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Message to ISSMGE Members from Prof. R. Terzariol, The Vice President for South America

Currently the ISSMGE Vice President for South America is Professor Roberto Terzariol. His term will continue until 2013. Roberto E. Terzariol graduated Civil Engineering of National University of Córdoba, Argentine, in 1981. During 1983-1985, he did graduate studies in geotechnical engineering and structures at the University of Rome "La Sapienza". In 2003 he majored university education at the National Technological University of Argentine. He started teaching in 1982 when he was appointed Professor of Geotechnical Engineering at the National University of Cordoba. He was promoted to the position of Academic Secretary for Research and Graduated Studies and then Head of Civil Construction Engineering Department both at the University of Córdoba, and became a member of the Academic Council and Executive Board at the same university. Currently he is Vice Dean of the School of Engineering at the same University. He is also Leading Professor at the National Technological University where he taught Foundation Engineering. He teaches courses of geotechnical engineering for Masters and Doctoral degree from several universities in Argentine. He is a very active member of various state and university scientific agencies, serving as the chairman of evaluation committee for research projects and grants.

Message to ISSMGE Members (continued)

Professor R. Terzariol

SOUTH AMERICAN REGION

It is necessary to explain from where we are, who we are, what our significance is in ISSMGE, what our presence is, and what will be the future challenges.

WHERE WE ARE :

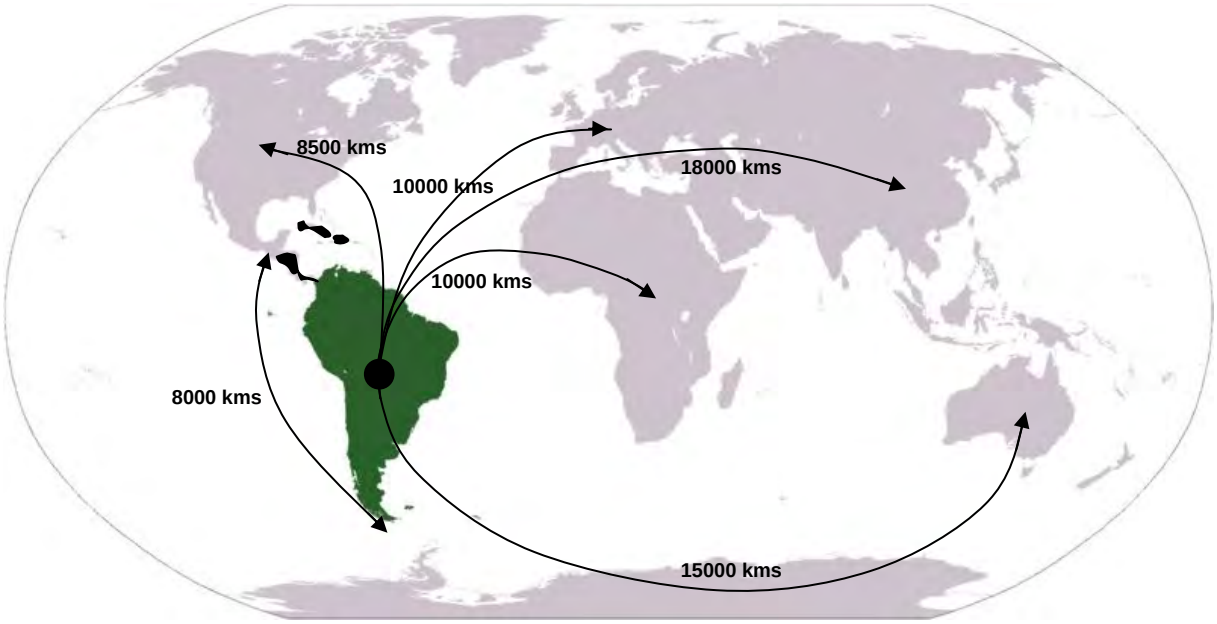

Figure 1 Location of SA and distance to other ISSMGE regions

We are located from the Central to the South part of the American Continent. The region includes countries from Central America, Caribbean and South America, both speaking Spanish or Portuguese.

The distance to the other regions ranges between 8.500 and 18.000 km, and the maximum distance from one end to the other of the region is 8.000 km.

This is the problem that threatens the easy communications and exchanges among the member societies. Our continent is the only that is subdivided into two regions.

WHO AND HOW MANY WE ARE:

The region have more than 1300 members in the ISSMGE, and they contribute with the 6% approx. of the ISSMGE`s subscriptions in 2009.

Members of the region, from Argentine, Brazil, Chile and Peru, work in more than ten TCs, like "Unsaturated soils", "Laboratory testing", "Underground construction" and others, with a significant involvement in each of them.

The chair of "Megacities" TC is located in the region (Prof. A. Negro of Brazil).

Message to ISSMGE Members (continued)

Professor R. Terzariol

Prof. Victor De Melo, President of the Brazilian Society and formerly VP for South America, was one of the most representative presidents of the ISSMGE.

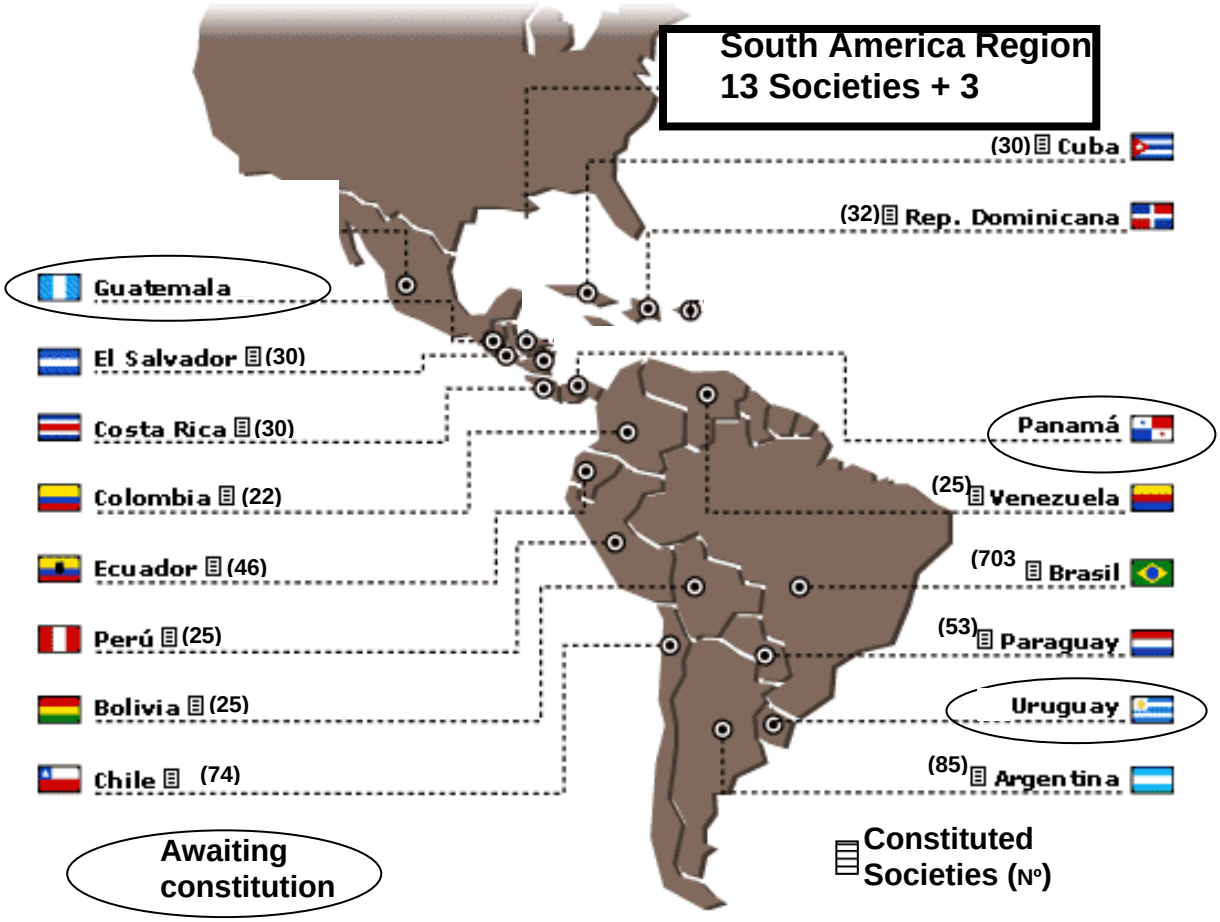

Figure 2 Societies in region and number of member of each one

The region is composed of 13 member Societies representing many countries. Some of them are very old as the Argentine Society which is 62 years old, and others are very recent as Dominican Society was founded just 3 years ago. There are now three countries that have interest in joining the ISSMGE. Guatemala has already completed the paperwork and from next year become a new member. Table 1 shows a list of the constituting Societies, and the presidents of each one.

Message to ISSMGE Members (continued)

Professor R. Terzariol

Table 1 List of Member Societies of SA Region

Society Denomination	President	Period
Sociedad Argentina de Ing. Geotecnica	P. Torres	2006-2011
Asociación Boliviana de Geotecnia	R. Barrientos	s/d
Asociacao Brasileira de M. dos Solos	J. Militiski - A. Negro	2011-2012
Sociedad Chilena de Geotecnia	R. Verdugo	2006-2011
Sociedad Colombiana de Geotecnia	A. Gonzalez G.	2010-2012
Asociación Costarricense de Geotecnia	M. Jimenez J.	2009-2011
Com. Tec. Nac. de M. de Suelos y Geot. Cuba	R. Armas N.	s/d
Soc. Dominicana de Geotecnia y Mat.	L. Carpio M.	2007-2012
Soc. Ecuat. de M. de Suelos y Rocas	A. Velazco F.	2009-2011
Sociedad Salvadoreña de Geotecnia	L. Pineda	2010-2012
Sociedad Paraguaya de Geotecnia	C. Lopez B.	2009-2011
Sociedad Peruana de Geotecnia	A. Carrillo - C. Torres	2010-2014
Sociedad Venezolana de Geotecnia	J. Amundaray - A. Benarroch	2010-2012

The number of members on their own is not a reliable indicator. In this respect, Figure 3 shows the members of each society per million of inhabitant of each country, and Figure 4 shows the media of members per million of habitants in each region.

Figure 3 Societies and members per millions of habitants

Message to ISSMGE Members (continued)

Professor R. Terzariol

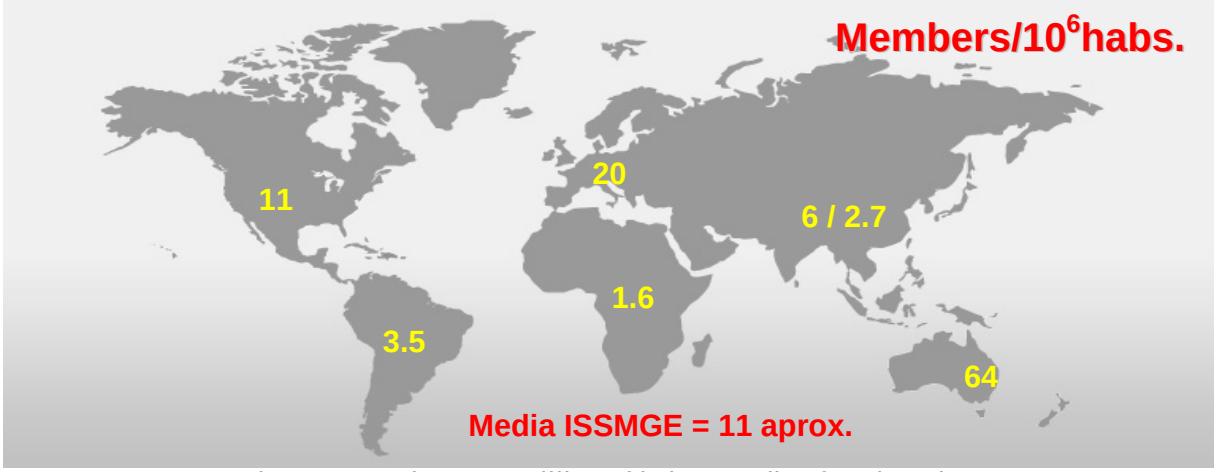

Figure 4 Members per million of habs., media of each region

The media in South America is 3.5 and in the whole ISSMGE is 11 approx. In one sense this index measures the degree of geotechnical engineering development of a particular region, but it needs to be linked to the maximum and minimum of that region to balance the asymmetries between different countries. Table 2 shows the regional averages and maximum and minimum within it.

Table 2 Media, maximum and minimum in each region

REGION	COUNT.	Members per million habitants				
		Media	Minimum		Maximum	
AUSTRALASIA	2	64	Australia	40	New Zealand	88
EUROPA	32	20	Russia	2.2	Iceland	77
NORTH AMERICA	3	11	Mexico	2.5	Canada	21
SOUTH AMERICA	13	3,5	Peru	0.9	Paraguay	9.5
ASIA (** Without Singapore and Hong Kong)	22	6,0 *	China	0.26	Singapore	42
		2.7 **			Japan	10.6
AFRICA	11	1,6	Nigeria	0.26	Tunisia	4.0

This table shows that Mexico and Russia in NA and Europe regions are similar to the South American countries, and Canada in NA is similar to the European countries. On the other hand, countries with low population, like Iceland, Singapore or Paraguay, have great influence on the media values. With all these considerations SA is located in an area between highly developed countries and the most delayed ones, and has a large asymmetry with its neighbor of NA.

CHALLENGES FOR THE NEXT 3 YEARS

Table 3 summarizes the situations, issues and challenges in SA Region.

Message to ISSMGE Members (continued)
Professor R. Terzariol

Table 3 Summary of situations in SA Region

Situation	Issues	To do
2011 Pan Am Conference (the only Regional Conf. with 2 regions)	Low participants from the non host region. Economic asymmetries	Work together. PanAm Committee Meeting in August 2010
Poor interaction between Societies of the region	Overlay of Conferences. Not optimized itinerant seminars and courses	Build up a calendar of events. Improve personal contact. Regional events & TC´s. (with SAIG)
Lack of communication between authorities	Misunderstanding and wariness among societies	Meetings of Presidents of South American Societies
No official web page	Poor interaction between VP and member societies	Web page, with information, calendar of events, reports of TC members, etc.
Unbalanced participation in TC´s Committees	Some Societies are not aware of these activities	Promote societies. Publish reports of TC´s members
Countries not members ISSMGE	Many Geotechnical Engineers not integrated	Promote the creation of local societies (SGG-SUG-CPG)

REGIONAL ACTIVITIES

During 2010 and the first months of 2011, the main following activities were undertaken in the region:

- 4 National Conferences (Argentine, Brazil, Colombia, Venezuela)
- 2 International Conferences (Brazil, Chile)
- 8 International Seminars and Courses (Argentine, Brazil, Chile, Colombia, Ecuador, Perú, Sto. Domingo)
- More than 20 National Seminars and Courses (Argentine, Brazil, Chile, Colombia, Ecuador, Sto. Domingo)
- 2 Chile`s Earthquake Report (SoChiGeo-GREE / CICCba-SAIG Argentine)
- 1 International Publication (Soils & Rocks in English and Portugues) + 8 Local Publications (hard copy and electr. in Spanish) (Argentine, Brazil, Colombia, Costa Rica, Ecuador, Perú, Venezuela)
- Annual Meeting of the Panamerican Committee (Brazil)
- First Meeting of Societies from South America (Brazil)

All this shows the strength and the maturity of the geotechnical engineering in the region and the efforts of each member society.

To be especially mentioned is the meeting of SA`s societies to be held in August of 2010. It is the first time that all the representatives of the member societies can discuss issues, and find the solutions together. The meeting of the Pan Am Committee will be held at the same time and place as the SA meeting.

Message to ISSMGE Members (continued)
Professor R. Terzariol

ACTIVITY OF VICE PRESIDENT

MEETING OF THE PRESIDENTS OF NATIONAL SOCIETIES OF SOUTH AMERICAN REGION

Figure 5 Participants of the Societies Meeting, Brazil, August, 18 - 2010

In August 18 of 2010 in Gramado (RS) in the South of Brazil, 12 countries over 13 that make up our region participated in the meeting of representatives from the geotechnical member societies. This meeting began as an idea of the former Vice President, Jorge Bonifazzi (Argentine), during the International Conference in Alexandria, Egypt, and was conducted during the present term.

Together with the ISSMGE Vice President Roberto Terzariol (Argentine), the following representatives participated; Pablo Torres (Argentine), Jaime Bustillo (Bolivia), Jarbas Militiski & Arsenio Negro (Brazil), Luis Valenzuela (Chile), Alvaro Gonzalez (Colombia), Marlon Jiménez (Costa Rica), Rolando Armas Novoa (Cuba), Luis Marin (Ecuador), Carmen Rico (El Salvador), Cesar Lopez Bossio (Paraguay), Alvaro Carrillo Gil (Perú), and Jose Amundaray (Venezuela). Unfortunately, Luis Carpio (Dominican Republic) had an accident which made it impossible for him to travel to Brazil for this meeting. Additionally the presence of Alvaro Gutierrez (Uruguay) was included as an observer from a future member society.

The meeting was held in Serrano Hotel that previously hosted the XV Brazilian National Conference on Geotechnical Engineering. The Brazilian Society made a very big effort in order to support all the participants during their stay in Gramado. Prof. Roberto Terzariol opened the meeting by welcoming all delegates. He acknowledged the COBRAMSEG2010 Organizing Committee, and Prof. Jarbas Milititsky, President of ABMS, host of this meeting.

Each representative talked about the history, number of members, local issues and events to be held during 2010-2011 in each country. The performance of each society was different, but in general all are preparing national conferences, seminars and courses with local and international characters.

The journals and bulletins of each society are crystallized in a manner to establish itself as a means of communicating news and research articles. As a result in all the regional societies, with few exceptions, activities are developing which, through the participation of its members, shows the strength of geotechnics in the different countries. After all the meeting agenda was prepared.

Message to ISSMGE Members (continued)
Professor R. Terzariol

MEETING OF THE PANAMERICAN COMMITEE

On August, 20, 2010, also in Gramado (RS) of Brazil, during the XV Brazilian Conference of Geotechnical Engineering, Prof. Jean Louis Briaud, President of the ISSMGE, Prof. Pedro Seco e Pinto, the immediate past President of the ISSMGE, the Vice President for South America, 12 representatives of South American Societies, 3 representatives of Mexico (Walter Paniagua), United States (Robert Holz), and Canada (Giovanni Cascante), and the Vice President from North America, Gabriel Auvinet, participated in Pan American Committee.

Figure 6 Members of the Pan American Committee Meeting
with Prof. J. L. Braiud and P. Seco e Pinto

Prof. Roberto Terzariol opened the meeting by welcoming all delegates. He acknowledged the presence of Dr. Jean-Louis Briaud, Prof. Seco e Pinto, and Prof. Jarbas Milititsky, President of ABMS, who was the host of this meeting. An informal introduction of all delegates was made, emphasizing the fact that most countries of the continent were represented.

Dr. Gabriel Auvinet presented a brief report concerning the North American Region, which includes three countries. Highlights in conferences, seminars and other events were mentioned. Prof. Roberto Terzariol briefly discussed the importance of SA Societies within the ISSMGE, with 13 active countries and 2 more in formation (Uruguay and Guatemala).

After that the participants prepared the agenda; particularly the organization of the next Pan American Conference and the By Laws of the Committee.

ACTIVITIES IN EACH NATIONAL SOCIETY

For the better understanding, the activity in each country is described separately.

Message to ISSMGE Members (continued)
Professor R. Terzariol

ARGENTINE SOCIETY FOR GEOTECHNICAL ENGINEERING - SOCIEDAD ARGENTINA DE INGENIERIA GEOTECNICA (SAIG):

The Argentine Society is the oldest in the region, and has more than 80 members. There were 5 main events in Argentine during 2010. It president is Pablo Torres whose term will be completed this year.

The Argentine Society of Geotechnical Engineering (SAIG), in partnership with Argentine Society of Structural Engineers (AIE), organized a seminar on "Pile Design for Building and Infrastructure" on August, 2, 2010, at the Borges Cultural Center in Buenos Aires. There were 3 lectures, the first given by Prof. Eduardo Nunez, on "Design of drilled piles, driven piles and piled raft foundations", the second about "Control of deep foundation construction" given by Juan Fernandez Vincent and the third by Tomas Van Cauwelaert on "Design and Construction of CFA Piles". More than 200 people participate in these events.

