IAEG NEWSLETTER

Electronic Version

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Edited by the IAEG Secretariat, Beijing

CONTENTS

News from the IAEG Executive Committee and the Council

Activity Report of the President

Activity Report of web-editor of www.iaeg.info

Awards and Prizes

Hans Cloos Medal

Richard Wolters Prize 2012 – Call for Nominations

Special Report

Engeopro-2011

International Scientific Conference Marcel Arnould

Activities of National Groups

China Group of the IAEG

NZ Group of the IAEG

Canada Group of the IAEG

USA Group of the IAEG

Activities of Commissions

Letter to Chairpersons of IAEG Commissions

Report from C21

Report from C29

Report from C33

Cooperation with Sister Societies

The 12th congress and 50th anniversary of ISRM

On the name change of ISSMGE

Information on Academic Activities

Book Review

Articles

IAEG Contact Information

NEWS FROM THE EXCOM AND THE COUNCIL

Annual Meeting of IAEG Executive Committee and the Council

The IAEG Executive Committee and Council Meetings were held on 4th and 5th September 2011 on the occasion of Engeopro-2011 in Moscow, Russia. The President, Carlos Delgado, chaired the meetings.

Professor Delgado expressed his thanks to the secretariat and the Vice Presidents (VPs) from each of the geographic regions. He stressed that the VPs and the secretariat should spend more time contacting National Groups (NGs) to ensure continuing growth in the number of NGs and members.

The Vice Presidents from 6 of the 7 geographical regions presented their working reports.

The Secretary General, Faquan Wu, summarised the work of the secretariat in the past year and the current membership of IAEG. He expressed appreciation to all the NGs, Commissions and the ExCom members for their help and asked for strong support from the VPs in communication with the NGs. A financial report has been made by the treasurer, Pierre Potherat. The financial report for 2010-2011 and a budget for 2011-2012 were approved.

The web-editor, Giorgio Lollino, reported progress on the website improvement. The ExCom and Council expressed their appreciation of the work of the team working on the website. The chief-editor of the Bulletin, Brian Hawkins, identified that this year the number of pages can be increaseed from about 500 pages at present to 720 pages and up to 800 pages the following year, without extra charge from Springer.

The ExCom has established a Technical Operational Committee (TOC) to monitor and encourage the IAEG Commissions.

The Council has approved that the next meeting will be held in conjunction with the ISL-NASL 2012 in Banff, Canada in June 2012. IAEG support of the International Symposium on Coastal Engineering to be convened in Shanghai, China, in September 2012 is also approved.

The Council discussed the proposal of ISSMGE to change its name to International Society of Geotechnical Engineering. The Council expressed its opposition to this proposal because the new name would encompass IAEG, ISRM and ISSMGE.

Proposals to nominate Michel Deveughele to be IAEG Honorary Member and to create a Marcel Arnould Medal have been put forward and approved by the Council. It is also proposed to prepare a book commemorating the 50th anniversary of IAEG to be ready for the 2014 IAEG Congress in Torino, Italy.

MINUTES OF IAEG COUNCIL MEETING 2011

MOSCOW, RUSSIA, 5th SEPTEMBER 2011

PRESENT

Members of the council (36/70, 52%, The President, the Vice-Presidents, the Secretary General and the Treasurer 9; Past Presidents 6; and a nominated representative of each National Group 55)

Executive committee (10/11, 91%)

President:	Prof. Carlos Delgado
Immediate Past President:	Dr. Fred Baynes
Secretary General:	Prof. Wu Faquan.
Treasurer:	Mr. Pierre Potherat
Vice Presidents:	
Africa:	Dr. John Stiff
Asia:	Prof. Huang Runqiu
Australasia:	Dr. Ann Williams
Europe:	Prof. Atiye Tugrul
North America:	Dr. R ǵean Couture
South America:	Dr. Silvina Andrea Marfil

Apologies

Dr. Ian Jefferson (Europe)

Past presidents (3/5: 40%)

Marinos Paul
Ricardo.Oliveira
Niek Rengers (Faquan Wu as proxy)

National Groups (23/55: 42%)

Argentina	Silvina Andrea Marfil (proxy)	Japan	Wu Faquan (proxy)
Australia	Ann Williams (proxy)	New Zealand	Ann Williams
Bulgaria	Kiril Anguelov	Portugal	Ricardo Oliveira
Canada	R ǵean Couture	Romania	Cristian Marunteanu
China	Shengwen Qi	Russia	Dmitry Sergueev (proxy)
Colombia	Silvina Andrea Marfil (proxy)	Serbia	Biljana Abolmasov
Croatia	BOSTJANCIC,Iris or GULAM,Vlatko	South Africa	John Stiff
France	Pierre Potherat(proxy)	Spain	Javier Olmedo
Germany	Carlos Delgado (proxy)	Turkey	Resat Ulusay
Greece	Marinos Paul (proxy)	United kingdom	Helen Reeves
Italy	Nicola Sciarra	USA	R ǵean Couture (proxy)
Korea	Wu Faquan(proxy)		

Bulletin of Engineering Geology and the Environment

Brian Hawkins

Website

Giorgio Lollino

Other participants

C33	Resat Ulusay	C29	Hu Ruilin, Li Lihui, Qi Shengwen
C21	Dmitry Sergueev	C17	Atiye Tugrul

Agenda for IAEG Council Meeting 2011

Venue: Business centre (BC) "Alfa" 3rd floor, room №7, Hotel Izmailovo, Moscow
Date: 9.00-18.00, Monday, 5th September 2011

1. Opening of the meeting and welcome [CD] (10.00-10.10)
2. List of delegates and proxies– verification of the quorum [FW] (10.10-10.25)
3. Agreement of the agenda [FW] (10.25-10.35)
4. Minutes of previous meeting in Auckland – submission for acceptance [FW] (10.35-10.55)
5. Report of the president [CD] (10.55-11.25)
   - activity report for 2011-2012
6. Report of the secretary general [FW] (11.45-12.10)
   - activity report for 2011-2012
   - membership and national groups
7. Report of the treasurer [PP] (12.10-12.40)
   - financial report for 2010-2011 – presentation for approval
   - Budget for 2011-2012 –presentation for approval
8. Report of the vice-presidents on geographical area [VPs] (12.40-13.30)
   - activity report for 2011-2012
9. Report of the Bulletin editor-in-chief [BH] (14.30-15.00)
   - activity report for 2011-2012
   - discussion and comments
10. Report of the web-editor of www.iaeg.info [GL] (15.00-15.30)
   - activity report for 2011-2012
   - discussion and comments on new framework of the web
11. Report of the IAEG Commissions (15.30-16.00)
   - activity report for 2011-2012
   - proposal for new commissions
   - proposal for closure of commission [FB]

12. IAEG-sponsored meeting [FW] (16.20-16.40)
13. Co-operation with sister societies ISRM and ISSMGE– FedIGS [CD] (16.40-17.10)
14. Relation with other international bodies [CD] (17.10-17.30)
15. Any other business (17.30-17.40)
16. Date of the 2011executive committee and council meeting [CD] (17.40-18.00)

1. Opening of the meeting and welcome

President Carlos Delgado opens the meeting at 9 AM. He welcomed the participants to the meeting and thanked the organizers.

2. List of delegates and proxies-verification of the quorum

24 National Groups were represented by a delegate or a proxy
10 members of the Executive Committee were present
3 Past Presidents were present.

With 37 voting delegates out of the 71 council members, the quorum (52%) is reached.

3. Agreement of the agenda

The agenda was approved.

4. Minutes of previous meeting in Auckland-submission for acceptance

Secretary General Faquan WU presented the Minutes of the Auckland meeting of September 2010.
The Minutes were approved without modifications.

5. Report of the President

Thanks to Prof. Faquan WU and the secretariat for their jobs, especially the 1st Newsletter directly emailed to members.

The IAEG website is expected to play a big role in the future to serve the Association.

All the VPs and Secretary should put in a concentrated effort to contact NGs and members to encourage steady growth of the number of NGs and members, especially focusing on areas with great growth potential such as China, India, Brazil and nations in Africa.

It is also necessary to promote the Association and implement initiatives to attract and support members, such as low fees for student membership.

----------Coffee break----------

6. Report of the Secretary General

6.1 Activity report for 2011-2012

1) The 1st Newsletter was distributed in May, and a second one will be issued shortly. It is planned to continue this initiative with regular issues.
2) Consider hard copy of newsletter also for wider distribution.
3) Secretariat fully transferred from Paris to Beijing, along with IAEG Archives.

6.2 Membership and National Group

The data in the report was collected from 35 NGs of the total of 55 NGs. IAEG now has 3114 members, including 1985 members with Bulletin, 1105 members without Bulletin and 24 associate members. There are 20 NGs supplying no information as follows:

Africa: Algeria, South Africa
Asia: Indonesia, Malaysia, Nepal, Singapore, Vietnam
Europe: Albania, Bulgaria, Hungary, Belgium, Denmark, Estonia, Iceland, Ireland, Norway, Poland, Sweden
North American: Mexico
South American: Peru

The secretariat would like to thank all the NGs, commissions and colleagues who presented their news.

6.3 Discussion

1) VPs should work with the President and Secretary General to keep the NGs active.
2) VPs should be visible and contact NGs by visiting them and presenting at regional conferences, but taking into account budget issues.
3) It is difficult to collect member information especially addresses for Bulletin dispatch. Also, Springer still can't manage the dispatch of the Bulletin effectively and correctly.

7. Report of the Treasurer

1) IAEG is financially in good health with a 2010 surplus of over 22k Euros and a total asset of over 344k Euros.
2) The current financial report has not been audited due to a minor accounting problem. It will be carried out shortly. The budget was approved by the Council.
3) The budget for the next three year period will be prepared and presented to the Council at the next meeting in Banff.
4) It was also decided that an amount of 20k Euros will be dedicated to travel funds for members of the Ex.Com to allow those with many countries in their portfolio to visitwith the objective of increasing the visibility and membership of IAEG. Approval of expenditure for such trips is by the IAEG President.

The financial report for 2010-2011 is approved.

The Budget for 2011-2012 is approved.

8. Report of the Vice-Presidents on their geographical areas

The VPs give brief oral presentations of their reports:

1) John Stiff for Africa
2) Runqiu Huang for Asia
3) Ann Williams for Australasia
4) Atiye Tugrul for Europe
5) Réjean Couture for North America
6) Silvina Marfil for South America

----------Lunch----------

9. Report from the web-editor of www.iaeg.info

This report, item No.10 on the agenda, was put ahead of item No.9 due to the temporary absence of reporter of item No.9.

9.1 Report

1) The IAEG website is online since June with the domain iaeg.info in the Netherlands. The IAEG has paid the fee for this domain for the next two years. The change of the webmaster will allow more close co-operation with Giorgio Lollino. The host server and the web editor (Giorgio Lollino) and his team are now fully operating from Italy (Torino office of CNR-IRPI).
2) The ExCom has established a sub-committee to identify how the website will be developed.
3) The ability for direct management by National Group presidents and Commission presidents for updating address lists, material, etc. was discussed.
4) Each month will highlight a National Group and its significant outputs/ work/ characterization/ events/ construction work/etc.
5) A webpage will be dedicated to career/job opportunities.
6) It was suggested that some of the web content be restricted to IAEG members only, not immediately but at mid-term. National Groups are now invited to feed the website with relevant information, images, news, etc…

9.2 Discussion

1) All presidents of NGs and Commissions should now be able to log in to the website to put information and details online.

2) There should be people to focus on attracting people who would act as sponsors and people to manage the registers on the website and distribute the benefits to our members.

10. Bulletin of Engineering Geology and the Environment [BH]

1) This year, the number of pages will increase from about 500 pages to 720 pages and up to 800 pages next year, without extra charge from Springer (the publisher). The Bulletin is pretty healthy but not good. We are getting 130-140 papers a years, but 1/3~1/2 are rejected. Most of the papers are just common knowledge and technical notes not qualified for the standard, so a lot of time is spent in rewriting.
2) The Bulletin has a good citation index, similar to the Canadian Geotechnical Journal, but significantly less than Engineering Geology or Landslides.
3) A table of contents of the new issue will be put online every three months.
4) The programs of conferences, especially the lectures and keynote papers, could be included in IAEG pages in the Bulletin.
5) The Bulletin has an agreement with Springer that papers would be rejected in any languages Springer is not familiar with.

11. Report of the IAEG Commissions

1) There is a good growth of number of commissions in the past few years. We only had 4 active commissions before, but now have nearly 18 commissions including about 8 active commissions.
2) Commissions have contributed to the increase in contact between members and information on the website and Bulletin.
3) The current state of commissions has been colour coded according to their level of activity and status. Some commissions have problems with no report submittal and are in need of chair replacement.
4) ExCom approved the creation of a Technical Operational Committee (TOC) to monitor and encourage commissions. Members of TOC are selected as follows: Carlos Delgado President, Fred Baynes, Ann Williams, Runqiu Huang, and Silvina Marfil.
5) The TOC should review the commission topics and group some together, and review the Terms of Reference of Commissions to avoid overlap.

----------Coffee break----------

12. IAEG-sponsored meetings

12.1 Next sponsored conference by IAEG in 2012:

International Symposium on Coastal Engineering Convened in Shanghai, China, September 2012.

12.2 Next IAEG ExCom and Council Meetings in 2012:

The Council members voted in favor of holding the next meetings in conjunction with the ISL-NASL 2012 (Banff, Canada). The ExCom and Council meetings will be held on Saturday June 2nd and Sunday June 3rd respectively. IGC in Brisbane (Australia, Sept. 2012) was also considered but Banff received 29 votes compared to 6 for Brisbane.

13. Co-operation with sister societies and other international bodies

ISSMGE has proposed to change its name to International Society of Geotechnical Engineering. IAEG expressed its opposition to this name change and will express so once again at the next ISSMGE Meeting to be held in Toronto (Oct. 2). The new name would encompass IAEG, ISRM and ISSMGE. The President will send a letter to JL Briaud to express IAEG's position.

Key items discussed at the last FEDIGS meeting in Rome on May 15, 2011:
1) The International Geotextile Society (IGS) has joined the FEDIGS;
2) Maintain independence for each society;
3) Keep expenses to a minimum;
4) Main objective is to co-ordinate scientific and technical activities of overlapping interest and communication of conference and symposia schedules;
5) No annual fee charged;
6) Maintain only 3 JTCs (JTC3-Education being under the IAEG responsibility, chair: Keith Turner);
7) Remains open to other societies;

Maintain right of veto in case of issue with negative consequences for any of the founding members.

14. Any other business

IAEG Honorary Member
A proposal to nominate Michel Deveughele, Secretary General for many years, to be IAEG Honorary Member was unanimously approved by the Council.

