προσανατολισμού σε σχέση με την επιφάνεια διαρροής. Ο προτεινόμενος νόμος ροής μπορεί να βαθμονομηθεί ώστε να προβλέπει την επιθυμητή πλαστική διαστολικότητα σε ακτινικές τασικές οδεύσεις (με έμφαση σε συνθήκες μονοδιάστατης παραμόρφωσης) ενώ ταυτόχρονα επιτρέπει τον ανεξάρτητο έλεγχο της θέσης της γραμμής κρίσιμης κατάστασης στο επίπεδο λόγου κενών (v) – μέσης ενεργού τάσης (p).

- Ενσωματώνει έναν νέο μικτό νόμο κράτυνσης ο οποίος περιλαμβάνει τρία επιμέρους μέρη:

  a) έναν νέο νόμο ισότροπης κράτυνσης, ο οποίος ενσωματώνει το πλαίσιο εγγενούς συμπίεσης των Belokas & Kavvadas (2011) και δύναται, σε συνδυασμό με τον νόμο κινηματικής κράτυνσης, να περιγράψει με ακρίβεια τη συσχέτιση των καμπυλών εγγενούς συμπίεσης με το επίπεδο της επιβαλλόμενης τασικής ανισοτροπίας,

  b) τον κινηματικό νόμο κράτυνσης του Kavvadas (1982), ο οποίος περιγράφει την εξέλιξη του προσανατολισμού της επιφάνειας διαρροής με την εξέλιξη της ανισοτροπίας και

  c) έναν νέο νόμο κινηματικής κράτυνσης, ο οποίος μέσω των διεκτροπικών πλαστικών παραμορφώσεων περιγράφει τη σταδιακή «απώλεια μνήμης» της ανισοτροπίας σε τασικές οδεύσεις που προκαλούν αστοχία. Ο προτεινόμενος νόμος κινηματικής κράτυνσης αποσκοπεί στην ενοποιημένη και φυσική περιγραφή, αφενός της τασικής χαλάρωσης που επιδεικνύουν ανισότροπα στερεοποιημένα εδαφικά υλικά σε δοκιμές αστράγγιστης τριαξονικής συμπίεσης, αφετέρου μίας ενιαίας και μοναδικής κρίσιμης κατάστασης, ανεξάρτητης τόσο της αρχικής ανισοτροπίας όσο και της επιβαλλόμενης τασικής διαδρομής που οδηγεί στην αστοχία.

- Η επέκταση του καταστατικού προσομοιώματος για εδαφικές καταστάσεις μερικού κορεσμού γίνεται με χρήση της τάσης εδαφικού σκελετού του Bishop ως η πρώτη καταστατική παράμετρος, καθώς και της μύζησης και του βαθμού κορεσμού ως επιπλέον καταστατικές παραμέτρους. Η χρήση της τάσης του Bishop επιτρέπει τη φυσική περιγραφή της εξέλιξης της αντοχής με τη μύζηση και επιπρόσθετα επιτρέπει την προσομοίωση μίας ομαλής μετάβασης από καταστάσεις πλήρους κορεσμού σε καταστάσεις μερικού κορεσμού και το αντίθετο.

- Τέλος, ενσωματώνει μία καταστατική επιφάνεια τύπου Φόρτισης – Κατάρρευσης (Loading - Collapse) για την περιγραφή πλαστικών καταστάσεων που συνδέονται με φόρτιση επί καταστάσεων παρθενικής συμπίεσης υπό διαφορετικά επίπεδα μύζησης και με τις ογκομετρικές μεταβολές που προκαλούνται λόγω μεταβολής της μύζησης. Βασίζεται σε ένα νέο πλαίσιο συμπιεστότητας για καταστάσεις μερικού κορεσμού, το οποίο προβλέπει γραμμές παρθενικής συμπίεσης με κλίση εξαρτώμενη τόσο από τη μύζηση όσο και από τον βαθμό κορεσμού.

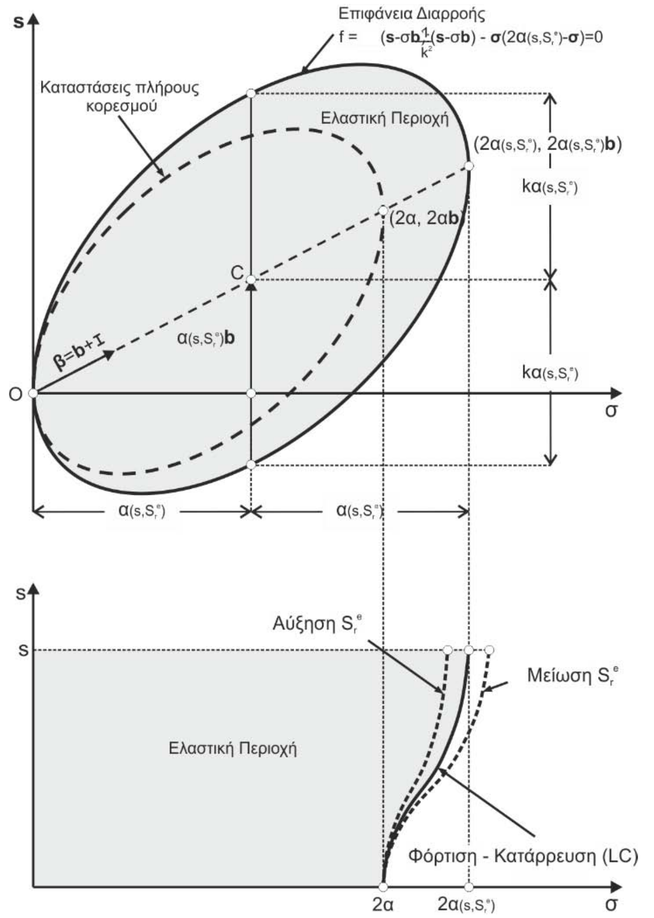
Στο Σχήμα 1 παρουσιάζεται η επιφάνεια διαρροής του προτεινόμενου καταστατικού προσομοιώματος στον χώρο μέσης τάσης του Bishop (σ) - διεκτροπικής τάσης (**s**) καθώς και η επιφάνεια φόρτισης κατάρρευσης η οποία οριοθετεί την ελαστική περιοχή στον χώρο μύζησης (s) - μέσης τάσης του Bishop (σ).

Το προτεινόμενο καταστατικό προσομοίωμα ενσωματώνεται σε αλγόριθμο επίλυσης των καταστατικών εξισώσεων σε υλικό σημείο, ο οποίος χρησιμοποιείται τόσο για την εκτέλεση απλών προσομοιώσεων τυπικών τασικών οδεύσεων φόρτισης και μεταβολής της μύζησης σε υλικό σημείο, όσο και για την ενσωμάτωση του προσομοιώματος στον κώδικα πεπερασμένων στοιχείων Simulia Abaqus. Για την πραγματοποίηση προσομοιώσεων της συμπεριφοράς μη κορεσμένων εδαφών, ενσωματώνονται στον αλγόριθμο δυνατότητες συζευγμένης ανάλυσης της μηχανικής και υδραυλικής συμπεριφοράς μέσω του μαθηματικού προσομοιώματος περιγραφής της καμπύλης συγκράτησης ύδατος των Gallipoli et al. (2003).

Για την **επαλήθευση και αξιολόγηση** του καταστατικού προσομοιώματος εκτελέστηκαν οι ακόλουθες επιμέρους εργασίες:

- Εκτελέστηκε ικανό πλήθος παραμετρικών αναλύσεων με σκοπό: α) την επαλήθευση της συμμόρφωσης του προσομοιώματος με τις προβλέψεις του πλαισίου μηχανικής συμπεριφοράς, β) την ποιοτική σύγκριση των προβλέψεων του προσομοιώματος με τα συνήθη ευρήματα εργαστηριακών διερευνήσεων, γ) την αποσαφήνιση της επιρροής διαφόρων παραμέτρων με σκοπό τη διευκόλυνση της βαθμονόμησής του και δ) τη σύγκριση των αποτελεσμάτων αναλύσεων υλικού σημείο με τα αποτελέσματα αναλύσεων πεπερασμένων στοιχείων σε επίπεδο απλών τασικών οδεύσεων συνήθων εργαστηριακών δοκιμών για την επαλήθευση των αριθμητικών εργαλείων. Στο Σχήμα

2 ... (Σχήμα 2 a) ... (Σχήμα 2 b).



Σχήμα 1. Ο ... - **s** - s.

- Το ... Lower Cromer Till ... Gens (1982), β) της Jossigny Silt από την Casini (2008) και γ) της Barcelona Clayey Silt από τον Barrera (2002). Στο Σχήμα 3 ... Gens (1982) ...

- Ε... Simulia Abaqus. Ε... Το ...

Σχήμα 2 . a) K ... b) ...

Σχήμα 3 . A ...

Π... Ε... Ο ...

του προτεινόμενου προσομοιώματος μπορούν να συνοψιστούν στα εξής:

- Δύναται να περιγράψει με ακρίβεια την εξάρτηση των καμπυλών εγγενούς συμπίεσης από τον βαθμό της επιβαλλόμενης τασικής ανισοτροπίας.
- Ο προτεινόμενος νόμος ροής περιγράφει επιτυχώς τις πλαστικές παραμορφώσεις τόσο σε δοκιμές ακτινικής συμπίεσης όσο και σε στραγγισμένες δοκιμές τριαξονικής φόρτισης.
- Ο προτεινόμενος νόμος κράτυνσης για την «απώλεια μνήμης» της ανισοτροπίας με τη συσσώρευση διεκτροπικών πλαστικών παραμορφώσεων περιγράφει επιτυχώς τόσο την τασική χαλάρωση που επιδεικνύουν ανισότροπα στερεοποιημένα εδαφικά υλικά όσο και μία ενιαία κρίσιμη κατάσταση.
- Η εφαρμογή της τάσης εδαφικού σκελετού του Bishop περιγράφει με επιτυχία την εξέλιξη της διατμητικής αντοχής με τη μύζηση σε καταστάσεις μερικού κορεσμού.
- Το προτεινόμενο πλαίσιο συμπιεστότητας για καταστάσεις μερικού κορεσμού, προσομοιώνει επιτυχώς την εξέλιξη της συμπιεστότητας με τη μύζηση και τον βαθμό κορεσμού και δύναται να προβλέπει: α) καμπύλες συμπίεσης ανεξάρτητες της μύζησης για καταστάσεις πλήρους κορεσμού, β) συνεχή μεταβολή της συμπιεστότητας για καταστάσεις φόρτισης υπό σταθερή μύζηση καθώς και γ) ένα μέγιστο στις ογκομετρικές παραμορφώσεις λόγω διαβροχής (κατάρρευση).

Μελλοντικές εκδόσεις του προσομοιώματος θα πρέπει να εστιάσουν στην άρση των κυριότερων αδυναμιών του προσομοιώματος, ως εξής:

- Το προσομοίωμα τείνει να υπερεκτιμά τη μέγιστη αντοχή ανισότροπα στερεοποιημένων εδαφών. Απαιτείται τροποποίηση του νόμου κινηματικής κράτυνσης του Kavvadas (1982) με σκοπό τη δυνατότητα μεγαλύτερης ευελιξίας ως προς τον προσανατολισμό της επιφάνειάς διαρροής σε ακτινικές τασικές οδεύσεις. Στην παρούσα έκδοση το πρόβλημα αυτό μπορεί να ξεπεραστεί μέσω κατάλληλης βαθμονόμησης των παραμέτρων του προσομοιώματος.
- Λόγω της μεγάλης ελαστικής περιοχής, οι προβλέψεις του προσομοιώματος υστερούν σε καταστάσεις που αναφέρονται σε έντονα υπερστεροποιημένα εδαφικά υλικά. Για την βελτίωση των προβλέψεων απαιτείται η εισαγωγή εσωτερικής επιφάνειας πλαστικής διαρροής για την μετατροπή του προσομοιώματος σε προσομοίωμα οριακής πλαστικότητας, όμοια με τα προσομοίωμα των Μπελόκας (2008) και Καλός (2014).
- Ο νόμος ροής απαιτεί βελτίωση με σκοπό την καλύτερη πρόβλεψη της αύξησης της τάσης για διαστολική συμπεριφορά που τα μη κορεσμένα εδαφικά υλικά επιδεικνύουν. Η ενσωμάτωση κάποιου τύπου άμεσης εξάρτησης της επιφάνειας πλαστικού δυναμικού από το επίπεδο της μύζησης θα μπορούσε να αποτελεί έναν πιθανό τρόπο βελτίωσης των προσομοιώσεων.

Η υποστήριξη της Διατριβής έγινε στις 14/07/2016 ενώπιον της επταμελούς εξεταστικής επιτροπής αποτελούμενης από τους: κ. Καββαδά Μιχαήλ Αν. Καθηγητή ΕΜΠ (Επιβλέπων), κ. Μπουκοβάλα Γεώργιο, Καθηγητή ΕΜΠ (μέλος της τριμελούς συμβουλευτικής επιτροπής), κα. Γεωργιάννου Βασιλική, Αν. Καθηγήτρια ΕΜΠ (μέλος της τριμελούς συμβουλευτικής επιτροπής), κ. Γκαζέτα Γεώργιο, Καθηγητή ΕΜΠ, κ. Gens Antonio, Καθηγητή UPC, κ. Γερόλυμο Νικόλαο, Επικ. Καθηγητή ΕΜΠ και κ. Παπαδημητρίου Αχιλλέα Επικ. Καθηγητή ΕΜΠ. Η ορκωμοσία του κ. Σιταρένιου έγινε στην Γενική Συνέλευση της Σχολής Πολιτικών Μηχανικών του ΕΜΠ στις 08/11/2016.