On August 25 to 27, 2010, the "International Symposium on Landslides and Associated Risks" took place in the Auditorium of Civil Engineers Council of Cordoba. This event was organized jointly by SAIG and the Argentine Association for Engineering Geology and Environment (ASAGAIA). This symposium had 3 main lectures given by Prof. Pedro Seco e Pinto, Dr. Raul Sarra Pistone (Portugal) and Prof. Roberto Terzariol (Argentine). The event received more than 70 participants, 15 paper presentations, and Prof. Pablo Torres President of SAIG and Jorge Bejerman Secretary of ASAGAIA attended. All the participants joined a technical tour to the mountain road named "El Cuadrado" under construction, where they saw problems associated with landslides and new construction techniques applied in that project.

Figure 7 Prof. P. Seco e Pinto, Dr. Sarra Pistone, Eng. Pablo Torres, Prof. Terzariol, and Geol Jorge Bejerman. Dr. Zeballos during Seminar on Landslides

During October 6 to 9 of 2010, in Auditorium A. Bustillo (Convention and Expositions Center) of Mendoza, SAIG together with the National and Technological Universities organized the "XX National Conference on Soil Mechanics and Geotechnical Engineering – CAMSIG2010". This Conference received more than 270 participants, 140 scientific and technical papers, and 5 international lectures given by Carlos Santamarina (Georgia Tech – USA), Carlos Costa (Univ. of San Luis, Argentine), Luis Ortuño (Polytechnic University of Madrid, Spain), Pedro Ortigosa (Chile) and Oscar Varde (Argentine). After the meeting the participants attended technical visits to Potrerillos Dam. This is a concrete-face rock fill dam, 140 meters high, placed in a very high seismic zone on the Andes Mountains near the international road that link Argentine and Chile.

Message to ISSMGE Members (continued)

Professor R. Terzariol

Figure 8 Professors Fabri, Rocca, Zeballos, Terzariol, Santamarina and Redolfi

The "International Course on Advanced Numerical Geomechanics – PLAXIS" was held in Buenos Aires between October 25 to 29, 2010 with more than 40 participants from Argentine, Bolivia, Brazil, Chile, Colombia, Peru and Venezuela. There were 2 main lectures given by Dr. Esteban Hormazabal (SRK Consulting) and Dr. Raul Bertero (Buenos Aires University). The teachers were Cesar Sagaseta Millán (University of Cantabria, Spain), Juan Pestana Nacimento (University of California, Berkeley), Alejo Sfrisso, Juan Fernadez Vincent and Jorge Laiún (University of Buenos Aires), and Dennis Waterman & Alfonso Alvarez Manilla (PLAXIS VB).

Finally on November 30 in the Borges Cultural Center of Buenos Aires, the "Seminar on Excavations, Braced Cuts, and Underpinning" was organized jointly by SAIG and the Association of Structural Engineers. This seminar hosted more than 450 attendants including professionals and students. In the event various recognized professionals shared their experiences, recommendations and possible solutions to a variety of risks existing in excavation, underpinning and building of basements. The first lecture was given by Prof. Alejo Sfriso, SAIG Secretary, who spoke about the problem of "Excavations and Support Methods".

During 2011, the Argentine Society for Geotechnical Engineering (SAIG) plans the organization, among other events, of the "Symposium on Geotechnical Problems in the Design and Construction of Mountain Roads" in Tucumán, together with the Association for Engineering Geology (ASAGAIA). In Córdoba, SAIG together with the locals Councils of Engineers and Architects will organize two courses regarding geotechnical implications in construction management.

Additionally the Argentine Society continues, as it did in 2010, participating in developing the Argentine standards in geotechnical tests (IRAM) and for the civil construction (CIRSOC).

Also during April 2011, SAIG elects its news authorities for the next 2 years.

Message to ISSMGE Members (continued)
Professor R. Terzariol

BRAZILIAN ASSOCIATION FOR SOIL MECHANICS AND GEOTECHNICAL ENGINEERING - ASOCIACAO BRASILERA DE MECANICA DOS SOLOS E ENGENHARIA GEOTECNICA (ABMS)

The Brazilian Society is one of the most active societies in the region with more than 700 members, divided in Regional Chapters for different states in the country, and has a continuous participation in the ISSMGE´s Technical Committees and Conferences. A distinguished member of ABMS, Prof. V. De Melo, was the president of ISSMGE between 1981 and 1985.

From 12 to 14 April, 2010, the Conference "Ecos da Sardenha" on urban solid waste treatment and deposition took place in Sao Paulo in association with the Faculty of Public Health of University of Sao Paulo.

In Sao Paulo on April 16, the Engineering Institute held the tribute to Professor Milton Vargas, an emeritus member of ABMS and its past president. Authorities of ABMS presented in that occasion a document about Natural Disasters in Brazil.

During April 21-23, 2010, in Foz do Iguacu (PR), the Regional Conference "GEOSUL2010" was organized by the Regional Chapter of Paraná/Santa Catarina with more than 350 attendants and featured national lecturers.

Between March and June of 2010, the Chapter Center and West of ABMS together with the Federal Net of Technical and Professional Education held a course for bore hole operators, and qualified 29 of them. The same chapter organized in Guarujá (SP) the "Symposium on Soft Soils" on May 21-.23, 2010.

From May 23 to 27, 2010, ABMS organized the 9th International Conference on Geosynthetics. This conference took place in Guarujá and was organized together with the International Geosynthetics Society (IGS). This conference had 800 participants and more than 75 booths of exhibition. This conference had 7 keynotes and special lectures. Lecturers were Professors S. Sandroni (Brazil), J. Giroud (USA), R. Holtz (USA), H. Brandl (Austria), D. Cazzuffi (Italy), S. Perkins (USA) and A. Fourie (Australia). Also Dr. Jorge Zornberg, President of IGS, and members of ISSMGE attended this occasion.

Figure 9 Professor Jorge Zornberg, IGS President and ISSMGE member

In Cuiabá, from October 30, 2010, Professor Roberto Quental Coutinho gave the 6th Conference on "Management of Urban Landslides Risks, together with the Regional Chapters of ABMS from Cuiabá, Salvador, Minas Gerais, Sao Paulo, Paraná-Santa Catarina, Rio Grande do Sul, Rio do Janeiro and Nordeste, with more than 600 of participants from all the locations.

Message to ISSMGE Members (continued)

Professor R. Terzariol

In Gramado (RS), from October 17 to 22, 2010, the XV Brazilian Conference on Soil Mechanics and Geotechnical Engineering – COBRAMSEG2010 was held. During COBRAMSEG2010, the Luso-Brazilian Symposium and the Geojovem took place as well The former was organized jointly with the Portuguese Geotechnical Society and the latter was directed for young geotechnical engineers and students with a participation of more than 450 people. COBRAMSEG2010 had an attendance of more than 1000 specialists from many parts of the country and the world. Jean Louis Briaud, ISSMGE President and Prof. Pedro Seco e Pinto, the immediate past president, attended the Conference together with Roberto Terzariol and Gabriel Auvinet, ISSMGE Vice Presidents for South and North America, respectively.

Figure 10 Attendants, Chairpersons, Professors J.L. Briaud and G. Auvinet during COBRAMSEG 2010

The event held the "Victor de Melo Lecture", that was delivered by Professor Harry Poulos of Australia after the introduction of Professor John Burland (UK). During COBRAMSEG2010, ABMS elected new authorities (Prof. A. Negro was elected as president) and meetings were organized between the executive secretary of the Deep Foundation Institute and the Brazilian Association of Foundation Engineering. A special tribute to all the past presidents of ABMS was performed.

The Nordeste Chapter of ABMS organized in Recife (PE) during November, 10-11 of 2010, the 1st North East Symposium on Geotechnics with a participation of more than 230 attendants.

During the month of January of 2011, ABMS presented the "Soils and Rocks Prize", in a ceremony which had the participation of Dr. Laura Caldeira, President of the Portuguese Geotechnical Society (SPG), Prof. Arsenio Negro, President of ABMS, Prof. Henio Palmeira from International Geosynthetics Society (IGS), and Dr. Heloisa Frasca, a past president of the Brazilian Association for Engineering Geology and Environment ABGEE.

Message to ISSMGE Members (continued)

Professor R. Terzariol

Figure 11 Professors A. Negro, H, Palmeira, F. Masad, and L. Caldeira

In February, the second course for bore hole operators started and qualified 40 technicians, in association with the National Secretary of Education which supervises qualifying courses. For the rest of the year ABMS had scheduled the following events:

Date	EVENT	Place	Kind
07 to 09/04/2011	II Geocentro / VI INFOGEO / Solos Tropicais (Tropical Soils)	Brasília	Conference
02 to 03/06/2011	GEORS 2011	Passo Fundo	Seminar
29 to 31/08/2011	N-SAT2011 - Simpósio Brasileiro de Solos Não Saturados (Unsatured soils)	Pirenópolis	Symposium
21 to 24/11/2011	REGEO 2011 - VII Congresso Brasileiro de Geotecnia Ambiental	Belo Horizonte	Conference
03 to 04/11/2011	GeoNordeste	Natal, RN	Seminar
21 to 24/11/2011	Geossintéticos 2011 - VI Simpósio Brasileiro de Geossintéticos	Belo Horizonte	Symposium

CHILEAN GEOTECHNICAL SOCIETY - SOCIEDAD CHILENA DE INGENIERIA GEOTECNICA (SOCHIGE)

The Chilean Society is an important society in the region especially on issues of geotechnical earthquake engineering and mining geotechnics, with more than 70 members. Professor Ramón Verdugo is the president of SOCHIGE and also a member of the ISSMGE Technical Committee 203 on Earthquake Geotechnical Engineering.

During January, 10-13, 2010, the city of Santiago de Chile held the 5th International Conference on Earthquake Geotechnical Engineering, presided by Professor Ramón Verdugo and organized between the SOCHIGE and the National University of Chile, sponsored by the TC203 of ISSMGE. About 500 participants came to this occasion from all over the world and exhibited deep interests in this field of study.

Message to ISSMGE Members (continued)

Professor R. Terzariol

Prof. Jean Louis Briaud, the President of the ISSMGE, Prof. Pedro Seco e Pinto, the past immediate president, and Prof. Roberto Terzariol, currently ISSMGE Vice President for South America, attended this conference. Additionally the following people were attended this conference; Professors Kiriazis Pitilakis (Greece) president of the 4th ICEGE, Kenji Ishihara (Japan) ISSMGE past president, I.M. Idriss (USA), G. Gazetas (Greece), E. Faccioli (Italy), W.D. Liam Finn (Chairman of Steering Committee), Luis Valenzuela (Chile), Ikuo Towhata (Japan), T. Kokusho (Japan) and Atila Ansal (Turkey), co-chairmen of the advisory committee.

Figure 12 Professors Jean Louis Briaud and Roberto Terzariol, ISSMGE President and Vice President for SA, respectively, starting the conference

During the conference Professor Ricardo Dobry (Rensselaer Polytechnic Institute) was honored with the Ishihara Lecture, who gave an interesting lecture about the "in situ" methods for liquefaction prediction", concerning specially the traditional procedures.

There were:

- 10 special sessions led by F. Leyton, J. Bray, C. Ledezma, D. Frost, S. Yasuda, R. Verdugo, B. Bradley, M. Cubrinovski and R. Saragoni.
- 7 state-of-the-art sessions, coordinated by Ikuo Towhata, An-Bin Huang, F. Chavez, R. Boulanger, S. Kramer, P. Seco e Pinto and G. Gazetas.
- 12 theme lectures given by J. Bray, P. Ortigosa, L. Valenzuela, K. Pilitakis, R. Villagra, M. Cubrinovski, R. Verdugo, A. Elgamal, E. Ovando Shelley, J. Kuwano, S. Yasuda and K. Stokoe.
- 3 workshops led by Professors Jorge Troncoso, Takaji Kokusho and Atila Ansal, respectively.

A post-conference technical visit was a guided trip to the areas of Concepción and Arauco in the south region of Chile, where major geotechnical damages were observed after the earthquake of February, 27, 2010.

Message to ISSMGE Members (continued)
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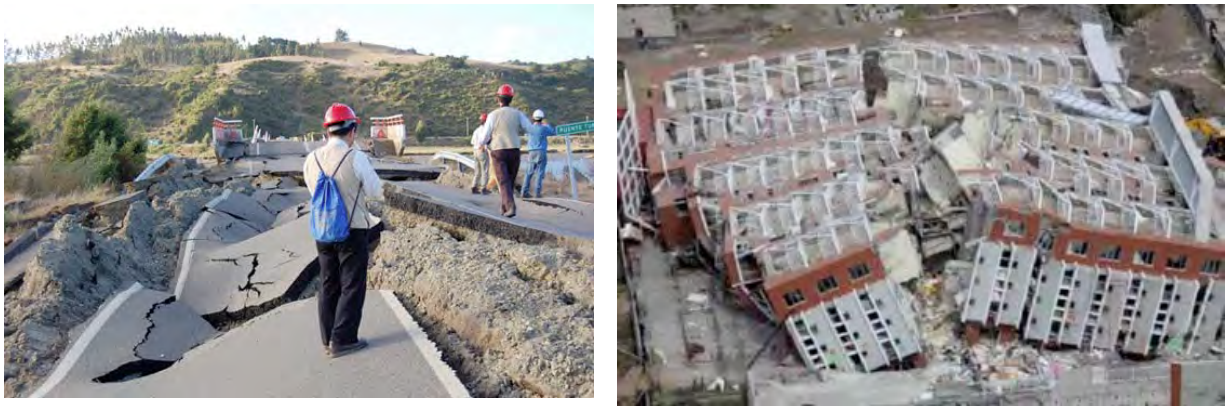

Figure 13 Views of damages during the post-conference technical visit

During the year of 2011, SOCHIGE has intention to organize the Chilean National Conference on Geotechnical Engineering, and for 2012 there is an agreement with the chair of the TC305 – Megacities to organize in Santiago and Valparaiso the next International Conference about the matter.

COLOMBIAN GEOTECHNICAL SOCIETY - SOCIEDAD COLOMBIANA DE GEOTECNIA (SCG)

In this year the SCG celebrates the 40th year since its establishment. It is a strong society that includes the Societies for Engineering Geology and Rock Mechanics. Prof. Alvaro Gonzalez is the president of the SCG and also ISRM Vice President for South America.

During September of 2010, in Manizales the SCG associated with National University of Colombia organized the XIII Colombian Geotechnical Conference and the VII Colombian Seminar on Geotechnics; the latter being on mining geology.

Figure 14 Lecturers: Celestino, Perri, Salcedo, Wesley, Montero and Samaniego

Message to ISSMGE Members (continued)
Professor R. Terzariol

These events occurred simultaneously, having the presentation of 77 papers and 12 main lectures. The lectures were offered by Laurence Wesley (New Zealand), Daniel Salcedo (Venezuela), Tarsicio Celestino (Brazil), Antonio Samaniego (Peru), Gianfranco Perri (Venezuela) and Jaime Suárez, Juan Montero and Alvaro Correa from Colombia.

There were in total 301 attendants who could additionally make a post-conference technical visit in the vicinity of Manizales.

On November 18-19, 2010, SCG organized with INGEOMINAS, the "International Seminar-Course on Petrologic and Climates Aspects in the Behavior of Aggregates". The lecturers were Antonio Gomes Correia (Portugal-ISSMGE), Chris Rogers (Canada), Dar Hao Chen (USA) and Juan Montero, Sandra Campagnoli, Octavio Coronado and Diego Sánchez de Guzmán from Colombia. The Seminar had 77 participants from all over the country.

Bogotá held the "V Academic Seminar on Rock Engineering - Theoretical and Applied Rock Mechanics for Tunnels and Slopes", in November, 18-20, 2010. The event was organized together with the Research Group on Rock Engineering from the National University of Colombia, with the support of the SCG´s Rock Engineering Commission.

The next activities includes the organization of the "VIII Colombian Geotechnical Seminar and the International Geotechnical Seminar on Urban Geotechnics" in September 2011, and the participation in "GeoHuman International Conference June 9-11, 2011" organized by Professor Dar Hao Chen, in Changsha, China. For these events, Professors Juan Montero, Mario Camilo Torres and José Vicente Amórtegui in the name of SCG sent papers to be presented, and will represent SCG.

COSTA RICA GEOTECHNICAL ASSOCIATION – ASOCIACION COSTARRICENSE DE GEOTECNIA (ACG)

The ACG is 30 years old and is very active in the region. Professor Marlon Jimenez is the president of ACG is pro-active and recognized in Central América and Caribbean geotechnical community.

On April, 8, 2010, in the University Auditorium, Professors Luis González de Vallejo and Mercedes Ferrer, from Spain, gave a lecture on "Geotechnical Risks and Impact in Civil Facilities and Environment", with 83 attendants.

Figure 15 Professors Gonzales de Vallejo, Marlon Jimenez and Mercedes Ferrer

In October, 2010, the ACG held the "Strategic Workshop of ACG´s Technical Committees." This event treated the following issues:

- Geotechnical Engineering Teaching
- Rock Mechanics
- Foundations Standards
- Landslides

Message to ISSMGE Members (continued)
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Figure 16 Participants in the Strategical Workshop

The 2nd Geotechnical Colloquium about "Geotechnical Characterization of Material from a Cut" was given by Eng. Alejandra Morice during the annual Assembly of ACG in November, 2010.

Figure 17 ACG Annual Assembly and Eng. Morice's Lecture

On March 16-19, 2011, Professor Nick Barton (Norway) gave the Regional Geotechnical Course "Latest techniques and experiences in the design and stabilization of excavations in rock for civil works in complex geology", organized by the ACG in the Hotel San José Palace. This event was successful with a participation of more than 160 people (40 from Central America, and 15 from the rest of Latin America).

Message to ISSMGE Members (continued)
Professor R. Terzariol

Figure 18 Professor Nick Barton during the Regional Course

Also the ACG in collaboration with the National Emergency Committee, the Justice Secretary, the President of the Republics and the CFIA, all of Costa Rica, makes inspections and assistance in many civil facilities and projects, like the road San José-Caldera and a slope in the Women Penitentiary "Buen Pastor" of San José.

The Society is interested in active participation in international conferences like 5 ICGE held in Chile last January, and in the next Pan American Conference to be held in Toronto, Canada.

CUBAN NATIONAL COMMITTEE OF SOIL MECHANICS AND GEOTECHNICS - COMITÉ TECNICO NACIONAL DE MECANICA DE SUELOS Y GEOTECNIA DE CUBA (CTNMSG)

The Cuban Society is under the direction of Professor Rolando Armas Novoa from the National University of Cuba "José Antonio Echevarria" and is a part of the National Union of Architects and Engineers of Cuba (UNAICC).

The CTNMSG in association with the University of Las Villas, organized the "9º Symposium on Structures, Geotechnics and Materials" during November 23-26, 2010, in Santa Clara, Cuba. In addition to Cuban professionals, colleagues from Colombia, Mexico, Spain and Brazil participated in this symposium.

The CTNMSG presented 15 papers, and 5 of which were selected to be sent to the next Pan American Conference in Toronto, Canada.

Professor Rolando Armas Novoa gave the main lecture entitled "Causes of catastrophic failure in earth dams: Priority and Sequences".

In the same symposium the CTNMSG had its assembly where Professor R. Armas Novoa gave information to all members about the meetings held in Gramado in August of 2010.

Message to ISSMGE Members (continued)
Professor R. Terzariol

Figure 19 Professors Rolando Armas Novoa (Cuba) and Marlon Jimenez (Costa Rica) during the meeting in Gramado, Brazil

DOMINICAN SOCIETY FOR GEOTECHNICS, FOUNDATIONS AND MATERIALS - SOCIEDAD DOMINICANA DE GEOTECNIA, FUNDACIONES Y MATERIALES (SODGYM)

The SODGYM is presided by Professor Luis Carpio and is one of the newest societies in the region; being only 3 years old. Nevertheless Professor Carpio has imposed a very particular dynamism to the society.

This society is working in the elaboration of the Handbook titled "Behavior of Citizens under Earthquakes", and the translation of the "Soils Laboratory Handbook" from Professor Braja M. Das (USA). They expect to publish these works in 2011.

In April, 2010, SODGYM organized together the ISSMGE a series of technical tours, seminars and courses.

On April, 11, 2010, Professor Carpio organized a trip to Puerto Principe, Haiti, with Professors Briaud and Seco e Pinto, ISSMGE president and a past president respectively, and Prof. B. M. Das, in order to observe the damages generated by the Haiti Earthquake in January, 2010, which caused hundreds of thousands of victims and destroyed the city of Puerto Principe.

Figure 20 Professors, Carpio, Briaud and Seco e Pinto taking a plane to visit Haiti

Message to ISSMGE Members (continued)
Professor R. Terzariol

This trip was prior to the seminar on Earthquake Geotechnical Engineering held on April 12, 2010, in Santo Domingo. The Seminar was a part of the touring lectures sponsored by the ISSMGE and had a very important number of attendants.