Marcel Arnould Medal:
1) A proposal to create a Marcel Arnould Medal, named after the late first IAEG President and co-founder, has been put forward by the President and unanimously approved by the Council.
2) The medal will be given to an IAEG member for his/her outstanding service to the Association.

3) The Medal will be first awarded at the IAEG Torino Congress in 2014

Hans Cloos Medal:

1) The criteria will be slightly altered to focus fully on outstanding scientific/technical contribution only.
2) Call for nominations sent out on Sept. 15, 2011, deadline is October 15, 2011!

IAEG 50th Anniversary Book:
It is proposed to prepare a book commemorating the 50th anniversary of IAEG to be ready for the 2014 IAEG Congress in Torino. Edition work should be given to a professional editor to ensure a high-quality product.

The meeting was concluded at 5.30pm

ACTIVITY REPORT OF THE PRESIDENT

April-October 2011

During the last period the President attended the FEDIGS meeting in Rome, where he discussed with the other Presidents the future of this Federation.

The summer was spent preparing the Executive and Council meetings for the Moscow conference in September.

In October the President gave a lecture during the Scientific Day Sessions in Paris in honour of Marcel Arnould and various matters were discussed with the IAEG assisting members.

The President sent IAEG representatives to the 2nd World Landslide Forum in Rome and encouraged the preparation of the IAEG panel.

An Ex. Com. Video conference was organized for the end of October to discuss the Hans Cloos Medal candidatures and other pending matters.

The preparation of the IAEG 50th anniversary book is going ahead and an editor will be selected shortly.

Carlos Delgado
IAEG President

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ACTIVITY REPORT OF WEB-EDITOR

The new IAEG website one month after the kickoff date Technical Report

IAEG Web Editorial Board

October 27th, 2011

General consideration about the "switch-off" date.

On August 25th 2011 we switched off the old IAEG website. Simultaneously, we put online the new website. From a technical point of view we performed these steps:

1. we set up our own webserver, containing all website files and databases;

2. we configured our DNS server and added the required records to associate the IAEG domain to our server;

3. we changed the settings of our domain provider (Gandi.net): it now points to our DNS servers instead of the DNS servers of PowerDNN (the company who provided us the hosting service for the old website);

4. we cancelled our subscription to PowerDNN that had a cost of 20$ per month for our association; the subscription is scheduled to expire on September 26th, 2011;

In summary, the new website configuration is such that we directly control both the webserver and the DNS server (the cost is then "zero" for the association). We still have a 2-years subscription to Gandi.net for the domain registration (28.70€, already payed by S. Dupray and P. Potherat) which expires on March 2013.

To implement the new website we adopted the following choices:

1. The webserver platform is based on Apache[1] + PHP[2] + MySQL[3], a popular choice, free and opensource, adopted by 63% of all worldwide websites[4].

2. The site is based on Joomla![5], a popular powerful, easy-to-use, opensource, free Content Management System, adopted not only by home users, but also by professional companies as platform for many types of websites (e-commerce, newspapers, companies and associations).

3. The website adopts only free extensions (e.g., for document management).

4. More complex parts (National Group pages, IAEG member confirmation) have been implemented in PHP+MySQL.

These choices go towards two main necessities:

1. make the transfer of website management as easy as possible;

2. make any periodical restyling of the website easily accessible thanks to the wide availability of layout templates for Joomla!.

The new website has been activated successfully. We had to face few minor technical problems (links pointing to the old website), which have been solved thanks to the help of members of the ExComm other visitors. The new functionalities have been warmly welcomed

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1 http://httpd.apache.org/ 2 http://www.php.net/ 3 http://www.mysql.com/
4 http://news.netcraft.com/archives/2011/05/02/may-2011-web-server-survey.html
5 http://www.joomla.org/
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by many people. In particular, interactive National Group pages have been already tested and employed by some NG presidents and secretaries. The protocol adopted for the IAEG member confirmation has also been used successfully. Moreover, many companies demonstrated their interest for the website and proposed some pictures that we promptly added to the slideshow of the website. We received lots of suggestions for improvements: all of them have been already taken into account.

New facilities for NG Presidents and Members of the IAEG

So far, these new facilities have been used by very few people. We have only 7 user who registered as IAEG Members. Moreover, only 3 National Groups have updated their information in the NG pages: Italy, China and New Zealand. **We recall that it is of extreme importance that every VP communicate to the NG of their area the availability of these functions and encourage the National Presidents to use them. Instructions are on the website.**

Traffic analysis for the first two months

We estimate that a first significant comparison w.r.t. the old website traffic will be possible at the end of 2011. However, thanks to the Google Analytics[6] facility, we pointed out some relevant traffic information and encouraging results. At this purpose, we compared the traffic data of www.iaeg.info for the first two months following the "switch-off" date, with the same period of 2010. The results are presented in the screenshot reported in Figure 1.

Figure 1. Google Analytics data for www.iaeg.info

Notice that these data are biased by the fact that in September 2010 there was the IAEG2010 congress. The pick of visits in September 5th, 2010 is certainly due to this great event. Also the total numbers of visits and new visits are affected by this major event (resp. -22.17% and -7.24%). However, all other analysis parameters have positive trends. In particular, visitors seem to pass more time on the new website (+55.86%), visiting more pages (+41.18%). The bounce rate (the percentage of visitors who enter the site and leave it rather than continue viewing other pages within the same site) is also decreasing (-15.48%).

Conclusions

During the period of restricted accessibility of the website, we received multiple feedbacks by the members of the Executive Committee and other valuable colleagues. We took into

6 http://www.google.com/analytics/

account all comments and modified the website consequently. Even though it is too early to evaluate the results in terms of appreciation rate and number of visitors, we have already some useful indications that we are taking into account to further improve the IAEG website from the point of views of the look, content and functionalities. We recall that, to provide up-to-date information on the website, it is extremely important that each VP notifies to the NG of their area the availability of these functionalities.

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Background

The Richard Wolters Prize has been awarded biannually since 1986 to commemorate the life and work of Dr Richard Wolters, his significant achievements in the advancement of engineering geology and his important role in the development of the IAEG.

Procedure for Richard Wolters Prize Candidates for 2012

The Richard Wolters Prize for 2012 will be administered in the following way:

1. Selection by each IAEG National Group of their best young engineering geologist in a procedure which may vary per National Group. The selected engineering geologist must meet the age criteria set out in the Bylaws (that is be less than 40 years of age on 1 January 2012) and submit for evaluation one scientific publication (MSc or PhD thesis, or paper on a case history submitted to a conference or published in a (refereed) journal), his or her CV, and be able and willing to present a technical paper on the submitted publication in person orally at the Banff ISL-NASL2012 (**note that only persons presenting their papers in Banff in person will be considered for the prize**). Such presentations would be made immediately in association with the IAEG meetings immediately prior to the Conference and are not part of the formal technical programme of the conference .
2. Nomination by the National Groups of their candidate for the Richard Wolters Prize in an official letter with all documentation including identification of the paper to be presented, to the IAEG Secretary General by **03 December 2011**. Where the candidate is from a country whose National Group is not active, self-nomination to the IAEG Vice President representing their part of the world can be made.
3. If the number of nominations exceeds 10, then the Executive Committee will, by **03 February 2012**, make the selection of the 10 best candidates.
4. The National Groups will then be informed, four months before the Conference is held, if their nominee is invited to present her/his paper in Banff.
5. Competition will be held on **Monday June 4, 2012**. The Oral presentation is about 15 minutes (10 minutes presentation and 5 minutes mandatory question session to test knowledge of candidate). Selection of the winner of the Richard Wolters Prize and runner-up will be made by a jury appointed by the IAEG Executive Committee. The winner will be informed before 'Richard-Wolters Prize Luncheon' on Thursday June 7, 2012. (submitted publication 30 %; CV 10 %; Oral presentation 60 %).
6. The presentation only of the 2012 RWP winner will be held during a 'Richard-Wolters Prize Luncheon' on **Thursday June 7, 2012**.

It is expected that the IAEG National Groups will support the travel costs, accommodation and (student rate) fee for Conference participation of their candidate. National Groups from low income countries and National Groups with very small numbers of members can apply for (partial) financial support by the IAEG solidarity fund in a letter to the IAEG President.

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SPECIAL REPORT

ENGEOPRO-2011: International Conference IAEG, Moscow, Russia, September 6-8, 2011

Written by Administrator Wednesday, 28 September 2011 10:32

The international conference **"Environmental Geosciences and Engineering Survey for Territory Protection and Population Safety" (Engeopro-2011)** was held in Moscow, Russia, on September 6-8, 2011. The conference was organized by the Russian Academy of Sciences, the Ministry for Emergencies of the Russian Federation, and the National Union of Russian Surveyors under the aegis of the International Association for Engineering Geology and the Environment (IAEG) with participation of the Russian national group IAEG and the Scientific Council RAS on the problems in environmental geoscience, engineering geology and hydrogeology. IAEG Executive and Council meetings, as well as IAEG Commissions gathered on the occasion of this conference. The latter fact emphasized a high scientific level of this event.

The Organizing Committee of the ENGEPRO Conference consisted of prominent scientists, leaders of research and production institutions, officials of the Emercom of Russia, businessmen, etc. Vice President of the Russian Academy of Sciences academician Nikolay P. Laverov headed the Organizing Committee. Academician RAS, chairman of the Russian national group IAEG Prof. Victor I. Osipov and Head of the Centre for Strategic Research in Civil Defense at EMERCOM of Russia, Dr. Valerii A. AKIMOV, were Deputy Chairmen of the Organizing Committee.

President of the IAEG, Prof. Carlos Delgado (Spain), General Secretary Prof. Wu Faquan (China), and other IAEG leaders contributed significantly to the work of International Advisory Committee of the conference.

Topics for discussion at ENGEOPRO-2011 were dealing with natural hazards and risks: their investigation, analysis, monitoring, modeling, prediction, prevention, and management; engineering survey for rational use of territories and providing population safety; engineering protection of territories under the impact of various natural and natural-anthropogenic hazards; and socio-economic aspects of engineering protection.
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Over 300 scientists from 28 countries attended the Engeopro-2011 conference. Apart from the Russian attendees, more than 100 participants represented Australia, Argentina, Bulgaria, Canada, Chile, China, Croatia, Czech Republic, Finland, France, Great Britain, Greece, Italy, India, Kyrgyzstan, Kazakhstan, New Zealand, Portugal, Serbia, Singapore, South Africa, South Korea, Spain, Romania, Turkey, Ukraine and Uzbekistan. The most numerous delegation came from China (33), there were also 9 participants from Italy, 7 from Turkey, and 4 from Spain.

Among honorable guests at the conference there were: IAEG President Prof. Carlos Delgado (Spain), General Secretary IAEG Prof. Wu Faquan (China); Immediate Past President IAEG Dr. Fred Baynes (Australia), Past Presidents IAEG Prof. Wang Sijing (China), Prof. Paul Marinos (Greece), Prof. Ricardo Oliveira (Portugal); Vice Presidents IAEG Prof. Dr. Atiye Tugrul (Turkey), Prof. Runqiu Huang (China), Dr. Silvina Andrea Marfil (Argentina), Dr. Rejean Couture (Canada), Dr. John Stiff (South Africa), Dr. Ann Williams (New Zealand); IAEG website editor, President of the Italian national group IAEG Dr. Giorgio Lollino.
The work of Engeopro-2011 was subdivided in the following oral sessions: 1. Endogenous geohazards and engineering protection; 2. Exogenous geohazards and engineering protection (with two subsessions); 3. Hydrometeorological geohazards and engineering protection; 4. Hydrogeological geohazards and engineering protection; 5. Soils and rocks as an important factor of territory vulnerability; 6. Regional problems in engineering protection of territories (case study); 7. Socio-economic and ecological aspects of engineering protection.

A total of 90 high-level oral reports (including 7 invited and 8 key-note lectures) were delivered at 2 plenary and 8 sectional meetings. In addition, 58 reports were presented at the poster session. The volume of conference proceedings included 180 full papers (issued on CD) and 286 abstracts (published in print) of participants' contributions.

The conference provided a venue for discussion and sharing opinions in a wide range of topics on the rational use of territories, engineering survey, and engineering protection of territories and population from various natural hazards. We hope that this meeting also enabled

participants from all over the world to update their pre-existing partnerships and to establish new fruitful scientific contacts.

A technical exhibition and scientific photo exhibition were organized during the conference. We also tried to suggest an interesting socio-cultural program for the Engeopro-2011 participants.

The conference photos are available at the ENGEOPRO website: http//:www.engeopro2011.com.

The Organizing Committee of Engeopro-2011 and the Russian national group IAEG are very grateful to all participants for attending our conference. We hope that you enjoyed your staying in Moscow and we'll be very happy to welcome you in Russia again.

Vice Chairman of the Engeopro-2011,
Chairman of the Russian national group IAEG,

Prof. Victor I. Osipov

Executive Secretary of Engeopro-2011,
Secretary of the Russian national group IAEG,

Olga N. Eremina

LETTER OF THANKS

"Environmental Geosciences and Engineering Survey for Territory Protection and Population Safety"
EngeoPro-2011
International Conference
Moscow, Russia, September 6-8, 2011

Dear colleagues!

The Organizing Committee of the international conference **"Environmental Geosciences and Engineering Survey for Territory Protection and Population Safety" (Engeopro-2011)** would like to thank sincerely all of you for participation in this major event.

Engeopro-2011 was held in Moscow, Russia, on September 6-8, 2011. The conference was organized by the Russian Academy of Sciences, the Ministry for Emergencies of the Russian Federation, and the National Union of Russian Surveyors under the aegis of the International Association for Engineering Geology and the Environment (IAEG) with participation of the Russian national group IAEG and the Scientific Council RAS on the problems in environmental geoscience, engineering geology and hydrogeology.

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Over 300 scientists from 28 countries attended the Engeopro-2011 conference. 90 high level oral reports (including 7 invited and 8 key-note lectures) were delivered at 2 plenary and 8

sectional meetings. In addition, 58 reports were presented at the poster session. The volume of conference proceedings included 202 full papers and over 300 abstracts of participants' contributions.

IAEG Executive and Council meetings, as well as IAEG Commissions gathered on theoccasion of this conference.

We also tried to suggest an interesting socio-cultural program for the conference participants.

Please, find the list of Engeopro-2011 attendees in the attached file.

Very soon the conference photos will be available at the conference website: http//:www.engeopro2011.com.

We are very grateful to all of your for attending our conference and we hope that you enjoyed your staying in Moscow.

We'll be very happy to welcome you in Russia again.

Kind regards,

Chairman of Engeopro-2011

Organizing Committee,

Vice President of the Russian Academy of Sciences

Academician

Nikolay Laverov

Vice Chairman of Engeopro-2011 Organizing Committee,

Academician RAS

Victor I. Osipov

International Scientific Conference Marcel Arnould

By Roger Cojean

professor at Mines ParisTech.