Ολόκληρο το τεύχος της Διατριβής είναι διαθέσιμο από την Κεντρική Βιβλιοθήκη του ΕΜΠ μέσω του ακόλουθου συνδέσμου:

https://dspace.lib.ntua.gr/handle/123456789/43849

ΝΕΑ ΑΠΟ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

ΕΛΛΗΝΙΚΟΣ ΣΥΝΔΕΣΜΟΣ ΓΕΩΣΥΝΘΕΤΙΚΩΝ ΥΛΙΚΩΝ
HELLENIC GEOSYNTHETICS SOCIETY (HGS)

Στις 31 Μαρτίου 2016, πραγματοποιήθηκε η τακτική εκλογική Γενική Συνέλευση του Ελληνικού Συνδέσμου Γεωσυνθετικών Υλικών στην αίθουσα εκδηλώσεων του ΤΕΕ, Νίκης 4, Αθήνα. Πρόεδρος της Γ.Σ. εκλέχθηκε ο κ. Δ. Ατματζίδης και Γραμματέας η κα Ε. Καπόγιαννη. Συζητήθηκαν τα παρακάτω θέματα :

- Εγγραφές Νέων Μελών.
- Πεπραγμένα – Οικονομικός Απολογισμός
- Δραστηριότητες Ελληνικού και Διεθνών Συνδέσμων Γεωσυνθετικών Υλικών.
- Εκλογή νέου Διοικητικού Συμβουλίου.
- Εκλογή Εξελεγκτικής Επιτροπής.

Κατά τη συνεδρίαση εκλέχθηκαν ως μέλη της εφορευτικής επιτροπής για την διεξαγωγή της εκλογικής διαδικασίας οι Δ. Ατματζίδης (Πρόεδρος) και Γ. Αθανασόπουλος (Γραμματέας).

Προ της Γ.Σ. και έως την Τετάρτη 30 Μαρτίου 2016, σύμφωνα με το άρθρο 15 του Καταστατικού του Συλλόγου, είχαν δηλώσει υποψηφιότητα τα κάτωθι μέλη :

Κολλιός Αναστάσιος, Φίκιρης Ιωάννης, Τσάτσος Νικόλαος, Καπόγιαννη Έλενα, Ρίτσος Απόστολος, Στρατάκος Χρήστος, Ζέκκος Δημήτριος, Μάρκου Ιωάννης, Παχάκης Μιχαήλ, Τσιτόπουλος Αλέξανδρος, Γιαλίδης Κωνσταντίνος.

Κατόπιν φανερής ψηφοφορίας (παρ. 7., άρθρο 8 καταστατικού) εκλέχθηκαν για το Δ.Σ. της επόμενης περιόδου (τριετία 2016-2019) οι κάτωθι :

Κολλιός Αναστάσιος, Φίκιρης Ιωάννης, Τσάτσος Νικόλαος, Καπόγιαννη Έλενα, Ρίτσος Απόστολος, Στρατάκος Χρήστος, Ζέκκος Δημήτριος, Μάρκου Ιωάννης.

Κατόπιν επίσης φανερής ψηφοφορίας (παρ. 7, άρθρο 8 καταστατικού) εκλέχθηκαν για την Εξελεγκτική Επιτροπή της επόμενης περιόδου (τριετία) οι κάτωθι :

Παχάκης Μιχαήλ, Τσιτόπουλος Αλέξανδρος, Γιαλίδης Κωνσταντίνος

Την 19η Απριλίου 2016 τα εκλεγμένα μέλη της ψηφοφορίας της Γενικής Συνέλευσης της 31ης Μαρτίου 2016 (βλέπε σχετικά και το πρακτικό της εφορευτικής επιτροπής της 18ης Απριλίου 2016) συγκροτήθηκαν σε σώμα με την ακόλουθη σύνθεση :

Νέα Σύνθεση Δ.Σ. 2016-2019

Πρόεδρος: Κολλιός Αναστάσιος
Αναπληρωτής Πρόεδρος: Φίκιρης Ιωάννης
Υπεύθυνος Οικονομικών: Τσάτσος Νικόλαος
Γραμματέας: Καπόγιαννη Έλενα
Μέλος: Ρίτσος Απόστολος
Μέλος: Στρατάκος Χρήστος
Μέλος: Ζέκκος Δημήτριος
Αναπληρωματικό Μέλος: Μάρκου Ιωάννης

Κατά την διάρκεια του συνεδρίου EUROGEO 6 – Ljubljana (25-28.09.2016) συμμετείχαν από Ελληνικής πλευράς μόνον οι συνάδελφοι - εκθέτες από την THRACE Non-wovens and Geosynthetics (με περίπτερο) και ως σύνεδροι από τα Πλαστικά Κρήτης (Στ. Φλουρής) καθώς και οι Ν. Μουτάφης και Α.Κολλιός.

Διαλέξεις της ΕΜΑΕΤ

Η Εταιρεία Μελέτης Αρχαίας Ελληνικής Τεχνολογίας έχει προγραμματίσει για τους επόμενους μήνες τις παρακάτω διαλέξεις, οι οποίες και θα πραγματοποιηθούν στην αίθουσα του Συλλόγου των Αθηναίων (Κέκροπος 10, Πλάκα), με ώρα έναρξης 18.30 .

- 5 Δεκεμβρίου – Μνήμη Ευάγγελου Κακαβογιάννη. Εισαγωγή: Γ. Βαρουφάκης, Ομιλητές: Ο. Κακαβογιάννη, Σ. Κουρσούμης

- 16 Ιανουαρίου 2017, Π. Αυγερινού «Νέα ευρήματα στην αρχαία ύδρευση των Μεγάρων»

- 30 Ιανουαρίου 2017, Θ.Π. Τάσιος «Ιδιότητες στερεών σωμάτων κατά τον Αριστοτέλη»

- 13 Φεβρουαρίου 2017, Κ. Παλυβού «Αρχιτεκτονική και ένδυση – οικοδομική και ραπτική»

- 6 Μαρτίου 2017, Ε. Χιώτης «Τα Μινωικά αστικά υδραυλικά έργα»

- 20 Μαρτίου 2017, Τ. Δεβετζή, Κ. Μπίρταχα «Η τεχνολογία των χρωμάτων στην Εποχή του Χαλκού. Ενδείξεις από τον προϊστορικό οικισμό στο Ακρωτήρι Θήρας»

- 3 Απριλίου 2017, Κ. Μπίρταχα «Ενδείξεις για τη χρήση εργαλείων-βοηθημάτων κατά τη σχεδίαση των μορφών στις τοιχογραφίες του Ακρωτηρίου Θήρας»

- 24 Απριλίου 2017, Κ. Γιαννακός «Γραπτές Πηγές, Τεχνολογία Ξεστής Λιθοδομής και Παρουσία των Μυκηναίων στην Κύπρο»

- 15 Μαΐου 2017, Α. Αρχοντίδου «Εργαστήρια ανάγλυφης κεραμεικής στη Μυτιλήνη»

- 29 Μαΐου 2017, Αρχαιοτεχνογνωστική εκδρομή.

Η είσοδος είναι ελεύθερη για το κοινό. Πληροφορίες: emaet.tee@gmail.com, www.emaet.tee.gr, τηλ. 6949 829158.

Οι ομιλίες της ΕΜΑΕΤ μαγνητοσκοπούνται από το Ίδρυμα Μποδοσάκη (http://www.blod.gr/lectures/Pages/viewevent.aspx?EventID=297).

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

Basements and Underground Structures 2016, 5-6 October 2016, London, United Kingdom, https://basements.geplus.co.uk

2nd International Specialized Conference on Soft Rocks – ISRM 2016 Understanding and interpreting the engineering behavior of Soft Rocks, 6-7 October 2016, Cartagena, Colombia, www.scg.org.co/?p=1634

GE0-EXPO 2016 Scientific-Expert Conference Geotechnics, Ecological Engineering And Sustainable Development, October 7 - 8, 2016, Banja Luka, Bosnia and Herzegovina www.geotehnika.ba/en/Home.php

HYDRO 2016 - Achievements, opportunities and challenges 10-12 October 2016, Montreux, Switzerland, www.hydropower-dams.com/hydro-2016.php?c_id=88

The British Tunnelling Society Conference and Exhibition 2016, October 11 – 12, 2016, London, United Kingdom, www.btsconference.com

65th Geomechanics Colloquium 2016, Georg Feder Colloquium, October 13 - 14th, 2016, Salzburg, Austria, www.oegg.at/en/geomechanics-colloquium-3/65th-geomechanics-colloquium-2016-georg-feder-colloquium-79

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

SFGE 2016 Shaping the Future of Geotechnical Education International Conference on Geo-Engineering Education 20 - 22 October 2016, Minascentro, Belo Horizonte, MG, Brazil, http://cobramseg2016.com.br/index.php/sfge-sobre/?lang=en

10th ICOLD European Club Symposium & Exhibition, 25-30 October 2016, Antalya, Turkey, http://trcold.com

1st International Symposium on Seismic Rehabilitation of Heritage Structures 30-31 October 2016, Tehran, Iran, www.srhs.ir

NEMO International Conference Probing the Santorini volcano for 150 years / Διεθνές συνέδριο NEMO 150 χρόνια μελέτης ηφαιστείου της Σαντορίνης, 3-5 November 2016, Santorini, Greece, http://nemo.conferences.gr

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

3rd Annual Underground Infrastructure & Deep Foundations UAE, 13 - 15 November 2016, Dubai, United Arab Emirates, www.undergrounduae.com

Risk Management in Underground Construction, November 14-16, 2016, Florida University, USA, http://undergroundriskmanagement.com/agenda

5th International Conference on Geotechnical Engineering and Soil Mechanics, 14-16 November 2016, Tehran, Iran, www.icgesm2016.ir

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

TBM DiGs Istanbul 2016 2nd International conference on "TBM DiGs in difficult grounds", 16-18 November 2016, Istanbul, Turkey, www.tbmdigsturkey.org

International Seminar on Roads, Bridges and Tunnels, 18-24 November 2016, Thessaloniki, Greece, http://isrbt2016.civil.auth.gr

GEOTEC HANOI 2016, The 3rd International Conference on Geotechnics for Sustainable Infrastructure Development, 24-25 November, Hanoi, Vietnam, www.geotechn.vn

TUNNELLING SUMMIT - Pinpointing project opportunities and exploring innovation in tunnelling, 7-8 December 2016, London, U.K., https://tunnelling.newcivilengineer.com

5th International Conference on Forensic Geotechnical Engineering, 8-10 December 2016, Bangalore, Karnataka, India, http://5icfge.com

International Symposium on Submerged Floating Tunnels and Underwater Tunnel Structures (SUFTUS-2016), 16-18 December 2016, Chongqing, China, www.cmct.cn/suftus

MPM 2017

First international conference on the material point method for Modelling Large Deformation and Soil–Water–Structure Interaction

10 – 13 January 2017, Delft, The Netherlands

http://mpm2017.eu

We are delighted to invite you to join us at the First International Conference on the Material Point Method for "Modelling Large Deformation and Soil–Water–Structure Interaction" organised by the Anura 3D MPM Research Community in January 2017 in Delft. This is the first conference following a series of international workshops and symposia previously held in Padova (2016), Barcelona (2015), Cambridge (2014) and Delft (2013) in the context of the FP7 Marie-Curie project MPM–DREDGE.

The aim of the conference is to provide an international forum for presenting and discussing the latest developments in both the fundamental basis and the applicability of state-of-the-art computational methods that can be effectively used for solving a variety of large deformation problems in geotechnical and hydraulic engineering. Special focus is on the numerical modelling of interaction between soils, water and structures where the interface and transi-

tion between solid and fluid behaviour plays an essential role.

Papers on any aspect of these subjects are most welcome. Active discussion on key topics will be facilitated through invited keynote lectures. In addition, the partners of the MPM–DREDGE project will present the highlights of their research programme, achieved through intense collaboration between industry and academia. The results include validated computational tools based on the material point method to improve the understanding of installation of geocontainers, liquefaction of submarine slopes, landslides and erosion around offshore and near-shore structures.

For more information and the latest news regarding the conference programme and registration, please regularly visit our website at www.mpm2017.eu.

On behalf of the MPM 2017 Conference Organising Committee we are looking forward to welcoming you in Delft in January 2017!