Figure 21 Professors B. Das, Carpio (SODGYM), J.L. Briaud (Pres. ISSMGE), Seco e Pinto (past pres. ISSMGE), among other speakers and participants in the Seminar

On April, 14, Professor Braja M. Das gave a lecture titled "Poverty does not justify mediocrity" in the auditorium of the Autonomous University of Santo Domingo, Santo Domingo, Dominican Republic.

Figure 22 Professor Braja M. Das with two participants in his lecture

Finally on June 5, 2010, SODGYM organized the "Presentation of the conclusions of the "1st. International Seminar on Earthquake Geotechnical Engineering and related problems in the Caribbean Dominican Republic".

Message to ISSMGE Members (continued)
Professor R. Terzariol

Professor Carpio unfortunately could not attend the meetings in Gramado because of a personal accident, but he is interested in the final reports of both meetings and will participate in the subsequent communications.

ECUATPORIAN SOCIETY OF SOIL MECHANICS AND ROCKS - SOCIEDAD ECUATORIANA DE MECANICA DE SUELOS Y ROCAS (SEMSIR)

The SEMSIR is presided by Alejandro Velazco Fili, from Guayaquil. This society was founded on May 10, 1961. It is a scientific society that is nonprofit and nongovernmental, being dedicated to the promotion of science and technology in earth sciences and linked to civil engineering, geology and environment.

Its mission is to disseminate among engineers and university students of Ecuador the scientific advances in geotechnical and environmental engineering, for the welfare of the people.

SEMSIR organizes a series of lectures on "Landslide and Slope Stability" in 26-28 May, 2010. The lecturers were:

- Mr. Stalin Benitez: Landslides in the city of Guayaquil.
- Mr. Xavier Vera G.: Analysis and geotechnical designs for mitigation in unstable banks of Via Sabanetilla and Zaruma sector.
- Mr. Miguel Chávez: Sliding hillside slopes, and soft soils/rocks of Ecuadorian coast.

Other series of lectures addressed "Introduction to Flexible Pavements" held on June 23, 24, and 25, 2010. At this time the lecturers were:

- Mr. Alejandro Velasco Fili: Features, quality control and failure modes.
- Mr. Victor Nuques: Design of the asphalt pavement structure.

The third lecture series concerned "Earthquake and its Impact on Guayaquil" during 8, 9, 10 September 2010. Lectures were given by:

- Mr. Stalin Benítez: Geology and Seismicity in Guayaquil.
- Mr. Xavier Vera Grunauer: Performance and dynamic response of subsurface in the city of Guayaquil.
- Mr. Alex Villacrés Sanchez: Structural vulnerability in the city of Guayaquil.

On October 21, 2010, the seminar on “Dynamic Methods for Testing and Analysis of Deep Foundations”, was realized and the speaker was Mr. Camilo A Álvarez.

The last series of lectures on "Geotechnical Aspects and Construction Processes on Bridges and Roads. " was developed on December, 1,2 and 3, 2010, and given by the following colleagues:

- Mr. Nelson Caicedo Aspinall (CPR) and Mr. Victor Bastidas Serra (CPR): Foundations: Evaluation results regarding the design procedure by dynamic test results on-site application in the San Vicente Bridge.
- Mayor Fausto Erazo (CIE): Bridges System and Roads in Esmeraldas.
- Mr. Marcelo Romo and Colonel Pedro Mosquera Burbano (ICE): Project on Chone River estuary, San Vicente Bay Bridge.

The upcoming activities for year 2011 will be the followings:

- Solemn Session in the auditorium of the University of Guayaquil, in tribute to 50 SEMSIR and 75 anniversary of the ISSMGE. May 10, 2011.

Message to ISSMGE Members (continued)
Professor R. Terzariol

- Second Conference of Geotechnical and Environmental Engineering Students and Young Engineers and V Ecuadorian Congress of Soil Mechanics. Quito and Guayaquil, November, 16-18, 2011.

SALVADOR GEOTECHNICAL SOCIETY - SOCIEDAD SALVADOREÑA DE GEOTECNIA (SSG)

Profesor Luis Pineda is the president of SSG and Carmen Rico is her Secretary. Carmen Rico participates in the Pan American and South American Representative Meetings, developed in Gramado, Brazil, during august, 2010.

Figure 23 Professors Roberto Terzariol VP for South America, Carmen Rico (El Salvador) and Rolando Armas Novoa (Cuba) during Gramado Meetings, 2010.

SSG's activities for this year will be as what follows:

- Colloquium about OPAMSS changes to the regulations of Slope Stability, in May, 2011.
- Supporting the Ministry of Public Works for post-graduate course on slope stability.
- Symposium on "Security Recommendations for Excavations", in June, 2011.
- Course on "Slope Stability in Soils and Rocks" held by the Salvadorian Association of Engineers and Architects, in August, 2011.
- Roundtable: "Recommendations for the Regulation of Foundations and Slope Stability in El Salvador", during October, 2011
- Lecture series on geotechnical engineering experiences in the 2009-2011 period, in December, 2011.

PARAGUAYAN GEOTECHNICAL SOCIETY - SOCIEDAD PARAGUAYA DE GEOTECNIA (SPG)

The Paraguayan Geotechnical Society (SPG) is immersed in an important internal change. First, it is making a depuration of it list of members and is working hard with the new generations of geotechnical engineers in order to transmit to them the governance of the SPG, which will change the authorities in next December.

Message to ISSMGE Members (continued)

Professor R. Terzariol

SPG had a significant history in the ISSMGE South American Region. It organized the Pan-American Conference in Foz de Iguacu, together with Argentine and Brazil, and held the First Meeting of Presidents of Geotechnical Societies of Mercosur, in 2003 in Asunción. SPG has organized many conferences and seminars in the Sub Region, and Professor Bosio Ciancio was the ISSMGE Vice President for South America for the period of 2001-2005. Currently the president is Cesar Lopez Bosio who participated actively in the meetings in Gramado.

Figure 24 Professors Jean Louis Briaud, President of ISSMGE, and Cesar Lopez Bosio, President of SPG, during the meetings in Gramado, August, 2010

Through a series of lectures the SPG take advantage of the start of construction of “Waterfront Avenue” in Asuncion, and present to the entire engineering community the newest technology that is being used.

During the next month, continued with the lectures, addressing topics such as, among others:

- "The Formation of Asuncion Bay"
- " Dispersive Soils”
- "Occurrence of soft rock in the Metropolitan Area of Asunción “
- " Waterfront Avenue in Asuncion”

Geotechnical Society of Paraguay is working closely with the National Secretary for Emergencies, looking technical responses to floods in coastal cities along the Paraguay River.

The SPG prepares a Handbook of Procedures for the Conservation of Retaining Walls of these coastal cities.

The SPG are in tratatives with the local Committee on Large Dams and the Paraguayan Association of Structures, in order to organize together Symposia, Courses and Seminars. The first meeting is scheduled after Easter recess.

Through its newsletter and website the Society keep up all, partners and the Paraguayan community of engineers, from the advances in geotechnical engineering.

Message to ISSMGE Members (continued)
Professor R. Terzariol

PERUVIAN GEOTECHNICAL SOCIETY - SOCIEDAD PERUANA DE GEOTECNIA (SPG)

The SPG was historically a very active society, hosting the Pan-American Conference on Geotechnical Engineering, in the year 1979, but in the recent years it has been some stagnated in activities.

At the end of 2010 the inevitable generational change in our societies brought about a new Directive Committee for the years of 2011-2012. Currently the SPG is presided by Cesar Torres Chung, with the vice-presidency of Professor Arnaldo Carrillo Gil and Patricia de los Rios as a secretary.

The first activity of this new committee was the organization of the ISSMGE touring lecture in Lima, Perú. On 6 and 7 January the "International Seminar on Earthquake Geotechnical Engineering and Unsaturated Soils" was held.

Figure 25 Speakers and Peruvian Society Authorities during the Seminar in Lima, Perú, January, 2011

The event was organized by the ISSMGE (International Society for Soil Mechanics and Geotechnical Engineering) and SPG (Peruvian Geotechnical Society). The agenda was as what follows:

Unsaturated Soils – January, 06, 2011.

- Jean Louis Briaud (USA) – President ISSMGE: "UNSATURATED SOILS: SOME FUNDAMENTALS AND SOME APPLICATIONS"
- Victor Rinaldi (Argentine) : "EFFECT OF THE STRUCTURE AND PARTIAL SATURATION IN THE DEFORMATIONAL BEHAVIOR OF SOILS"
- Nasser Khalifi, (Australia): "APPLICATION OF EFFECTIVE STRESS PRINCIPLE TO MECHANICS OF UNSATURATED SOILS"

Message to ISSMGE Members (continued)
Professor R. Terzariol

Earthquake Geotechnics: - January, 07, 2011.

- Roberto Terzariol (Argentine) - V.P South America ISSMGE: "ASPECTS OF EARTHQUAKE RESISTANCE OF SHALLOW AND DEEP FOUNDATIONS, AND RETAINING WALLS - NEW CRITERIA AND STANDARDS IN ARGENTINE 2010".
- Jorge E. Alva Hurtado (Perú) & Zenon Aguilar Bardales (Perú): "ADVANCES IN THE GEOTECHNICAL EARTHQUAKE ENGINEERING STUDY OF THE 2007 PERUVIAN EARTHQUAKE"
- Susumu Yasuda (Japan): "DAMAGE TO STRUCTURES DUE TO SOIL LIQUEFACTION"
- Pedro Seco e Pinto (Portugal) – Past President ISSMGE: "EUROCODE 8 – DESIGN OF STRUCTURES FOR EARTHQUAKES RESISTANCE-GEOTECHNICAL ASPECTS"

Figure 26 Participants in the Seminar, Authorities and Speakers

The Peruvian Society of Geotechnics has the support of companies which are part of its corporate members. Among them, the followings are highlighted:

- Maccaferri of Peru S.A.C
- Geofundaciones of Peru
- DSI
- Techdilling
- Geo-Instrument

Among the most important outreach activities developed by the society in Peru are the so-called "Geotechnical Thursdays", held at the Council of Engineers of Peru. That activity has been developed by recognized technical consultants, which are active members of the society and discuss various topics of interest for the public.

Message to ISSMGE Members (continued)
Professor R. Terzariol

VENEZUELA GEOTECHNICAL SOCIETY - SOCIEDAD VENEZOLANA DE GEOTECNIA (SVG)

The SVG is an historic society in our region. This society held the Pan American Conference twice; once in Caracas (1967) and the second in Isla Margarita (2007), and provided one of the Vice President of the region (Prof. Hiedra Lopez).

In March, 2011 SVG changed its authorities. The new president is Prof. Abraham Benarroch, who replaced Prof. Jose Amundaray. In 2010, Jose Amundaray was the representative of SVG to the regional meeting held in Gramado, Brazil.

The Venezuelan Society inaugurated its new headquarters bigger and more comfortable than the previous one, with a new library, and improved the web page of the society.

SVG is involved in a series of courses for the associated engineers in general in order to improve the industry in geotechnical issues.

Caracas hosted the XIX Venezuelan Seminar on Geotechnics, in October, 28-30, 2010. The seminar´s central issue was the study and solutions of practical cases.

Figure 27 Attendants to the XIX Venezuelan Seminar

The event had 210 attendants with 25 papers and 2 main lectures in honor to Gustavo Perez Guerra and Juan Francisco Lupini, given by Prof. N. Rodriguez and I. Contreras both from Venezuela.

In 2011 SVG has an intention to organize, in September, the XX Venezuelan Geotechnical Seminar, and schedule the new geotechnical courses for engineers.

The society is in tratatives with the Universities, municipalities, mayors and governors in order to advise them on geotechnical problems and create committees to deal with natural disasters all over the country.

Earthquake News

Geotechnical Damage due to the 2011 Christchurch, New Zealand

Suguru Yamada, Assistant Professor, University of Tokyo
Rolando Orense, Senior Lecturer, University of Auckland
Misko Cubrinovski, Associate Professor, University of Canterbury

INTRODUCTION

On 22 February 2011, a magnitude Mw 6.3 earthquake occurred with an epicenter located near Lyttelton at about 10km from Christchurch in Canterbury region on the South Island of New Zealand (Figure 1). Since this earthquake occurred in the midst of the aftershock activity which had continued since the 4 September 2010 Darfield Earthquake occurrence, it was considered to be an aftershock of the initial earthquake. Because of the short distance to the city and the shallower depth of the epicenter, this earthquake caused more significant damage to pipelines, traffic facilities, residential houses/properties and multi-story buildings in the central business district than the September 2010 Darfield Earthquake in spite of its smaller earthquake magnitude. Unfortunately, this earthquake resulted in significant number of casualties due to the collapse of multi-story buildings and unreinforced masonry structures in the city center of Christchurch. As of 4 April, 172 casualties were reported and the final death toll is expected to be 181. While it is extremely regrettable that Christchurch suffered a terrible number of victims, civil and geotechnical engineers have this hard-to-find opportunity to learn the response of real ground from two gigantic earthquakes which occurred in less than six months from each other. From geotechnical engineering point of view, it is interesting to discuss the widespread liquefaction in natural sediments, repeated liquefaction within short period and further damage to earth structures which have been damaged in the previous earthquake. Following the earthquake, an intensive geotechnical reconnaissance was conducted to capture evidence and perishable data from this event. The team included the following members: Misko Cubrinovski (University of Canterbury, NZ, Team Leader), Susumu Yasuda (Tokyo Denki University, Japan, JGS Team Leader), Rolando Orense (University of Auckland, NZ), Kohji Tokimatsu (Tokyo Institute of Technology, Japan), Ryosuke Uzuoka (Tokushima University, Japan), Takashi Kiyota (University of Tokyo, Japan), Yasuyo Hosono (Toyohashi University of Technology, Japan) and Suguru Yamada (University of Tokyo, Japan)

GEOLOGICAL AND TECTONIC SETTING

The Canterbury Plains, about 180 km long and of varying width, are New Zealand's largest areas of flat land. They have been formed by the overlapping fans of glacier-fed rivers issuing from the Southern Alps, the mountain range of the South Island. The plains are often described as fertile, but the soils are variable. Most are derived from the greywacke of the mountains or from loess (fine sediment blown from riverbeds). In addition, clay and volcanic rock are present near Christchurch from the Port Hills slopes of Banks Peninsula. The city of Christchurch is located at the coast of the Canterbury Plains adjacent to an extinct volcanic complex forming Banks Peninsula. Most of the city was mainly swamp, behind beach dune sand, and estuaries and lagoons, which have now been drained (Brown et al., 1995). The simplified geographical and geological information are shown in Figures 1, 2 and 3.

Canterbury has abundant water, in the rivers which carry mountain rainfall to the coast, and in aquifers. Beneath the plains, layers of porous gravels are interspersed with impermeable finer sediments. Near Ashburton, bedrock is at a depth of 1,600 meters (Wilson, 2009). Unlike most urban water supplies, Christchurch's water comes from aquifers beneath the city. The aquifers are recharged by rainfall and by river seepage. They have been tapped to irrigate farmland and for town water supplies.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

The two main rivers, Avon and Heathcote, which originate from springs in western Christchurch, meander through the city and act as main drainage system. The Waimakariri River with its catchment in the Southern Alps, regularly flooded Christchurch prior to stopbank construction and river realignment, which began shortly after the city was established in 1850. Variable foundation conditions as a consequence of a high water table and lateral changes from river floodplain, swamp, and estuarine lagoonal environments, impose constraints on building design and construction (Brown et al., 1995).

According to studies by Brown et al. (1995), the geology, tectonic setting, and active seismicity of the Christchurch area indicate that future large earthquakes will occur which will have major impact on the city. Based on historical records, the north Canterbury Earthquake of 1888, centered on Amuri, damaged many buildings and caused the top of the spire on Christchurch Cathedral to collapse. In addition, the 1901 earthquake centered near Cheviot caused minor damage in the city while the Arthur's Pass earthquake of 1929 caused significant rockslides in the mountains. Moreover, as already reported, the 4 September 2010 earthquake centered in the town of Darfield about 40km west of Christchurch, caused widespread liquefaction in the eastern suburbs of Christchurch and in Kaiapoi.

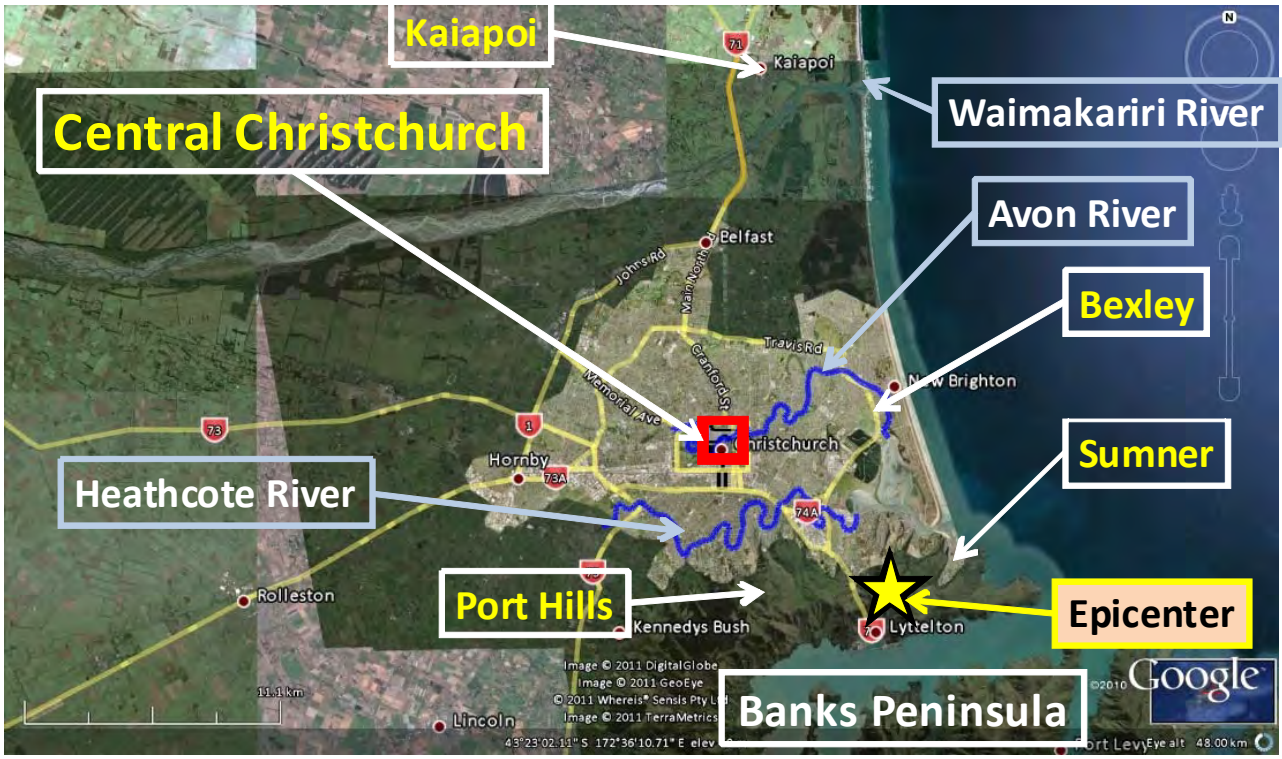


Figure 1. Geographical information in Christchurch region.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

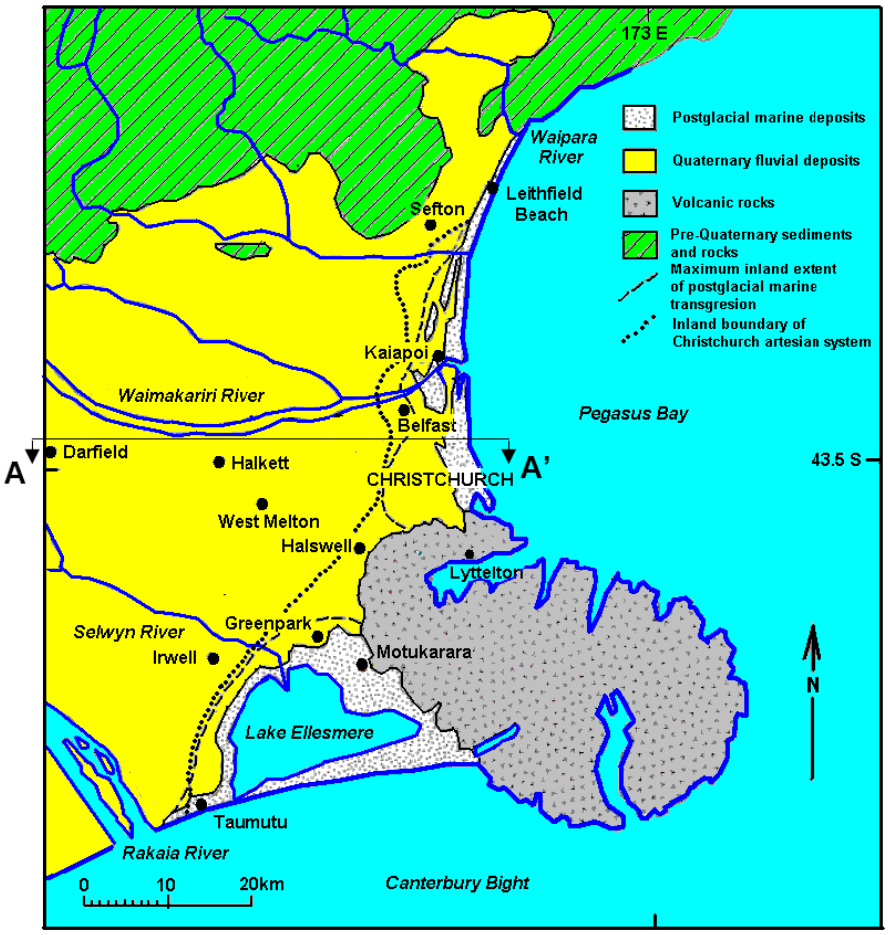


Figure 2. Simplified geology of Christchurch region. (Modified from Brown and Weeber, 1992).