Organized by CFGI (French Committee of Engineering Geology and the Environment), with the support of IAEG (International Association of Engineering Geology and the Environment), the International Scientific Conference Marcel Arnould was attended by nearly 200 people. Mines Paris Tech (School of Mines of Paris) hosted the event.

On the platform of the auditorium were present: Carlos Delgado, president of IAEG, Wu Faquan, Secretary General of IAEG, Michel Schmitt, Assistant Director – Director of Research at Mines Paris Tech, Michel Deveughèle, former director of CGI and former Secretary General of IAEG, Jean-Louis Durville, Chairman of CFGI, Roger Cojean, former chairman of CFGI,

The Conference was truly international, with many countries represented: Algeria, Belgium, China, Spain, France, Great Britain, Greece, Portugal, Switzerland. In the audience, two past presidents of IAEG (Ricardo Oliveira and Paul Marinos), as speakers also, were present and the editor-in-chief of BEGE: Brian Hawkins. The assistance also included former students or colleagues of Marcel Arnould, academics and researchers, experts in engineering geology, geotechnical engineering, rock mechanics, etc., various organizations: Bordeaux University, BRGM, CNAM, Ecole des Ponts ParisTech, ENSG, Franche-Comté University, GEODERIS, IFSTTAR (ex-LCPC), INERIS, LMS Polytechnique, MINES ParisTech, Orsay University, Paris-Est Marne-la-Vallée University, UPMC Paris VI University, professionals in engineering geology, geotechnical engineering, civil engineering, consultant firms in geotechnical engineering, consulting offices: Antea, Bouygues-Construction, CETU, CETEs, Coyne-et-Bellier, EDF, Eiffage, Fugro, Hydrofis, Hydrogéotechnique, Inexia, Mairie de Paris-IGC, Razel-Fayat, SNCF, Socotec, Soletanche Bachy, Terrasol. There were also students at M2 level enrolled by academic professors: Bordeaux University, CNAM Paris VI University, Orsay University.

Each participant, including students, received the book "Géologie de l'ingénieur – Engineering Geology – Tribute to Marcel Arnould", a book of 400 pages, bringing together the texts of the communications and many other contributions, coordinated by Roger Cojean and Martine Audiguier, published by the Presses des Mines.

A welcome message was delivered by Michel Schmitt, on behalf of the teaching and research staff at Mines Paris Tech, especially in the field of Geosciences. Then Carlos Delgado presented the works of Marcel Arnould in IAEG, noting the recent creation of a medal Marcel Arnould intended to honor individuals who worked for the development of engineering geology at the international level. Wu Faquan spoke of the international relations of Marcel Arnould and decisive actions conducted with Chinese partners, recalling his friendship with Professor Wang Sijang. Roger Cojean delivered a speech of tribute to the memory of Marcel Arnould. He specially addressed the younger people in the audience, outlining their responsibilities in the world of the future and encouraging them to follow the teachings of Marcel Arnould and precepts of engineering geology.

The scientific program was then conducted as mentioned below:

Morning:

Chairman: Michel Deveughèle

10 am: Carlos DELGADO (Polytechnic University of Madrid, President of IAEG)

Problèmes géologiques et géotechniques relatifs au projet de tunnel sous le détroit de Gibraltar
Geological and geotechnical issues relating to the proposed tunnel under the strait of Gibraltar

10:30: Paul MARINOS (National Technical University of Athens)

Excavation des tunnels dans un massif rocheux de faible résistance mécanique
Excavation of tunnels in rock masses of low strength

11 am: Ricardo OLIVEIRA (COBA Consultant and Universidade Nova de Lisboa, Lisbon)

Optimisation de projets d'ouvrages de génie civil du point de vue environnemental
Optimization of civil engineering projects, in the environmental perspective

11:30: Jean-Louis DURVILLE (MEDDTL – CGEDD, Président du CFGI)

Aux origines de la réglementation française actuelle en matière de mouvements de versants : la coulee du Plateau d'Assy en 1970
The origins of the current French regulation regarding slope movements: the mudslide of Plateau d'Assy in 1970

12 am: Martine AUDIGUIER (Mines-ParisTech, Centre de Géosciences)

Sécheresse géotechnique : apports de l'analyse minéralogique et microstructurale dans l'étude des processus de retrait-gonflement des sols argileux
Drought and construction: the contribution of mineralogical and micro-structural analyses in the study of the shrink-swell processes of clayey soils

Afternoon :

Chairman : Jean-Louis Durville

14:30: Aurèle PARRIAUX (Ecole Polytechnique Fédérale de Lausanne)

Projet de recherche DEEP CITY, avec la collaboration de Marcel Arnould
DEEP CITY research project, in collaboration with Marcel Arnould

15 pm: Marcel RAT (Consultant, anciennement LCPC)

Rôle de la géologie dans la définition des tracés autoroutiers, illustré à partir de trois exemples : A89 : la traversée des volcans, A75 : la déviation de Millau, A 51 : Grenoble- Sisteron
Role of geology in the definition of highway routes, illustrated using three examples: A89: crossing the volcanoes, A75: the bypass of Millau, A51: Grenoble-Sisteron

15:30: Sylvine GUEDON (IFSTTAR : Institut Français des Sciences et Technologies des Transports, de l'Aménagement et des Réseaux)
L'alcali-réaction ou le gonflement d'un barrage
The alkali reaction or swelling of a dam

16 pm: Jean-Alain FLEURISSON (Mines-ParisTech, Centre de Géosciences)

Prise en compte des discontinuités dans l'élaboration d'un modèle mécanique de massif rocheux. Application au creusement de l'écluse à bateaux du barrage des Trois-Gorges (Chine)
Taking into account discontinuities in the development of a mechanical model of rockmass. Application to the cutting of the shiplock of the Three-Gorges dam in China

16:30: Roger COJEAN (Mines-ParisTech, Centre de Géosciences)

Analyse et modélisation des glissements de la retenue du barrage des Trois-Gorges (Chine). Le cas du glissement de Huangtupo

Analysis and modeling of landslides in the reservoir of the Three-Gorges dam in China. The case of Huangtupo landslide

In conclusion, a word of thanks to all who contributed to the success of this Conference was given by Roger Cojean, before inviting everyone to the glass of friendship.

Compte-rendu de la Journée scientifique internationale Marcel Arnould

Roger Cojean

Organisée par le CFGI (Comité Français de Géologie de l'Ingénieur et de l'Environnement), avec le soutien de l'AIGI (Association Internationale de Géologie de l'Ingénieur et de l'Environnement), la Journée scientifique internationale Marcel Arnould a rassemblé près de 200 personnes. Mines ParisTech a accueilli cette manifestation.

A la tribune étaient présents : Carlos Delgado, président de l'AIGI, Wu Faquan, Secrétaire Général de l'AIGI, Michel Schmitt, Directeur adjoint - Directeur de la Recherche à Mines ParisTech, Michel Deveughèle, ancien directeur du CGI et ancien Secrétaire Général de l'AIGI, Jean-Louis Durville, Président du CFGI, Roger Cojean, past-président du CFGI, professeur à Mines ParisTech.

La journée fut vraiment internationale, avec de nombreux pays représentés : Algérie, Belgique, Chine, Espagne, France, Grande Bretagne, Grèce, Portugal, Suisse. Dans l'assistance, deux past présidents de l'AIGI, et conférenciers, étaient présents ainsi que le rédacteur-en-chef du BEGE: Bulletin of Engineering Geology and the Environment, Journal officiel de l'AIGI. L'assistance comportait par ailleurs des anciens élèves ou collègues de Marcel Arnould, des universitaires et chercheurs, experts de la géologie de l'ingénieur, de la géotechnique, de la mécanique des roches, etc., de divers organismes : BRGM, CNAM, Ecole des Ponts ParisTech, ENSG, Geoderis, IFSTTAR (ex-LCPC), INERIS, LMS Polytechnique, MINES ParisTech, Université de Bordeaux, Université de Franche-Comté, Université d'Orsay, Université UPMC Paris VI, Université Paris-Est Marne-la-Vallée, des professionnels de l'engineering geology, du geotechnical engineering, du génie civil, des bureaux d'étude de géotechnique, des bureaux d'ingénieurs conseils : Antea, Bouygues-Construction, CETU, CETEs, Coyne et Bellier, EDF, Eiffage, Fugro, Hydrofis, Hydrogéotechnique, Inexia, Mairie de Paris-IGC, Razel - Fayat, SNCF, Socotec, Sol étanche-Bachy, Terrasol, Il y avait aussi des étudiants de niveau M2 que des collègues universitaires avaient inscrits : M2 Cnam-Paris 6, M2 Université de Bordeaux 1, M2 Université d'Orsay.

Chaque participant, étudiants compris, a reçu l'ouvrage « Géologie de l'ingénieur - Engineering geology - Hommage à la mémoire de Marcel Arnould », ouvrage de près de 400 pages, rassemblant les textes des communications et de nombreuses autres contributions, coordonné par

Roger Cojean et Martine Audiguier, édité par les Presses de Mines.

Un message de bienvenue à l'assistance a été adressé par Michel Schmitt, présentant les activités d'enseignement et de recherche de l'Ecole des Mines, spécialement dans le domaine des Géosciences. Puis Carlos Delgado a présenté l'oeuvre de Marcel Arnould au sein de l'AIGI, soulignant la toute récente création d'une médaille Marcel Arnould destinée à récompenser des personnalités ayant oeuvré pour le développement de l'engineering geology à l'international. Wu Faquan a parlé des relations internationales de Marcel Arnould et des actions déterminantes conduites avec les partenaires chinois. Roger Cojean a prononcé un discours d'hommage à la mémoire de Marcel Arnould. Il s'est plus particulièrement adressé aux plus jeunes de l'assemblée, soulignant leurs responsabilités dans le monde de demain et les encourageant à suivre les enseignements de Marcel Arnould et les préceptes de l'engineering geology.

MARCEL ARNOULD AND IAEG

By Carlos Delgado

In New Delhi in 1964 during the International Geology Congress, some forerunners, anxious to promote the creation of a commission in IUGS, agreed with the idea of Asher Shadmon to create the International Association of Engineering Geology IAEG. The most enthusiastic person amongst them was the new Secretary General, Marcel Arnould, who was very directly involved in the development of the independent association, in the drawing up of its statutes according to French law with headquarters at L'Ecole de Mines in Paris.

Marcel Arnould was Secretary General from 1964 to 1972 under the presidency of Zaruba from Czechoslovakia and Eugeni Sergeev from Russia.

He was the organiser of the 1st IAEG International Congress which took place in Paris in 1970, the year in which the first edition of the IAEG Bulletin appeared, bilingual English-French, and he was the first Editor-in-Chief, and later a member of the Editing Committee of the magazine edited by Springer. At the same time, he founded the IAEG French Group, was Vice President and President from 1972 - 1975 and then Honorary President.

In 1972 he was elected President of the IAEG, a post which he held for six years, confirming the representation of an autonomous and active branch of geology within the universe of geoscience, independently from his affiliation to IUGS.

In 1978 he was appointed Honorary President of IAEG, and is, until now, the only person ever to have received such an appointment.

He continued, up until the last moment, to give his support to the association and was an assiduous member and tireless contributor to Council sessions. The successors to the Presidency, many of whom are present here today, can be witness to this.

Amongst his numerous international liaison works, he was Consultant Professor of the Geomechanics Laboratory of the Geology Institute at the Chinese Academy of Sciences in Beijing.

In 1980 Marcel Arnould received the Hans Cloos Medal from IAEG amongst other German and French awards, including Dr. Honoris Causa from the University of Prague, and Dr. Honoris Causa from the Mining Institute of St. Petersburg.

In 2009 he was named an Honorary Member of AEG in recognition of the ties created by him between this American association and IAEG, at that time the biggest national group within IAEG, in the words of Allen Hatheway, Marcel Arnould was "the most influential of world leaders of our association".

Just recently, I have had the honour of presenting to the general assembly of IAEG the proposal to create a Marcel Arnould Medal for "exceptional services to the association" which was unanimously approved. This medal will be awarded in Congress Years to coincide with the General Assembly.

I don't want to finish without mentioning the deeply humane side of Marcel Arnould. Although I only knew him in recent years, as a very pleasant surprise he arrived in Madrid following my election as Director of the Civil Engineering School of the Polytechnic, on the day of my investment ceremony, having travelled at his own expense and in poor health, to show his support and that of the association.

It was a gesture that I will never forget and which shows his spirit of service and solidarity which were ever constant throughout his life, as an example for future generations.

Carlos Delgado
IAEG President
Paris, 12th October 2011

MARCEL ARNOULD，THE MOST SINCERE FRIEND OF CHINESE PEOPLE

Wang Sijing, past president of IAEG, Academician of Chinese academy of engineering
Wu Faquan, Secretary General of IAEG, Chairperson of China National Group

Dear French colleagues, ladies and gentlemen,

Professor Marcel Arnould left us 9 months ago. On behalf of the past president of IAEG, professor Wang Sijing, and the IAEG China National Group, I am here expressing the affectionate mourning of this great pioneer of the international engineering geology field, honoring the distinguished contribution that he made to the engineering geology cause all over the world, I also cherish the memory of his profound friendship for the Chinese people.

Professor Arnould is an internationally renowned engineering geologist and engineering geological educationist. He had long been engaged in teaching and research work of engineering geology and environmental geology, and made outstanding achievements in the field of engineering geology.

He is one of the founders of the International Association of Engineering Geology. He served as the president of IAEG for six years, and became the lifetime honorary president of IAEG. In the initial period of IAEG, professor Arnould made a fundamental contribution to building the Association as an international academic communication platform. IAEG closely linked engineering geologists throughout the world together by the communication and cooperation, which made engineering geology win its own domain in the world's scientific palace.

In awarding professor Arnould the honor of distinguished contribution that he made in his international scientific career, IAEG bestowed upon him the Lifetime Achievement Award - the Hans Cloos Medal.

Professor Arnould has profound friendship to the Chinese engineering geologists, he is a well-respected old friend of Chinese people.

Since China's reform and opening to the world, professor Arnould visited China 7 times, which established a bridge between China and the outside world. He made deep and extensive academic exchanges in China and personally participated in geological research of the Three Gorges Project. He also gave enthusiastic guidance for the construction of the Three Gorges Dam and geological hazards prevention at the reservoir. He gave strong support and assistance for the International

Symposium on Mountainous Engineering Geology held in China, he also published a special issue for major engineering geologic problems in China in the Journal of Engineering Geology that was edited by him, which comprehensively introduced the development of geological theory and practice in large scale construction in China to the world. Under his recommendation and training, a group of Chinese scientists and technicians burgeoned into internationally renowned: professor Wang Sijing had served three terms as the vice president and president of IAEG, and he also won the highest honor of IAEG — the Hans Cloos Medal; professors Wu Faquan and Huang Runqiu undertook the vice president and secretary general roles; professor Qin Siqing and Shang Yanjun won the Youth Award of IAEG — the Richard Wolters Prize.