CONFERENCE TOPICS

- Material point method, formulation and applications
- Other computational methods for large deformations in geomechanics and fluid mechanics, amongst many others e.g. SPH, DEM/LBM, PFEM, ALE, CEL, UL–FEM, CFD
- Coupling of geomechanics and fluid mechanics concepts
- Constitutive models for large deformations, dynamic problems, cyclic loading, unsaturated behaviour
- Soil–water interaction and transition, modelling of sedimentation and erosion, sediment transport and deposition, coastal erosion and scouring
- Modelling of water–soil boundary layers under currents and waves, turbulence modelling

Experiments, benchmarks and case studies:

- Physical modelling of large deformation engineering problems at field-, model- or laboratory-scale
- Forensic engineering: (back-)analysis of large deformation failure events and natural hazards
- Case studies and benchmark solutions for large deformation problems

Applications in geotechnical and hydraulic engineering:

- Slope liquefaction and breaching, dredging processes, jetting, cutting
- Installation of geocontainers, stability of breakwaters, wave attack on structures
- Submarine slides, turbulent flow slides
- Landslides (weather-, earthquake-, man-induced), debris flows, avalanches
- Dike stability (e.g. macrostability, piping, erosion) and dike reinforcement
- Installation problems, e.g. pile installation
- Soil investigation, e.g. pile load testing, CPT simulation, pore pressure dissemination testing
- Impact problems and stability problems, e.g. boreholes, sinkholes

Contact

Anura3D MPM Research Community
Conference Secretariat MPM 2017
c/o Deltares, P.O. Box 177, 2600 MH Delft, The Netherlands
Visiting address: Boussinesqweg 1, 2629 HV Delft, The Netherlands
info@mpm2017.eu

International Workshop on "Advances in Multiphysical Testing of Soils and Shales", 18-20 January 2017, Villars, Switzerland, http://atmss.epfl.ch

ICNCGE-2017 International Conference on New Challenges in Geotechncial Engineering, 23 January 2017, Lahore, Pakistan, www.pges-pak.org/home/icncge-2017

TUNNELLING ASIA' 2017

Design, Construction and Risk Management in Underground Construction : Issues & Challenges
9 - 10 February, 2017, Mumbai, India

Location of various facilities underground will be the order of the day in the immediate future to ensure sustainable life for future societies by providing necessary infrastructure to accommodate transportation, communication utility networks and complexes for handling, processing and storage of many kinds of materials, more so in urban areas which will have to accommodate large populations. Application of new technologies besides use of sophisticated equipment for underground construction works would be warranted for execution of works in a cost effective manner conforming to sustainable development. With rapid growth of underground structures anticipated, there will be evolution of new technologies and innovative construction practices.

With a view to provide information at international level of knowledge and experience gained in the large scale underground structures and tunnel projects for the benefit of future projects throughout the world, delegates will be provided with a unique opportunity through this conference to facilitate exchange of views and ideas with professionals who have been actively involved in the success of the tunnel projects. A large number of experts are likely to participate to stimulate the debate on the challenges met and the lessons learnt, with the application of new practices and technologies. It is in this context that this International Conference "Tunnelling Asia' 2017", is being organised by Tunnelling Association of India, Central Board of Irrigation and Power (CBIP), Delhi Metro Rail Corporation Ltd. and Mumbai Metro Rail Corporation Ltd. jointly on 9-10 February 2017 at Grand ITC Maratha, Mumbai which would be unique experience for the participants.

TOPICC

Planning, Investigation and Design of tunnel, Cavern & underground Projects

- Planning, Investigation & Interpretation of Geological Data;
- Engineering Classification and Characterization of Rock Mass;
- Hydraulic and Structural Design of Tunnels;
- Stabilization and Support System for Tunnelling;
- Determination of In-situ Stresses for Underground Excavation;
- Instrumentation Monitoring, Back-analysis and Modelling Methodologies;
- Analysis and Design Methodologies including Effect of Seismicity on the Underground Structure.

Tunnel & Cavern Construction technologies and equipment

- Construction Methodologies for Tunnels, Caverns, Underground Storages including Remedial Measures for Large Collapses;
- Tunnelling in Urban Areas - Cut & Cover method and TBM Tunnelling
- Micro Tunnelling;
- Soft Ground Tunnelling including Shotcrete Methods, Lining;
- New Developments – TBM Performance & NATM Experiences;
- Trenchless Technology – Practice and Evaluation;
- Cost optimization in tunnel construction – Assessment of new developments and cost saving in Excavation, construction equipments, single shell lining system, spray applied water proofing membranes etc.

Risk Management

- Better Preparedness against Tunnel Related Natural Hazards;
- Fixed fire fighting systems and new challenges in the fire protection of tunnels
- Risk Analysis and Decision-making Techniques for Large Underground Projects.

Environmental and Social Impacts

- Environmental and Social Impact Assessment of Underground Works and their Norms and Methodologies;
- Environmental Control in Tunnel/Cavern and Underground Spaces;
- Effective Ventilation in Tunnels and Practices.

Safety Issues – Standards and Policies

- Fire Safety Arrangement and Measures in Tunnels and Transport;
- Safety Standards and Policies in Different Countries and New Developments.
- Traffic Management while construction of underground space.
- Behaviour aspects of tunnel fires and evacuations
- Tunnel ventilation

Contractual, insurance aspects and Financing of underground Construction Works

- Costing and Contractual Practices in Tunnel and Underground Works including Aspects of Measurements and Payment;
- Experience and Structure of Model Contract Document;
- Project and Equipment Financing of Build Operate Transfer (BOT) Projects;

Research & Development

- Robotisation of TBM Tunnelling

INDUSTRY SPECIAL ASPECTS

In addition, the following Tunnel and Underground Industry special aspects will also be covered in the special session on industries special aspects will be presented by the sponsor organisation during the conference

EXCAVATION :

1. Mechanised Tunnelling Equipment

Tunnel Boring Machines

- Case Histories for tunneling in Urban areas
- Monitored disk cutters
- Cutter optimization
- Large diameter TBM
- Solution for Mechanised Tunnelling

Drill and Blast method

2. Roadheaders

- Use of road header in tunnel and underground construction
- Instrumented road headers
- Tool optimization
- Conquering different ground

3. Innovation in Concrete Pumps, Formwork, Ventilation Fan and Instruments for Underground Construction

4. Materials

- Innovation in materials, segments and shotcrete
- Future development of shotcrete lining & associated methods
- Innovation in materials, segments and shotcrete
- Speed Dam/ Smart Dynamic Concrete Technology
- Use of Fibres for fire control

5. Waterproofing

- Overview of the Waterproofing for Tunnels and Underground Structures
- Waterproofing Methods and Case Histories : Injections, Pre-grouting, Membrane Sheets, Spray-on Water Proofing Membranes
- Composite Tunnel Lining
- Contractual Aspects, Liability and Costs
- Fire protection during Construction and Consequences during Operation

Conclave Secretariat
Secretary General
Tunnelling Association of India and Secretary
Central Board of Irrigation & Power
Malcha Marg, Chanakyapuri, New Delhi - 110 021, India
Phone : 91-11-2611 5984 / 2611 6567 - Ext. 113;
Fax : 91-11-2611 6347
Contact Person : Mr. A.C. Gupta (Mobile No 91-9871995996) / Mr. Sunil Sharma (Mobile No 91-9811299136)
Email : sunil@cbip.org; cbip@cbip.org;
Website : http//www.cbip.or

International Congress and Exhibition
HYDROPOWER
CASPIAN AND CENTRAL ASIA
15-16 February 2017, Tbilisi, Georgia
www.hydropowercongress.com

This international congress is a professional platform for high-level participants to discuss key topics to guide the course for hydropower construction and operation in the Caspian and Central Asia region. High-profile speakers will discuss the changing role of hydropower in the energy mix and the benefits of interconnections beyond national borders. Participants will review initiatives and commitments and discuss action priorities.

- Stake on hydropower! New projects in the Caspian and Central Asia. Business meets Ministers of Energy regarding the international cooperation that will enable better hydro

- 11 states – one goal. Turkey, Iran, Armenia, Georgia, Kazakhstan, Azerbaijan, Russia, Ukraine, Belarus, Tadjikistan and Kirgizia – which facilities are in progress of construction and design?
- Case studies from the companies implementing successful projects for the construction of HPPs in America, Europe and Asia
- Specialized parallel streams for large, as well as medium and small hydropower plants
- Hot issue: Where's the money coming from – investments and finance. Alternative solutions
- Roadshow: innovations and breakthrough technologies
- Special session and exclusive exhibition: modern technologies and equipment – construction and modernization
- Ultimate networking opportunities: coffee and networking breaks, gala-dinner, exhibition, round tables
- Meetings with investors, who will discuss how the early understanding and management of sustainability can remove barriers to investment

Contacts

E-mail: events@vostockcapital.com

4th Arabian Tunnelling Conference & 20th Gulf Engineering Forum - Advancing Underground Space, 21-22 February 2017, Dubai, UAE, www.atcita.com

AFRICA 2017 - Water Storage and Hydropower Development for Africa, 14-16 March 2017, Marrakech, Morocco, www.hydropower-dams.com/AFRICA-2017.php?c_id=89

http://isocarp.org/events/3rd-annual-urban-underground-space-tunneling

Overwhelming growth of cities in developing countries, shifting demographics and aging infrastructure in older cities engaged with the demand for improved liveability and environmental protection are creating a strong demand for new underground infrastructure. The underground as a spatial asset needs to be clearly understood by urban decision makers if it is to achieve its full potential in adapting cities to the many challenges that will be faced in the coming decades. In a congested city, the main concerns are designing of sustainable underground space and exploring the tunneling aspects to address the problems of urban sprawl, traffic congestion and pollution that have threatened the prospects of biodiversity, livability and general well-being of the inhabitants. The underground space in big cities is an important potential resource, where effective utilisation of urban underground space can perfect the urban comprehensive function.

This conference will cover technology of underground space and tunneling and the corresponding protection measures to put forward and provide guidelines for engineering practice for the infrastructure sector in cities.

The large scale conference will be focusing on the following streams:

Stream One: Underground Space Design & Development

This stream will highlight about Urban underground space potential that could contribute significantly to the sustainable and resilient development of cities. Despite this, the importance of the ground beneath cities is still underrecognised and often overlooked, this stream will further focus on Planning and design aspects of urban Underground Space which would mainly cover non-Tunneling aspects, Sustainable growth of cities and the livability of urban population in new underground spaces.

Stream 2: Innovative Construction & Tunneling Technologies

This Stream will cover Engineering and construction technicalities, TBM issues and challenges, Operational and maintenance aspects of underground structures, Incorporating innovative technologies and advancements for effective and efficient underground development.

General enquiries

Maheswari Ganga Gangaya
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Innovation, best practice and projects
29- 30 March 2017 | Inmarsat, London, U.K.
https://monitoring.geplus.co.uk

Building on the success of previous years, the 2017 Instrumentation and Monitoring event will again be an essential gathering for anyone using monitoring on major construction or asset management projects. Whether you are a client or contractor procuring the monitoring work, a consultant writing the specifications or a supplier bringing innovative new sensors to market, the event has something for you.

Instrumentation and Monitoring is an essential event for industry leaders and those new to the sector, looking learn,

build knowledge and network with the clients, consultants and contractors that matter.

Enquiries: Adam Hassan 020 3033 4296, adam.hassan@emap.com

2nd International Conference on Geotechnical Research and Engineering (ICGRE'17), April 3 - 4, 2017, Barcelona, Spain, http://icgre.org

IS - São Paulo 2017, 9th International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground, April 4 and 5 2017, São Paulo, Brazil, www.is-saopaulo.com

Southeast Asian Conference and Exhibition in Tunnelling and Underground Space 2017 (SEACETUS 2017)
Innovation and Sustainable Underground Space Development
18 – 19 April 2017, Subang Jaya, Selangor, Malaysia

The Tunnelling & Underground Space Technical Division of The Institution of Engineers, Malaysia (IEM TUSTD) is hosting for the first time the Southeast Asian Regional Conference and Exhibition on Tunnelling and Underground Space in March/April 2017 in Subang Jaya, which is approximately 27 km from Kuala Lumpur City Centre (SEARCETUS 2017). The conference will offer case studies and strategies that demonstrate innovation, skills and best practices, and help delegates understand the technologies and techniques guiding the Tunnelling and Underground Space Development Industry.

Its aims are to promote the sharing of knowledge, experience, skills, ideas and achievements in the designing, financing and contracting as well as construction, operation and maintenance of tunnels and other underground facilities among the ASEAN Countries on an organised basis and with agreed aims. International paper contributions are also welcomed.

The Conference covers:

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

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 and inspection services, robotic development, sewerage 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

SEARCETUS 2017 Secretariat
c/o IEM Training Centre Sdn. Bhd.
No. 33-1A (1st floor), Jalan 52/18, P.O. Box 224 (Jalan Sultan)
46720 Petaling Jaya, Selangor Darul Ehsan, MALAYSIA
Tel. No.: +(603) 7958 6851
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EURO:TUN 2017 IV International Conference on Computational Methods in Tunneling and Subsurface Engineering, 18 – 20 April 2017, Innsbruck, Austria, www.eurotun2017.com

SEE TUNNEL
2017 Zagreb
7th International Symposium on Tunnels and Underground Structures in South-East Europe
May 4-5, 2017, Zagreb, Croatia
www.promovere.hr

ITA Croatia is organizing in 2017 a new 7th International Symposium on Tunnels and Underground Structures in South-East Europe with the title "SEE Tunnel". With the support of International Tunneling Association ITA-AITES and our neighboring countries we are glad to open the possibility to speak about ideas, technical possibilities and financial interest to develop numerous future underground solutions in SEE cities.