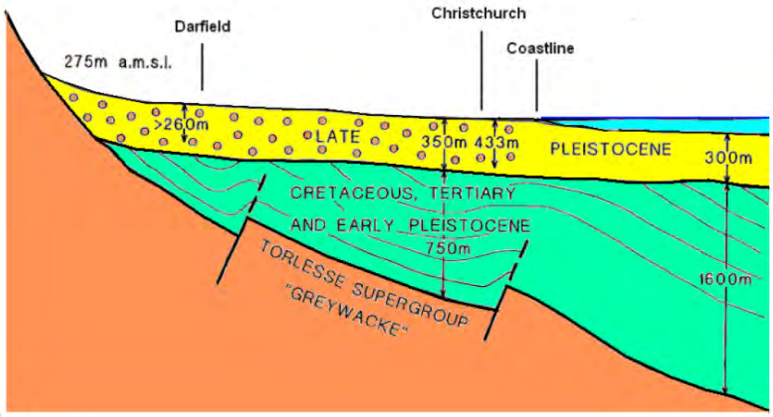


Figure 3. Simplified soil strata along a cross-section A-A' indicated in Figure 2. (Modified from Brown and Weeber, 1992).

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

THE 2011 CHRISTCHURCH EARTHQUAKE

An earthquake of magnitude Mw 6.3 occurred at 12:51 pm local time, on 22 February 2011 with an epicenter located at Port Hills, near Lyttelton, about 10 km south-east of the city of Christchurch. The earthquake has a focal depth of 5 km and the maximum intensity felt was 8 based on MMI scale (GNS, 2011). The 2011 Christchurch Earthquake occurred more than 5 months after the 2010 Darfield Earthquake (4 September 2010), with the epicenter 50 km away from the last one. This earthquake is considered to be an aftershock of the earthquake that occurred on 4 September 2010 in spite of the long interval between the events and the large distance between the epicenters. The epicenter of this earthquake is located on a different fault from the Greendale Fault which was the source of the 2010 earthquake. However, it is considered that the earthquake was caused by a fault rupture within the zone of aftershocks that followed the earthquake on 4 September 2010 (NHRP, 2011).

NHRP (2011) described the aftershock activity as follows: "*At first the aftershocks were clustered largely along the east-west fault line across the Canterbury Plains, but they soon spread well beyond the visible ends of the Greendale Fault. Over many months a cloud of aftershocks has developed, indicating a network of subsurface faults. One cloud of aftershocks extended both north-northeast and south-southwest from the eastern end of the Greendale Fault. At the south end of the zone was another line of aftershocks, roughly parallel to the Greendale Fault but many kilometres further southeast. It extended eastward into southern Christchurch and beneath the Port Hills area*."

Figure 4 the shows locations of the main shock, aftershocks with magnitude above 3, and fault ruptures in Canterbury. It is clearly understood that large number of aftershocks occurred in the south-west part of the fault that includes the epicenter of the February 2011 earthquake.

During the 2011 Christchurch earthquake, a series of strong motion accelerographs were triggered and motions recorded at several stations. The distribution of maximum accelerations is shown in Figure 5. The values indicated in the figure correspond to the maximum of the three components recorded. It can be seen that the maximum recorded acceleration was in the order of 2.2 g near the earthquake epicenter, a number of rock falls were caused by significant shaking in this area. The accelerometers around the CBD showed maximum acceleration ranging from 0.57 g to 0.80 g in this earthquake, more than three times of those recorded during the September 2010 event. Due to much stronger shaking, many multi-story buildings suffered severe structural damage in the CBD.

Figure 6 shows time histories of acceleration recorded on 4 September 2010 and 11 February 2011 at Christchurch Hospital which is locating at south-west edge of CBD. The waves colored in black and red shown in the figure correspond to the 4 September 2010 and 11 February 2011 earthquakes, respectively. Because of the short distance to the epicenter, the acceleration records in this earthquake indicate higher frequency and shorter duration time as well as larger amplitude in comparison with the ones recorded in 4 September 2010.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

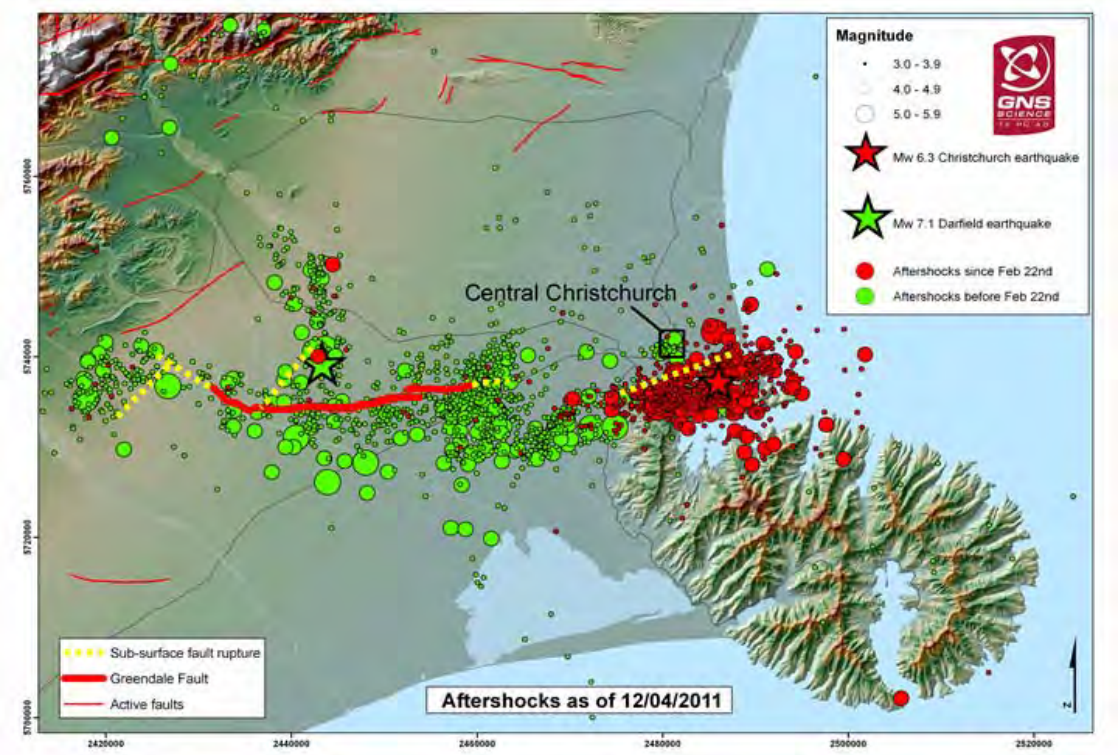


Figure 4. Location of main shock, aftershocks above magnitude 3, and fault ruptures in Canterbury. (Graphic by GNS Science, http://www.gns.cri.nz/) (as of 12 April 2011).

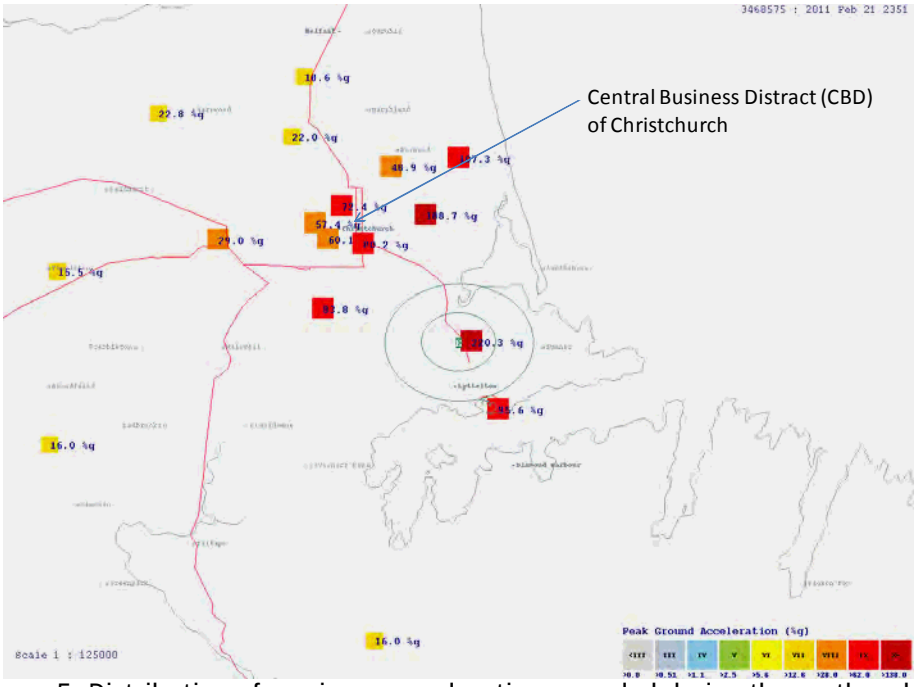


Figure 5. Distribution of maximum acceleration recorded during the earthquake. (Graphic by GNS Science, http://www.gns.cri.nz/).

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

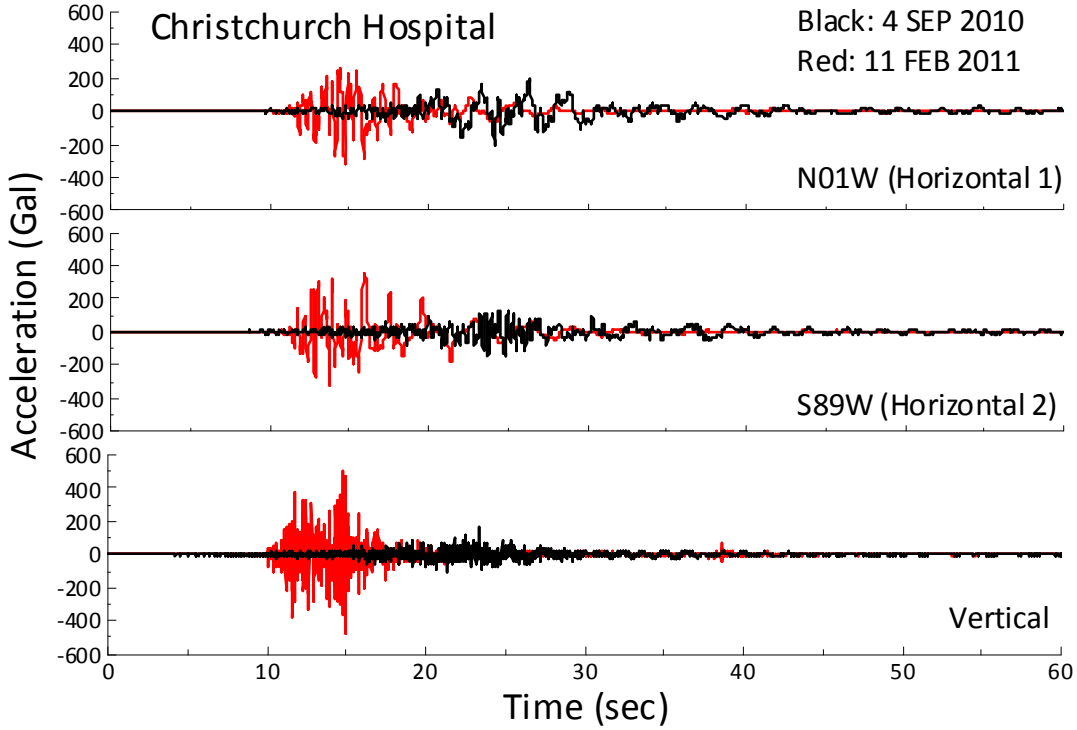


Figure 6. Acceleration records of the 2010 Darfield Earthquake and 2011 Christchurch earthquake at the Christchurch Hospital.

EFFECTS OF LIQUEFACTION

Because of the short distance to the city and the shallower depth of the epicenter, this earthquake caused more significant damage in Christchurch city than the September 2010 Darfield Earthquake in spite of its smaller earthquake magnitude (energy). The earthquake caused widespread damage to residential buildings, lifeline facilities and transportation infrastructure due to soil liquefaction and the associated ground deformations. Repeated liquefaction was observed in many places where liquefaction occurred in September 2010, such as in the eastern suburbs of Christchurch and in Kaiapoi town.

(1) Christchurch

The earthquake caused widespread liquefaction in the eastern suburbs of Christchurch city as well as in Central Business District (CBD). The liquefaction-affected area in Christchurch during this earthquake was much wider than the one in September 2010. While major liquefied sites in the September 2010 earthquake were distributed along the Avon River (northeast of CBD), liquefaction was observed in the 2011 earthquake across a wide areas in suburbs north to south of Christchurch city. Figures 7 and 8 show the areas of observed liquefaction in urban area of Christchurch after the 2010 Darfield earthquake and 2011 Christchurch earthquake, respectively. These two maps were based on surface manifestation of liquefaction visible in aerial photographs and initial observations from ground surveying. The survey to understand areas of liquefaction caused by each quake was conducted immediately after the earthquake occurrence by a reconnaissance team of the University of Canterbury.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

Figure 7. Areas of liquefaction (red shaded regions and red points) in Christchurch and Kaiapoi caused by the 2010 Darfield Earthquake (Cubrinovski et al, 2010).

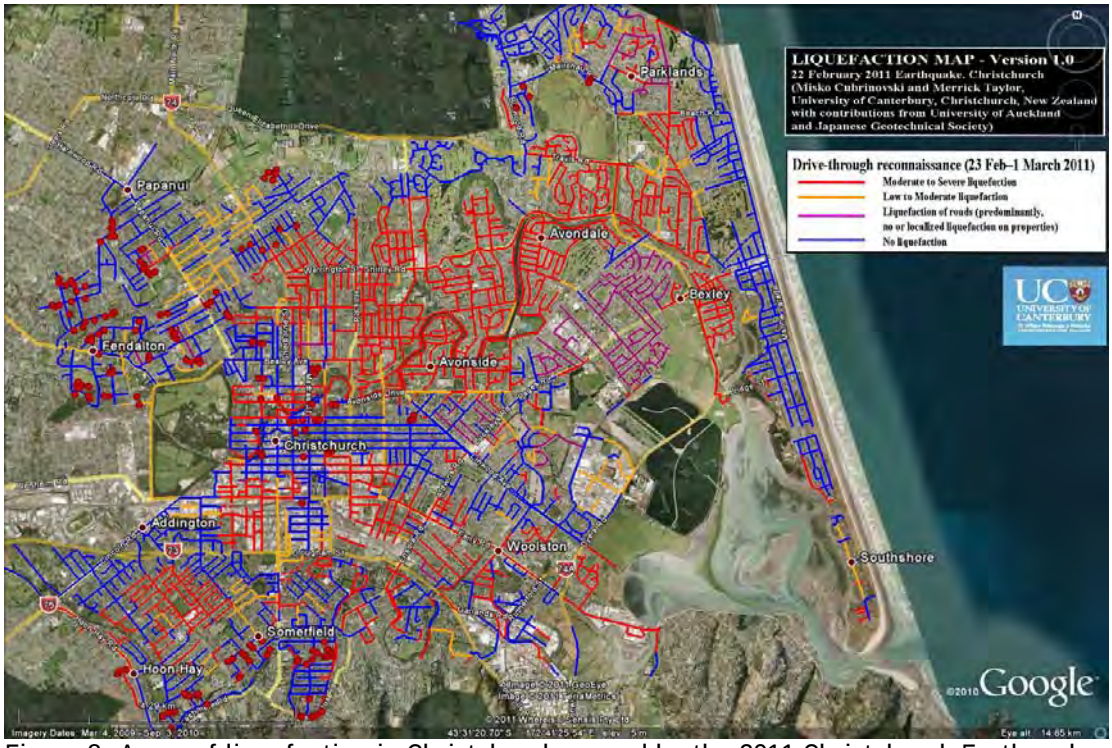


Figure 8. Areas of liquefaction in Christchurch caused by the 2011 Christchurch Earthquake. (Cubrinovski and Taylor, 2011, http://www.nzsee.org.nz/)

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

After the 2010 Darfield earthquake, Swedish Weight Sounding (SWS) tests were performed by University of Canterbury at numerous locations affected by liquefaction and lateral spreading. SWS is a simple manually operated penetration test under a dead-load of 100 kg in which the number of half-rotations required for a 25 cm penetration of a rod (screw point) is recorded (JIS, 1995). As a result of SWS test, the corresponding standard penetration test N-value (SPT-N) can be obtained through the following empirical equation (Inada, 1960);

$$N = 0.002W_{SW} + 0.067N_{SW}$$

where W_{SW} (kg) is the weight less than 100 kg and N_{SW} (/m) is the number of half-rotations for 1.0 m of penetration. W_{SW} is counted when penetration occurs with dead-load less than 100 kg. Note that this equation is applicable for gravel, sand and sandy soils.

Typical results of SWS tests in Christchurch are shown in Figure 9. It can be understood from the figures that there are strata of very loose (N < 5) silt/sand, at about 5 m or deeper below the ground water table.

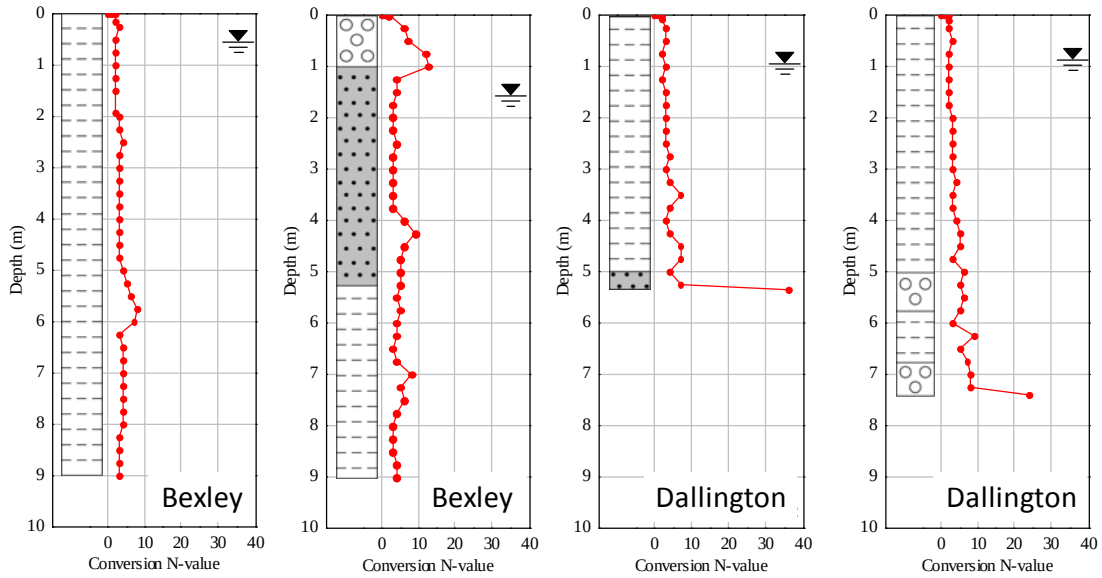


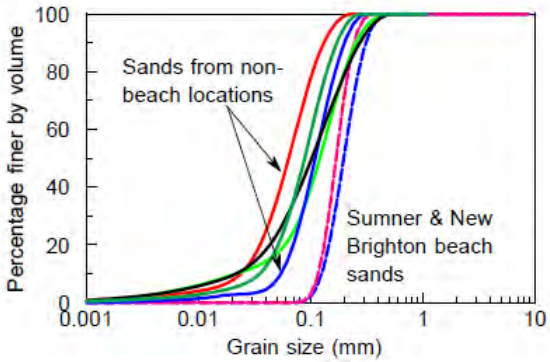
Figure 9. Converted N-Value profile in Bexley and Dallington. Ground survey was conducted by University of Canterbury and JGS Reconnaissance teams in September 2010 (JGS, 2010).