Professor Arnould had been invited as the honorary professor of the Key Laboratory of Engineering Geomechanics, Chinese Academy of Sciences. He paid high attention and gave enthusiastic support to the construction and development of the laboratory. He worked on the research and exchanges collaboratively with laboratory researchers. He discussed research experiences, guided the laboratory's construction, encouraged young scientists in the laboratory to move bravely onto the international stage, and he had become a long term mentor of scientific and technical workat the laboratory. In the course of academic exchanges with young scientists, he not only gave them academic instruction but also set up profound friendships with them like a loving father. All of these made Chinese scientists feel the sincere friendship from French people and a famous engineering geologist.

In May of 2006, professor Arnould made his farewell visit to China. From 12th to 17th of May, by invitation of academician Wang Sijing and professor Yin Yueping, professor Arnould visited Beijing and investigated engineering geological problems related to loess landslides, ground fissure and land subsidence in Xi'an, west China. During the visit to Beijing, he had the discussion and seminar with the members of National Group of China, IAEG and the colleagues of the China Geological Survey. Professor Arnould listened to the report carefully and put forward all kinds of problems in high spirits from time to time, he also gave enthusiastic encouragement to the work of China's national group.

The death of professor Arnould is not only a big loss for international engineering geology, but also, it makes the Chinese people lose a great friend.

The IAEG and the Chinese people will remember him forever!

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ACTIVITIES OF NATIONAL GROUPS

CHINA

By Shengwen Qi

In China, IAEG is well represented by the China national group of the IAEG, which places emphasis on the importance of high level forums and annual meetings and is honored as one of most active science organizations. The number of members of the China national group is now 323 and more and more young scientists are rushing to join the group. As usual, the group sees cooperation and communication as its belief and has held a series of academic activities in 2011. Among them, there were two very important high-level forums and one annual meeting respectively held in 2011.

On April 16th 2011the Third High-level Forum of Engineering Geology was held in Luoyang, Henan Province, which had more than 50 elites from all over the country, with the theme “Challenges and Strategies about China Engineering Geology Discipline”. Around the theme, there were 18 specialists lecturing including Academician Sijing Wang, Prof. Runqiu Huang (IAEG vice president), Prof. Yuepin Yin and Prof. Huiming Tang respectively made comprehensive presentations. Moreover, Prof. Juhua Xiong of National Natural Science Foundation (NSFC) was invited to introduce the situation about the application for the national natural science fund. It can be seen from the reports and discussion of the conference that the discipline of engineering geology in China made a great success. However, there are also some problems that need to be summarized systematically and to be further considered. It is of particular importance to hold the High-level forum to understand the current situation of the discipline and guiding its improvement.

The Fourth High-level Forum of Engineering Geology was held in Tianjin new coastal district on July 16th 2011. The theme of the conference is “Combination and Applications between Internet of Things (IOT) and Engineering Geology”, aiming to discuss and promote the applications and improvement of high technologies i.e. as IOT in geological hazards monitoring and forecasting. The forum was advocated by NSFC, sponsored by Committee of Engineering Geology of China and

The Fourth High-level Forum of Engineering Geology held in Tianjin new coastal distirct, July 16th 2011

undertaken by Institute of Tianjin IOT Application Technology. More than 50 specialists including Prof. Faquan Wu (SG of IAEG), Prof. Runqiu Huang (IAEG vice president), Prof.
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Yuepin Yin were invited to the forum. Professor Runqiu Huang first reviewed the achievements of the previous three forums, then laid emphasis on the significance of the forum and the application of IOT in engineering geology. Furthermore, experts discussed the basic principle of IOT, analyzed the present situation and the huge losses due to geological hazards in China, detailed the great significance of IOT applied in geological hazards monitoring and forecasting, and then highlighted the present situation and challenges of IOT and engineering geology. During the forum, some IOT high-tech instruments designed by the Institute of Tianjin IOT Application Technology were displayed to the specialists. The forum was a great success, which both the sponsor and delegates felt productive and fruitful and determined to further strengthen the cooperation and to further discuss the advanced subjects applying IOT to the geological hazards.

With the theme "The Major Engineering Geology Problems of the Reconstruction in the Earthquake Disaster Region", National Engineering Geology Annual Meeting was successfully held on August 3rd 2011 in Xining, Qinghai Province. Three huge geohazards including 2008 Mw7.9 Wenchuan earthquake, 2010 Mw6.9 Yushuan earthquake and 2010.8.7. tremendous debirs flow not only brought about great social and economic impact, but also a

2011 annual national conference of Chinese Engineering Geology

Committee held in Xining, August 3rd -6th 2011

series of professional problems i.e. geohazards identification, mitigation, emergency measures and residence reconstruction. Xining locates at the north margin of Qinghai-Tibet plateau, and faces high risks of geohazards especially earthquakes, landslides and debris flows. Therefore, it is of great importance to organize the conference in Xining.

The conference was a grand meeting in recent years and there were more than 170 papers contributed and more than 450 delegates attended. The local government also laid emphasis on the meeting and lots of formal media reported it. It should be stressed that the meeting, underlined the foundation role of geology theory in engineering geology, and appealed that engineering geology seek root in geology to refresh the theory of engineering geology. Geology subjects i.e. tectonics, petrology should be strengthened. China well-known scholar of tectonics, academician Guowei Zhang from Northwest University was specially invited to introduce the research progress about mainland structure and dynamics. Prof. Peizhen Zhang from IGCEA was also specially invited to introduce the geological structure patterns of activities structure and strong earthquakes.

Meanwhile, the meeting emphasized the importance of the young scientists, and set up special academic reports for young scientists. 17 talented young scientists were chosen and gave keynote lectures respectively, and Young scientists began to play leading parts in the meeting, which is beneficial for the young scientists' growth and the team construction of the engineering geology discipline.

In this meeting there were six parallel sessions with 74 specialists lectures, including prevention of geohazards in earthquake damaged areas, mechanisms of geohazards in the west mountainous areas and measures mitigation urban geological disasters, geohazards in the three gorges reservoir area, geohazards in the loess plateau, special soil engineering geology and engineering geology theory and technology.

Meanwhile, China National Group actively takes part in the international conference.

Prof. Huang Runqiu gave key note speech in the conf.

During September 6-9, 2011, International Association of Engineering Geology and the Environment (IAEG) European regions Conference took place in Moscow. 41 Chinese delegations including Academician Prof. Wang Sijing, past president of IAEG, Prof. Wu Faquan, SG of IAEG, Prof. Huang Runqiu, VP of IAEG, Prof. Hu Ruilin, president of C29, and Dr. Qi Shengwen, SG of CNG attended the meeting. Academician Wang Sijing, Prof. Huang Runqiu, Prof. Huangyu and Dr. Qi Shengwen and other scholars from China gave speeches respectively in the meeting.

During September 4-5, 2011, IAEG president Prof. Carlos Delgado and Secretary General Prof. Wu Faquan co-hosted the executive committee meeting and council meeting. The Secretary of China National Group Dr. Qi Shengwen attended the meeting on behalf of China.

Prof. Wang gave a presentation at the conference

The International Society of Rock Mechanics (ISRM) 12th international congress on rock mechanics with the theme of harmonizing rock engineering and the environment took place in China National Conventional Center (CNCC) during Oct. 17-21, 2011 Beijing, China. Over 1000 delegates from all over the world attended the congress. The congress was organized by the Chinese Society of Rock Mechanics and Engineering (ISRM National Group for China) and Society for Rock Mechanics and Engineering Geology, Singapore (ISRM national Group for Singapore). China National Group of IAEG has close relationship with China National group of ISRM, and IAEG past president Prof. Wang Sijing is also one of past vice presidents of ISRM, and he also acted as president of China Society of Rock Mechanics and Engineering (CSRME). Prof. Wu Faquan, IAEG SG, Chairperson of China National Group, is also SG of CNG of CSRME. ISRM president, Prof. Feng Xia Ting, is also one of members of IAEG. Over 100 delegates from IAEG CNG took part in the conference, among them, over 20 delegates including Prof. Feng Xiating, Prof. Huang Runqiu, Prof. Yin Yueping, Prof. Yue Zhong Qi (from Hong Kong) gave lectures.

Additionally, a new website for CNG of IAEG is now available: http://www.iaeg-china.org/IndexPage/InfoShow/DefaultHome.aspx?tabid=-1. All members of

CNG of IAEG can register online, share information and download electric materials without payment. The system is still in consummating.

In brief there were five highlights of the meeting as follows. First, young talents enthusiastically rushed to join in the meeting and actively exchanged academic ideas. Second, the meeting contents kept close track of national key engineering construction. Third, the meeting contents laid emphasis on the study of basic theory of engineering geology. Fourth, the meeting content strengthened the consideration and construction of the engineering geology. Fifth, the meeting content laid emphasis on the cultivation of the rigorous style of study and credibility.

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NEW ZEALAND

Some comments from the Chair, David Burns

Canterbury Earthquakes

NZGS registered its intention to prepare a submission to the Royal Commission on the Canterbury earthquakes. The remit of the commission is relatively narrow and aimed at the CBD buildings that failed and in which lives were lost. We have been liaising with IPENZ (Institute of Professional Engineers New Zealand) and the other affiliated societies to ensure that presentations to the Commission will present a coherent understanding of both the historical and current practice of engineering in NZ. From a geotechnical perspective, that includes a discussion on the historical controls on land development for commercial and residential purposes.

Of immediate interest is the work of the Engineering Advisory Group, which is promoting draft guidelines for assessment of liquefaction potential for land development. This document requires close examination and comment from Society members to ensure that it actually achieves what it sets out to do. SESOC has also just released a Practice Note on Design of Conventional Structural Systems, which includes geotechnical issues. These need to be reviewed and commented on.

Geomechanics News

Paul has sent out a call for content for the upcoming edition of Geomechanics News. It may be hard to top the last effort however, which generated a lot of interest and comment, including requests for copies. Relevant international contributions are also welcome (submit to Amanda Blakey: secretary@nzgs.org).

Conferences

The NZGS has offered its support to the organisers of the 6th International Conference on Earthquake Geotechnical Engineering to be held in Christchurch in 2015.

The next (19th) NZGS Symposium is tentatively set for 2013 in Queenstown. With other conferences and events squeezing the calendar in recent years we have not had a national symposium since the September 2008 event in Auckland.

The next YGP (Young Geotechnical Professionals) conference is likely to be held in 2012 at about the time of the ANZ (Australia New Zealand) conference.

Geomechanics Lecture

Dr Dave Bell is currently presenting the Geomechanics Lecture at venues around the country, finishing in Christchurch in mid October at a meeting that will also include presentation of the Rankine Lecture by Prof Tom O'Rourke.
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IAEG VP North America：Info for Fall 2011 Newsletter

Contributors: Erik Eberhardt, Corey Froese, Jeff Keaton, Tim A. Newson, Doug Stead, Régean Couture

CANADA

64th Canadian Geotechnical Conference and 14th Pan-American on Soil Mechanisc and Geotechnical Engineering, Oct. 2-6, 2011, Toronto, Canada

With over 1100 abstracts received that have turned out into 508 full papers in the conference proceedings, this conference was well attended by almost 700 participants from 50 different countries. The technical conference includes about 300 oral presentations and a series of keynote addresses by top geoprofessionals from the Americas:

- Kerry Rowe (Canada) – Casagrande Lecture: Long term performance of modern waste disposal facilities
- Carlos Santamarina (USA) – Keynote: Geophysical characterisation of geotechnical materials
- Gabriel Auvinet (Mexico) – Keynote: Geotechnical characterisation of Mexico soft soil
- Marcio Almeida (Brazil) – Keynote: Construction methods in very soft soils
- Jose Amundaray (Venezuela) – Invited Theme: Collapsible soils in Northern Venezuela
- John McCartney (USA) – Invited Theme: Soil-structure interaction in energy foundations
- Andy Take (Canada) – Invited Theme: Physical modelling of rock avalanche runouts.

Finally and in conjunction with this joint conference, the 5th Pan- American Conference on Teaching and Learning of Geotechnical Engineering was held on Sunday, October 2, 2011, in which outstanding keynote speakers, practical workshops and presentations explored teaching and learning methods, as well as the implementation of industrial practice sessions into the classroom.

Website: www.panam-cgc2011.ca/

Slope Stability 2011 conference (Vancouver)

Slope Stability 2011, the International Symposium on Rock Slope Stability in Open Pit Mining and Civil Engineering, was held September 18-21, 2011 in Vancouver, Canada. This specialty meeting explored recent innovation and key developments in the design, analysis, excavation and management of rock slopes. Slope Stability 2011 provided a forum for mine owners and operators, consultants, engineers, suppliers and researchers to exchange views on how to promote best practices in slope stability investigations, design, monitoring and management. The symposium was hosted by the Canadian Association of Rock Mechanics, the University of British Columbia and Simon Fraser University with Dr. Erik Eberhardt (UBC) and Dr. Doug Stead (SFU) acting as Co-Chairs. Attendees came from Africa, Asia, Australia, Europe and North America with over 420 participants. The symposium was preceded by three successful workshops on Saprolites, Radar Technology in Slope Stability, and Surface Mining in Western and Northern Canada, attended by over 100 people. The symposium itself was opened by Dr. Evert Hoek. Three days followed with invited keynotes and 60 presentations on the state-of-the-art in slope stability in Mining and Civil Engineering. The symposium was closed by Dr. Chuck Brawner, organizer of the 1st Slope Stability in Mining and Engineering Symposium in Vancouver in 1970. Two successful technical tours
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were held after the symposium to the Sea to Sky Highway and to the Highland Valley Copper mine. The next slope stability in mining and civil engineering symposium will be held in Australia in 2013.

Website: www.slopestability2011.ca

11th International Symposium on Landslides and Engineered Slopes *and* 2nd North American Symposium on Landslides

The Canadian Geotechnical Society, the Association of Environmental and Engineering Geologists and the Joint Technical Committee on Landslides and Engineered Slopes (JTC-1) **invite you** to the 11th Annual International Symposium on Landslides) and the 2nd North American Symposium on Landslides at the Banff Springs Hotel, in Banff, Alberta, Canada, from **June 2 to 8, 2012.**

Located in Banff National Park, a UNESCO World Heritage site, the conference is set in the heart of the Canadian Rocky Mountains and provides a stunning venue for the international landslide community to convene. This location is ideally situated to stage a series of pre-, post- and mid-conference field trips that will provide delegates with a taste of the culture, geology and landslide issues facing Western Canada and the Rocky Mountains.