The Symposium will be held in the city of Zagreb, Croatia in Sheraton Zagreb Hotel, from Wednesday to Friday, May 3-5, 2017.

MAIN TOPICS

1. Underground traffic infrastructure in SEE region
2. Hydraulic structures in SEE region
3. Underground space for various purposes in SEE
4. New technologies, materials and methods in tunneling
5. Financing of underground structures

Contact us for further information:

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YSRM2017 & NDRMGE 2017 Challenges and Innovations in Rock Mechanics and Engineering

Challenges and Innovations in Rock Mechanics and Engineering
10-13 May 2017, Jeju Island, South Korea
www.ysrm2017.com

Korean Society for Rock Mechanics (KSRM) cordially invites the international community of rock mechanics and rock engineering to attend the joint international symposium, the 2017 ISRM Young Scholars' Symposium on Rock Mechanics (YSRM 2017 – an ISRM Specialized Conference) and the 2017 International Symposium on New Developments in Rock Mechanics and Geotechnical Engineering (NDRMGE 2017). Both series of international conference have been well attended in the past decade since there were many ongoing or planned rock engineering projects with challenging issues and innovative technologies involved. The theme of the Symposium "Challenges and Innovations in Rock Mechanics and Rock Engineering" was therefore selected to provide a forum to discuss the related subjects.

The event will be held in beautiful Jeju Island, a UNECSO's World Natural Heritage Site. The beautiful volcanic island and lava tubes attract many national and international tourists because of easy access with convenient flight schedules and no-VISA entry policy for most countries.

We would like to welcome you to Jeju Island in May 2017 to exchange knowledge and experiences in rock mechanics and rock engineering and to discuss innovative ideas in multi-disciplinary subjects among participants including many young scholars.

Topics

Papers on a wide variety of topics in rock mechanics and rock engineering are invited to submit.

- Fundamental rock mechanics
- Laboratory and field testing and physical modeling
- Analytical and numerical methods in rock mechanics and rock engineering
- Underground excavation in civil and mining engineering
- Slope stability and subsidence for surface and underground mining system
- Sustainable development for energy and mineral resources
- Petroleum geomechanics
- Rock dynamics
- Coupled processes in rock mass
- Environmental issues in mining and land development
- Safety and risk management
- New frontiers and innovations of rock mechanics

Contact Information

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TechnoHeritage 2017 3rd International Congress Science and Technology for the Conservation of Cultural Heritage, May 20-23, 2017, Cádiz, Spain, http://technoheritage2017.uca.es

EPS'17 5th International Conference on the Use of EPS Geofoam Blocks in Construction Applications, 22-24 May 2017, Istanbul, Turkey, www.geofoam2017.org

Rapid Excavation and Tunneling Conferrence, June 4-7, 2017, San Diego, USA, www.retc.org

www.geotechnicalmonitoring.com/en

"During the last three years more than 330 people have come from 48 countries to attend the "International Course on Geotechnical and Structural Monitoring" in the 1000 years old Castle of Poppi in the beautiful countryside of Tuscany. Moreover, 42 international companies have exhibited their products during the course.

Evaluations by attendees have shown how very much the courses have been appreciated, both from technical and networking perspectives. We strive to make each edition of the course better than the previous one, including technical, cultural, historical and social considerations.

For 2017 we've decided to take up the challenge of moving the venue to Rome – a city of huge historical and cultural interest that hosts one of the oldest and largest universities in the world: Sapienza University of Rome. This new venue allows us to satisfy the continuously increasing number of participants and make accessibility for participants easier than in Poppi.

In 2016 we initiated sessions on "New Monitoring Trends" and "Case Histories and Lessons Learned", with presentations given by practitioners and exhibitors. These were well received and in 2017 we plan to strength their content. We invite all of you to take advantage of our offer to make presentations during these sessions, by contacting paolo.mazzanti@nhazca.com.

In addition, we're organizing some Master Classes (that will be held the day before the official beginning of the course), led by international experts, specifically oriented to provide practical basic know-how on use of the most common monitoring systems (inclinometers, piezometers, total stations, GNSS, extensometers, terrestrial RADAR).

Contacts

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Progressive Rock Failure
5-9 June 2017, Ascona, Switzerland
www.prf2017.ethz.ch

The situation

Geological materials change their strength properties through time, which has significant implications for the stability of natural and artificial slopes, surface or subsurface excavations, and deep boreholes used for energy production.

The challenge

While some of these mechanical property changes lead to slow phenomena like creep, consolidation and swelling, others lead to rapid and hazardous deformations and failure of geological materials. Time-dependent aspects of weakening and failure in natural systems are, however, difficult to study as internal damage is not visible to the naked eye, and the underlying processes can last from several seconds to many thousands of years.

Conference goal

Better understanding and predicting these processes represents a great challenge to those involved in the preservation of existing structures, future development of critical transport and energy infrastructure, and the assessment of natural hazards in response to a changing climate. By bringing together participants from diverse backgrounds, this event will provide an exciting opportunity to address processes controlling the degradation and failure of brittle rock across an exceptional range of spatial and temporal scales.

Core themes

Three days of seminars/discussions and one day of integrated excursions will be arranged around five core themes: creep and stress corrosion, long term strength limits, progressive slope failure, environmental drivers, and, subsurface infrastructure. The core themes will allow practitioners and researchers from diverse backgrounds to progress beyond current knowledge barriers, and lay out a framework for the future evaluation of time-dependent weakening and failure of brittle rocks. Participants are encouraged to present recent insights derived from:

- field observations in both surface and sub-surface environments,
- laboratory testing,
- theory and conceptual modelling, and,
- advanced numerical methods.

Depending on the level of interest, workshops arranged for the final day will demonstrate practical approaches to observing and modelling progressive damage evolution and brittle failure using industry-leading tools and software.

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EAgs - EurAsian Geotextiles Symposium 2017, 07 - 08 June 2017, Beijing, China, www.edana.org/education-events/conferences-and-symposia/event-detail/eurasia-geotextiles-symposium-2017

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

EUROCK 2017 Human Activity in Rock Masses, 20-22 June 2017, Ostrava, Czech Republic, www.eurock2017.com

BCRRA 2017 Tenth International Conference on the Bearing Capacity of Roads, Railways and Airfields, 28th to 30th June 2017, Athens, Greece, www.bcrra2017.com

85th Annual Meeting of
International Commission on Large Dams
July 3-7, 2017, Prague, Czech Republic
www.icold2017.cz

Dear colleagues, members of ICOLD and friends of dam engineering and associated disciplines.

For the first time in its history the ICOLD Annual Meeting will be held in Prague. On behalf of the Czech National Committee on Large Dams, one of the founding members of ICOLD in the early thirties, let me introduce what will be on the agenda of ICOLD 2017 Annual Meeting, which is to be held in the charming capital of the Czech Republic.

During your visit to the Czech Republic on the occasion of the ICOLD 2017 Annual Meeting you will have an opportunity to attend the technical part of the Annual Meeting as well as to learn more about the history and present time of dams and experience the cultural and social life of our country.

The key event of the technical agenda of the Annual Meeting will be a one day symposium called "Knowledge Based Dam Engineering". Other important items on the agenda will be the discussions of the Technical Committees, Working Groups, regional clubs and other groups of ICOLD The venue – Clarion Congress Hotel Prague – and its surroundings will offer a pleasant working environment for all the events held as part of the technical programme of the Annual Meeting.

The traditional technical tours, from which the participants can choose, will be directed to three regions of the Czech Republic. The participants will visit dams and other places of interest in each of these three regions. The tours will include past and present examples of dam engineering and

construction in the Czech Republic. At present World Register of Dams includes 118 structures located in the Czech Republic. The history of dam construction on the territory of what is now the Czech Republic dates back to the thirteenth century. Eight big reservoirs, which are on the ICOLD list, have survived since Middle Ages (structures built from 1272 to 1590) and are still in operation. Some systems of lakes, particularly in South Bohemia, built in medieval times are now protected natural reserves together with the landscape that surrounds them.

Late in the nineteenth and mainly in the twentieth century modern dams were built with multipurpose reservoirs. In the first period from 1850 to 1940 thirty two dams were built. After WWII seventy eight dams were built from 1943 to 1997, which are in the ICOLD World Register of Dams.

As part of the ICOLD Annual Meeting Prague 2017 we are preparing post study tours for those interested in learning more about other regions of the Czech Republic where there are many cultural and technical sites of interest. The post study tours will lead to five regions of the Czech Republic.

Ladies and Gentlemen, we are looking forward to meeting you at the technical and social events in the contemporary and historic parts of Prague during the warm summer month – in the region with a long tradition of water management which is often referred to as the "Roof of Europe". We will share our experience with you and we will be interested in and inspired by your achievements in the design, engineering, construction and operation of dams.

We are looking forward to a friendly atmosphere of traditional annual meeting of the ICOLD family. We most cordially invite you to participate in this event.

SYMPOSIUM THEMES

1. Investigation and application of advanced materials, technologies and solutions in dam engineering
2. Enhancements in dam surveillance systems for dam safety and site security
3. Uncertainties and risk-informed decision making in dam design, construction and operation
4. Balancing technical, socio-economic and environmental aspects of dam engineering
5. Advancements in analysis and design within flood protection reservoirs, levees and tailing dams
6. Recent improvements and modern applications in reservoir and catchment management
7. Design and operational considerations of global climate change, regional droughts and other extreme events
8. Assessment of aging dams considering remaining service life and decommissioning
9. Hydro-electro-mechanical equipment of dams

Contact

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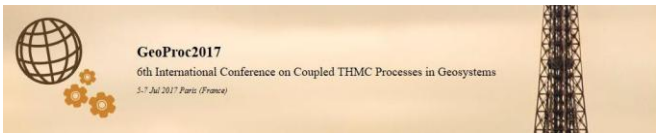


6th International Conference on Coupled THMC Processes in Geostystems
5-7 July 2017, Paris, France
https://geoproc2017.sciencesconf.org

As part of GeoProc conference series, this event carries forward certain traditions as well as breaks new grounds related to Coupled Thermo-Hydro-Mechano-Chemical (THMC) processes in Geosystems.

After Stockholm, Sweden, in 2003 (GeoProc03), Nanjing, China, in 2006 (GeoProc06), Lille, France in 2008 (Geo Proc08), Perth, Western Australia in 2011 (GeoProc11) and Utah, United States in 2015 (GeoProc15), the 6th GeoProc is held in Paris, France, at the Ecole des Ponts ParisTech, between 5 and 7 July 2017.

It is co-organized by the Ecole des Ponts ParisTech (ENPC), the French institute of science and technology for transport, spatial planning, development and networks (IFSTTAR), the University of New South Wales (UNSW) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

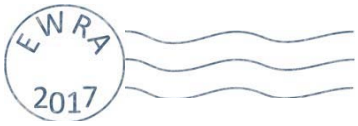
The conference theme "Multiphysical processes and phenomena across the scales" symbolizes scientists, engineers and practitioners coming together from different backgrounds to address common scientific issues for a wide range of natural and engineering phenomena in geological systems and energy production. These phenomena include traditional fields, such as oil extraction, nuclear waste disposal, formation of mineral deposits, induced seismicity and natural hazards, as well as some new emerging areas, such as enhanced oil and gas recovery, geothermal energy and CO_2 geological sequestration. Although each field may have its own characteristics, a number of common scientific issues remain the same.

Geoproc gives emphasis into approaches that highlight the coupled multiphysical aspects of the applications as well as the techniques used to approach them.

TOPICS

- Reservoir mechanics (Nuclear waste disposal, CO_2 sequestration, Energy storage, Petroleum engineering, Geothermal energy etc.)
- Hydrauling fracturing
- Induced seismicity, fault reactivation and landslides
- Numerical challenges in THMC modeling
- Instabilities, bifurcation phenomena and strain localization due to THMC processes
- Experimental advances in THMC processes
- Legal and economical aspects related to induced seismicity and reservoir mechanics

Contact: geoproc2017@sciencesconf.org



10th World Congress on Water Resources and Environment "Panta Rhei"
5-9 July 2017, Athens, Greece
http://ewra2017.ewra.net

Based on the decision of the General Assembly of the European Water Resources Association (EWRA) held in Porto (26 June 2013), which was reaffirmed during the General Assembly of EWRA in Istanbul (10 June 2015), the 10th World Congress on Water Resources and Environment will be held in Athens, 5-9 July 2017.

The Congress is organised by the National Technical University of Athens and the American Society of Civil Engineers.

The aim of the Congress is to promote environmentally sustainable water resources management and assist in improving the capacity of countries to mitigate and adapt to climate change and natural hazards. The Congress intends to become a benchmark event, by gathering a large number of scientists and engineers from various countries and cultures around the world, who will interact and explore ways to face the old and new global and regional challenges on water resources and ecosystems, for the benefit of the present and future generations.