The ejecta from sand boils found at liquefied areas in Christchurch were generally similar and had distinctive features, like presence of non-plastic fine sand and silty sand with grey/blue color. Figures 10 (a) and (b) show the grain size distribution curves of sand ejecta collected at several sites in Christchurch after 2010 Darfield earthquake and 2011 Christchurch earthquake, respectively. In general, the sand ejected in both earthquakes had very similar grain size distributions.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

(a) 2010 Darfield earthquake using laser diffraction method (Cubrinovski et al., 2010)



(b) 2011 Christchurh earthquake using sieve analysis

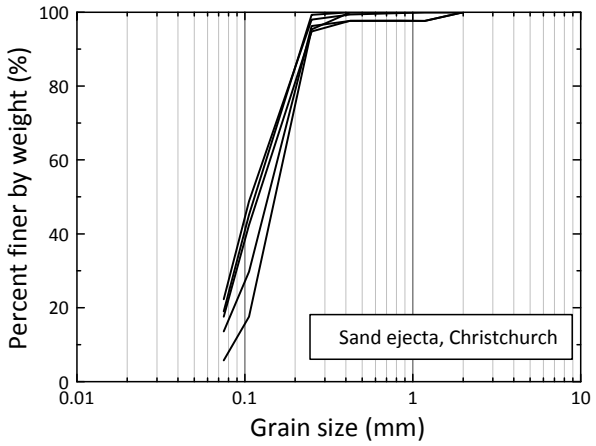


Figure 10. Grain size distribution curves of sand efecta collected in Christchurch city.

In the Central Business District (CBD), several buildings collapsed, while many of the buildings that survived suffered significant or some form of structural damage. Severe liquefaction was also observed in the CBD, such as along Kilmore Street (Figure 11a) and Armagh Street (Figure 11b). The relation between the building structural damages and liquefaction of the foundation ground is currently under investigation.

(a) along Kilmore Street (b) along Armagh Street

Figure 11. Liquefaction-induced damages in CBD.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

There are very few structures in the area where liquefaction countermeasures have been implemented in the foundation ground. One example is the AMI stadium located near CBD, where the ground under the east stand was stabilized with stone column. Minor liquefaction was observed near the east stand in spite of the severe liquefaction all around the stadium (Figure 12).

(a) Massive amount of sand ejecta in front of the west stand of AMI stadium.

(b) The ground in front of the east stand of AMI stadium. The green turf was not covered by sand boils.

Figure 12. Liquefaction adjacent to AMI stadium.

Because of short time interval between the two gigantic earthquake events, the earthquake caused additional damages to many facilities which suffered liquefaction-induced damage and had not been repaired. Figures 13 (a) and (b) are photos of a river embankment in Porritt Park (east bank of Avon River), after the 2010 earthquake and 2011 earthquake, respectively. The width of crack openings on the shoulder and settlement of the crown became larger due to repeated liquefaction of the foundation ground of the embankment. Extensive repeated liquefaction was observed in entire Porritt Park, where half of green grassy area was covered by sand boils again following the previous earthquake.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

(a) Damage in Porritt Park after 2010 Darfield Earthquake (JGS, 2010)

(b) Same area after the 2011 Christchurch Earthquake

Figure 13. Lateral spreading and the crown settlement of a stop bank near Porritt Park.

Extensive liquefaction was observed widely in residential areas along Avon River. The very shallow ground water table (1.0m to 1.5m) has been recognized in western suburb of Christchurch, particularly in areas close to the coastal line. Bexley is a newly constructed residential area developed by reclaiming the wetland near the mouth of Avon River. Figure 14 shows a broad panorama overlooking Bexley, taken from the South Brighton Bridge crossing the river mouth of Avon. It can be seen that residential houses are now located on an area where the ground elevation is almost the same as the water surface.

Figure 14. A photo overlooking the Bexley residential area.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

In Bexley, a large number of residential houses/properties suffered severe damage from liquefaction in September 2010 earthquake. After the 2011 earthquake, it was again one of the worst hit areas in terms of liquefaction-induced damage. Figures 15 (a) and (b) show damaged residences after the 2010 and 2011 earthquakes, at Seabreeze Close in Bexley. Massive amount of sands were ejected and deposited around the houses. Differential ground settlement was caused by severe sand boils, resulting in tilting in many houses.

(a) After the 2010 Darfield Earthquake (Cubrinovski and Orense, 2010) (b) after the 2011 Christchurch Earthquake

Figure 15. Damage to residential houses due to repeated liquefaction in Seabreeze Close, Bexley.

Damages in levees along Avon River were observed everywhere, spanning from inside the CBD to the river mouth. Many bridges crossing the Avon river suffered tilting in their abutments, as a result of lateral spreading and loss of bearing capacity due to liquefaction (Figure 16a). Damage to pipelines was also observed at the connections between bridge and backfill. In most cases, the settlement of the bridge abutment itself is smaller than that of the adjacent soil because the bridge is supported by pile foundations (Figure 16b).

(a) Tilt in abutment due to lateral spreading (b) Damage to pipeline installed in the bridge

Figure 16. Damage to bridge crossing the Avon River (Avondale Road).

Due to lateral spreading and heaving of the river bed, the cross-sectional area of the Avon River has become smaller than before the earthquake (Figure 17). Therefore, people living in areas adjacent to the river will now have to worry about flooding during the rainy season.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

(a) River dike moved laterally toward the river

(b) River bed appeared above water surface as lateral spreading pushed up the river bed

(c) High water level in Avon River

Figure 17. Ground distortions due to liquefaction along Avon River.

The South Brighton Bridge which crosses the mouth of Avon River was severely affected by liquefaction on ground basement. Observed damages near the bridge were lateral deformation and crown settlement in the bridge approach, large tilt of abutments, tension and compression cracks in pile foundations and failure of pipeline installed underneath bridge girder (Figure 18). The body of the embankment spread laterally, with the top settling down due to liquefaction of the ground underneath and causing large tilt of the abutments. The back side of the abutment settled down, the front side lifted up, and the pile foundation protruded to the ground surface. Tension and compression cracks were observed in the battered pile foundation; however no pile was broken. Thus, it can be considered that the loss of lateral bearing capacity of the pile foundation was induced by liquefaction below the abutment.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

(a) Damage to the body of the embankment (b) Tilted abutment and protruding battered pile foundation

Figure 18. Liquefaction-induced damage to South Brighton Bridge.

(2) Kaiapoi

Kaiapoi is located in the northeastern end of Canterbury Plains, about 20 km north of Christchurch (Figure 1). The Kaiapoi River, which cuts through the centre of the town, joins the Waimakariri River on the eastern edge of town and flows to the sea.

Extensive lateral spreading occurred in the areas close to Waimakariri and Kaiapoi Rivers during the 2010 Darfield earthquake. A large number of residential houses/properties, commercial facilities and stop banks suffered severe structural and geotechnical damage due to lateral spreading and liquefaction. Although repeated liquefaction was observed in Kaiapoi during this earthquake, the impact of liquefaction was minor than that in 2010 Darfield earthquake.

Figure 19 shows two photos of a residential house which suffered severe damage due to lateral spreading in 4 September 2010 earthquake. This residence is standing on a ground that moved toward Waimakariri River, resulting in tilting of the house and formation of 1.6 m wide crack. An investigation was carried out at the residential property shown in the figure on 4 March 2011. Sand boils were observed only in the crack, with the width of crack increasing to 1.9 m. It is unknown, however, whether the increase in crack opening was caused by this earthquake alone. Creep deformation in this area due to the aftershocks of 2010 Darfield earthquake has been reported (Cubrinovski and Orense, 2010). Therefore, there is a possibility that the width of the crack was more than 1.6 m before the February 2011 earthquake and the impact of the recent earthquake to this area was minor. No other remarkable additional damage to residential house/properties was observed in South Kaiapoi.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

Figure 19. Minor additional damage to a residential house which underwent foundation failure due to lateral spreading and liquefaction in 2010 Darfield Earthquake. (South Kaiapoi)

In areas close to the waterways, most of sand boils were observed at existing/repaired cracks caused by the 2010 earthquake. Aside from the lower intensity of ground shaking in Kaiapoi, it is possible that the excess pore water pressure generated by the earthquake motion could have been dissipated easily through the existing cracks and therefore, significant ground distortion was not caused by this earthquake (Figure 20 and 21).

Figure 20. Repeated liquefaction at a park adjacent to Courtenay Lake (South Kaiapoi). Liquefied soil was ejected from existing cracks, but ground distortion was minor compared to the ones observed in September 2010 earthquake.

Figure 21. Damage to the stop bank along Kaiapoi river (North Kaiapoi). Sand boils were observed on restored cracks. The damage to the stop bank was minor and lots of small fissures were observed at restored cracks.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

On the other hand, a more pronounced liquefaction was observed in residential houses/properties in North Kaiapoi, although relatively minor compared to those after the 2010 Darfield earthquake. Two examples of damage to residential properties are described below.

Figure 22 is comparative photos of settlement of a two-story house due to liquefaction. The slope in front of the garage was originally uphill, but it became a downhill after 2010 Darfield earthquake as a result of more than 50 cm of ground subsidence. This house suffered additional 15 cm of subsidence from the 2011 earthquake. The narrowing gap between the roof and the head of a member of the research team can be recognized from the figure. Although the investigators appearing in the photos are actually different, their heights are almost the same.

Figure 22. Further subsidence in two-story house neighboring the stop bank. (North Kaiapoi)

Massive amount of sand ejecta, about 400 mm in thickness, was observed in a property following the September 2010 event (Figure 23). The ejected sand covered a deck in front of the entrance, with thickness of about 10 cm. The observed thickness of sand ejecta after the 2011 earthquake was around 20 cm.

Figure 23. Repeated liquefaction in a residential property in North Kaiapoi.

As mentioned above, liquefaction-induced damage comparable to September 2010 was observed at few residential properties in North Kaiapoi. However, the areas affected by liquefaction in this earthquake were more localized than during the previous one. The areas where evidence of liquefaction were observed during the 2011 earthquake are indicated as red colored areas in the liquefaction map of 2010 Darfield earthquake (Figure 24; Cubrinovski et al., 2010). Note that liquefied area shown in the figure is based on the view observation conducted on 27 February and 4 March 2011. The indicated area may be extended as a result of further investigations.

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

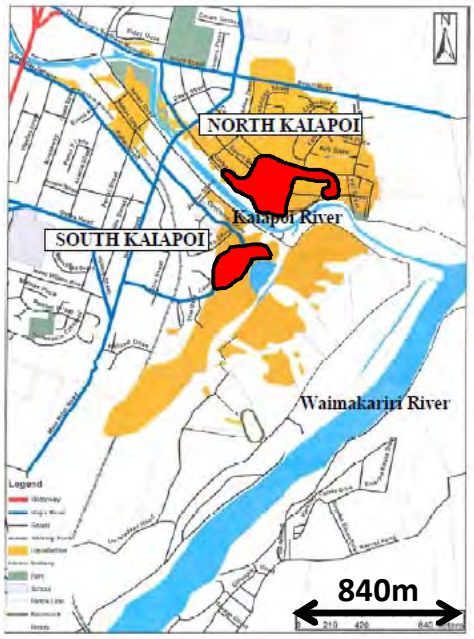


Figure 24. Comparison of liquefied area in Kaiapoi between 2010 Darfield and 2011 Christchurch earthquakes (Modified from Cubrinovski et al., 2010).

After the 2010 Darfield earthquake, SWS tests were conducted at a residential property shown in Figure 23 (Cubrinovski et al., 2010 and JGS, 2010). The profiles of converted N-value from SWS tests are shown in Figure 25. The upper portion of the ground consists of very loose sand, with depth more than 7 m and the ground water table was very shallow. Figure 26 shows the grain size distribution curves of sand ejecta collected in Kaiapoi. The solid curve with red color in the figure indicates the grain size distribution of soil collected after this earthquake, while the other dashed curves correspond to soils taken after the 2010 Darfield earthquake. The sands ejected in both earthquakes have generally similar grain size distribution. Moreover, they have similar grain size distributions as the sand ejecta in Christchurch, which are shown in Figure 10.

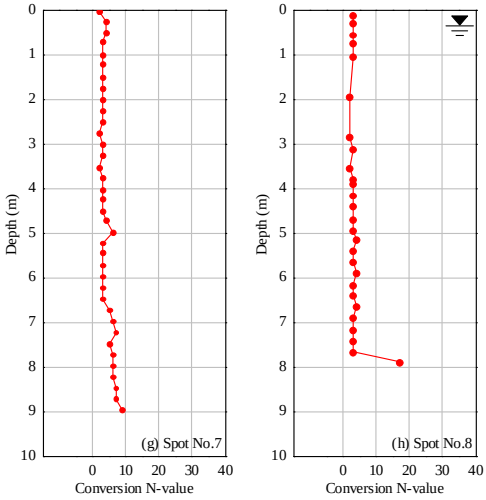


Figure 25. Converted SPT N-value profile in North Kaiapoi. Ground survey was conducted by University of Canterbury and JGS Reconnaissance team on September 2010 (JGS, 2010).

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

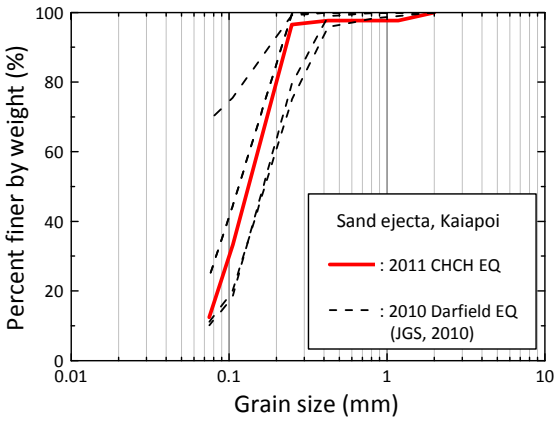


Figure 26. Grain size distribution curves of sand ejecta collected at Kaiapoi.

EFFECT ON SLOPE (CLIFF) STABILITY

During the Christchurch earthquake, numerous slopes and cliffs suffered shallow land slides and rock falls. One of the most severe damages to a cliff was observed in Sumner, located at the north end of Port Hills in the Banks Peninsula, about 12 km south-east of Christchurch. The cliffs in this area were formed by slope erosion of an ancient volcano. Residential houses were constructed on the cliffs as well as on the flat ground underneath. Many residential houses were built at the edge of the cliff.

Figure 27 shows a landscape of the affected cliff located at the west side of Wakefield Avenue in Sumner. This cliff is approximately 70 m high and 500 m long in north-south direction. The cliff surface was previously covered with vegetation, but became bare due to earthquake disturbance.

Figure 28 shows a rock fall near a building. The fallen rock is about 4.8 m wide, 6.6 m high and 15.8 m long. Numerous rock falls occurred in other hilly areas adjacent to the epicenter and residential houses and traffic were severely affected.

Figure 27. Panoramic view of a disturbed cliff (Sumner).

Earthquake News (continued)

Geotechnical Damage due to the 2011 Christchurch, New Zealand

Figure 28. Huge rock fall adjacent to a building (Sumner).

CONCLUDING REMARKS

Although the collapse of many commercial buildings led to the greatest casualties in the M 6.3 Christchurch earthquake, by far the most significant damage to residential buildings and lifelines was the result of liquefaction and associated ground deformations. Although the M 7.1 Darfield earthquake caused liquefaction in Christchurch and adjacent areas, the M 6.3 Christchurch earthquake induced more widespread liquefaction and caused more serious damage to infrastructure. Experiences from case histories all over the world have highlighted the effect of liquefaction to buildings and buried structures, but the scale of damage experienced in Christchurch following the 2011 event was unprecedented and may be the greatest ever observed in an urban area. Moreover, the short time interval between two large events has presented a very rare opportunity to investigate liquefaction in natural deposits.

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Earthquake News
On Gigantic Tohoku Pacific Earthquake in Japan

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INTRODUCTION

At 2:46 PM local time on March 11th, 2011, a gigantic earthquake of magnitude Mw=9.0 occurred and affected the eastern half of Japan. Because the seismological aspects of this earthquake have been reported at many web sites and publications, the present report puts emphasis on the damage aspects that have so far been revealed by the post-earthquake investigations. This report is a contribution made by many members of the Japanese Geotechnical Society.

The causative fault of this earthquake is located in the Pacific Ocean off east Japan where an oceanic tectonic plate has been subsiding under the archipelago (Fig. 1). In the area of Sendai City, that is one of the biggest cities in the eastern part of Japan, there had been warning about a possible big earthquake in the coming years. It was anticipated that a part of the plate subduction to the east of Japan would cause this extreme event. The reality was, however, more than anticipated, the size of the causative mechanism being 500 km in length in the NS direction and the width being 200 km.

In modern times, two gigantic earthquakes have been reported in this part of subduction. The one in 1896 registered the seismic magnitude (M) of 8.2 to 8.5 and the associating tsunami killed 21,915 victims together with 44 missing. The other one in 1933 was of M=8.1 (Mw=8.4) and claimed 1522 victims with 1542 missing. Both earthquakes caused minor intensity of shaking. Another tsunami disaster in the same area was caused by the 1960 Chile earthquake of Mw=9.5 and 142 people were killed. Those experiences encouraged both public and private sectors to be prepared for future tsunami disasters by constructing high sea walls and conducting tsunami evacuation drills, in which the height of future tsunami was decided on the basis of previous tsunamis. Despite those efforts, the present earthquake produced much bigger tsunami over the entire coast of east Japan (Fig. 1). It is often said that the 2011 earthquake is of similar size and effect as the *Jogan* earthquake in AD 869 that hit the same area and produced huge tsunami damage.

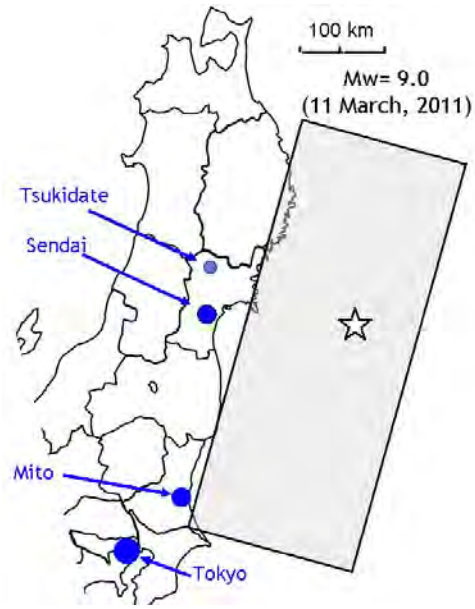


Fig. 1 Location of causative mechanism and major damage areas (Fault model by National Research Institute for Earth Science and Disaster Prevention)

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

Geospatial Information Authority of Japan announced that the coseismic displacement of the earth crust in the coastal area was at maximum 5.3 m in the horizontal direction towards the Pacific Ocean and 1.2m in subsidence. Thus, many areas along the affected coastal area got under water, the tsunami effect was made more serious, and the tsunami water remained in the area for a longer time, making the rescue very difficult. Fig. 2 illustrates the coseismic subduction in Sendai area. Note that similar subsidence occurred at many places in the world during past gigantic earthquakes: Kohchi of Japan in 1946 and at several more times in the history, Valdivia and surrounding area in Chile in 1960, South Alaska in 1964, and Izmit Bay of Turkey in 1999. Kohchi and Valdivia came upwards again after the quakes.

(a) Natori City, south of Sendai (b) Gamo of Miyagino Ward, Sendai

Fig. 2 Coseismic subsidence in Sendai (Photographs by Daiken Suzuki, former student of University of Tokyo)

EARTHQUAKE GROUND MOTION

Figures 3 and 4 show the distribution of peak ground acceleration (PGA) and peak ground velocity (PGV) of horizontal components, respectively. PGA values do not simply attenuate from the east coast, but major two clusters are recognized in 1) Miyagi Prefecture (around N38.5^{o} E141.0^{o}), and 2) Tochigi and Ibaraki Prefectures (around N36.5^{o} E140.5^{o}). This implies that the rupture process during the earthquake was not uniform, and contained several asperities radiating strong ground motions. Another point to note is that Tokyo and its surrounding area near the bottom of the figures were subjected to strong shaking. Therefore, damage occurred at many places therein. Fig. 5 illustrates the acceleration records at K-NET Ishinomaki station to the east of Sendai City in Miyagi. It is evident here that there are at least two strong earthquake events that are superimposed on each other. Thus, it is reasonable to assume several asperities in the source mechanism. Another important issue is the long duration time of strong shaking. Increasing the number of seismic loading cycles, this long duration time made the extent of subsoil liquefaction more serious.