The local technical committee, in partnership with the international advisory panel, has developed a program of sessions and plenary lectures to highlight the state-of-the-art advancements in landslide research and practice around the globe. In addition to field trips, sessions and workshops, the social events and the partner program will make this meeting an unforgettable event.

Website: www.ISL-NASL2012.ca

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UNITED STATES

AEG Annual meeting, Anchorage, AK

~ 400 participants, with field trips and concurrent technical sessions, as well as committee and organizational meetings. A special committee meeting was held to discuss improving participation of members of the USA National Group in IAEG activities. A special committee of AEG members is starting the planning for the USA National Committee to be able to submit an invitation to IAEG Council for the 2018 IAEG Congress to be held at a USA location. Preliminary discussions of the special committee were considering a location in the western United States, such as San Francisco or Portland.

Some discussions at the AEG Annual Meeting pertained to the scope of IAEG Commission 1, Engineering Geological Characterisation and Visualisation, chaired by Jeff Keaton (USA). One of the individuals who participated in the Anchorage meeting was Resat Ulusay (Turkey) who also attended the 2011 IAEG Council meeting in Moscow. Another participating individual was Bill Haneberg (USA), a member of C1, and the 2011 Richard H Jahns distinguished lecturer.

Plans are underway for the 2012 AEG Annual Meeting which will be held in Salt Lake City, UT, September 15-23, 2012.

2011 Shlemon

This specialty series consists of small conferences to consider topics of current interest and on-going research. The next one will be entitled “Opportunities for Alternative Energy
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Development in Arizona and the Southwest – Geologic/Hydrologic Considerations" and held in Oct. 2011 in Phoenix, Arizona

R.H. Jahns Lecturer in 2012

Scott Burns, Portland State University, Portland (OR), will be the 2012 Jahns lecturer. Scott is planning to deliver lectures on several topics at universities and professional society meetings across the US and Canada. Scott is an expert on landslide hazards, but possibly of more interest to many who attend his lectures is his expertise on the geology of wine.

GSA Public Service Award

The Geological Society of America will hold its annual meeting in Oct. 2011. The Environmental and Engineering Geology Division has planned technical sessions and an awards luncheon. Scott Burns, Portland State University, Portland (OR), will receive the 2011 GSA Public Service Award. Lynn Highland (US Geological Survey) and Peter Bobrowsky (Geological Survey of Canada) will receive the Environmental and Engineering Geology Division E.B. Burwell Award for, "The Landslide Handbook: a guide to understanding landslides." (2008); USGS Circular 1325.

Multi-disciplinary oral and poster sessions will feature topics of relevance to engineering geologists. One of the sessions, Geological Mapping: Key to Successful Management of Water and Land Resources, was organized by a group that included Holger Kessler (British Geological Survey and IAEG Commission No 1 secretary). Participants in this session include Jeff Keaton (AMEC and IAEG Commission No 1 chair) and Keith Turner (Colorado School of Mines emeritus and IAEG Commission No 1 member).

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ULUSLARARASI MÜHENDİSLİK JEOLOJİSİ TÜRK MİLLİ KOMİTESİ

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY AND THE ENVIRONMENT
TURKISH NATIONAL COMMITTEE

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Activities of the IAEG Turkish National Group.

1. Currently the Turkish National Group has 134 active members with bulletin. Thirteen papers from Turkey (with contribution from 9 of our members) have been published in the Volume 69 of the Bulletin of Engineering Geology and the Environment in 2010.

2. The journal "Bulletin of Engineering Geology" being published in Turkish is the technical and scientific publication of the National Group since 1978. Its last issue (No.30) is published in June 2010. In addition, we also annualy publish a "News Bulletin".

3. The National Committee annually gives awards in the categories of PhD thesis, MSc thesis, graduate project and outstanding research papers published in international journals to honour the memory of Prof. Dr. Kemal Erguvanlı, who is the founder of engineering geology in Turkey, and to recognize outstanding young researchers in the field of engineering geology.

4. The 33th General Meeting of the Turkish National Group was held in Ankara on 18 June 2010. However, the 34th General Meeting is planned to be held in Ankara on 17 June 2011. Representatives from universities, organizations and Chambers of Geological Engineers will attend the meeting.
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The Turkish National Group was represented by Prof. Dr. Tamer Topal in IAEG Council Meeting which was held in Auckland in 2010. Our group will be represented by Prof. Dr. Reşat Ulusay in EngeoPro-2011 in the IAEG Council Meeting.

I wish you a successful Conference and IAEG Council Meeting in Moscow, Russia.

Best regards

Prof. Dr. Tamer TOPAL

Secretary General

ACTIVITIES OF COMMISSIONS

A LETTER TO CHAIRPERSONS OF IAEG COMMISSIONS

Dear colleagues,

Following the instructions of our President Carlos Delgado I would like to inform you that in the last meeting in Moscow on September 5th, the Council approved the creation of a Technical Overseeing Committee to collaborate with the Chairpersons of the commissions, give them all assistance possible and receive information on the state of work in each commission.

The members of TOC are:
Carlos Delgado President
Fred Baynes
Ann Williams
Runqiu Huang
Silvina Marfil

In order to share out the work of the TOC, commissions have been distributed amongst members and you should report to the members of TOC.

The IAEG association would like greater development of the commissions which we believe to be part of the future and maintain a living relationship with the academic and research world. For these reasons, I would like TOC to be seen as an organ of collaboration and help so that you, as chairperson, can develop your task with all the necessary support from our association.

I look forward to hearing from you.

Carlos Delgado
IAEG President

Report from C21

In 2011 the Commission held the following meeting:

EngeoPro-2011 Conference, Moscow, Russia, 6-8 September 2011. The Commission 21 meeting took place with the participation of D.Sergeev, E.Makaricheva, R.Couture and J.Khalilova.

The discussion was concerned with possible ways of raising the Commission’s effectiveness. The best direction identified is the organizing of a comparative study of national engineering

geological approaches for the permafrost region by using the web-page of C21 at IAEG.info-space.

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(a) Preparation of a "Glossary" by the Commission only in English will be useful. Its versions in different languages (German, French and Spanish) may be considered later on. For the purpose, the existing list of terms written by the commission chairman should be re-arranged by extracting some terms, and terms related to the aspects of risk and environment should be included. Link to existing electronic glossaries may also be established.

(b) The "Technical Guideline on Geological Aspects of Rock Slope Stability" should be written by the commission. However, it should be considered that the guideline should only include the general aspects of rock slope stability rather than to be a detailed document, and recent literature may be cited for details. In addition, some examples may be included in some chapters. Aspects of risk and environment should also be included in the guideline; however, risk should be discussed only for rock slope stability applications.

(c) For the preparation of "List of Norms and Guidelines for Rock Slope Stability Assessments", it was advised that announcement to invite engineering geologists to send their reports and other published materials to the Commission to be listed in the website.

(d) Preparation of a list of a limited number of excellent text books that may be used by the IAEG members will be useful and it should appear on the Commission's website.

2) The files to be used for the construction of the C33 website were submitted to IAEG webmaster and finally it has been constructed. This is a temporary text for the opening page of the C33 webpage and will be improved soon.

3) Although the Terms of Reference of C33 have been accepted by the Commission members, and C33 has made a great effort to push the activity of the commission, some overlap with JTC1 on slope stability resulted in some questions. In addition, since glossaries have been made before, some members recommended stopping the idea of a glossary and if a technical guide will be written it should particularly focus on geological data collection. The Commission members are also very busy. Due to these factors, the progress of this new Commission has been slow. To establish a consensus on the above mentioned issues among the members, the Commission needs time.

4) The 2011 annual meeting of C33 was held in Moscow on September 6, 2011 during EngePro2011. Only Resat Ulusay and Faquan Wu attended this meeting as the commission members. In this meeting, both members considered that invitation of some new members, who can actively participate in the Commission, will be useful to motivate the commission. In addition, Executive and Council felt it was important that C33 continues. For this purpose, R. Ulusay and F. Wu identified some persons studying rock slopes to be invited to the Commission. A list of books on rock slope stability is being prepared to be loaded on the website of the Commission.

Prof. Reşat ULUSAY

Commission President

October 24, 2011

COOPERATION WITH SISTER SOCIETIES

The 12th congress and 50th anniversary of ISRM

By Shengwen Qi

The 12th ISRM International Congress on Rock Mechanics with the theme of Harmonizing Rock Engineering and the Environment was held in the China National Conventional Center (CNCC) during Oct. 17-21, 2011 in Beijing, China. Over 1000 delegates from all over the world attended the congress. The congress was organized by ISRM China National Group and Singapore National Group. ISRM annual council meeting and 50th anniversary celebration ceremony were held during the conference. IAEG Secretary General Prof. Wu Faquan attended the activities mentioned above.

Prof. Wu gave a congratulation speech on behalf of IAEG and the president Carlos Delgado in the 50th anniversary celebration ceremony of ISRM.

In order to promote and strengthen friendship and cooperation between IAEG and ISRM, professor Wu Faquan, as the representative of IAEG and the president Carlos Delgado, hosted a banquet lunch for the new Board Members of ISRM. Professor Wang Sijing, the past president of IAEG, professor John Hudson, the past president of ISRM, and the chairperson of IAEG C33, professor Resat Ulusay attended the banquet and gave warm welcome speech.

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On the name change of ISSMGE

IAEG has been informed that the Council Meeting of ISSMGE is to be held in Toronto, Canada, 2nd October 2011, and a proposal to change the name of ISSMGE to the International Society for Geotechnical Engineering will be discussed. The council meeting of IAEG in Moscow, 2nd September has discussed the proposal and expressed strong opposition to this possible name change. The president, Carlos Delgado, wrote a letter to the president, professor Jean-Louis, and the Council of ISSMGE, and ask the IAEG past president, Professor Owen White, to attend the meeting and express the position of IAEG.

Because many responses were submitted against the name change, there will be no name change of the ISSMGE.

A LETTER FROM THE PRESIDENT OF IAEG

THE INTERNATIONAL ASSOCIATION FOR ENGINEERING GEOLOGY AND THE ENVIRONMENT
IAEG AIGI
ASSOCIATION INTERNATIONALE DE GÉOLOGIE DE L'INGÉNIEUR ET DE L'ENVIRONNEMENT

President:	Prof. Carlos Delgado
Past President:	Dr. Fred Baynes
Secretary General:	Prof. Wu Faquan.
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South America:	Dr. Silvina Andrea Marfil

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Email: iaegsg@163.com

Dear Jean-Louis and the Council of ISSMGE,

Congratulations on the Council Meeting of ISSMGE to be held in Toronto, Canada, 2nd October 2011.

Professor Owen White, a past president of IAEG, will be the representative of IAEG at this meeting. The IAEG council meeting in Moscow, 2nd September last, discussed the proposal to change the name of ISSMGE to the International Society for Geotechnical Engineering. The council expressed strong concern regarding the possible name change, feeling that the term "Geotechnical Engineering" is not appropriate for the name of an international society at present because it has included the niches in the fields both for engineering geology and the environment for IAEG and rock mechanics for ISRM. The IAEG council wishes to express its opposition to this name change and also wishes to see independent development and friendly collaboration with the sister societies in the geo-engineering world.

Professor Owen White will express this position on behalf of the IAEG Council at your meeting in Toronto.

Best regards,

Carlos Delgado
IAEG President
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AN EMAIL FROM OWEN WHITE

Dear Professor Wu:

Now that I am back at home, I am pleased to report briefly on the ISSMGE Council Meeting.

I was the first to be called on the matter of the name change, so I read your response as per your request.

In no time, there were many responses against the name change, over 9 in all, so there will be no name change of the ISSMGE!! I must admit I was surprised at the extent of the opposition (especially as I was to present the first opinion against the change!!).

I was pleased to have the opportunity to represent the IAEG.

Many thanks,

Owen

October 10/11

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INFORMATION OF ACADEMIC ACTIVITIES

The 11th International Symposium on Landslides (ISL) and the North American Symposium on Landslides

The theme of the symposium:

Landslides and Engineered Slopes: Protecting Society through Improved Understanding.

Conference Program

The ISL/NASL 2012 symposium is designed to provide a stimulating forum for geoscientists, engineers, planners, economists, program managers, and other decision makers concerned with landslide hazards and their impact on society.

Technical Themes

The ISL/NASL 2012 Technical Committee invites authors from industry, government and academia to submit abstracts pertaining to the investigation, classification, monitoring, analysis and mitigation of landslides. Case studies together with papers featuring innovative analysis techniques and solutions, as well as research (recent and/or future trends), are strongly encouraged.

The symposium theme Landslides and Engineered Slopes: Protecting Society through Improved Understanding was selected because we believe that the profession is undergoing a revolution, as unprecedented amounts of quantitative data become available through new measurement and analysis techniques. Therefore, perhaps it is time to stress understanding of landslide mechanisms and behaviour. How do we make sense of all the numbers that are now available to us?

Several session themes are proposed that authors are being asked to consider when submitting their abstracts:

1. Landslides and Society: Processes and Impacts
2. Understanding Landslide Mechanisms
3. Advances in Investigation, Characterization and Modeling Tools for Hazard Assessment
4. Application of New Monitoring Technologies for Improved Landslide Hazard Management
5. Evaluation and Control of Landslides: Avoidance, Prevention and Protection Strategies
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In addition, several "Key Issues" sessions will be developed to highlight initiatives of the JTC-1 as well as fundamental and strategic challenges being faced by landslide professionals. These include:

6. Classification of Landslides: Strategies and Requirements
7. Managing, Understanding and Using Complex Data Sets arising from New Technologies
8. Slope Stability in Forest Management
9. Impacts of Climate Change on Landslide Risk
10. Sub-Marine Landslides: Impacts, Assessment and Control

There will be four days of technical sessions (Monday, Tuesday, Thursday, and Friday) and one day (Wednesday) of technical excursions, included in the registration fee.

The conference will address the entire range of technical and social-economic policy issues surrounding assessment and management of all types of slope instability – conference papers will be published in a proceedings volume.

The address of the symposium:

the Banff Springs Hotel in Banff, Alberta, Canada from

The time of the symposium:

June 2 to 8, 2012

Conference organizers:

The Canadian Geotechnical Society, the Association of Environmental and Engineering Geologists and the Joint Technical Committee on Landslides (JTC-1)

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The 10th Symposium on Engineering Geology and the Environment

The themes of the symposium:

1. Groundwater
2. Engineering geological mapping
3. Work cases
4. Contamination of natural resources
5. Applied engineering geology education
6. Geotechnical studies
7. Environmental evaluation of plans, projects and works
8. Geoindicators
9. Environmental geology
10. Water resources management
11. Construction materials
12. Land planning
13. Geologic hazards
14. Engineering-geological problems in works
15. Recuperation of degraded lands

The time of the symposium:
August 15, 16 and 17, 2012

The address of the symposium:
Villa Carlos Paz City, Cordoba Province, Argentina.