A large number of cutting edge topics addressing the most critical aspects of Water Resources Management and Environment with world dimensions will be presented and discussed in the Congress. Key issue behind these topics is the change of variables and processes in time and space, which is delineated by the saying of the ancient philosopher Heraclitus "Panta rhei" (everything flows).

Topics

The Congress will be organised in a number of specialised Conferences around the following topics:

- Hydrological Processes in a Changing Environment
- Groundwater Hydrology and Contamination
- Geo-information and Water Resources
- Water Distribution and Water Treatment
- Water Pollution and Eco-systems Conservancy
- Wastewater Treatment and Reuse
- Climate and Land Use Changes
- Environmental Vulnerability and Risk
- Water-Energy-Food Nexus
- Sustainable and Adaptive Water Resources Management
- Social, Political, Institutional, Legislative Aspects and Ethics

Call for Papers

There are four types of papers which can be submitted to the Congress: a) Oral b) Poster c) Demonstration d) Distant. http://ewra2017.ewra.net/abstract_submission/

Contact

Interested scientists may contact the organising committee at: ewra2017@ewra.net

Secretariat: D. Asimianaki, dasimian@central.ntua.gr

***Queries on abstract/paper submission*:** H. Vangelis, harrivag@central.ntua.gr

GeoMEast2017, 15 - 19 July 2017, Sharm El-Sheik, Egypt, www.geomeast2017.org

3rd International Conference on Performance-based Design in Earthquake Geotechnical Engineering (PBD-III), July 16 - 19, 2017, Vancouver, Canada, http://pbdiiivancouver.com

ICTUS17
The 2017 International Conference on Tunnels and Underground Spaces
28 August 2017 - 1 September 2017, Seoul, Korea
www.i-asem.org/new_conf/asem17.htm

The Korean Tunneling and Underground Space Association (KTA) would like to invite you to the 2017 International Conference on Tunnels and Underground Spaces (ICTUS17) ICTUS17 will be held on 28 August - 1 September 2017 at KINTEX (Korean International Exhibition and Convention Center) in Ilsan (Seoul), Korea. The conference is operated ynder the platform of the 2017 world congress of Advances in Structural Engineering and Mechanics (ASEM17). ASEM17 is a single platform for various fields of studies including tunnel technologies, a total of 8 conferences will be held under the platform of ASEM17.

ICTUS17 is the conference dedicated to tunnel and underground space related technologies. The theme of the conference is "Frontier Technologies in Tunneling and Underground Space Technologies", which includes sessions as following:

- Innovation in Mechanized Tunneling
- Improvements in Conventional Tunneling
- Tunneling and Underground Works in Extreme Conditions
- Structural and Hydraulic Interaction in Underground Structures
- Resilience and Sustainability in Underground Space

The conference will be a wonderful platform to exchange new information and ideas related to tunneling and underground space construction industry, and it will be a successful one with experience gained through ITA-WTC 2006, TU-SEOUL 2013, Subsea Tunnel Forum 2015, held by KTA. Since ICTUS17 will be held in close association with Techno-Press journals, in particular with the "Geomechanics and Engineering *An International Journal* (SCI(E) Indexed), selected papers will be considered for publication in the "Conference Special Issue" of GAE journal.

For more information ictus17@gmail.com

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

SIFRMEG 2017
Shaoxing International Forum on
Rock Mechanics and Engineering Geology
http://forum.hmkj.com.cn/index.php/Index/show/tid/20

The SIFRMEG will be hosted by Shaoxing University and sponsored by International Society for Rock Mechanics (ISRM), International Association for Engineering Geology and the Environment (IAEG), National Natural Science Foundation of China (NSFC), Chinese Society for Rock Mechanics and Engineering, the Engineering Geology Commission - Geological Society of China, Bulletin of Engineering Geology and the Environment, and the International Journal of Rock Mechanics and Mining Sciences.

The Forum is aimed at the fundamental innovation of theory and technology in rock mechanics and engineering geology. Different from the current conferences, deeply and broadly discussion on the specialized topic will be the main style of the forum. The Forum will be organized every two years, each focused on a special topic. The Scientific Committee of top scholars for the Forum will select topics for each of the forum. One or two international famous scholars will be invited for keynote speeches and outstanding speakers will give invited lectures. English will be the official language of the forum. And the Forum will be open and free of registration fees. A website will be developed as the platform for information exchange and resources provision for professional education and training.

The first Forum, SIFRMEG 2017, will be held in Shaoxing University on September 20, 2017, focused on "The Rock Mechanical and Engineering Geological problems for the B&R" (B&R, i.e. Silk Road Economic Belt and the 21st-Century Maritime Silk Road). Around 50 international famous scholars will be invited to the meeting.

AfriRock 2017, 1st African Regional Rock Mechanics Symposium, 2 – 7 October 2017, Cape Town, South Africa, www.saimm.co.za/saimm-events/upcoming-events/afrirock-2017

Geotechnique Symposium in Print 2017 Tunnelling in the Urban Environment, http://www.icevirtuallibrary.com/pb-assets/Call%20for%20Papers/Geo-Symposium-CFA-AW.pdf

Shaping the Future of Hydropower
9-11 October 2017, Seville, Spain

Aqua~Media International is pleased to announce the Call for Papers for HYDRO 2017, which will take place at the FIBES I Congress and Exhibition Centre in Seville, southern Spain, from 9-11 October 2017.

The Aqua~Media team is delighted to be bringing the annual hydropower conference back to Spain, following successful events in Barcelona (1995), Granada (2007) and Bilbao (2012).

Spain has been, and continues to be, among Europe's leading countries for water resources development, hydropower and pumped storage. Unevenly distributed water resources, with southern areas suffering severe droughts, led the country to develop a comprehensive water management strategy and in particular a National Hydrological Plan.

The country's history of dam construction dates back to the second century of the Christian era, with several Roman dams still in operation for water supply, such as Prosperina and Cornalvo.

Today there are 1082 large dams in operation, by ICOLD's definition, providing a total storage capacity of 56.5 km3. About 20 per cent of the dams have hydro production as there sole purpose, and a further 12 per cent are multipurpose, with hydro production as one of the functions.

Spain's installed hydro capacity currently stands at 19.6 GW, which represents 18 per cent of the total. Among the major Spanish hydro plants are Aldeadavila (1139 MW, see photo above right) and Alcantara (915 MW). The largest of the country's 25 pumped storage plants is Cortes-La Muela (1720 MW). Hydro produces around 43 TWh/year, which is about 17 per cent of total production. Spain is a major developer of other renewable sources of energy, particularly wind and solar power.

The Spanish Government, principal utilities and industry warmly welcome the world hydro community to Seville, where there will be a chance to learn about Spanish past and present water resources development, and to visit some of the most important hydro and pumped-storage installations.

CONFERENCE THEMES

POTENTIAL AND PLANNING

- Unexploited potential: country profiles
- New tools for site identification
- Feasibility studies
- Hydraulic modelling
- BIM: roles and applications
- Civil and E&M aspects: synergy in planning

PROJECT PREPARATION

- Securing finance
- Project structuring
- Contractual issues
- FIDIC from the perspective of all players
- Risk management
- Legal and insurance aspects

• Anticipating and avoiding delays
• Innovative design: case studies

PROJECT IMPLEMENTATION

• Advances in construction techniques
• Construction management
• Interface between civil and electromechanical design
• Challenging site conditions
• On-site safety
• Avoiding cost and schedule overruns

OPERATION AND MAINTENANCE

• Reservoir operation and management
• Optimization for multiple stakeholders (multi-criteria decision analysis)
• Monitoring, maintenance and upgrading
• Ensuring powerplant safety
• Control and automation
• Gateworks: selection, operation and safety
• Learning from incidents and failures
• Cyber security

UPGRADING AND PLANT LIFE EXTENSION

• Retrofitting existing water infrastructure
• Uprating electromechanical equipment
• Refurbishment of dams and appurtenant works

REGIONAL COLLABORATION

• Transboundary projects
• Power trading
• Legal issues
• Integrated regional development
• Water rights and usage issues
• Roles of river basin agencies and power pools

ENVIRONMENTAL AND SOCIAL ASPECTS

• New approaches to sustainable development
• Timely communication with stakeholders
• Enhancing public awareness
• Benefits of multipurpose schemes: case studies
• Fish protection and species conservation
• Sedimentation management

CLIMATE ISSUES

• Issues arising from COP 22
• Climate research
• Hydrology
• Climate resilience: strategies and experience
• Flood and drought mitigation and management
• Flood discharge works

HYDRO TECHNOLOGY

• Research and development for hydro machinery
• New developments in hydro turbines and generators
• Improving safety and efficiency
• Instrumentation and flow measurement
• Marine energy (tidal, wave, instream systems)
• Penstocks and hydromechanical equipment

SMALL HYDRO

• Small,micro and pico hydro: technical issues
• Innovative case studies
• Incentives for development

PUMPED STORAGE

• Role and benefits: case studies
• Innovations in pumped-storage schemes
• Pumped storage versus battery storage and grid interconnection?
• Optimising operation in developing power grids

GRID ISSUES

• Increasing grid capacity
• Hydro in synergy with other renewables
• Regional supergrids
• Smart grids

CIVIL ENGINEERING

• Innovation in dam design and construction
• Spillway design and operation
• Building dams in challenging site conditions
• Safety and monitoring of water infrastructure
• Seismicity and extreme hazards
• Geotechnical issues and tunnelling

REGIONAL SESSIONS AND ROUND TABLES

• Updates and case studies on development issues and projects in Africa, Asia, Latin America, Europe
• Special session on hydro and pumped storage in Spain and Portugal

CAPACITY BUILDING AND TRAINING

• Preparing the next generation of hydro practitioners
• Training opportunities and industry encouragement
• (A panel discussion is planned for young engineers)

CONTACT

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GeoAfrica 2017
08 - 11 October 2017, Marrakech - Morocco

GeoAfrica 2017
3rd African Regional Conference on Geosynthetics
9 – 13 October 2017, Morocco
http://geoafrica2017.com

The Organizing Committee would like to thank you for taking the time to consider participating in GeoAfrica 2017, the 3rd African Conference on Geosynthetics — Hosted IGS Moroccan Chapter .

A Rich History: The previous editions of GeoAfrica featured a vibrant influx of attendees from throughout the Africa, eager to exchange knowledge, and do business. It is an engineering event like no other—one that needs to be experienced.

Fantastic Location: Conference participants will be drawn from all Africans countries. It is no coincidence that we have selected a conference location in Marrakech. Serviced by the international airport. The conference and accommodations are all in one place for easy access to sessions and great networking.

You can enjoy your stay in Marrakech to discover the city that offers many opportunities for visits.

We look forward to welcoming you to Marrakech soon. We have a few things to mention as you prepare for your trip.

If you have questions or suggestions, please contact us by one of the following means:

Secretary of the Moroccan Committee of geosynthetic - C.M.G

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E-mail : contact@geoafrica2017.com
Phone : 00 212 5 22 54 75 81
Fax : 00 212 5 22 54 75 12

3ο Πανελλήνιο Συνέδριο
Φραγμάτων και Ταμιευτήρων
Διαχείριση Έργων και Προοπτικές Ανάπτυξης
12 - 14 Οκτωβρίου 2017, Αθήνα
www.fragmata2017.gr

Η Ελληνική Επιτροπή Μεγάλων Φραγμάτων (ΕΕΜΦ) διοργανώνει το **3ο Πανελλήνιο Συνέδριο Φραγμάτων και Ταμιευτήρων στην Αθήνα, στις 12 - 14 Οκτωβρίου του 2017.**

Στα δύσκολα χρόνια που διανύει η χώρα μας, ήταν αναπόφευκτο ακόμη και τα πιο μεγάλα και σημαντικά έργα, να νιώσουν τις επιπτώσεις της οικονομικής ύφεσης. Τα φράγματα δεν αποτέλεσαν εξαίρεση, με συνέπεια πολλά έργα να παραμένουν ημιτελή ή στα χαρτιά, παρότι είναι μεγαλύτερη παρά ποτέ η ανάγκη διαχείρισης υδατικού δυναμικού και παραγωγής υδροηλεκτρικής ενέργειας (εγχώριας, φθηνής και πράσινης). Η αυξανόμενη απαίτηση διαθεσιμότητας νερού για ύδρευση και άρδευση, η αναγκαιότητα παραγωγής πράσινης ηλεκτρικής ενέργειας και η δυνατότητα παροχής αντιπλημμυρικής προστασίας, ενισχύουν την ανάγκη φροντίδας και προστασίας του περιβάλλοντος (επανατροφοδότηση υπόγειων υδροφορέων, αναβάθμιση ποτάμιων και λιμναίων οικοσυστημάτων) καθώς και την πρόβλεψη για ανάπτυξη παράπλευρων δραστηριοτήτων σε ταμιευτήρες. Όλα τα παραπάνω συνδέονται άρρηκτα και με τον τουρισμό που αποτελεί έναν από τους πλέον βασικούς άξονες ανάπτυξης της χώρας μας.