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

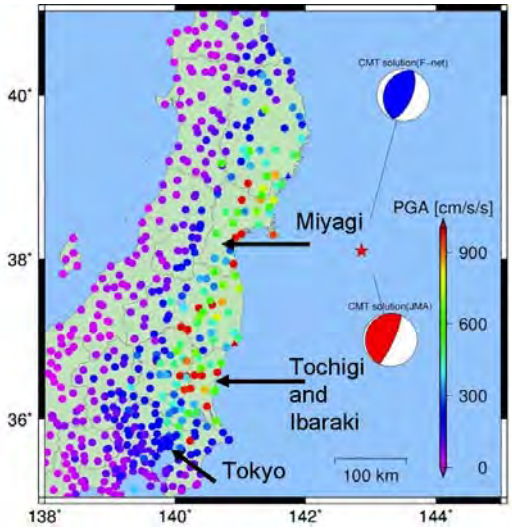


Fig. 3 Distribution of peak ground acceleration provided by NIED, ERI (the University of Tokyo), AIST, and PARI

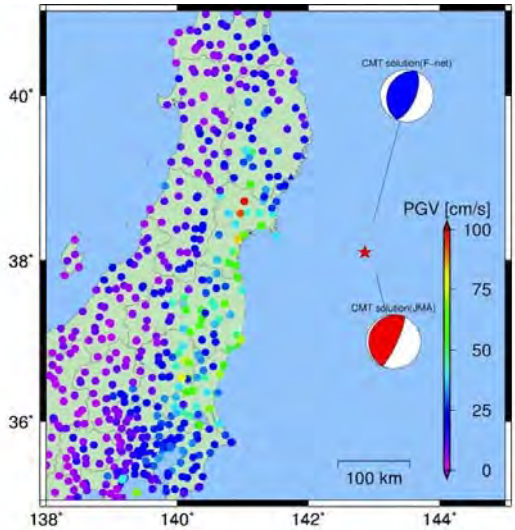


Fig. 4 Distribution of peak ground velocity provided by NIED, ERI (the University of Tokyo), AIST, and PARI

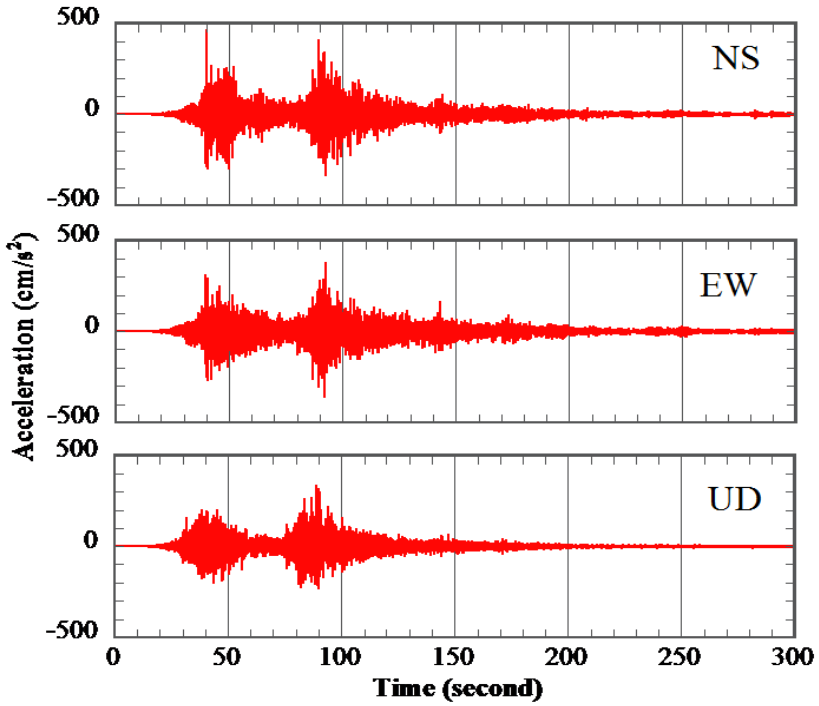


Fig. 5 Strong earthquake motion record at Ishinomaki to the east of Sendai City, Miyagi Prefecture (K-NET MYG010)

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

DISTRIBUTION OF DAMAGE

Many kinds of damage were caused by the earthquake over a large area in the eastern part of Japan (Fig. 6), ranging over 500 km in NS direction. The number of victims is not yet finalized in the middle of April because tsunami brought many people into sea and also debris of destroyed houses have made searching very difficult. It is anticipated that the total number of victims would be more than 25,000, most of which were killed by tsunami, while the total amount of debris is 26.7 million tons.

The major induced damages are classified into tsunami-related ones, liquefaction of sandy ground, and instability of slope and embankment. It is noteworthy that structural damage was not so significant as in the cases in previous gigantic earthquakes in the concerned region. Fig. 7(a) indicates the central part of Sendai City where many high-rise buildings survived the earthquake without problems. Of particular interest is illustrated in Fig. 7(b) in which Tsukidate Township survived the quake without structural damage despite that the Meteorological Agency issued the highest seismic intensity scale of 7 here. A local dentist was interviewed to mention that the shaking was long and strong, he could not keep standing up, but his old wooden house survived this event without structural damage. Information about lifeline damage is not yet available.

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

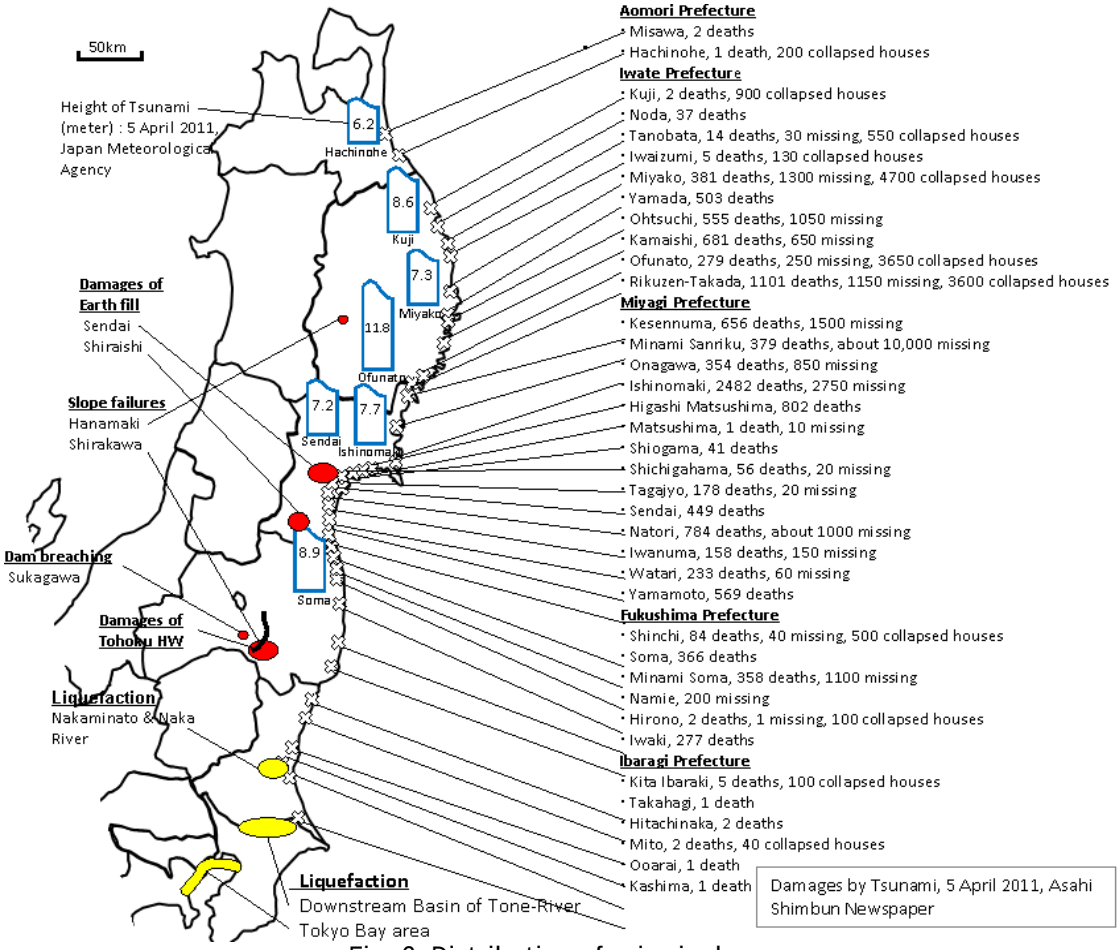


Fig. 6 Distribution of seismic damage

(a) Intact buildings in central Sendai City (b) Houses and shops without damage in Tsukidate Township

Fig. 7 Good performance of buildings and houses in the affected region

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

TSUNAMI DISASTER

Tsunami was the most serious type of damage. Because of the sympathy to tsunami victims and their families, engineering societies decided to postpone damage reconnaissance in the affected area unless very necessary. There is, however, minimum information available. First, the height of tsunami was investigated to find that the height was more than 15 m and easily overtopped sea walls that had been constructed against the previously known tsunami height. The destructive power of high tsunami was substantial and removed nearly all the structures in the attacked areas (Fig. 8). This photograph reminds us of Banda Aceh after tsunami disaster in 2004. In this flat land, there is no place for people to evacuate, even if a tsunami alert is issued properly. In some tsunami-affected areas, the sea water remained on shore for many hours and evacuation was made impossible. Prof. Nozomu Yoshida of Tohoku Gakuin University had to take refugee on a pedestrian bridge crossing a street for 12 hours without food and warm overcoat, because the street was inundated until 1 AM. There was a huge amount of debris after tsunami attack (Fig. 9). This debris has to be disposed in an appropriate way, which is a very difficult task.

Fig. 8 Yuriage township near Natori River mouth to the south of Sendai (Photo by Daiken Suzuki)

Fig. 9 Tsunami debris in Tagajo Municipality

(a) Intact quay wall

(b) Erosion in building foundation

Fig. 10 Post-tsunami situation in Ishinomaki Harbor to the east of Sendai

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

Fig. 11 Erosion of embankment at bridge abutment after tsunami Strike (Iwanuma in Miyagi Prefecture)

Fig. 12 Resuming business of fish restaurants after tsunami strike (Nakaminato Harbor, Ibaraki)

Fig. 13 Destroyed sea wall near Abukuma River mouth

Figure 10(a) shows that the quay wall of Ishinomaki Harbor was intact, although the retreating tsunami water was so powerful to erode sand in building foundation (Fig. 10b). Despite this good seismic performance of the quay wall, the operation of the harbor was stopped for many weeks because facilities for cargo handling were destroyed. Hence, rescue stuffs could not rely on mass transportation by ship. Fig. 11 demonstrates tsunami erosion in bridge abutment. There are local people who have been working hard to reestablish previous life conditions. Fig. 12 shows recovery of fish restaurants in Nakaminato Harbor in Ibaraki Prefecture, 100 km NE of Tokyo, where the tsunami height was 4.2 m, being 1.0 m above the ground surface. The loss of backfill soil behind a coastal levee near the mouth of Abukuma River (Fig. 13) suggests that erosion by the arrival of tsunami was the main cause of the damage, which was more serious than the effect of retreating tsunami.

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

LIQUEFACTION PROBLEMS

Example of Liquefaction

Liquefaction risk is high in sandy ground that is loose, water-saturated, and young in age. This liquefaction-prone situation is found in recent artificial islands, abandoned river channels, and backfill of sewage pipelines. Liquefaction occurred at many places of such environment during the present earthquake.

Many artificial islands have been constructed along the coast of Tokyo Bay since 1960s mostly by using dredged seabed sand. Because the risk of liquefaction in such islands has been known for many years, big factories and business buildings have improved subsoil by densification and other methods. During the present earthquake, consequently, most liquefaction problems occurred in the unimproved residential areas where people did not have much knowledge about liquefaction risk.

Figure 14 illustrates sand boiling, which is an evidence of subsurface liquefaction, in a sports facility in Urayasu City in the east suburb of Tokyo. Land reclamation took place in 1980s in this area. Fig. 15 shows the consolidation settlement of liquefied sand in the same area. Because the building was supported by a pile foundation, no structural damage occurred therein and this shopping mall was able to start business within a few weeks after the quake. It is possible, however, that the differential settlement between the building and the ground destroyed many lifeline connections. Fig. 16 indicates road pavement that distorted substantially because of liquefaction. One important feature of the liquefaction problem is the damage in private properties. Overall liquefaction in residential development in manmade islands caused subsidence and tilting of many houses (Fig. 17). Lack of liquefaction mitigation measure in private lands and houses and their restoration at reasonable cost are now attracting public concern. Moreover, damage to lifeline, which is in particular sewage pipeline, is important. Figs. 18 and 19 demonstrate floating of manholes in Urayasu and another northern city of Sukagawa. Floating and surface subsidence imply need for more efficient compaction of backfill sand. Noteworthy is that quay walls around the manmade islands were maintained stable, being different from those in Niigata (1964) and Port Island in Kobe (1995), and lateral flow of liquefied subsoil did not occur.

Fig. 14 Liquefaction in Urayasu City of Chiba

Fig. 15 45-cm subsidence of ground surface in front of a shopping center (Urayasu City)

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

Fig. 16 Distortion of road pavement in residential area (Mihama of Chiba)

Fig. 17 Tilting of house (Mihama of Chiba)

Fig. 18 Uplifting of manhole of 2 meter In Urayasu of Chiba

Fig. 19 Uplifting of manhole and surface subsidence in Sukagawa of Fukushima

Liquefaction occurred in other areas as well. One part of the sheet piles quay wall at Nakaminato Fishermen's Harbor in Ibaraki Prefecture was distorted as illustrated in Fig. 20. Because this particular place is probably situated upon a small river channel, liquefaction occurred and allowed profound outward displacement of the quay wall and subsidence of the backfill where a later tsunami strike eroded the soil. Figs. 21 and 22 indicate distortion and subsidence of a road embankment and associating uplift at the foot of the slope. Boiled sand obviously verifies the occurrence of liquefaction. It seems that the higher embankment subsided and the lower ground surface came up because of volumetric balance during soil movement. It is noteworthy that the industrial site next to this place did not liquefy probably because of soil improvement.

Fig. 20 Damaged quay wall in Nakaminato Harbor

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

Urbanization and development of residential area have been conducted out of Tokyo area as well. Fig. 23 indicates house damage in Abiko City of Ibaraki. Liquefaction was concentrated in a small area which used to be a small pond that was filled with sand in 1950s for urban expansion. Liquefaction damage occurred in a residential area in Kuki City (Fig. 24) to the north of Tokyo where originally swampy topography was converted to a residential area.

Fig. 21 Distortion of road embankment in Nakaminato of Ibaraki Pref.

Fig. 22 Uplift near the toe of distorted slope in the previous figure

Fig. 23 Liquefaction in residential area of Abiko City (Fusa area)

Fig. 24 Liquefaction-induced tilting of house in Kuki City of Saitama Prefecture

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

Fig. 25 Liquefaction-induced lateral spread of Naka River levee

River levee was damaged by liquefaction at many places in Tokyo and Sendai areas as well. Because the number of damage is substantial and the rainy season is going to start soon in early June, quick and efficient restoration work is needed. Many river channels have been made straight from the original meandering shape and consequently levees are now resting upon liquefaction-prone subsoil. Boiling sand from the levee body was also observed as well during the reconnaissance, suggesting that levees may be partially loose and that water content is high. Fig. 25 shows subsidence and lateral spreading of Naka River levee in Ibaraki Prefecture (near the site of Nakaminato Harbor). This part of levee is situated upon an abandoned river channel.

(a) Crack on the crest (covered for protection)

(b) Sliding in slope on river side

Fig. 26 Distortion of Naruse River levee on right bank near 40.0 km post

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

Fig. 27 Flattened Levee of Hinuma Lake near Mito City (Pechanko!)

Fig. 28 Repeated liquefaction behind Eai River levee at Kita Wabuchi site

Figure 26 illustrates significantly distorted levee of Naruse River to the north of Sendai City. Longitudinal deep cracks and sliding of slope towards the toe are remarkable. Liquefaction was found as well on the river side. A very significant subsidence and lateral motion occurred at a levee of Hinuma Lake near Mito (Fig. 27). The entire body of the levee became almost level because of liquefaction at the bottom.

Liquefaction in an abandoned river channel in Fig. 28 indicates repeated liquefaction during the main and after-shocks in 1978, another earthquake in 2003 and finally in 2011. In spite of liquefaction, the levee was maintained intact.

Roles to Be Played by Geotechnical Engineering

It is desired by people living on liquefaction-prone land that geotechnical engineering serves them with protections from future risks. However, there are two problems to be overcome. First, restoration of tilting and subsidence of houses are urgently needed. In the example damage of Fig. 29 (Hinode area of Itako City, Ibaraki, that used to be a small lake), there seems to be no structural damage in a house, and its restoration is possible. However, the risk of repeated liquefaction and damage during aftershocks after expensive restoration has to be taken into account. It is feared that aftershocks may continue for months or years after this gigantic earthquake. On the other hand, residents are annoyed by such tilting problems as headache and dizziness that are caused by as small as 1% or less of floor inclination. Thus, despite the risk of repeated liquefaction, house restoration is still desired. It is noteworthy that conventional liquefaction mitigation such as shown in Fig. 30 was successful. Now such measures as are possible under existing houses are sought so that liquefiable subsoil is improved and tilting is restored. Because private houses are structurally less strong than RC buildings, special care and experience are indispensable.

The second problem is the meaning of liquefaction hazard maps. Many local governments had assessed liquefaction risk and published hazard maps. However, there are claims now that liquefaction occurred in areas where the hazard map did not warn liquefaction risk. This situation was caused by the following reasons:

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

- Liquefaction risk was assessed against a future earthquake that was most likely to affect the concerned municipality and the 2011 earthquake of Mw=9.0 and many number of shaking cycles has been out of concern.
- Old topography and surface geology should be more carefully studied because the size of artificial land reclamation may be very small.
- Location of available borehole investigation may have a large interval and very local soil condition may be overlooked. This risk is particularly high if liquefaction risk is evaluated on the basis of averaged borehole data in a square grid of, for example, 50m*50m.
- It should be widely understood that existing methodologies for liquefaction risk assessment employ many empirical correlations that are subject to data scattering and are not so accurate as those formulae in electrical engineering and material science.
- Because of many uncertainties, published liquefaction risk is rather overestimation in order to avoid future troubles on responsibility.

Fig. 29 Liquefaction-induced house damage in Hinode area of Itako City, Ibaraki

Fig. 30 Successful soil improvement in Irifune-Kita area of Urayasu residential area

Many problems have to be overcome in order to successfully help people from geotechnical earthquake problems. It is easy to point out how difficult the problems are. However, such an attitude does not produce anything good for future. This is the time for geotechnical engineers to work hard so that people will recognize the importance of out discipline.

INSTABILITY OF SLOPE AND EMBANKMENT

Shear failure of slopes and embankments occurred at many places. As far as natural slopes are concerned, the size of failures is not very large. Fig. 31 indicates an example in Ibaraki, north of Tokyo. A bigger slope failure occurred in Shirakawa City of Fukushima Prefecture (Fig. 32). This failure developed within a layer of weathered welded tuff and claimed 13 victims. Noteworthy is the long distance of run-out that suggests the apparent friction angle of 5 degrees approximately. It is necessary to further watch the slope behavior during aftershocks to come and the rainy season.

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

Fig. 31 Rock fall at Ohgo of Ibaraki

Fig. 32 Failure of natural slope at Hanokodaira of Shirakawa City

Fig. 33 Distortion of Shida Bridge approach Naruse River, north of Sendai

Fig. 34 Distortion of railway embankment (Joban Line of Japanese Railway East, near Mito, Ibaraki)

Distortion of embankment occurred at many places and hindered operation of transportation. Fig. 33 is a distorted road embankment. Fig. 34 shows ongoing restoration of railway truck resting on distorted embankment. Although railway service was stopped for many weeks, the earthquake did not kill any passenger in trains. It is particularly remarkable that the bullet trains (Shinkansen) successfully stopped at the onset of earthquake when they were running at a velocity greater than 200 km/h. This success was achieved by combination of many safety technologies.