***Conference organizers*:**
The Asociación Argentina de Geología Aplicada a la Ingeniería (ASAGAI),
Argentina National Group of the International Association for Engineering Geology and the Environment (IAEG),
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THE 34TH INTERNATIONAL GEOLOGICAL CONGRESS

The theme of 34th International Geological Congress:

The overall theme, Unearthing our Past and Future – Resourcing Tomorrow, reflects the cruc ial roles the geosciences play in meeting the needs of societies while sustaining the Earth. A b road scientific program based on 37 Themes has been developed by the Scientific Program Co mmittee and the Scientific Theme Coordinators, with input from International Union of Geolo gical Sciences (IUGS) affiliated groups and individual scientists.

The time of 34th International Geological Congress:
5-10 August 2012
The address of 34th International Geological Congress:
Brisbane, Australia
Congress Manager:
The organizing committee of the 34th International Geological Congress appointed Carillon C onference Management to the position of Congress Manager in April 2008.

Should you need assistance at anytime with your attendance at, or involvement in, the 34th Int ernational Geological Congress, please contact Carillon.
Enquiries regarding the following specific issues should be sent to the email address noted.
General enquiries - info@34igc.org
Registration enquiries- register@34igc.org
Accommodation enquiries - accommodation@34igc.org
Program enquiries- program@34igc.org
Abstract enquiries - abstract@34igc.org
Travel enquiries - travel@34igc.org
Sponsorship enquiries - sponsor@34igc.org
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P 61 7 3368 2644
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E info@34igc.org
M PO Box 177, Red Hill Queensland 4059, Australia
website- http://www.34igc.org/

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The 4th International Workshop of the EARSeL

The Topics of the 4th international workshop of the EARSeL Special Interest Group Geological Applications:

Remote sensing provides efficient data and effective methods for many geological applications such as mapping, water monitoring, mineral exploration and geohazards. Remote sensing data are useful because they can provide very accurate, up-to-date information for almost every place on the planet. The use of remote sensing data allows effective localization of targets and reducing costs and time spent during the field work. Optical, radar and thermal data can be used in many different "Geological Applications".

Some topics of interest:

- Geological Mapping,
- Tectonic Geology,
- Mine Monitoring,
- Hydrogeology,

Geomorphology,
Geohazards (Landslides, Floods, Earthquakes)

The address of the 4th international workshop of the EARSeL Special Interest Group Geological Applications:

Mykonos Island, Greece

The time of the 4th international workshop of the EARSeL Special Interest Group Geological Applications:

"Geological Applications" , May 24-25 2012

the 32nd EARSEL Symposium "Advances in Geoscience" ,May 21-24-2012.

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RESEARCH ASSOCIATE AND LECTURER IN QUANTITATIVE ENGINEERING GEOLOGY

By Paul G. Marinos

The Chair of Engineering Geology at the ETH Zuerich is looking for a junior or senior research associate and lecturer in Quantitative Engineering Geology. The successful candidate must have a Ph.D. or equivalent degree in earth sciences, civil engineering or related field. Practical experience of engineering geological investigations and fundamental understanding of engineering geological processes in slopes and underground excavations are of prime importance. Knowledge in rock or soil mechanics, numerical modeling, remote sensing or laboratory testing is desirable.

The candidate will be expected (1) to teach two or three classes in the field of rock or soil mechanics and applied engineering geology, (2) to develop funded research programs addressing geomechanical or hydromechanical processes in fractured rocks, (3) to supervise undergraduate and graduate students and their thesis work, and (4) support students in the use of our comprehensive field or lab testing equipment.

This ETH position with an attractive pool of field and lab equipment can be filled by the successful candidate in fall or winter 2011 over a period of about 6 years. The Chair of Engineering Geology is a multidisciplinary research and teaching unit devoted primarily to the study of hydromechanical processes in the subsurface within the context of deep underground constructions, unstable slopes, geothermal energy and deep geological waste disposal. Further information about the Chair of Engineering Geology is available at our Web Site www.engineering-geology.ethz.ch. Questions related to the open position can be addressed to Prof. Simon Löw and Dr. Keith Evans, Engineering Geology, ETH Zurich, Switzerland (e-mail: keith.evans@erdw.ethz.ch, simon.loew@erdw.ethz.ch).

Please send your application per regular mail (not e-mail), including cover letter, curriculum vitae with full personal and career details, statement of research interests, and 2 letters of recommendation to ETH Zurich, Prof. Dr. Simon Löw, Engineering Geology, Sonneggstrasse 5, CH-8092 Zuerich, Switzerland. Applications should be submitted until August 15th, 2011 and will be accepted until the position is filled.

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BOOK REVEIEW

By Paul G. Marinos

AURÈLE PARRIAUX : GEOLOGY. BASICS FOR ENGINEERS

CRC Press/Balkema, Taylor and Francis Group, 2009, ISBN: 978-0-415-46165-8

This book by Aurèle Parriaux, Professor at the Swiss Federal Institute of Technology (EPFL) in Lausanne, appeared in its first form in French in 2006. The following year the book received the Roberval Higher Educational Prize, an award that promotes the diffusion of scientific and technological knowledge in the French language. The success of the book was such that a second edition appeared last year, together with a substantial revised edition in English, published by CRC Press.

The structure of the book does not follow a dry descriptive approach. The development of chapters is greatly based on geological processes so that the geological rationale of fundamentals can be understood by the engineer. The text derives from the courses that Professor Parriaux gives to his students of Civil Engineering and Environmental Engineering. Its insights and understanding of geology is thus friendly for engineers because it uses easily comprehensible language. In addition, it refers to many case histories in the practice of Engineering from around the world. At the same time, it remains an excellent treatise on the applied facets of geology that are presented in such a way as to be both instructive and educational for geology students too and of course as a reference textbook to practitioners of Engineering Geology, Civil and Environmental Engineering.

This 570 page book contains numerous excellent illustrations, figures and sketches for the effective conception of the information and contains original photographs that exemplify the potency of observation, a prime tool in geological science. Most of the illustrations are in color.

The pedagogic value of the book is underlined by exercises throughout the chapters.
An accompanying DVD contains the solutions to problems and also animations that make the description of geology much more dynamic and alive.

I highly recommend the book as a resource for the basic background of geological knowledge necessary for the understanding of the behaviour of the ground in engineering practice, infrastructure development and environmental protection.

Paul G. Marinos

Readers may find that this book is published in high quality standards and more details on the English version at: http://www.crcpress.com/product/isbn/9780415461658 and the French version at: http://www.ppur.info/geologie.html

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ARTICLES

COMPARATIVE STUDY OF THE USE OF HOEK-BROWN AND EQUIVALENT MOHR-COULOMB PARAMETERS IN TUNNEL EXCAVATION

By Paul G. Marinos

Presses de l'École des Mines

INTRODUCTION

The Hoek-Brown failure criterion [1] can sufficiently describe the strength of rock masses, based on the characteristics of the intact rock and the rock mass fracturing state. However, Mohr-Coulomb is a widespread failure criterion in geotechnical engineering, incorporated in almost every relevant software, whereas the Hoek-Brown criterion was only recently incorporated in some of them. For that reason, a serious problem is the conversion of the Hoek-Brown parameters (GSI, σ_{ci}, m_i, D) to the equivalent Mohr-Coulomb ones (c, φ of the rock mass) and also the estimation of the divergence of the results from these two approaches, since the transformation of a non-linear criterion to a linear one can never be exact.
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Since the Hoek-Brown failure criterion describes a non-linear equation, the determination of the equivalent Mohr-Coulomb parameters is really based on the transformation of a curve to an equivalent straight line for the range of parameters that are involved in every different problem. This approach can be achieved either by a tangent line to a certain point of the curve (this method leads to good results for the certain point but to large deviations for the adjacent part of the curve), or by adjusting a straight line to a specific part of the curve (this method provides sufficient results for the particular length and the equivalent stress limits). Given that tunnel problems demonstrate significant changes of the stress field around the excavation, the second approach is considered more appropriate. Therefore, the problem lies on which is the section of the curve that must be isolated in the analysis, in order to have the best possible convergence of the two different criteria.

Thus, the scope of the present study is firstly to compare the equivalent Mohr-Coulomb parameters derived from the implementation of different methods proposed in the literature. Moreover, it is attempted to quantify the differences in numerical analyses results for cases that the strength of a Hoek-Brown geomaterial is simulated directly via Hoek-Brown failure criterion or indirectly via the Mohr-Coulomb criterion and to evaluate the geotechnical conditions where such transformations are considered reliable. It is noted that the paper concerns the evaluation of the Hoek-Brown equivalent approach through Mohr-Coulomb criterion and not the comparison of the failure criteria.

LITERATURE REVIEW

The most known and used transformation method was introduced by Hoek et al. [1]. According to this method the adjustment of the linear equation to the Hoek-Brown curve is done in the area of minor principal stresses $\sigma_t<\sigma_3<\sigma_{3max}$, where σ_t is the tensile strength of the rock mass and σ_{3max} is determined through closed form solutions for both failure criteria Hoek-Brown [2] and Mohr-Coulomb [3] given that this value results in similar characteristic curves. This method does not consider the equivalent internal support pressure, which reduces the width of the plastic zone and differentiates the stress and displacement distribution.

Sofianos and Nomikos [4] proposed different methodologies for elastic - perfectly plastic and elastic - brittle plastic rock mass (with peak and residual strength parameters) using two different procedures; best fitting in the existing stress range method (BFe) and equating model responses method (EMR), which take into account the internal support pressure p_i. BFe method follows a best fitting procedure for the envelopes of the two failure criteria, in the stress range $p_{iN}<\sigma_3<p_{eN}$, where p_{iN} is the normalized support pressure (with respect to σ_{ci}) and p_{eN} the normalized critical stress σ_3 at the outer boundary of the plastic zone (with respect to σ_{ci}). EMR method is based on closed form solution and suggests that the two criteria should evaluate the same thickness of plastic zone and cross for a minor principal stress equal to the critical pressure. As for brittle rock masses, for the calculation of peak strength parameters before failure, for both methods BFe and EMR, the Mohr-Coulomb envelope is determined as a tangent line to the Hoek – Brown curve, at the maximum value p_e of the minor principal stress, on the boundary of the plastic zone. Afterwards, parameters of residual strength are calculated in the range $p_i<\sigma_3<p_e$.

Moreover, a methodology was recently proposed by Jimenez et al. [5] that uses non - dimensional formulae of Hoek-Brown failure criterion and proposes linearization in the stress range of σ_3 developed in the plastic zone around the tunnel, taking into account the internal pressure p_i. Initially the internal friction angle φ is estimated, according to the boundaries of plastic region. Afterwards, maintaining a constant slope of the straight line, a sensitivity analysis is performed to determine the value of equivalent cohesion c.

Another effort to approach Hoek-Brown with Mohr-Coulomb failure criterion has been presented by Yang & Yin [6] and concerns the calculation of strip footing bearing capacity.

For clarity in the following paragraphs the above methods will be mentioned as M1 for the Hoek et al. method [1], M2 for the Sofianos & Nomikos BFe method for the elastic-perfectly plastic rock masses [4], M3 for the Sofianos & Nomikos EMR method for the elastic-perfectly plastic rock masses [4], M4 for the Sofianos & Nomikos method for the brittle rock masses (maximum strength parameters values) and M5 for the Jimenez et al. method [5].

COMPARISON OF THE METHODS FOR THE EQUIVALENT MOHR-COULOMB PARAMETERS ESTIMATION

The first step of the present study is the comparison of the equivalent Mohr-Coulomb strength parameters which are calculated through the aforementioned approaches. The results are presented in terms of c_i/c_1 and φ_i/φ_1. It is noted that method M1 has been chosen as reference method since it is the most widely used in practice.

A set of results of all the methods for a small range of geotechnical parameters is presented in the paper of Jimenez et al. [5], based on which the following histograms (Figure 1) have been created in order to compare the values of the equivalent cohesion and friction angle. It is obvious that the variation of the proposed values is more intense for the equivalent cohesion than the equivalent friction angle. The ratios of the cohesion values range between 0.40 and 2.80 (the highest percentage lies between 0.40 and 1.20), whereas the friction angle ratios range from 0.55 to 1.25 (the biggest percentage is concentrated between 0.75 and 1.15).

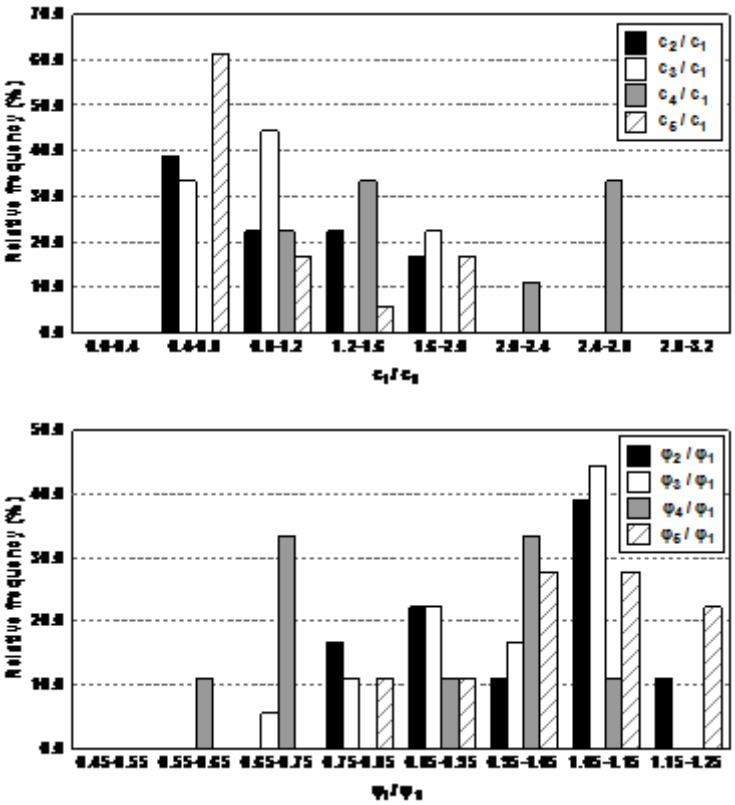

Figure 1: Variation of the proposed values for the rock mass equivalent Mohr-Coulomb parameters (Data from: Jimenez et al. [5])

In order to determine the geotechnical conditions where the methods converge or diverge, a parametric analysis in a wide spectrum of geotechnical properties has been carried out. In this analysis the equivalent Mohr-Coulomb parameters were calculated via methods M1, M2, M3 and M4 (peak strength), since the method M5 does not propose a closed form relationship. It is noted that methods M2, M3 and M4 lead to valid results only if plastic zone is developed around the tunnel section. Therefore, only these cases are examined in the parametric analysis. The parameters that were chosen reflect to a very wide range of in situ stresses, rock mass quality and support (Table 1).