Η ΕΕΜΦ καλεί όλους όσους πιστεύουν ότι τα φράγματα για ταμίευση νερού και άλλες κρίσιμες χρήσεις, είναι σημαντικά για τη χώρα μας και το λαό της, να συμμετάσχουν στο Συνέδριο, να ανταλλάξουν γνώσεις, εμπειρίες και ιδέες και να μοιραστούν τους προβληματισμούς τους σχετικά με τις εξελίξεις και το μέλλον των έργων αυτών. Στόχος του Συνεδρίου είναι να αναδειχθούν, μέσω της εμπειρίας των συγγραφέων και των συνέδρων, τρόποι, μέσα και διαδικασίες, ώστε τα φράγματα να πάρουν τη θέση που τους αξίζει στο όχημα ανάπτυξης της χώρας, της διαχείρισης των υδατικών πόρων, και να γίνουν παράλληλα πιο φιλικά στο περιβάλλον, πιο αποδεκτά στο κοινό, πιο άρτια τεχνικά, πιο σύγχρονα τεχνολογικά, ασφαλέστερα στη λειτουργία τους και πιο φιλικά στην ανάπτυξη παράπλευρων δραστηριοτήτων.

Φιλοδοξούμε το 3ο Πανελλήνιο Συνέδριο Φραγμάτων και Ταμιευτήρων, βαδίζοντας στα χνάρια των προηγούμενων συνεδρίων, να αποτελέσει εργαλείο βελτίωσης και ανάπτυξης όχι μόνο του θεσμικού πλαισίου, όχι μόνο αυτών που ασχολούνται με το σχεδιασμό, την κατασκευή, την επίβλεψη, τη λειτουργία και τη συντήρησή τους, αλλά και όλων αυτών που είναι αποδέκτες των θετικών επιπτώσεων αυτών των μεγάλων και σημαντικών έργων, δηλαδή όλων μας.

Σας καλούμε λοιπόν να συμμετάσχετε στις εργασίες του Συνεδρίου και να αποστείλετε εργασίες σχετικές με το θεματολόγιο που παρουσιάζεται παρακάτω.

Θεματολογία Εργασιών

1. Φράγματα, Ταμιευτήρες και περιβάλλον

- Φιλικές προς το περιβάλλον κατασκευές φραγμάτων και ταμιευτήρων
- Περιβαλλοντικοί όροι, κοινωνικά οφέλη και επιπτώσεις
- Περιορισμός υδρομορφολογικών αλλοιώσεων και αισθητική αποκατάσταση περιβάλλοντος
- Εμπλουτισμός – αποκατάσταση υπόγειων υδροφορέων, δημιουργία υγροβιότοπων αντιπλημμυρική προστασία κ.λπ.
- Διατήρηση και βελτίωση ποιότητας υδατικών πόρων
- Εκτίμηση και διαχείριση φερτών υλών

2. Φράγματα και ολοκληρωμένη διαχείριση υδατικών πόρων

- Διαχείριση υδατικών πόρων σε επίπεδο λεκάνης απορροής
- Οι ταμιευτήρες ως έργα διαχείρισης υδατικών πόρων πολλαπλού σκοπού
- Τεχνικο-οικονομικά κριτήρια υλοποίησης νέων φραγμάτων
- Ο ρόλος των φραγμάτων στον ενεργειακό σχεδιασμό - Σύγχρονες τάσεις και τεχνολογικές εξελίξεις
- Ταμιευτήρες και υβριδικά συστήματα παραγωγής ενέργειας

3. Ασφάλεια φραγμάτων και ταμιευτήρων

- Εφαρμογή του Κανονισμού Ασφάλειας Φραγμάτων – Διοικητική Αρχή Φραγμάτων.
- Προβλήματα οργάνωσης του κυρίου διαχειριστή του έργου
- Παρακολούθηση συμπεριφοράς φραγμάτων και ταμιευτήρων
- Αναλύσεις θραύσης φράγματος και επιπτώσεις
- Μακροχρόνια συμπεριφορά και κίνδυνοι οφειλόμενοι στη γήρανση των φραγμάτων
- Κίνδυνοι οφειλόμενοι σε αστοχίες Η/Μ εξοπλισμού
- Ασφαλής παροχέτευση εκτάκτων πλημμυρικών παροχών κατάντη – απαιτήσεις οριοθέτησης της κοίτης
- Σχέδια Αντιμετώπισης Επικίνδυνων Καταστάσεων
- Παρουσίαση πρόσφατων συμβάντων ή περιστατικών

4. Εξελίξεις στις μεθόδους σχεδιασμού & κατασκευής

- Προδιαγραφές μελετών φραγμάτων-συμπλήρωση Ε-ΤΕΠ
- Υλικά κατασκευής Φραγμάτων, μέθοδοι κατασκευής, νέες τεχνικές
- Εκτίμηση, επιλογή και αναθεώρηση πλημμυρών σχεδιασμού
- Σχεδιασμός υπερχειλιστών – αναβάθμιση υπερχειλιστών
- Η επιρροή των Γεωλογικών συνθηκών στο σχεδιασμό.
- Εξελίξεις στο Γεωτεχνικό σχεδιασμό
- Εξελίξεις στον αντισεισμικό σχεδιασμό
- Εξελίξεις στον Η/Μ εξοπλισμό

5. Παρουσίαση έργων

Γραμματεία Συνεδρίου
Μεσογείων 15, 11526, Αμπελόκηποι, Αθήνα
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Τηλ. (+30) 210 7499337
Τοτ. (+30) 210 7705752
Ηλ.Δι. efip@triaenatours.gr

XIII International Conference
"Underground Infrastructure of Urban Areas 2017"
24-26 October 2017, Wroclaw, Poland

PARIS 2017 AFTES International Congress "The value is Underground", 13-16 November 2017, Paris, France, www.aftes2017.com

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

EUROCK 2018
22-26 May 2018, Saint Petersburg, Russia

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16th European Conference on Earthquake Engineering (16thECEE), 18-21 June 2018, Thessaloniki, Greece, www.16ecee.org

CPT'18 4th International Symposium on Cone Penetration Testing, 21-22 June 2018, Delft, Netherlands, www.cpt18.org

RockDyn-3 - 3rd International Conference on Rock Dynamics and Applications
26-27 June 2018, Trondheim, Norway

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Norway
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UNSAT2018 The 7th International Conference on Unsaturated Soils, 3 - 5 August 2018, Hong Kong, China, www.unsat2018.org

11th International Conference on Geosynthetics (11ICG), 16 - 20 Sep 2018, Seoul, South Korea, www.11icg-seoul.org

ARMS10
10th Asian Rock Mechanics Symposium
ISRM Regional Symposium
29 October - 3 November 2018, Singapore
www.arms10.org

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14th ISRM International Congress
20-27 September 2019, Foz de Iguaçu, Brazil

Contact Person: Prof. Sergio A. B. da Fontoura
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ISDCG 2019
7th International Symposium on
Deformation Characteristics of Geomaterials
26-28 June 2019, Strathclyde, Scotland, UK,

Organizer: TC101

The 17th European Conference on
Soil Mechanics and Geotechnical Engineering
1st - 6th September 2019, Reykjavik Iceland
www.ecsmge-2019.com

The theme of the conference embraces all aspects of geotechnical engineering. Geotechnical engineering is the foundation of current as well as future societies, which both rely on complex civil engineering infrastructures, and call for mitigation of potential geodangers posing threat to these. Geotechnical means and solutions are required to ensure infrastructure safety and sustainable development. Those means are rooted in past experiences enhanced by research and technology of today.

At great events such as the European Geotechnical Conference we should: Spread our knowledge and experience to our colleagues; Introduce innovations, research and development of techniques and equipment; Report on successful geotechnical constructions and application of geotechnical design methods, as well as, on mitigation and assessment of geohazards and more.

Such events also provide an opportunity to draw the attention of others outside the field of geotechnical engineering to the importance of what we are doing, particularly to those who, directly or indirectly, rely on our services, knowledge and experience. Investment in quality geotechnical work is required for successful and safe design, construction and operation of any infrastructure. Geotechnical engineering is the key to a safe and sustainable infrastructure and of importance for the society, economy and the environment. This must be emphasized and reported upon.

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Crossrail, London, UK

- **Location:** London, UK
- **Value:** £14.5 billion
- **Contracts Used:** ECC, PSC, FC
- **Start-Finish:** 2009 - 2018
- **Employer:** Crossrail Limited
- **Contractor:** Various (see below)
- **Project Manager:** Bechtel

With an estimated total cost of £14.5 billion and a peak workforce of 14,000 people by 2013, Crossrail is Europe's largest construction project and the biggest ever to be procured by NEC3 contracts. Work started in May 2009 and is due for completion in 2018. The central section through London includes 21km of new twin-bore rail tunnels, eight new sub-surface stations, shafts for ventilation and escape, provision of all necessary railway systems and a mainline train fleet allowing 58 peak-period services along its overall 118km route. NEC3 contracts are being used to procure all central section works and systems requirements.

Achieving Excellence

According to Steve Rowsell, Interim Head of Procurement between 2008 and 2010, *"Crossrail's approach to procurement is aligned with the UK government's achieving excellence in construction principles, including a fair allocation of risk and reward, early involvement of the supply chain, minimising of interface risks, incentivising performance and selection of suppliers on the basis of best value.*

Following a review of available contracts and lessons learnt from recent major projects, we decided to use the NEC3 suite because it supports the desired culture and way of working, provides robust contract management processes, achieves a fair and sensible allocation of risk and can be used for all project requirements to give consistency in approach.

Crossrail is a wholly owned subsidiary of Transport for London (TfL) and NEC3 contracts are also TfL's contracts of choice, being those considered most likely to achieve a successful outcome", said Rowsell.

Hear from Chris Dulake, Crossrail Chief Engineer and David Morrice, Delivery Contracts Director, on how NEC Contracts have been used on Crossrail.

ECC, PSC and FC

A full range of NEC3 contracts are being used. Programme partner Transcend a joint venture of Aecom, CH2M Hill and Nichols Group is engaged under a £100 million NEC3 Professional Service Contract (PSC), and project delivery partner Bechtel is similarly engaged under a PSC worth £400 million.

Design framework agreements totalling £300 million have been secured by twelve engineering consultancies, along with enabling works framework agreements with 17 contractors worth £350 million. All of these are based on the NEC3 Framework Contract (FC).

Three major tunnelling contracts worth £1.25 billion were awarded in 2010 under the NEC3 Engineering and Construction Contract option C (target contract with activity schedule). The largest of these for the eastern running tunnels, worth over £500 million, went to a joint venture of Dragados and John Sisk. A joint venture of Bam Nuttall, Ferrovial Agroman and Kier Construction won a combined contract for the western running tunnels and station tunnels, also worth £500 million. The third contract for the eastern station tunnels was awarded to a joint venture of Balfour Beatty, Vinci and Morgan Sindall.

Over 20 more major ECC contracts will be awarded in 2011 and 2012, including £1.5 billion for the six central stations.

Benefits of NEC3

- Supports the clients desired culture and way of working and sends a message of intent to the industry.
- Can be used for all project requirements to give consistency in approach.
- Provides robust contract management processes and achieves a fair and sensible allocation of risk.

Further Information

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Modular Precast Dam - Cheaper, Faster, Safer

French Development Enterprises, Oldcastle Precast and GEI Consultants have constructed and assembled the first prototype French Dam, a modular precast impoundment for construction and retrofit of dams to impound water for hydroelectric facilities, water control systems and powerhouses.

According to a joint press release, the prototype is 24 feet long and 16 feet high and consists of six 27,000-lb concrete blocks 8 feet by 8 feet by 8 feet. The blocks are interconnected and anchored to the foundation. The entire dam was installed and assembled in less than 3.5 hours, the release says.

"With the introduction of modular precast technology to dam construction, we can significantly decrease time, reduce cost and minimize risk of the civil stage of the construction process, making it more feasible and attractive to investors, developers and dam owners," said Lenny Lozinsky, executive vice president of French Development Enterprises.

French Development Enterprises' technology was funded for $1.7 million in January 2016 by the U.S. Department of Energy under its Research and Development of Innovative Technologies for Low Impact Hydropower Development offering. The technology was also supported by the Massachusetts Clean Energy Center.

(Elizabeth Ingram / hydroworld.com, 19 October 2016, http://www.hydroworld.com/articles/2016/10/prototype-of-modular-dam-construction-technology-completed.html)

Prototype of modular dam construction technology completed

French Development Enterprises, LLC (FDE) (www.fdepower.com) of North Billerica, Mass., Oldcastle Precast of Littleton, Colo., and GEI Consultants of Woburn, Mass., announced successful construction and assembly of the first prototype "French Dam" — a modular precast impoundment for construction and retrofit of hydroelectric dams, water control systems and power houses.

French Development Modular Precast Concrete Scalable Technology is an innovative approach for construction of new and retrofit of existing small to medium Hydro electric and Water Control Systems.

French Dam technology is predicated on manufacturing modular segments off-site in a controlled environment and delivering and installing them on-site with a reduced impact on the environment. The segments are interconnected and secured to the river bed using underpinning. The lighter, more robust modular dam provides a number of benefits compared to the traditional gravity or RCC dams.

Market Challenge: Civil costs comprise the highest portion of total costs in new dam construction (66% of the total costs for large project and up to 90% of the costs for small and medium size projects). Current construction methods significantly reduce the dams' financial and economic feasibility. French Dam technology addresses both the technical and financial aspects to this problem.