On the contrary, many problems were detected in artificial earth fills for residential land development in hill areas. Fig. 35 demonstrates a slope failure at Midorigaoka area of Shiroishi City, south of Sendai. Formerly known as Kotobuki-Yama, this development slope failed during the 1978 Miyagiken-Oki earthquake when the earth filling was going on. It appears that engineers in those days judged that the slope would not be perfectly stabilized, and the land was converted to a green park instead of selling it for residence. That decision was right because the upper part of the slope failed once more (Fig. 35a). Note that part of the lower half of the slope has been stabilized by drainage of ground water (see drainage well in Fig. 35b) and was stable during the 2011 earthquake.

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

(a) At the top of slope (b) Drainage wells near the bottom of slope

Fig. 35 Slope failure at Midorigaoka of Shiroishi City of Miyagi Prefecture, south of Sendai

Fig. 36 Failure of residential development slope in Midorigaoka of Sendai City

Fig. 37 Compressive distortion of ground surface near bottom of unstable slope (Midorigaoka of Sendai)

Slope failure was repeated similarly in a land development area in Sendai City. Fig. 36 shows that the slope failure during a future earthquake was feared and this area has been left vacant until the slope failed once more in 2011. This right decision, however, was not made in a nearby area of Fig. 37. This figure indicates that ground was subjected to compressive distortion at the bottom of a moving slope. Fig. 38 shows soil liquefaction in a hilly area of Sendai City. A local person said that there used to be a small stream here and that it was backfilled at the time of land development. Therefore, the mechanism of this liquefaction is similar to what has happened in larger artificial islands near Tokyo.

Oritate area in the western part of Sendai City is a new residential development in hills. Cut-and-fill construction was practiced here and Fig. 39 indicates significant damage in a fill part. In contrast, the cut part was free of damage. Thus, the recent fear about seismic stability of residential fill was verified. Note, however, that there are stable fill as well because of the good quality of construction.

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

Fig. 38 Soil liquefaction in Asahigaoka 2 of Sendai City

Fig. 39 Damage that was limited to filled part of residential development in hilly area (Oritate 4 of Sendai)

Fig. 40 Empty reservoir of Fujinuma Dam in Sukagawa City of Fukushima Prefecture

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

Fujinuma earth dam (Fig. 40) in Sukagawa City was constructed from 1937 to 1949. Its height was 17.5 m and the slope gradient was 1:2.5 on the downstream side, while 1:2.8 on the reservoir side. Being of uniform cross section, this dam was probably not well compacted because modern compaction machine was not available in those days. There were two dams here and No. 1 Dam was eroded and breached (Fig. 41a) and caused flooding of 1.5 million cubic meters of water. No. 2 Dam failed towards the reservoir but did not breach (Fig. 41b). The flooding torrent rushed downstream from No. 1 Dam through a narrow small valley (Fig. 42) and attacked a village (Fig. 43) to destroy houses where 8 people were killed.

(a) No. 1 Dam after erosion and breaching (b) No. 2 Dam without breaching

Fig. 41 Seismically breached Fujinuma Dam

Fig. 42 Valley after torrent

Fig. 43 Village attacked by flood

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

Fig. 44 Intact shape of municipal waste landfill at Yumenoshima of Tokyo

Concern was addressed to the behavior of a solid municipal waste landfill at Yumenoshima in Tokyo. As shown in Fig. 44, no subsidence or instability was triggered therein by the earthquake motion.

NUCLEAR POWER PLANTS

There are several nuclear power plants along the Pacific Coast of Honshu Island in the earthquake affected region. While most reactors were in operation, some were out of operation for scheduled inspection / maintenance. Although all operating reactors safely shut down when the earthquake occurred, the ones of Fukushima I Power Plant caused serious problems. Because detailed information about this accident has been supplied to the public through media, the present article limits its scope to essential aspects and related environmental effects.

The Fukushima Nuclear Power Plant I was constructed and has been operated by the Tokyo Electric Power Company (TEPCO) since 1970. The strong shaking during the present earthquake did not damage the facilities. Conversely, the design tsunami height was 5.7 m as suggested by experiences in modern times and concerns about more serious height started in the 21st Century. Because the facilities were not fully designed against tsunami problems, the real tsunami height of 14 m washed away emergency water pumping machines and inundated the diesel power generators in the seismically safe basement. Thus, all the electric power sources were lost, emergency cooling became difficult, and many radioactive problems resulted.

Fukushima II Power Plant that is located at 11.5 km South of Fukushima I successfully shut down. In this plant, protection from tsunami was better than in Fukushima I. Two people were injured during the earthquake. Cooling problem and escape of smoke have been reported but no serious consequence has been known.

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

Onagawa Power Plant that is situated to the east of Sendai has been operated by Tohoku Electric Power. Reactors successfully shut down at the time of the earthquake and were well protected from tsunami strike. Before the quake, there were concerns about seismic instability of a high reinforced cliff behind this power plant. However, no instability problem was found after the earthquake.

There were six reactors in the Fukushima I plant and three of them, Nos. 1 to 3, were in operation while Nos. 4 to 6 had shut down for a scheduled inspection, when the earthquake occurred. When the plant was first designed, the design peak ground acceleration was 1.74 m/s^2 but was later raised to 4.12 or 4.52 m/s^2. Although there are fears that the real earthquake acceleration of more than 5 m/s^2 is greater than the real value, it should be recalled that modern earthquake resistant design relies more on response spectra and such a fear on acceleration is not reasonable. The tsunami effect was more serious than shaking. High waves destroyed and inundated electric facilities, and tsunami debris in the power plant made emergency activities more difficult.

During the days after the quake, the temperature in the reactors and connected facilities went up and even hydrogen explosions occurred. It appears that many cracks occurred either during the earthquake or upon explosions. Hence, the radioactivity in the air, in soil, in ground water, and in the sea increased. Damage to local farming and fishing is very significant. Leakage of hydrogen gas from the reactors caused explosions in the reactor buildings and destroyed their concrete walls. Another problem was the leakage of radioactive water into soil. Grouting was practiced to solve this problem.

Social effects of the nuclear accident will be stated in the next chapter.

SOCIAL IMPACTS

Because the earthquake source mechanism was remarkably large (Fig. 1), damage occurred over a huge area. Thus, the total number of damage was substantial. This fact made the impact of the damage to the entire nation extremely profound. This mass effect of damage is very important and was hardly experienced during past earthquakes. In contrast, the significance of individual (geotechnical) damage is not so serious as compared with what has happened during past big earthquakes. The large number of damage delayed the initiation of direct railway service by more than one month between Tokyo and Sendai. Road transportation was made difficult as well and the earthquake-hit Sendai area suffered from shortage of food, fuel, and other emergency materials. The industrial activities in the affected Tohoku region decreased substantially, causing very negative effects to both national and international economies. It is still unclear how to manage the assembled effect of many small damages.

The radioactivity discharged from Fukushima I nuclear power plant caused contamination of air, soil, and sea water. Near the power plant, cleaning of contaminated soil will be a very important issue. Similarly, salt contamination of soils in tsunami-hit areas and areas of coseismic subsidence (Fig. 2) will be very important for re-initiation of agriculture. Hopefully, the high rate of annual precipitation will naturally clean up the soil in a short period.

More problems are pointed out in the field of geoenvironmental engineering. Soil was contaminated by oil in tsunami-affected areas. Cleaning of those soils is urgently needed. Removal of debris and, in particular, tsunami debris (Fig. 9) is another important issue. The total amount of the debris will be as much as 26.7 million tons.

Earthquake News (continued)

On Gigantic Tohoku Pacific Earthquake in Japan

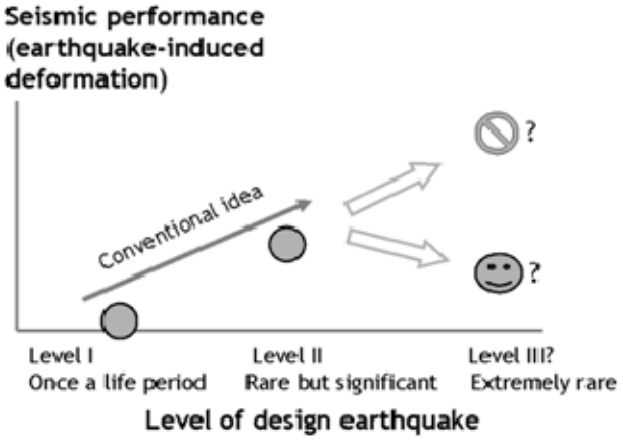


Fig. 45 Contradictory ideas in seismic performance-based design principle

These experiences raise a question to the principle of seismic performance-based design. The recent trend towards the seismic performance-based design stated that more damage (deformation) should be allowed for less frequent and stronger earthquake action. In this regard, in Fig. 45, Level I design earthquake that may occur once during a life time of a structure allows nearly no residual deformation, while Level II earthquake, that is considered rare, allows some but not fatal damage. Because the 2011 earthquake, which was extremely rare after the previous Jogan earthquake in 869, made a very significant impact on the national and international community, it may be felt that the allowable damage caused by this very rare Level III (?) earthquake should be made smaller than so far considered. Then a question arises why deformation has to be made smaller for less frequent (Level III) earthquake.

The contradiction between two opposite opinions arises because the engineering community is not accustomed to the cumulative effects made by a mass of damages. Individual damage may not be significant but, if the number of damage is 1000, the total impact is extremely bad. One of the most important lessons that are learnt from the 2011 earthquake is the lack of our suitable response to the mass effect of damages.

The accident of the nuclear power plant is still making many problems. During the first 4 weeks after the quake, many people in Tokyo were scared by the possibility of catastrophic explosion of the reactors. Accordingly, they escaped from Tokyo and took refugee in the western part of the country or in other countries. Although the feared catastrophe has not happened till the end of April, some leakage of radioactivity still continues. Agricultural and fishing products may be contaminated and life of local farmers and fishermen are becoming difficult. Local people around Fukushima I Plant have to be evacuated from their home land and have to live in remote areas without knowing when they can return home.

There are fears that Tokyo and even the entire Japan are subject to radioactive pollution. It should be recalled that this article was written in Tokyo without health problem.

Earthquake News (continued)
On Gigantic Tohoku Pacific Earthquake in Japan

CONCLUSIONS

The gigantic earthquake of M_w=9.0 on March 11th caused many damages and problems including tsunami tragedies and nuclear accidents. Geotechnical problems are made up of liquefaction in house foundation and river levees. It seems that the significant impact on the community caused by the problems, excluding tsunami and nuclear ones, was not the consequence of significant individual damage but the result of the number of damage and spatially wide distribution. Due to this mass damage effect, the post-earthquake response and restoration works have been made difficult and delayed. These features have not been considered in the conventional design philosophy and should be discussed from now on. Another important point is the damage caused in people's properties; house subsidence due to subsoil liquefaction and slope instability in residential developments in hilly area. People are now well aware of the problems under the ground surface and seeking for advice and help. Therefore, it should be stressed that this is the time for geotechnical engineers to work hard and demonstrate people the importance of our discipline. Geotechnical engineering of the People, by the People, for the People has to be constructed now.

ACKNOWLEDGEMENT

This report is supposed to be one of the earliest and comprehensive international reports on geotechnical damages caused by the gigantic earthquake in Japan. It is aimed by publishing this report in this bulletin to help ISSMGE members receive important information earlier than others. The authors conducted damage reconnaissance studies at many places for many days. They deeply appreciate supports provided by the Japanese Geotechnical Society, the Japan Society of Civil Engineers, and the Ministry of Land, Infrastructure, Transport and Tourism, together with the aid given by local communities that were indispensable in the success of the study.

News

Report on International Symposium on "Forensic Approach to Analysis of Geohazard Problems" held during 14-15 December in Mumbai, India.

Photo Participants in the International Symposium on Forensic Geotechnical Engineering (ISFFE)

Technical Committee (TC-302) on Forensic Geotechnical Engineering (FGE) of International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) organized an International Symposium on Forensic Geotechnical Engineering (ISFFE) on Forensic Approach to Analysis of Geohazard Problems" in Mumbai during 14-15 December 2010. The Symposium was held under the auspices of Indian Geotechnical Society (IGS) in association with Indian Institute of Technology, Mumbai and Mumbai Chapter of Indian Geotechnical Society. A number of experts from different countries and delegates participated in the symposium. The technical program spread over 14th and 15th December 2010 had eight invited lectures which were presented by the experts and they include

- Forensic aspects of professional services as geotechnical consultants by Dr. Kirty Dave, India
- Developments in liquefaction analysis from observations during earthquakes by Prof. Shamsher Prakash, USA
- Some Problems in Soils of loess origin in case of geotechnical damage Prof. József Mecsi, Hungary
- Case studies on sulphate induced heaving by Prof. Anand J. Puppala, USA
- A Case Study of Floor Heaving of a Condominium RC-Building with Seven Stories by Dr. Yoshi Iwasaki, Japan
- Damage to a Metro Tunnel Due to Adjacent Excavation by Dr. R. N. Hwang, Taiwan, R.O.C.
- Diagnosis of geotechnical failure causes using Bayesian networks by Prof. Limin Zhang, Hong Kong and

News (continued)
Report on International Symposium on "Forensic Approach to Analysis of Geohazard Problems" held during 14-15 December in Mumbai, India.

- Role of Instrumentation in Investigation of Failure of Dams by Dr V M Sharma, India

In addition, fourteen contributory papers in the different areas of forensic studies on the topics ranging from failure of foundations in areas of liquefaction, back analysis, failure of reinforced earth walls, landslides and cloud bursts were presented. The proceedings in CD containing the invited lectures as well as contributory papers were brought out. On 14th December 2010 a meeting of Technical Committee was held at 6 pm in Civil Engineering Department, Indian Institute of Technology Mumbai. Dr VVS Rao, Chairman of the TC 302 presided over the meeting. Prof. G L Sivakumar Babu, Prof. József Mecsi, Dr. Yoshi Iwasaki, Prof. Dr. R. N. Hwang, Prof. Anand J. Puppala (invitee) attended the meeting and discussed activities related to TC 302. Prof. J. Mecsi presented the details of the International Workshop on "Failures, Disputes, Causes and Solutions in Geotechnics" held in Hungary during 24-25 September 2010 in Budapest, Hungary. Dr Hwang presented a brief on forthcoming sessions on FGE in Asian Regional Conference in Hong Kong during May 2011 (Organiser Prof. W F Lee). Dr. Yoshi Iwasaki indicated that he would be conducting a symposium in Japan during July 2011. Prof. G L Sivakumar Babu, Secretary TC 302 thanked all the members for the excellent support to the activities of the TC.

News

3rd Indian Young Geotechnical Engineering Conference 2011: Brief Report

The Third Indian Young Geotechnical Engineers Conference (3IYGEC) was organized by Indian Geotechnical Society, Delhi Chapter at the Central Road Research Institute (CRRI), New Delhi, India, between 25th and 26th of March 2011. The Conference was inaugurated by Dr. S. Gangopadhyay, Director CRRI who also released the proceedings of the Conference. Prof. K. S. Rao, President, Indian Geotechnical Society was the Guest of Honor.

Mr. Ravi Sundaram, Chairman, IGS Delhi Chapter delivered the welcome address. Dr. R. Chitra Vice-Chairman of IGS Delhi Chapter presented the background of IGS Delhi Chapter, its activities and displayed the Best Chapter Plaque awarded to the Chapter. The Chief Guest lauded the activities of the Chapter and extended full support for future activities. Prof. K. S. Rao outlined this plan of IGS during his presidency term. Dr. Atul Nanda, Vice-Chairman of IGS Delhi Chapter addressed the vote of thanks.

About 120 delegates attended the conference. Majority of the delegates were students and young researchers from academic institutes, research laboratories, and practicing industries of the country. Twelve plenary lectures were delivered by eminent professionals in the two day conference. A total of 59 abstracts were received; 41 full papers were accepted and published after peer review. About 30 presentations were made by enthusiastic young geotechnical engineers in six technical sessions, chaired and co-chaired by eminent engineers and scientists.

Apart from technical deliberations, a job fair was organized wherein young engineers attended the interviews conducted by several companies from the geotechnical industry. A Geotechnical Dumb Charades added an element of fun and relaxation.

The presentations made by the young geotechnical engineers were judged by four distinguished judges and four best papers were selected. The following persons were awarded best paper awards:

- First Prize: Dr. B. Munawar Basha for his paper titled “Linear and Exponential Functions to evaluate Active Earth Pressure considering Strain Localization”.
- Second Prize: Mr. Deendayal Rathod for his paper titled “Migration of Sulphate in soil under Different Conditions”
- Third Prizes: Mr. Abishek Kumar for his paper titled “Amplification Factor from Intensity Map and Site Response Analysis for soil sites during 1999 Chamoli Earthquake” and to Ms. Sowmiya L.S. for her paper titled “Finite Element Analysis of Railway Tracks on Clayey Soil reinforced with Geosynthetics”.

Inauguration of Conference

Glimpse of Audience

Prize Distribution for Best Paper

Job Fair Organized for Young Engineers

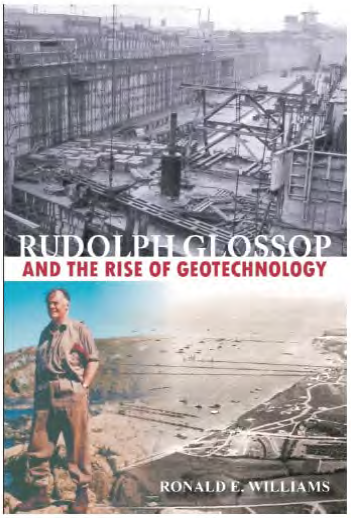
Paper Presentations by Young Engineers

Book News

"Rudolph Glossop and the Rise of Geotechnology"
by Ronald E. Williams, Whittles Publishing, UK
www.whittlespublishing.com

Rudolph Glossop was one of the founders of geotechnical engineering in the UK and his professional life is now described vividly in this book. Professor John Burland contributed a foreword to this book.

ISBN 978-184995-021-3 304pp 60 b/w photos and diagrams
hardback £50



News for Future Event

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.

KEY DATES

Abstract Submission	April 15, 2011
Abstract Acceptance Notice	June 1, 2011
Draft Paper Submission	October 1, 2011
Paper Acceptance/Review	December 15, 2011
Final Paper Submission and Speaker Registration	January 15, 2012

Authors can submit abstracts online through the conference website. Additional conference information is available at www.ISL-NASL2012.ca

Banff Springs Hotel, Banff, Alberta, Canada

News for Future Event

Workshop Organized by ISSMGE Technical Committee 211 GROUND IMPROVEMENT

Technical Committee 211 Ground Improvement (the former TC 17), which is chaired by S. Varaksin (France) and Jan Maertens (Belgium) deals with a wide range of ground improvement techniques.

It is the aim of TC 211 to foster an international technology transfer and know-how exchange that will effectively contribute to advancing the state of engineering and construction practice and accelerate reliable use of innovative ground improvement geosystems for a variety of engineering applications.

TC 211 in its present profile represents all the different ingredients of the ground improvement community. Actually, TC 211 involves more than 25 country members and more than 50 delegates. The elected structure of the TC Ground Improvement is given on the ISSMGE website www.issmge.org under Technical Committees 2010-2013, Ground Improvement TC 211.

The focus area of the TC for the period 2010-2013 has been summarized in its terms of reference, which can be found on the TC 211 website www.bbri.be/go/tc211.

It is worthwhile to mention that QC/QA methods for soil improvement works and recent research, advances and execution aspects in particular belong to the domain of interest. From that viewpoint, two main activities are planned.

On 26 May 2011, TC 211 organizes a **workshop** at the occasion of the 14th Asian Regional Conference in Hong Kong. During this workshop 8 contributions of distinguished lecturers will deal with the theme "QC-Methods for Ground Improvement Works". The complete workshop program is available on www.bbri.be/go/tc211.

From 31 May to 1 June 2012, TC 211 organizes under the auspices of the Belgian and French Member societies of ISSMGE an International Symposium **IS-GI Brussels 2012** on "Recent Research Advances and Execution Aspects of Ground Improvement works". Besides that, a series of short courses will be organized on 30 May 2012.
The first bulletin with a call for abstracts and pre-registration form has been launched.
More details, a template for abstracts, the sponsoring conditions, etc. are available on the conference website www.bbri.be/go/IS-GI-2012

Important dates for IS-GI Brussels 2012 are :
- by **30 April**: transmission of abstracts
- by **30 June:** notification of acceptance of abstracts
- by **30 November**: transmission of camera ready manuscripts.