TABLE 1: PARAMETERS OF ANALYSES

	Parameters	Symbol	Unit Range
Tunnel radius	R	m	5
Overburden height	H	m	100-500
GSI ([7], [8])			10-100
Intact rock compressive strength	σ_{ci}	MPa	5-150

Geomaterial constant		m_i	5-30
Disturbance factor	D		0.0-0.5
Internal pressure p_i normalised with	p_o	p_i/p_o	0.0-0.20
Total	100,800 combinations		

It becomes evident from the following histograms (Figure 2) that the ratio φi/φ1 (0.45-1.25) corresponds to a small scatter if compared with the scatter of the ratios ci/c1 (0.27-3.20). Regarding the friction angle for methods M2 and M3 about 70% of the ratios φi/φ1 lie between 0.85 and 1.15, whereas the scatter for method M4 is larger, leading in general to lower values of friction angle compared to method M1. On the contrary in the case of equivalent cohesion and the methods M2 and M3, only 30% of the ratio values are from 0.80 to 1.20, while the values for method M4 seem to have a uniform distribution with cohesion values in general higher than those of method M1.

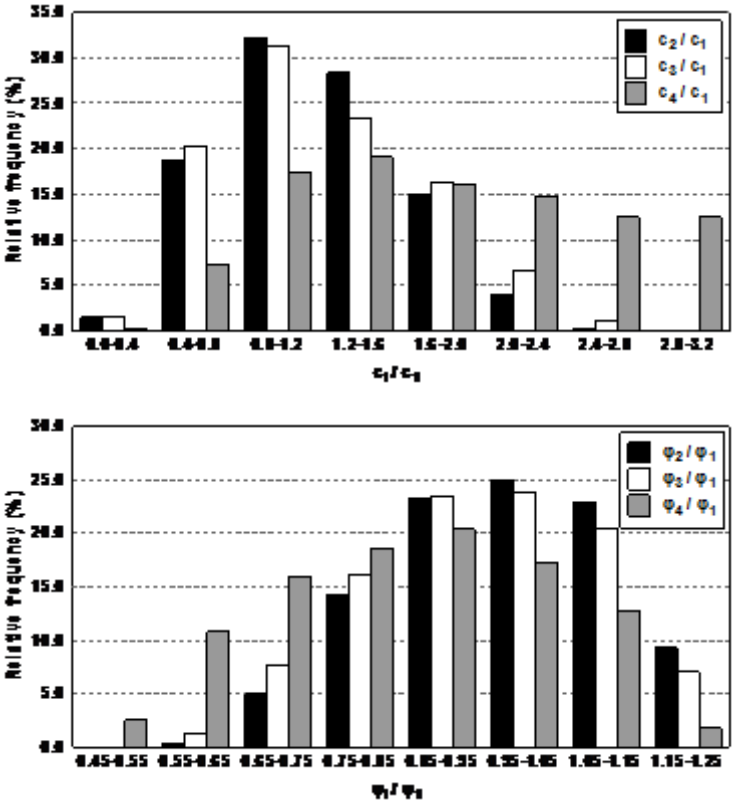

Figure 2: Variation of the proposed values for the Mohr-Coulomb parameters

Summarizing methods M2 and M3 lead to similar distributions of friction angle and cohesion ratios and in a large percentage of the analyses also converge with method M1. Method M4 leads to quite different results than the other methods, since the peak values are calculated based on the tangent line of the Hoek-Brown curve, at the minor principle stress that corresponds to the limit of the plastic zone, procedure that eventually leads to higher cohesion and lower friction angle values.

Thence, Figure 3 illustrates the distribution of the cohesion and friction angle ratios as a function of the factor σcm/po,m (σcm: global rock mass strength and po,m mean geostatic stress at the tunnel excavation level; σcm/po,m quantifies the geotechnical conditions) indicatively for pi/po=0 and pi/po=0.20. The diagrams for the case of pi/po=0.20 contain less points, since the implementation of the internal pressure as support, does not allow the development of plastic zone for several combinations of parameters, for which methods M2, M3 and M4 do not produce results.

The distribution of the ratio values shows in general that increase of the factor σcm/po,m, which means more favourable geotechnical conditions and decrease of the plastic zone extent corresponds to increase of the φi/φ1 values and decrease of ci/c1 values. For the case of pi/po=0.20 the ratios tend asymptotically to unity, whereas in the case of unsupported tunnel section (pi/po=0) the values of the

ratios may reach below unity for the cohesion and above unity for the friction angle. Additionally, the cases for which the methods seem to diverge are the unfavourable geotechnical conditions and the divergence becomes more intense as the internal pressure decreases.

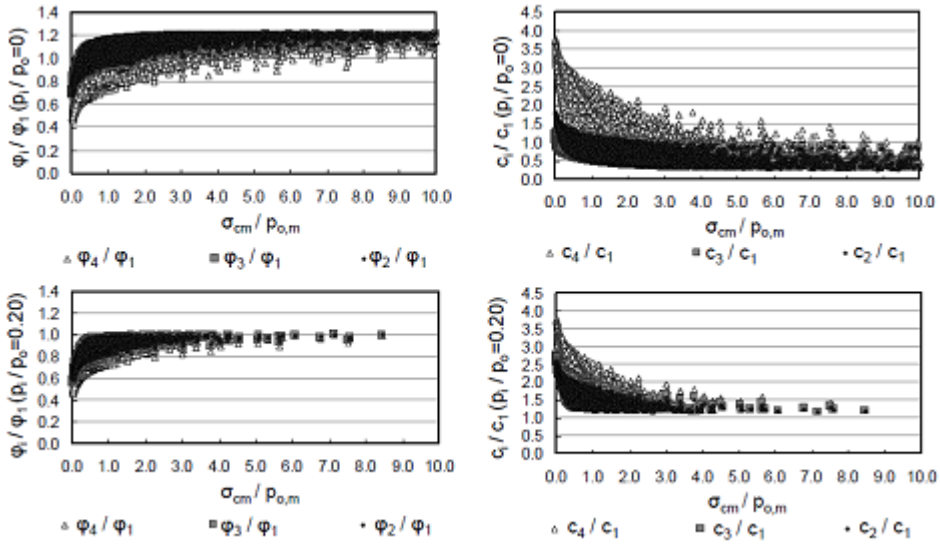

Figure 3: Distribution of the ratios φi/φ1 and ci/c1 as a function of the ratio σcm/po,m (pi/po=0.00, 0.20)

Taking into account the influence of the geotechnical conditions and the support pressure the magnitude that governs the convergence of the results is the plastic zone width and the range of the minor principal stress, in which the linearisation of the Hoek-Brown failure criterion is performed. As a result the convergence of all the methods compared is very satisfactory for higher values of σcm/po,m even for the case of pi/po=0.20, even though method M1 does not take the internal pressure pi into account.

COMPARISON OF NUMERICAL ANALYSES RESULTS WITH HOEK-BROWN AND MOHR-COULOMB FAILURE CITERIA

As a next step, a set of numerical analyses was carried out in order to quantify the deviation resulting from analysis of the same tunnelling problem using Hoek-Brown failure criterion and the equivalent Mohr-Coulomb approach. Initially the equivalent Mohr-Coulomb parameters were determined according to method M1 [1] and afterwards, in a specific range of geotechnical conditions, additional analyses were conducted using methods M2 and M3. The numerical analyses were carried out using finite elements code Phase2 (Rocscience Inc.), assuming a circular tunnel section with a radius R=5.0m. The results are presented and compared in terms of total displacements at the end of the excavation. The numerical analyses were performed for 14 parameter combinations shown in Table 1 that lead to development of plastic zone around the tunnel section and represent a wide range of geotechnical parameters. The dilatancy parameter was chosen equal to φ/4 for the Mohr-Coulomb criterion and mb/4 for the Hoek-Brown criterion. The temporary support was simulated with an equivalent support pressure. The range of the numerical analyses parameters is presented in Table 2.

TABLE 2: NUMERICAL ANALYSES PARAMETERS

Parameters	Symbol	Unit	Range
Tunnel radius	R	m	5
Overburden height	H	m	100-500
Geostatic stress ratio	k_o		0.7, 1.0, 1.3
GSI			10-70
Intact rock compressive strength	σ_{ci}	MPa	10-50
Geomaterial constant	m_i		5-20
Disturbance factor	D		0.30
Rock mass unit weight	γ	MN/m^3	0.025
Internal pressure p_i normalised with	p_o	p_i/p_o	0.0-0.20

In order to evaluate and compare the results, a factor uRatio is used, which is equal to the ratio of the average total displacement around the tunnel perimeter from the analysis with Hoek-Brown criterion to the average value from the corresponding numerical analysis with equivalent parameters of the Mohr-Coulomb failure criterion. Figure 4 shows the distribution of uratio as a function of the geotechnical conditions quantified through σcm/po,m (σcm: rock mass global strength and po,m: mean geostatic stress). It becomes evident that the divergence of the two approaches increases as the geotechnical conditions become less favourable (decrease of rock mass quality or/and increase of overburden height) and the support pressure decreases, leading to increase of the plastic zone around the tunnel section. The values of uratio are up to 1.20 for the case of medium to favourable geotechnical conditions and vary from 1.10 to 1.80 for low values of σcm/po,m.

The difference of the displacements is derived completely from the plastic deformations component, since both analyses are carried out with the same values for the rock mass deformation modulus. Therefore this difference depends on the dilatancy parameter as well as the development of the minor principal stress, and more specifically the relative "position" of the σ3,max value adopted in the transformation procedure in the σ3,max field of the numerical analysis. It should be noted that the uratio values do not depend only on σcm/po,m and the support pressure, but also on the individual values of H, ko, GSI, σci and mi and therefore a significant scatter of the points is observed especially in the area of the unfavourable geotechnical conditions.

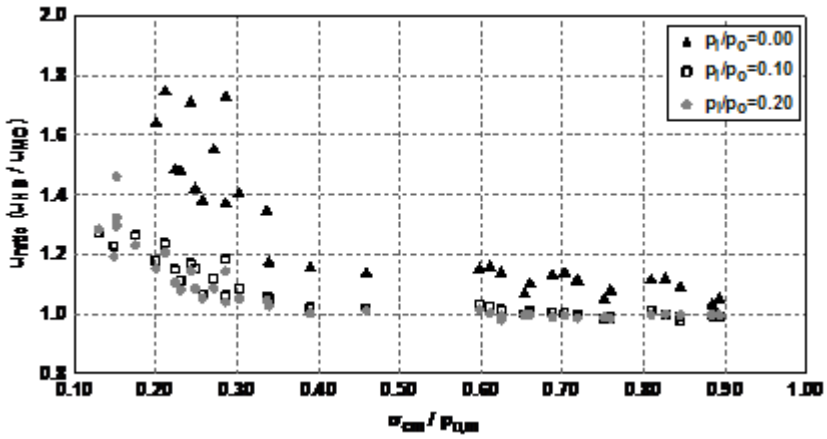

Figure 4: Variation of u_{ratio} (ratio of the mean value of displacements calculated using the Hoek-Brown criterion to the respective values calculated using the equivalent values of Mohr-Coulomb criterion) as a function of $\sigma_{cm}/p_{o,m}$ (Method M1)

In the area of the unfavourable geotechnical conditions (low values of σcm/po,m) where the divergence of the two approaches is significant, additional analyses were performed, in which the equivalent Mohr-Coulomb strength parameters were calculated based on methods M2 and M3 that consider the internal support pressure. The uratio values calculated based on these methods are in most cases lower than the corresponding ones of method M1 which means that the convergence of the Hoek-Brown and the equivalent Mohr-Coulomb approach is increased. Yet, the efficiency of methods M2 and M3 is diminished, since the internal pressure value that is an initial input, is usually an output of the numerical analyses and the empirical or analytical methods lead only to rough estimation of the internal pressure of a specific support category.

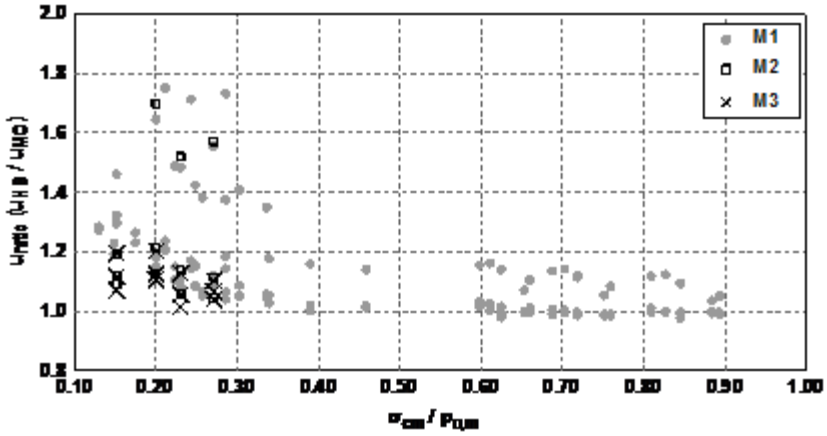

Figure 5: Variation of uratio as a function of the σcm/po,m ratio for all the internal pressure values (Methods M1, M2, M3)

Finally, in order to evaluate the sensitivity of uratio to the minor principal stress range that the Mohr-Coulomb envelope is fitted to the Hoek-Brown envelope, a sensitivity analysis was performed for three specific cases of geotechnical conditions. For each one of them the value of σ3,max (upper limit of adjustment) varied from 0.20σ3,max(ref) to 1.40σ3,max(ref) (σ3,max(ref) is the σ3,max value determined in method M1), the corresponding Mohr-Coulomb parameters were calculated and the uratio value was determined through numerical analyses. The sensitivity analysis was performed for three combinations of parameters for different geotechnical conditions (ko=1 and pi/po=0.00, 0.10). Figure 6 shows that in the case of σcm/po,m=0.69 the results change very slightly as the value of σ3,max increases whereas as the geotechnical conditions become less favourable the uratio value differs significantly (from 1.15 to 3.0 for the case of σcm/po,m=0.15) in the range of the assumed σ3,max.