Key Benefits

Reduction in Project Duration

Substituting the traditional dam cast in place construction methods with off-site precast manufacturing and on-site installation provides an ability to significantly (up to 4 times) reduce project duration, resulting in commissioning a precast dam into production for a fraction of the time compared to traditional methods.

Ability to Construct "In-the-Wet"

Precast modules are manufactured off-site, in a controlled environment, and delivered on site "Just in Time", thus allowing installation to be weather-independent. Ability to construct "In-the-Wet" often eliminates a need for expensive cofferdams and diversion tunnels, providing minimum environmental impact on the construction site. Installation can be done utilizing standard construction equipment.

Increase in Quality

In-house manufacturing of precast segments eliminates dependency on external factors that allows for the highest level of batch consistency and product quality. Employment of existing pre-cast materials and technology allows certifying the products up to 100-years warranty.

Scalable and Adaptable

The intelligent precast modular dam is a scalable segmental technology, compatible with the majority of small and medium hydro equipment, allowing flexible on-site serviceability and upgradeability of the equipment. The precast segments can be manufactured in any shape and size to reflect the civil structure needs of any manufacturers of hydro power equipment on the marketplace.

Reduction in Civil Costs up to 60%

Standardization and Modularization of the segments results in a significant cost savings on all stages of the process from manufacturing and installation to operations and maintenance of the dam.

Risk Mitigation

Decreasing the construction time and supplementing an outdoor construction environment with an off-site precast manufacturing facility significantly lowers the risk of the project from start to finish. In addition, extended warranty of the product reduces cost of ownership and operations.

(https://www.linkedin.com/groups/1579967/1579967-6208724720687288320)

Retaining wall collapse in Istanbul caught on camera

According to Cumhuriyet website, the event occured in Ikitelli Organized Industrial Zone, the biggest industrial centre in Turkey.

https://www.youtube.com/watch?v=ots3Rd8Uqzs

(Cumhuriyet, 27 September 2016, http://www.cumhuriyet.com.tr/video/video_haber/606500/istanbul_da_faciadan_donuldu__Cokme_ani_kamerada.htm)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

Έτσι δημιουργήθηκε η Σαντορίνη...

Ένα συγκλονιστικό βίντεο για τη δημιουργία του νησιού της Σαντορίνης κυκλοφορεί στο διαδίκτυο και δείχνει πώς «γεννήθηκε» το νησί, αλλά και πώς έφτασε να έχει τη σημερινή του μορφή.

Με τη βοήθεια της τεχνολογίας, φαίνεται η δημιουργία του κυκλαδίτικου νησιού μετά από εκρήξεις αλλά και σεισμούς από 4 διαφορετικά ηφαίστεια.

Το βίντεο δημιούργησε και ανέβασε στο διαδίκτυο ο Nikos Korakakis με βάση έρευνες επιστημόνων, ιδρυμάτων και πανεπιστημίων.

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

Study Finds Earthquakes Can Trigger Near-Instantaneous Aftershocks on Different Faults

Scripps scientists are studying earthquake aftershocks to better understand their triggers

Helena High School following a major aftershock from the 1935 magnitude 6.2 earthquake near Helena, Montana. Credit: NOAA/NGDC

According to a new study by scientists at Scripps Institution of Oceanography at the University of California San Diego, a large earthquake on one fault can trigger large aftershocks on separate faults within just a few minutes. These findings have important implications for earthquake hazard prone regions like California where ruptures on complex fault systems may cascade and lead to mega-earthquakes.

In the study, published in the Sept. 9 issue of the journal Science (http://science.sciencemag.org/content/353/6304/1133.ppt), Scripps geophysicist Peter Shearer and Scripps graduate student Wenyuan Fan discovered 48 previously unidentified large aftershocks from 2004 to 2015 that occurred within seconds to minutes after magnitude 7 to 8 earthquakes on faults adjacent to the mainshock ruptures.

In one instance along the Sundra arc subduction zone, where the magnitude 9 Sumatra-Andaman mega-earthquake occurred off the coast of Indonesia in 2004, a magnitude 7 quake triggered two large aftershocks over 200 kilometers (124 miles) away. These aftershocks miles away reveal that stress can be transferred almost instantaneously by the passing seismic waves from one fault to another within the earthquake fault system.

"The results are particularly important because of their seismic hazard implications for complex fault systems, like California," said Fan, the lead author of the study. "By studying this type of triggering, we might be able to forecast hosting faults for large earthquakes."

Large earthquakes often cause aftershock sequences that can last for months. Scientists generally believe that most aftershocks are triggered by stress changes caused by the permanent movement of the fault during the main seismic event, and mainly occur near the mainshock rupture where these stress changes are largest. The new findings show that large early aftershocks can also be triggered by seismic wave transients, where the locations of the main quake and the aftershock may not be directly connected.

"Multiple fault system interactions are not fully considered in seismic hazard analyses, and this study might motivate future modeling efforts to account for these effects," said Shearer, the senior author of the study.

The National Science Foundation funded the study.

(Mario Aguilera, Sep 08, 2016, https://scripps.ucsd.edu/news/study-finds-earthquakes-can-trigger-near-instantaneous-aftershocks-different-faults)

Moon's pull can trigger big earthquakes

Geologic strain of tides during full and new moons could increase magnitude of tremors.

Big earthquakes, such as the ones that devastated Chile in 2010 and Japan in 2011, are more likely to occur during full and new moons — the two times each month when tidal stresses are highest.

Earth's tides, which are caused by a gravitational tug-of-war involving the Moon and the Sun, put extra strain on geological faults. Seismologists have tried for decades to understand whether that stress could trigger quakes. They generally agree that the ocean's twice-daily high tides can affect tiny, slow-motion tremors in certain places, including California's San Andreas fault[1] and the Cascadia region[2] of the North American west coast.

But a new study, published on 12 September in *Nature Geoscience*[3], looks at much larger patterns involving the twice-monthly tides that occur during full and new moons. It finds that the fraction of high magnitude earthquakes goes up globally as tidal stresses rise.

Satoshi Ide, a seismologist at the University of Tokyo, and his colleagues investigated three separate earthquake records covering Japan, California and the entire globe. For the 15 days leading up to each quake, the scientists assigned a number representing the relative tidal stress on that day, with 15 representing the highest. They found that large quakes such as those that hit Chile and Tohoku-Oki occurred near the time of maximum tidal strain — or during new and full moons when the Sun, Moon and Earth align.

For more than 10,000 earthquakes of around magnitude 5.5, the researchers found, an earthquake that began during a time of high tidal stress was more likely to grow to magnitude 8 or above.

Breaking point

"This is a very innovative way to address this long-debated issue," says Honn Kao, a seismologist at the Geological Survey of Canada and Natural Resources Canada in Sidney. "It gives us some sense into the possible relationship between tidal stress and the occurrence of big earthquakes." Perhaps the miniscule added strain of tides, he says, could be the final factor that nudges a geological fault into rupturing.

The current study will not be the final word on the matter, adds Kao. There are just too many factors that contribute to triggering an earthquake — such as how stress transfers within the ground to cause a geological fault to move — to untangle exactly what role tides might have.

But "the results are plausible", says John Vidale, a seismologist at the University of Washington in Seattle who helped to debunk some of the more tenuous tide–earthquake claims[4]. "They've done a very careful job."

The discovery does not affect how societies should prepare for possible earthquakes, says Ide. Even if slightly enhanced by the tides, the probability of a quake happening on any particular day in an earthquake-prone region remains very low. "It's too small to take some actions," he says.

Ide is now looking at an additional list of earthquakes that occur where plates with oceanic crust plunge beneath continental crust, to see if the pattern holds up there as well.

References

1. Thomas, A. M., Nadeau, R. M. & Bürgmann, R. *Nature* **462**, 1048–1051 (2009).
2. Lambert, A., Kao, H., Rogers, G. & Courtier, N. J. *Geophys. Res.* **114**, B00A08 (2009).
3. Ide, S., Yabe, S. & Tanaka, Y. *Nat. Geosci.* doi:10.1038/ ngeo2796 (2016).
4. Kennedy, M., Vidale, J. E. & Parker, M. G. *Seismo. Res. Lett.* **75**, 607–612 (2004).

(Alexandra Witze / nature news, doi:10.1038/ \nature.2016 .20551, 12 September 2016)

Σεισμός Amatritce - Mt Vettore
Πρόδρομη Ανακοίνωση

Από την επίσκεψη της Ερευνητικής Ομάδας Γεωλογίας των Σεισμών του Α.Π.Θ. (Earthquake Geology Research Team; http://eqgeogr.weebly.com/) στη περιοχή του σεισμού (24/8/2016) της Κεντρικής Ιταλίας (Amatritce - Mt Vettore) 22-25/9/2016 προωθούμε τις πρόδρομες παρατηρήσεις μας και τις πρώτες φωτογραφίες υπαίθρου από τα γεωλογικά ρήγματα, τη γεωμορφολογία και κυρίως τις επιφανειακές διαρρήξεις του σεισμογόνου ρήγματος. Θα ακολουθήσουν τρισδιάστατες εικόνες και εναλλακτικές ερμηνείες της γεωμετρίας των ρηγμάτων που ενεργοποιήθηκαν.

-Οι επιφανειακές συν-σεισμικές διαρρήξεις, στο βόρειο ρήγμα (segment) εμφανίζονται για ορισμένα χιλιόμετρα στα βουνά Vettore και Vettoreto (βλ. φωτ.) σε μεγάλα υψόμετρα.

- Διαρρήξεις με άλματα 0-10 cm εμφανίζονται τόσο σε κορήματα, σε μανδύα αποσάθρωσης, όσο και σε πετρώματα του υποβάθρου, κυρίως πολυδιαρρηγμένα ανθρακικά, σε μικρές τεκτονικές επιφάνειες (βλ. φωτ.)

-Η σεισμική μετατόπιση φτάνει στην επιφάνεια και κατανέμεται σε πολλά μικρά κανονικά ρήγματα μιας ευρείας ζώνης διάρρηξης πλάτους μεγαλύτερου των 250 m (βλ. φωτ.).

-Στο άλλο νότιο τμήμα του σεισμικού ρήγματος (segment) στην περιοχή Amatritce (Fault Della Laga) οι παρατηρούμενες λίγες επιφανειακές διαρρήξεις δεν είναι τυπικές συνσεισμικές, αλλά βαρύτητας (gravitational cracks mainly).

-Οι πολλές παρατηρούμενες και χαρτογραφημένες καταπτώσεις βράχων, σάρες, "κατολισθήσεις" κτλ εμφανίζονται κυρίως σε τεχνητά πρανή δρόμων (βλ. φωτ.).

Σπύρος Β. Παυλίδης
Καθηγητής Γεωλογίας Α.Π.Θ.
Πρόεδρος ΔΣ Ελληνικής Γεωλογικής Εταιρίας

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

10 alien landscapes on Earth

Haleakala Crater, Hawaii, US

Pamukkale Thermal Pools, Pamukkale, Turkey

Salar de Uyuni, Uyuni, Bolivia

Antelope Canyon, Arizona, US

Grand Prismatic Spring, Wyoming, US

Uluru, Uluru-Kata Tjuta National Park, Australia

Waitomo Glowworm Caves, Waitomo Caves, New Zealand

Namafjall, Lake Myvatn, Iceland

Danakil Depression, Afar Region, Ethiopia

Zhangye Danxia Geopark, Gansu, China

(https://www.tripadvisor.com/TripNews-a_ctr.2016alienlandscapesEN)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Information Systems Briefing Sheet
Handover of Digital Asset Information for Owner and Operator Value

ICE's Information Systems Expert Panel has published a series of reports concerned with various subjects such as British Standards BS 1192: 2007, Sustainable roads - energy efficiency in road design, construction and operation, Wikipedia, A civil engineers guide to GPS and GNSS and many others. Designed to be both informative and contemporary, the reports are updated regularly and are intended to provide accurate information to a varied audience. The present report focuses on the handover of digital asset information at the end of complex projects, and how that can add value to owners and operators.

Importance of digital asset information

The project's dual deliverables: physical and digital

Digital information about physical infrastructure, such as airports, roads, railways and stations can be used by long-term owners and operators to improve operational performance and sustainability. Thus owners are beginning to procure both physical infrastructure and the related digital asset information. They see their investment in infrastructure projects as adding value through this dual output, with both a physical and digital deliverable.

This requires changes in the supply-side, as it becomes an information-intensive, and seeks to collate reliable digital asset information during the project; to handover this information to owners and operators and to work with them as they takeover responsibilities for management of this information. Such handover is vital to achieving the ambitions of the UK government BIM agenda.

Information integration and hand-over

Where infrastructure programmes have an organization that operates as the delivery client, this handover can have two parts, with: first, a handover of as-built information from project or sub-project supply-chains; and its approval, collation and integration at the programme-wide level; and second, a handover of as-built information collated at the programme level to the long-term owner and operator.

Effective handover of digital asset information

1. Systems integration

Challenges of the first handover of as-built information from project supply-chain to the programme-wide level are:

- Obtaining high quality information from the supply-chain towards the end of construction;
- Collating and checking information before teams disband; and
- Controlling changes to requirements and information.