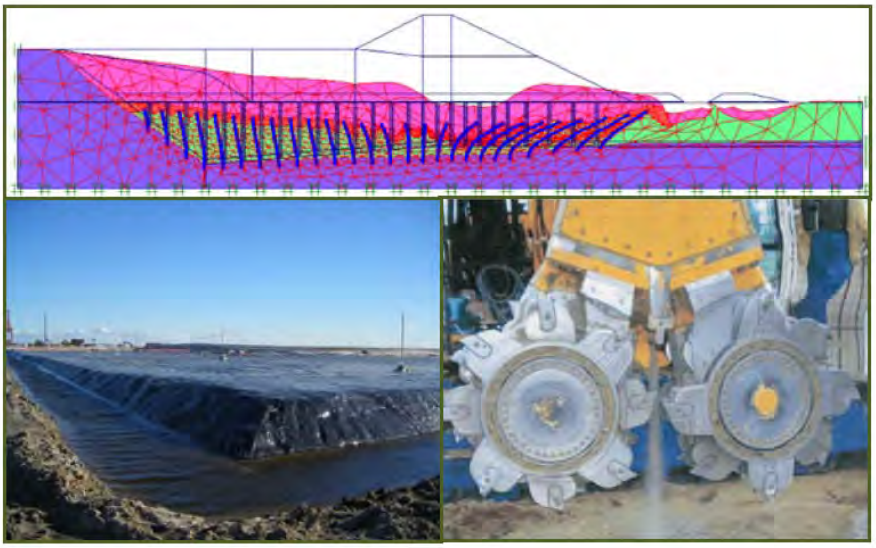
For other TC 211 related activities and events, more news is available on the TC 211 website as well as in the Newsletter that is distributed on regular base.

News for Future Event (continued)

Workshop Organized by ISSMGE Technical Committee 211 GROUND IMPROVEMENT

INTERNATIONAL SYMPOSIUM & SHORT COURSES

TC 211 IS-GI Brussels 2012



Recent Research, Advances & Execution Aspects of GROUND IMPROVEMENT WORKS

30 May – 1 June 2012, Brussels, BELGIUM

Event Diary

ISSMGE SPONSORED EVENTS

Please refer to the specific conference website for full details and latest information.

2011

7th International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground
Date: 16 - 18 May 2011
Location: Roma, Italy
Language: English
Organizer: TC28 and AGI
• Contact person: Dr. Ing. Claudio Soccodato
• Address: Associazione Geotecnica Italiana, viale dell'Università 1100185 Roma, RM, Italy
• Phone: 39064465569
• Fax: 390644361035
• E-mail: info@tc28-roma.org
Website: www.tc28-roma.org

The 3rd International Conference on Geotechnical Engineering for Disaster Mitigation and Rehabilitation 2011 (GEDMAR 2011) Combined with The 5th International Conference on Geotechnical and Highway Engineering
Date: 18 - 20 May 2011
Language: English
Organizer: JWG-DMR, Diponegoro University
• Contact person: Ir.H. Wuryanto MSc, Dr. Bagus Hario Setiadji
• Address: Indonesian Road Development Association (IRDA) of Central Java, Jl. Puri Anjasmoro Blok I.1 No 12,50144 Semarang, Central Java, Indonesia
• Phone: 62-24-7622790
• Fax: 62-24 7622785
• E-mail: hpjijateng@yahoo.co.id; geoconfina@yahoo.com
Website: reliability.geoengineer.org/GEDMAR2011/

XIV Asian Regional Conference on Soil Mechanics and Geotechnical Engineering
Date: 23 - 27 May 2011
Location: Hong Kong Poly University, Hong Kong, China
Language: English
Organizer: HKGES and CSE of HK Poly U
• Contact person: Miss Laurel Lau
• Address: Dept of Civil & Struc Eng, Hong Kong Polytechnic University, Hong Kong, China
• Phone: 852 2766 6017
• Fax: 852 2334 6389
• E-mail: 14arc.2011@polyu.edu.hk
Website: www.cse.polyu.edu.hk/14arc

3rd International Symposium on Geotechnical Safety and Risk (ISGSR2011)
Date: 2 - 3 June 2011
Location: Oskar-von-Miller-Forum, Munich, Germany
Language: English
Organizer: Zentrum Geotechnik, TU München
• Contact person: Dipl.-Ing. Gerhard Bräu
• Address: Arcisstraße 21
80290 Munich
Germany
• Phone: 49(0)89-289-27139
• Fax: 49(0)89-289-22441
• E-mail: G.Braeu@bv.tum.de
Website: www.isgsr2011.de

International Symposium on Backwards Problem in Geotechnical Engineering and Geotechnical Failure and Monitoring
Event organized under the auspices of ISSMGE
Date: 14 - 15 July 2011
Location: Green Hall, Kensetsu Koryu Kan, Osaka, Japan
Language: English
Organizer: TC302, ISSMGE
• Contact person: Yoshi Iwasaki
• Address: Geo Research Institute, 4-3-2, Itachi-bori, Nishi-ku, 550-0012 Osaka, Osaka, Japan
• Phone: 81-9-8938-1191
• Fax: 81-6-6578-6255

XV African Regional Conference on Soil Mechanics and Geotechnical Engineering - "Resources and Infrastructure Geotechnics in Africa: Putting theory into practice".
Date: 18 - 21 July 2011
Location: Maputo, Mozambique
Organizer: Soc. Moçambicana de Geotecnia
• Contact person: Prof. Carlos QUADROS, President of SMG, Dr Saturnino CHEMBEZE, Sec. Gen SMG
• Address: Mozambican Geotechnical Society, Av. 25 de Setembro nº 2526, Maputo, Mozambique
• Phone: 258 21322185
• Fax: 258 21322186
• E-mail: info@15arcsmge-maputo2011.com
Website: www.15arcsmge-maputo2011.com

Fifth International Symposium on Deformation Characteristics of Geomaterials (IS-Seoul 2011)
Date: 31 August - 3 September 2011
Location: Sheraton Grande Walkerhill, Seoul, Korea
Language: English
Organizer: ISSMGE (TC-29) and KGS
• Contact person: Prof. Dong-Soo Kim
• Address: Dept. of Civil & Environmental Eng., KAIST 305-701 Daejeon, Korea
• Phone: 82-42-350-5659
• Fax: 82-42-350-7200
• E-mail: is-seoul@kaist.ac.kr
Website: www.isseoul2011.org

21st European Young Geotechnical Engineers' Conference
Date: 4 - 7 September 2011
Location: Rotterdam, Netherlands, The
Language: English
Organizer: Netherlands Society for SMGE
• Contact person: Angelique van Tongeren
• Address: PO Box 30424, 2500GK The Hague, Netherlands
• E-mail: EYGEC2011@kiviniria.net
Website: www.kiviniria.net/EYGEC2011

Event Diary (continued)

XV European Conference on Soil Mechanics and Geotechnical Engineering "Geotechnics of Hard Soils - Weak Rocks"
Date: 12 - 15 September 2011
Location: Megaron Athens Int Conf Cntr, Athens, Greece
Language: English/French
Organizer: HSSMGE
• Contact person: Secretariat XV ECSMGE – Athens 2011
• Address: PO Box 26013, 10022 Athens, Greece
• Phone: 30 210 6915926
• Fax: +30 210 6928137
• E-mail: athens2011ecsmge@hssmge.gr
Website: www. athens2011ecsmge.org

XIV Pan-Am / CGS Geotechnical Conference
Date: 2 - 6 October 2011
Location: Sheraton Centre Toronto Hotel, Toronto, Ontario, Canada
Language: English, French, Spanish
Organizer: Cdn Geotechnical Soc. & ISSMGE
• Contact person: Wayne Gibson, P.Eng.
• Address: 8828 Pigott Rd
V7A 2C4 Richmond, BC, Canada
• Phone: 00 1 604 241 1297
• Fax: 00 1 604 241 1399
• E-mail: info@panam-cgc2011.ca
Website: panam-cgc2011.ca

TC207 workshop on Soil-structure Interaction and Retaining Walls
Date: 5 - 8 October 2011
Location: Valamar President Hotel, Dubrovnik, Croatia (Hrvatska)
Language: English
Organizer: TC207, Croatian Geotech Societ
• Contact person: Dr. Igor Sokolic;
• Address: Dept. Civil Engineering, University of Zagreb, Kaciceva 26, HR-10000 Zagreb
CROATIA
• Phone: 385 1 4639 618
• E-mail: isokolic@grad.hr
Website: www.georec.spb.ru/tc207/2011-Croatia/

2012

Second International Conference on Performance-Based Design in Earthquake Geotechnical Engineering
Date: 28 - 30 May 2012
Location: Conference Center, Taormina, Italy
Language: English
Organizer: ISSMGE TC-203
• Contact person: Dr. Claudio Soccodato
• Address: Associazione Geotecnica Italiana (AGI),
viale dell'Università, 11
00185 Roma
ITALY
• Phone: 39 064465569
• Fax: 39 0644361035
• E-mail: agiroma@iol.it
Website: www.associazionegeotecnica.it/novita

TC 211 International Symposium & Short Courses "Recent Research, Advances & Execution Aspects of GROUND IMPROVEMENT WORKS"
Date: 30 May - 1 June 2012
Location: IS: Crowne Plaza Brussels, Brussels, Belgium
Language: English
Organizer: TC 211 Ground Improvement
• Contact person: BBRI - Carine Godard
• Address: Avenue P. Holoffe 21, B-1342 Limelette BELGIUM
• Phone: 32 2 655 77 11
• Fax: 32 2 653 07 29
• E-mail: carine.godard@bbri.be
Website: www.bbri.be/go/IS-GI-2012

12th Baltic Sea Geotechnical Conference
Date: 31 May - 2 June 2012
Location: Stadhalle (Town Hall) Rostock, Rostock, Germany
Language: English
Organizer: German Geotechnical Society
• Contact person: German Geotechnical Society
• Address: Gutenbergstr. 43, 45128 Essen GERMANY
• Phone: 49 201 78 27 23
• Fax: 49 201 78 27 43
• E-mail: service@dggt.de
Website: www.12bsgc.de

International Conference on Geotechnical Engineering Education
Date: 4 - 6 July 2012
Location: NUI Galway, Galway, Ireland
Language: English
Organizer: ISSMGE TC - Geo-engineering Ed
• Contact person: Dr. Bryan A. McCabe (Conference Chair, Secretary of TC306)
• Address: Dept. of Civil Engineering, NUI Galway, Galway IRELAND
• Phone: 353 91 492021
• Fax: 353 91 494507
• E-mail: bryan.mccabe@nuigalway.ie

11th ANZ 2012 Geomechanics Conference
Date: 15 - 18 July 2012
Location: Crown Promenade Hotel, Melbourne, Victoria, Australia
Language: English
Organizer: Leishman Associates
• Contact person: Leishman Associates
• Address: 113 Harrington Street, 7000 Hobart, Tasmania
AUSTRALIA
• Phone: 61 36234 7844
• Fax: 61 6234 5958
• E-mail: nicole@leishman-associates.com.au
Website: www.anz2012.com.au

ICSE-6 - 6th International Conference on Scour and Erosion
Date: 27 - 31 August 2012
Location: Ecole Spéciale des Travaux Pub, Paris, France
Language:
Organizer:
• E-mail: contact@icse-6.com
Website: www.icse-6.com

Event Diary (continued)

2nd International Conference on Transportation Geotechnics
Date: 10 - 12 September 2012
Location: Hokkaido University, Sapporo, Hokkaido, Japan
Language: English
Organizer: ISSMGE (TC202) and JGS
• Contact person: Dr. Tatsuya Ishikawa
• Address: Faculty of Engineering, Hokkaido University Kita 13, Nishi 8, Kita-ku, 060-8628 Sapporo, Hokkaido JAPAN
• Phone: 81-706-6202
• Fax: 81-706-6202
• E-mail: tc3conference@eng.hokudai.ac.jp Website: congress.coop.hokudai.ac.jp/tc3conference/index.html

ISC'4 - 4th International Conference on Geotechnical and Geophysical Site Characterization
Date: 18 - 21 September 2012
Location: Porto de Galinhas, Pernambuco, Brazil
Language:
Organizer: TC102
• Contact person: Executive Secretary
• Address: Rua Ernesto de Paula Santos 1368, salas 603/604, Boa Viagem; Recife - PE CEP: 51021-330 BRAZIL
• E-mail: isc-4@factos.com.br
Website: www.isc-4.com/index.php

International Conference on Ground Improvement and Ground Control: Transport Infrastructure Development and Natural Hazards Mitigation
Date: 30 October - 2 November 2012
Location: University of Wollongong, Wollongong, New South Wales, Australia
Language: English
• Organizer: The Centre for Geomechanics and Railway Engineering, University of Wollongong, Australia, and the Australian Geomechanics Society (AGS)
. Contact person: Dr. Jayan Vinod
. Address: Centre for Geomechanics and Railway Engineering, Faculty of Engineering, University of Wollongong, 2522 Wollongong,, New South Wales AUSTRALIA
. Phone: 61 02 4221 4089
. Fax: 61 02 4221 3238
. E-mail: icgi_2012@uow.edu.au
. Website: www.icgiwollongong.com
. Deadline for Abstract submission: 1 July 2011

2013

18th International Conference for Soil Mechanics and Geotechnical Engineering
Date: 1 - 5 September 2013
Location: Paris International Conf. Ctr, Paris, France
Language:
Organizer:
• Contact person: Violaine Gauthier
• Address: Le Public Système, 38, rue Anatole France 92594 Levallois-Perret Cedex, France
• Phone: 33 1 70 94 65 04
• E-mail: vgauthier@lepublicsysteme.fr
Website: www.issmge2013.org/

NON-ISSMGE SPONSORED EVENTS

2011

5th Canadian Conference on Geotechnique and Natural Hazards
Date: 15 - 17 May 2011
Location: University of British Columbia, Kelowna, British Columbia, Canada
Organizer: Canadian Geotechnical Society
Website: www.geohazards5.ca/index.php?lang=en

Ottawa 2011 GAC-MAC-SEG-SGA
Date: 25 - 27 May 2011
Location: University of Ottawa, Ottawa, Ontario, Canada
Language: English
Organizer: Geological Assoc. of Canada
: • Contact person: Simon Hanmer
• Address: 601 Booth Street, K1A 0E8 Ottawa, Ontario CANADA
• Phone: 1-613-992-4704
• E-mail: simon.hanmer@nrcan.gc.ca

GeoRisk2011 (26-28 June)
Date: 26 - 28 June 2011
Language: English
Organizer: ASCE Geo-Institute
• Contact person: Charnghsein Juang
• Address: Clemson University, 29634 Clemson, South Carolina UNITED STATES
• Phone: 864-656-3322
• Fax: 864-656-2670
• E-mail: hsein@clemson.edu
Website: content.asce.org/conferences/GeoRisk2011/

4th International Geotechnical Symposium on Geotechnical Engineering for Disaster Prevention & Reduction
Date: 26 - 28 July 2011
Location: Fourth International Symposium, Khabarovsk, Russia
Language: English or Russian
Organizer: Far Eastern Transport Univ
• Contact person: Professor S.A.Kudryavtsev
• Address: Street Serishev, 47, Far Eastern State Transport University (FESTU) 680021 Kabarovsk RUSSIA
• Phone: 74212407540
• E-mail: its@festu.khv.ru
Website: www.igsh4.ru

7th Ukrainian Conference on "Soil Mechanics, Geotechnics and Foundation Engineering"
Date: 4 - 7 October 2011
Location: Sanatorium Complex “Magnolia”, Odessa, Ukraine
Language: Ukrainian, Russian
Organizer: UkrSSMGFE
: • Contact person: Vladimir Senatorov
• Address: 5/2 Ivan Klimenko Str. 03680 Kiev UKRAINE

Event Diary (continued)

• Phone: (38044) 249-38-30
• Fax: (38044) 248-89-09
• E-mail: v.senatorov@ndibk.gov.ua
Website: www.niisk.com

International Conference on "Geotechnics For Sustainable Development" - GEOTEC HANOI 2011 -
Date: 6 - 7 October 2011
Location: Fortuna Hotel, Hanoi, Vietnam
Language: English
Organizer: FECON JSC, VSSMGE and GCMM
• Contact person: Mr. Ta Xuan Hien
• Address: 15th Floor, CEO Tower, Pham Hung Road, Tu Liem District, Hanoi VIETNAM
• Phone: 84462690481
• Fax: 84462690484
• E-mail: secretariat@geotechn2011.vn

International Conference on Advances in Geotechnical Engineering (ICAGE 2011)
Date: 7 - 9 November 2011
Location: Burswood Entertainment Complex, Perth, Western Australia, Australia
Language: English
Organizer: Curtin University
• Contact person: EEC W Pty Ltd, Australia
• Phone: 61-8-9389 1488
• Fax: 61-8-9389 1499
• E-mail: info@eecw.com.au
Website: www.icage2011.com.au

5th Asia-Pacific Conference on Unsaturated Soils
Date: 14 - 16 November 2011
Location: Pattaya, Pattaya, Thailand
Language: English
Organizer: Thai Geotechnical Society, KU
• Contact person: Apiniti Jotisankasa
• Address: Department of Civil Engineering, Kasetsart University, 10900 Jatujak, Bangkok THAILAND
• Phone: 66819043060
• Fax: 6625792265
• E-mail: fengatj@ku.ac.th
Website: www.unsat.eng.ku.ac.th

Segunda Conferencia Ecuatoriana de Ingeniería Geotécnica y Ambiental para Ingenieros Jóvenes y Estudiantes (SCEIGA)
Date: 16 - 18 November 2011
Location: Universidad de Guayaquil, Guayaquil, Guayas, Ecuador
Language: Español
Organizer: SEMSIR
• Contact person: Maria Jose Avecillas Andrade
• Address: Laboratorio Ruffilli – Universidad de Guayaquil, Av. Kennedy, 9176 Guayaquil, Guayas ECUADOR
• Phone: 59384862808
• Fax: 59342286290
• E-mail: aniversariosemsir50@gmail.com
Website: semsir.blogspot.com

GEOMAT 2011-MIE, JAPAN
Date: 21 - 23 November 2011
Language: English
Organizer: Glorious International GEOMAT
• Contact person: Dr. Zakaria Hossain
• Address: Assoc. Prof., Graduate School of Bioresources, Mie University, 514-8507 Tsu, Mie JAPAN
• Phone: 81592319578
• Fax: 81592319591
• E-mail: zakaria@bio.mie-u.ac.jp
Website: gipremi.webs.com/

2012

4th International Conference on Grouting and Deep Mixing
Date: 15 - 18 February 2012
Location: Marriott New Orleans, New Orleans, LA, United States
Language: English
Organizer: ICOG and DFI
• Contact person: Theresa Rappaport
• Address: DFI; 326 Lafayette Avenue, 07506 Hawthorne, NJ USA
• Phone: 9734234030
• Fax: 9734234031
• E-mail: trappaport@dfi.org
Website: www.grout2012.org

NGM 2012. 16th Nordic Geotechnical Meeting
Date: 9 - 12 May 2012
Location: Tivoli Congress Center, Copenhagen, Denmark
Language: English
Organizer: Danish Geotechnical Society
. Contact person: Morten Jorgensen
. Address: Sortemosevej 2, DK-3450 Allerod, Copenhagen DENMARK
. Phone: +45 4810 4207 ; +45 4810 4207
. Fax: +45 4810 4300
. E-mail: moj@niras.dk
Website: www.ngm2012.dk

11th International Symposium on Landslides
Date: 2 - 8 June 2012
Location: Banff Springs Hotel, Banff, Alberta, Canada
Language: English
Organizer: Canadian Geotechnical Society
. Contact person: Corey Froese
. E-mail: Corey.Froese@ercb.ca
Website: www.ISL-NASL2012.ca

FOR FURTHER DETAILS, PLEASE REFER TO THE ISSMGE WEBSITE - http://addon.webforum.com/issmge/index.asp

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Brasfond Fundacoes Especiais SA
Rua Olimpiadas, 200, 13º Andar
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Attn: Flavio Teixeria Montez
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Cond. El Dorado
CEP 12238.577 São José dos Campos SP
BRAZIL

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The Foundation of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) was created to provide financial help to geo-engineers throughout the world who wish to further their geo-engineering knowledge and enhance their practice through various activities which they could not otherwise afford. These activities include attending conferences, participating in continuing education events, purchasing geotechnical reference books and manuals.

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    www.calgeo.org

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f. Prof. Ikuo Towhata http://geotle.t.u-tokyo.ac.jp/
towhata@geot.t.u-tokyo.ac.jp

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fill it, and send it to Prof. Harry Poulos at Harry.Poulos@coffey.com who chairs the Foundation effort. A request for grant above $2000 is unlikely to be successful. Smaller requests especially with indication of cost sharing have the best chance.