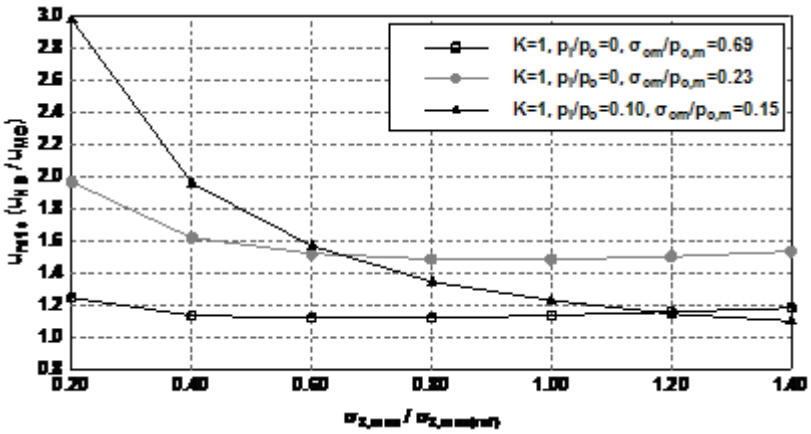

Figure 6: Variation of uratio as a function of the ratio σ3,max/σ3,max(ref)

A CASE STUDY

The difference resulting from the use of an equivalent Mohr-Coulomb failure envelope, compared to the use of the Hoek-Brown envelope, can be more clearly shown in the following application on a real tunnelling case. The case concerns Anthochori tunnel in Egnatia Highway (Northern Greece), which was excavated in a very weak siltstone mass, in the vicinity of a large scale tectonic thrust, under a maximum overburden equal to 90m. In this tunnel the motorway runs through a contact zone of the huge overthrust of a flysch unit (Pindos unit) over another flysch unit (Ionian unit). This thrust is a result of a big compression event during the alpine orogenesis with an ENE to WSW direction. Generally, the flysch is characterized by different alternations of siltstones and sandstones. Within the area of the tunnel, the flysch is of a more clayey nature and often exhibits a chaotic structure. Only small sections of the tunnel drive met sheared but not destructured parts of the initial geological stratigraphy, since the main thrust movement is associated with satellite shears within the thrusted body.

Thus, the overall rock mass is heavily sheared, the original structure is no longer recognizable, blockiness is lost and its behaviour can be assumed as isotropic. Thus, although the overburden is not very high the ratio σcm/po reaches very low values, corresponding to unfavourable geotechnical conditions. The geotechnical characteristics of the siltstone rock mass have been approached via back analyses ([9], [10]). The rock mass properties used in the analyses are summarized in the following table. Note that the analyses were performed with a geostatic stress ratio k0=0.7.

TABLE 3: GEOTECHNICAL PARAMETERS

Parameters	Symbol	Unit	Range
Overburden height	H	m	90
Geostatic stress ratio	k_o		0.7
GSI			13
Intact rock compressive strength	σ_{ci}	MPa	5
Geomaterial constant	m_i		5
Disturbance factor	D		0.00
Rock mass unit weight	γ	MN/m^3 0.024	
Hoek-Brown parameters	m_b		0.224
	s		0.0001
	a		0.570
Equivalent Mohr-Coulomb parameters	c	kPa	64
	φ	(^{0})	16

The tunnel had 2 branches with an equivalent diameter equal to 12m. The temporary support that was finally applied was quite heavy, consisting of:

· A thick shotcrete layer (30-35cm)
· A number of 8-12m long fully bonded bolts (Ultimate capacity 300-450kN)
· Heavy steel sets with an elephant foot
· Micropiles in the elephant foot foundation area
· Temporary and permanent invert closure
· Forepole umbrella

The tunnel excavation and support application procedure was simulated with a reasonable accuracy, based on construction data [11]. Excavation of the left branch top heading was simulated first, followed by excavation of the top heading of the right branch. Excavation of the bench was then simulated, initially for the left branch and then for the right branch. The FE model used for the analyses is illustrated in Figure 7 for the step before the excavation of the right branch bench. The rock mass confinement due to face advance was simulated through the methodology proposed by Chern et al. [12].

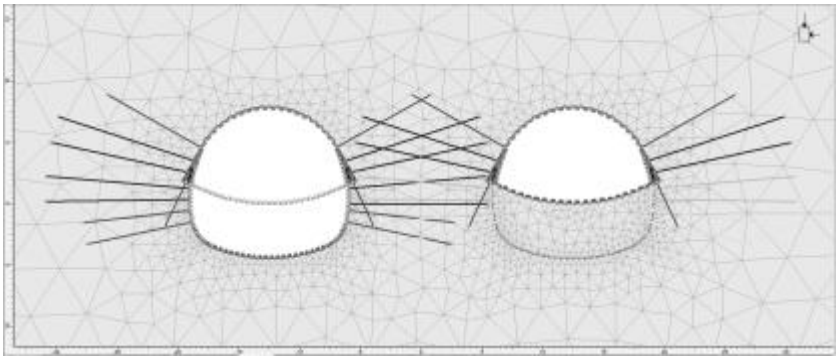

Figure 7: Indicative illustration of the finite element model for Anthochori Tunnel

Results of the analysis show that the use of the equivalent Mohr-Coulomb parameters, yields lower deformation values. The tunnel displacements are larger when the Hoek-Brown criterion is used and this is shown in the following figure. Figure 8 shows the distribution of the ratio of the total displacement (Umag) using Hoek-Brown criterion to the total displacement (Umag) using Mohr-Coulomb criterion, along the tunnel boundary for the right branch. The highest value of the ratio

(1.63) is observed on the right bench side (the side away from the twin branch), whereas the lowest value is observed locally on the left bench side (1.08).

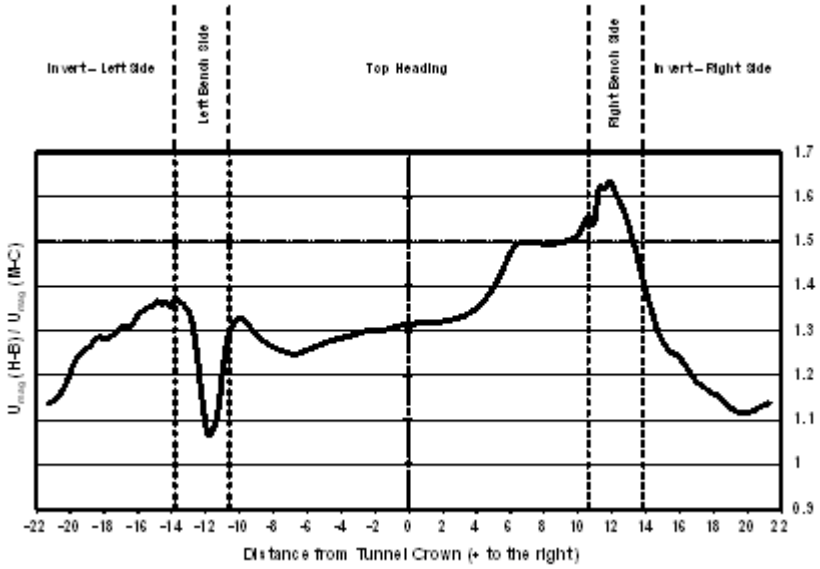

Figure 8: Distribution of total displacement ratio along the tunnel periphery for the right branch of Anthochori tunnel

Figure 9 shows the deformed tunnel profiles of the right branch, for both Hoek-Brown and Mohr-Coulomb criteria. Deformation is scaled 5 times to make it easier to observe the differences. The conclusions of Figure 8 can now be seen even more clearly, as the profiles are much closer on the top heading than on the bench walls. The maximum total displacement occurs on the left bench wall, which is expected, as this wall is in the disturbed part of the rock mass between the 2 branches.

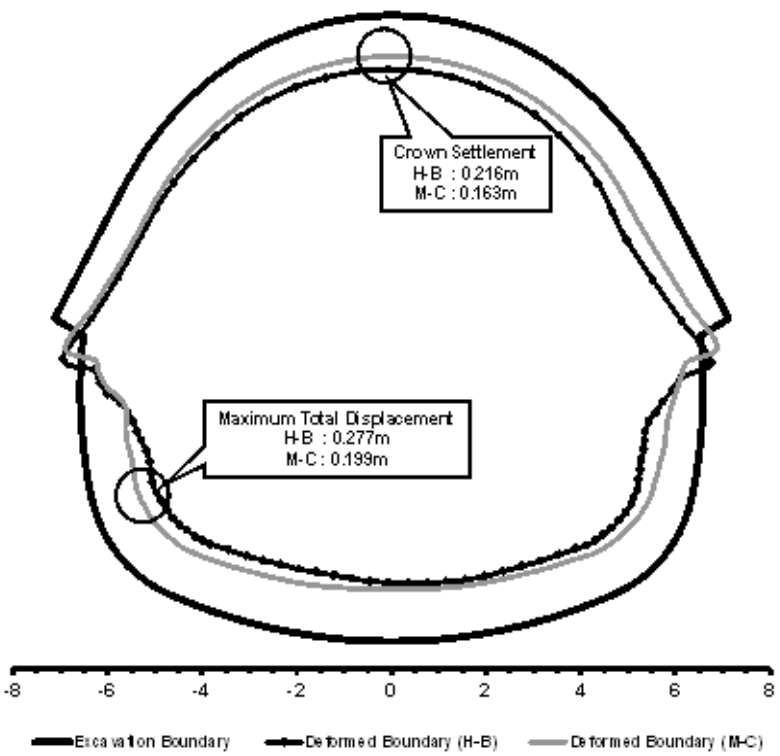

Figure 9: Deformed tunnel boundaries, compared to the excavation boundary, for both analyses, using generalised Hoek-Brown and equivalent Mohr-Coulomb parameters (Right tunnel branch - Deformation scaled 5 times)

The more unfavourable results that come from the use of the Hoek-Brown failure criterion are also visible on the extent of failure of the temporary support measures, especially the bolts. A more general and supervisory view of the difference between the results of both criteria is shown in Figure 10, where the plastic zone around the tunnels is illustrated for both cases. The extent of plasticization in the case of application of the Hoek-Brown criterion is significantly larger.

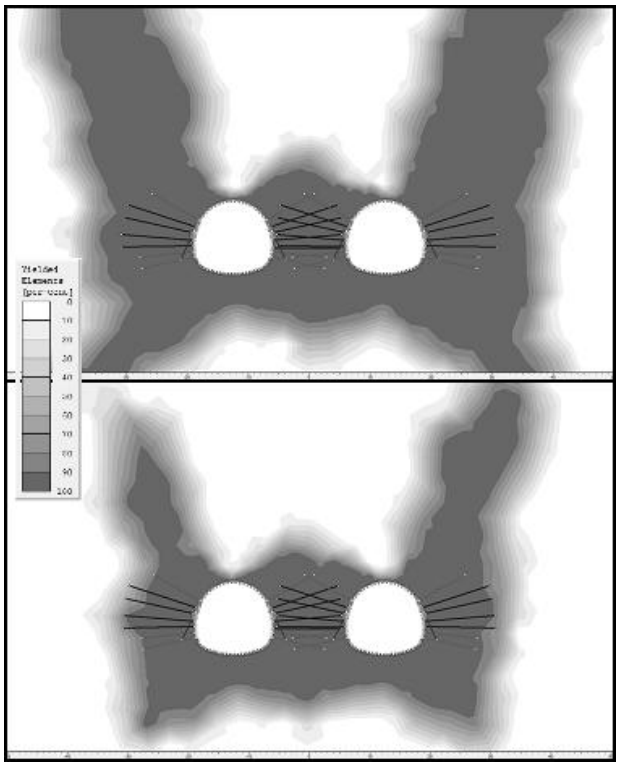

Figure 10: Plastic zones around the Anthochori twin tunnel, for both Hoek-Brown and Mohr-Coulomb criteria

The numerical analyses results, according to the admissions that have been presented, were compared with convergence measurements during construction. The selection of a representative monitoring station was based on the following criteria: a) sufficient data for the temporary support b) no significant signs of time dependent phenomena and c) similar distribution of displacements at the monitoring stations of the broader area to avoid influence of local geological conditions. The available monitoring construction data correspond to the top heading excavation of both branches. At the specific construction phase the maximum vertical displacement at the crown of the left branch was around 15cm, whereas the numerical analysis with Hoek-Brown failure criterion yielded around 13.5cm and the analysis with Mohr-Coulomb criterion around 8.5cm. The displacements from the numerical analyses that were compared to the monitored displacements correspond to the portion of the total displacement that is measured after the installation of the targets, since the preconvergence due to rock mass confinement has been subtracted.

CONCLUSIONS

The transformation of the Hoek-Brown failure criterion parameters to the equivalent of the Mohr-Coulomb failure criterion has been proved an interesting issue in tunnelling since Hoek-Brown parameters (GSI, σci, mi) are widely used for the description of rock masses and Mohr-Coulomb criterion is the most widely used in analytical methods, as well as the most common in numerical analyses software.

In the case of medium to favourable geotechnical conditions (σcm/po,m>0.40), all the methods for the calculation of the equivalent Mohr-Coulomb parameters that were examined result to similar values of cohesion and friction angle. Moreover, the numerical analyses showed that the total displacements calculated from the direct implementation of Hoek-Brown failure criterion are very close to the values from the analyses with the equivalent Mohr-Coulomb approach and the sensitivity analysis proved that the uratio values are not sensitive to the stress range of adjustment of the two criteria. On the contrary, in the case of unfavourable geotechnical conditions (σcm/po,m<0.40) the equivalent Mohr-Coulomb

parameters calculated from the different methods have a large scatter, because of the large width of the anticipated plastic region and the different assumptions they are based on. The numerical analyses showed that there may be a divergence between the two approaches, since the ratio of the average total displacements (uratio) varies from 1.10 to 1.80. This divergence increases almost exponentially as the values of σcm/po,m decrease. The exact value of uratio depends also on the values of the individual parameters (pi, ko, GSI, σci, mi). In this case the sensitivity analysis showed that the results of the equivalent Mohr-Coulomb approach are very sensitive to the stress range of adjustment, which means that in cases of more complex stress field than the one developed in the case of circular section, the divergence could be even larger.

Consequently, in the case of medium and favourable geotechnical conditions the approach of the equivalent Mohr-Coulomb strength parameters for a rock mass that has initially been described in terms of Hoek-Brown failure criterion is considered to be satisfactory. On the contrary, in the case of low σcm/po,m values the divergence of the two approaches is considerable and the direct implementation of Hoek-Brown criterion is proposed.

It is noted that the deviation of the two approaches (direct Hoek-Brown implementation or equivalent Mohr-Coulomb parameters) is sensitive to tunnel geometry (one or two branches, distance between branches, shape of tunnel section), the construction procedure (excavation phases and sequence) and the temporary support type. Therefore, the quantified conclusions derived from the numerical analyses of the present study for a single branch tunnel should not be considered as accurate when the tunnelling conditions are not simple. This is obvious in the analyses results regarding the case study, where the construction procedure and the geometrical particularities define the areas of stress and strain concentration and the areas where the largest divergence in the results of the compared approaches is observed.

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