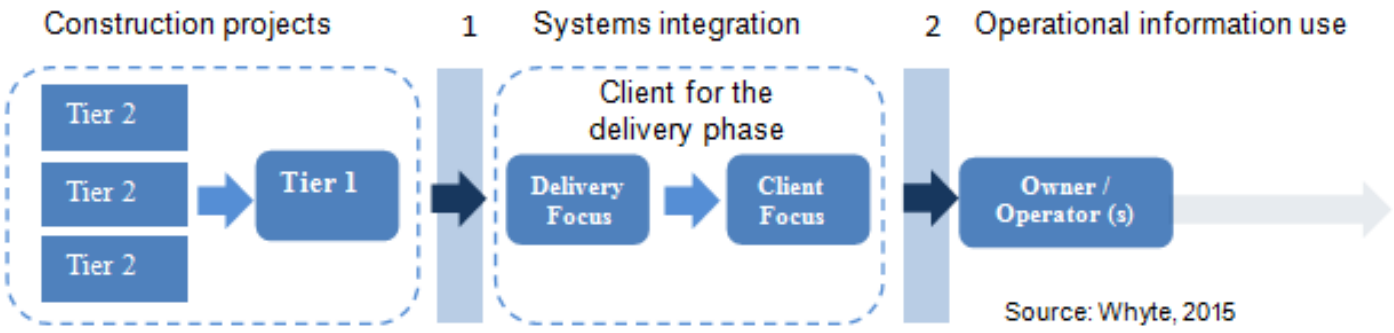
These challenges can be addressed through progressive build-up of information through the life of the project, with a structured set of meetings; deliverables; and responsibility matrices understood through a 'time minus' process to manage timely delivery of digital asset information. Training is needed to ensure the supply chain understands information requirements; and can implement meta-data and content checks for document compliance. This process should start early in the project. Assumptions regarding the time taken to check and approve information from the supply chain need to be tested. In the systems integration phase, a change control process is needed to control changes to requirements and digital asset information. Completeness of documentation should be monitored with different resource scenarios to avoid resource escalation as key people and organizations leave in the project close-out phase.

2. Handover to the owner operator

Challenges of the second handover of as-built information from the project or programme to the owners and operators are:

- Extraction of data to owner-operator systems;
- Establishing practices for managing change and maintaining the "single source of truth";
- Understanding (evolving/shifting) requirements for operation; and
- Timing of data handover.

The takeover of information by the owners and operators is different from the handover of information from the supply chain. There is a need for the supply-side to work with and help owner-operator teams in upskilling to takeover digital asset information; and in the extraction of data to owner-operator systems, which should be piloted and checked before batches of information are transferred. The operator needs information to be delivered alongside physical assets. The operator needs understanding of the project as an investment, with a business plan beyond infrastructure delivery and interests in operational readiness; commercial launch; change control; and planning for next generation support for digital asset information.



For further information please contact the author: Jennifer Whyte (j.whyte@imperial.ac.uk).

How artificial intelligence will reshape civil engineering

The next industrial revolution is dawning – powered not by steam but artificial intelligence and big data. Arup's Tim Chapman looks at what this will mean for the industry.

As computers are taught to think and solve more complex problems, the impact will be felt from the tools engineers use to the skills required.

The UK construction industry is being challenged to make huge improvements in its performance, in terms of the speed of project delivery, out-turn cost and contributing to reductions in national carbon emissions.

Fortunately, these challenges come at a time when technology is rapidly advancing, and the next industrial revolution is dawning. This second machine age is seeing machines that can think rather than just do.

Just as machine-brawn made vast earth-moving operations so much simpler from the middle of the 19th century, so thinking machines will make many intellectual tasks so much easier in the 21st century.

We are used to computers and their ability to do tasks for us – the speed of communications has vastly sped up over the past quarter century as email has replaced fax and telex. But the power of computers to change our industry is just starting. BIM is already occurring, implemented successfully on many projects, enabling electronic models of new schemes to be collaboratively shared and developed, saving time and improving deliverability. However films like Ex Machina shows us that current technology can achieve vastly more when the full powers of Artificial Intelligence begin to be effectively harnessed.

Big data revolution

Artificial intelligence will be the next huge wave to engulf our industry – using the vast data banks built up on our projects, supplemented by terabytes of easily accessible data from providers like Apple and Google and a myriad of other data providers that will emerge. Once we start to detect patterns and learn from these experiences and processes, then we will enable computers to be vastly more helpful – and to make our industry vastly more efficient.

Big data style data crunching can reveal hugely insightful patterns that we humans may suspect but can't prove – so machines will hugely assist our engineering judgement. The sorts of revolution that have happened in retail and financial services will be visited on us, for good and for bad.

The good and the bad

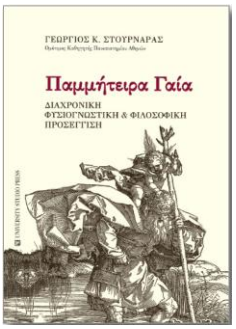
The good will be excellent – with a huge number of routine project planning and design tasks made so much slicker, with efficiencies feeding directly into construction processes too. The bad things will be more insidious and will need our professional institutions to ponder hard on how they should influence the future.

Artificial Intelligence will render many of the simpler professional tasks redundant – potentially replacing entirely many of the tasks by which our younger engineers and other professional learn the details of our trade. Experienced engineers probably have less to fear, at least initially, but we need to decide how we may form and develop the experienced engineers of tomorrow, if the tasks for younger engineers of today have been computerised. Later, as expert systems replace human thinking and process improvement steps up several gears, we also will need to reconsider the ethics that underlie our profession, as we code computers to replace much of what we now call engineering judgement exercised by humans.

BIM, drones and autonomous vehicles are today's technologies for which we can foresee many opportunities tomorrow. Artificial Intelligence is tomorrow's technology that will shake every aspect of our profession – mainly for great good, but not always. We need to consciously shape how such changes are introduced.

(Tim Chapman / Director Infrastructure Design Group, Arup, 30 August 2016, https://www.ice.org.uk/ice-thinks/infrastructure-transformation/how-artificial-intelligence-will-reshape-civil-eng)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Παμμήτειρα Γαία

ΔΙΑΧΡΟΝΙΚΗ ΦΥΣΙΟΓΝΩΣΤΙΚΗ & ΦΙΛΟΣΟΦΙΚΗ ΠΡΟΣΕΓΓΙΣΗ

Γεώργιος Κ. Στουρνάρας

Το βιβλίο του Γ. Στουρνάρα είναι ένα ταξίδι στη Φύση, στη Γνώση και στη Σοφία, που επιβεβαιώνει έναν ορφικό ύμνο για την Παμμήτειρα Θεά, την **Παμμήτειρα Γαία**, ύμνο που παρατίθεται ως τελευταία μαρτυρία για τα διαλαμβανόμενα στο βιβλίο, αλλά και για την αρχαιοελληνική σκέψη, γνώση και φιλοσοφία.

«Ω Φύσι, παμμήτειρα θεά, πολυμήχανε μήτερ, ουρανία, πρέσβειρα, πολύκτιστε δαίμον, άνασσα, πανδαμάτωρ, αδάμαστε, κυβερνήτειρα, παναυγής, παντοκράτειρα... Πάντων μεν συ πατήρ, μήτηρ, τροφός ηδέ τιθηνός, ωκυλόχεια, μάκαιρα, πολύσπορος... Πάντα σοι εισί τα πάντα. Συ γαρ μόνη τάδε τεύχεις. Αλλά, θεά, λίτομαί σε συν ευόλβοισιν εν ώραις ειρήνην υγίειαν άγειν, αύξησιν απάντων...».

«...Ο υπογράφων θεωρεί ότι το Σύγγραμμα αυτό είναι το επιστημο-φιλοσοφικό απόσταγμα της μακράς πορείας του Γιώργου Στουρνάρα, συνιστά μια πραγματική συμβολή στην ελληνική βιβλιογραφία και ελπίζει ότι θα βρει στον επιστημονικό, και όχι μόνο, κόσμο την απήχηση που πραγματικά αξίζει. Συγκέντρωσε συστηματικά, αξιολόγησε με προβληματισμό και παρουσίασε με άψογο συνειρμό και λογική τις κυριότερες απόψεις για την εξέλιξη και το μέλλον της Γης και το ρόλο του νερού στη δημιουργία κατάλληλου περιβάλλοντος για την αρχέγονη Ζωή και την εξέλιξή της στις σημερινές μορφές.»

Γεώργιος Σούλιος, Ομότιμος Καθηγητής Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης

«...Ο καθηγητής Γεώργιος Στουρνάρας, συμβάλλει στο θαύμα αυτό με την συγγραφή αυτού του βιβλίου, που καλύπτει όλη την γεωλογική ιστορία της Γης από την γέννηση του ηλιακού συστήματος και το χάος ενός πρωταρχικού νέφους. Μας διδάσκει, επίσης, με κατανοητό τρόπο, που απευθύνεται και στο ευρύ κοινό, ποιος είναι ο ρόλος του νερού στη γένεση και διαμόρφωση του πλανήτη μας, πώς το νερό κάνει τη Γη ένα ζωντανό οργανισμό μέρος του οποίου είμαστε και εμείς».

Ξενοφών Διον. Μουσάς, Αστρονόμος, αφυπηρετήσας, Καθηγητής Φυσικής Διαστήματος Πανεπιστημίου Αθηνών

«...Το νέο βιβλίο του Καθηγητή Γεωργίου Στουρνάρα αποτελεί μια ευχάριστη έκπληξη στην ελληνική βιβλιογραφία, στο χώρο των γεωεπιστημών, αφού κινείται σε ένα ευρύτερο επιστημονικό, κοινωνιολογικό και φιλοσοφικό πλαίσιο. Αποτελεί πραγματικά μια νέα, πρωτοποριακή, ολιστική και συναρπαστική διαδρομή για την ενότητα και συνεχή εξέλιξη αυτού του καταπληκτικού πλανήτη μας, μέσα από τα πολλά και ενδιαφέροντα δαιδαλώδη μονοπάτια της επιστήμης και της φιλοσοφίας. Το προτείνω ανεπιφύλακτα σε κάθε προβληματισμένο ενεργό πολίτη αυτής της χώρας».

Σπύρος Παυλίδης Καθηγητής Γεωλογίας Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης

(UNIVERSITY STUDIO PRESS, 2016)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

No. 35 - September 2016
https://www.isrm.net/adm/newsletter/ver_html.php?id_newsletter=129&ver=1

Κυκλοφόρησε το τεύχος υπ. αριθ. 35, Σεπτεμβρίου 2016 του NEWSLETTER της ISRM με τα ακόλουθα περιεχόμενα:

- The ISRM held its Council meeting in Ürgüp, Turkey, on 28 August
- 15th ISRM online lecture by Prof. Nielen van der Merwe
- ARMS9, Bali, Indonesia, 18-20 October 2016
- 2017 ISRM International Symposium - AfriRock 2017, 2-7 October, Cape Town, South Africa
- EUROCK 2017, Ostrava, Czech Republic, 20-22 June
- The 2016 ISRM International Symposium was held in Cappadocia (Ürgüp), Turkey, 29-31 August 2016
- ISRM Rocha Medal 2016 - winners were selected
- 2nd ISCSR, 6-7 October, Cartagena, Colombia, an ISRM Specialised Conference
- VIII SBMR, 19-22 October 2016, Belo Horizonte, Brazil, an ISRM Specialised Conference
- RARE-2016, 16-17 November, Bengaluru, India,an ISRM Specialised Conference
- YSRM 2017 & NDRM – Challenges and Innovations in Rock Mechanics and Engineering, Jeju Island, South Korea, 10-13 May 2017, an ISRM Specialised Conference
- GeoProc 2017, Paris, France, 5-7 July, an ISRM Specialised Conference
- Shaoxing International Forum on Rock Mechanics and Engineering Geology SIFRMEG 2017, an ISRM Specialised Conference
- ISRM Sponsored meetings

www.geoengineer.org

Κυκλοφόρησε το Τεύχος #138 του **Newsletter του Geoengineer.org** (Σεπτέμβριος 2016) με πολλές χρήσιμες πληροφορίες για όλα τα θέματα της γεωτεχνικής μηχανικής. Υπενθυμίζεται ότι το Newsletter εκδίδεται από τον συνάδελφο και μέλος της ΕΕΕΕΓΜ Δημήτρη Ζέκκο (secretariat@geoengineer.org).

Ενδεικτικά αναφέρονται:

- Florida Sinkhole Leaks Hazardous Water Into Aquifer (Video)
- Useful preliminary findings from the earthquake sequence in central Italy unveiled by an Italy-US GEER team's engineering reconnaissance
- Clay Mineral Image Collection for Education in Geotechnical Engineering and the Earth Sciences Made Freely Available
- Researchers Develop Theory Behind New Madrid Earthquakes
- Photos Found from Aberdeen Sewer Construction in 1901

http://campaign.r20.constantcontact.com/render?m=1101304736672&ca=19faa057-444f-47d2-a9f6-627c35add5ef

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