

REGIONAL GROUNDWATER FLOW COMMISSION

ANNUAL PROGRESS REPORT (April 2012-March 2013)

INTRODUCTION

The basic objective of the RGFC and Board is *internationally to foster the research and application of the concept of regional groundwater flow*. The means by which this objective is sought to be accomplished have been summarized in twelve groups of proposed "*Activities or Tasks*". The Annual Report follows the structure of the planned "*Activities or Tasks*":

- i) Special "Business and Mixer Meeting" for the "Friends of Regional Groundwater Flow", to be held in conjunction with the "International IAH Congress Niagara Falls, Canada, 2012, September 16-21;
- ii) Election of the *continuing* Board of Officers;
- iii) Global inventory of individual and institutional expertise on subject of regional groundwater-flow;
- iv) Stand-alone Specialist Meetings/Symposia;
- v) Collection and reprinting of published case studies and case histories;
- vi) Publishing annotated abstracts/summaries/reviews of theories, case histories, case studies;
- vii) Short courses;
- viii) Introduction of RGF concept and its consequences at early levels of education, for decision makers and the public;
- ix) Transfer of knowledge of theoretical and practical aspects of RGF to other IAH Commissions and Networks and to IAH National Chapters;
- x) Creation of a Liaison Committee to communicate/collaborate with other IAH Commissions and organizations at the national and international levels;
- xi) Promotion of the environmental and economic importance of the concept of RGF at the UN and National governments;
- xii) To communicate the "Activities and Tasks" of the Committee on the website of the RGF Commission (within the IAH website).

ACTIVITIES: APRIL 2012 –MARCH 2013

i) Business meeting

The special "Business and Mixer Meeting" for the "Friends of Regional Groundwater Flow" was held at the "International IAH Congress Niagara Falls, Canada, 2012, September 16-21, together with the election of the *continuing* Board of Officers. The RGFC "Kick-off Social" (Ice-Breaker) Reception was organised on the first day of the IAH Congress in Niagara Falls. The first Business Meeting of RGFC was included in the Congress programme. Close to 40 potential or already registered supporters attended.

ii) Elections

The members of the Election Committee for election the continuing Board of Officers of RGFC were: Mr. Dan Palombi, Alberta Geological Survey, Edmonton, Alberta, Canada, and Professor Larry Bentley, University of Calgary, Alberta, Canada. The Election of the Board of Officers was organised by the Election Committee by on-the-spot voting at the Congress and a previously-held online balloting. Dr. Larry Bentley and Mr. Dan Palombi registered and controlled the results of the voting.

Election results: Chair: Prof. Judit Mádl-Szőnyi (Eötvös Loránd University, Hungary); Vice Chair; József Tóth, Professor Emeritus (University of Alberta, Canada); Co-Chair-1: Prof. José Joel Carrillo Rivera (UNAM, Mexico); Co-Chair-2: Prof. Mengui Jin (China University of Geosciences, Wuhan). Based on a unanimous decision of the Board, Dr. Xiao-wei Jiang (China University of Geosciences, Beijing) was subsequently invited to join the Board as Co-Chair-3 and he accepted.



Based on the meeting of the elected board officers in Niagara Falls, "RGFC Circular-3" was completed and distributed: *"Invitation to become an Active Supporter of the RGFC of IAH."* in 2012 December.

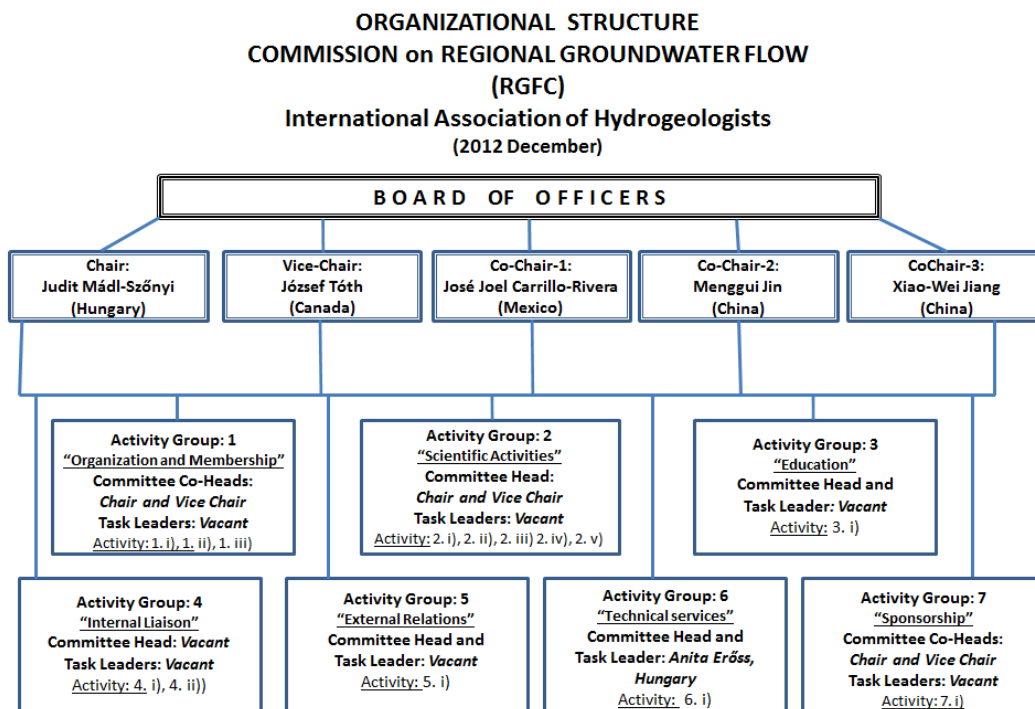
At the 2012 IAH Congress, on the 40th anniversary of the Canadian National Chapter of IAH, Prof. József Tóth was chosen for the IAH's "Award of Honorary Membership".

Prof. José Joel Carrillo Rivera of the University of Mexico received the NGWA Awards of Excellence, Life Member Award. The Life Awards were presented during the Keynote and Awards Ceremony at the 2012 NGWA Groundwater Expo and Annual Meeting on December 5, in Las Vegas. The "J. Tóth Award" was presented during the plenary ceremony of the IAH Congress to the authors of the Congress' "Best Student Paper" and the "Runner Up".



iii) Global inventory of individual and institutional expertise on the subject of regional groundwater- flow;

In a move to recruit supporters, an international survey was conducted to identify colleagues who intend to join, and contribute to, the RGFC. There are 147 listed supporters (professionals).



iv) Stand-alone Specialist Meetings and Symposia

A Workshop on "Climate, Drought and Groundwater: implications to ecosystems and population". – convened by Joel Carrillo was co-organized by the Regional Groundwater Flow Commission at the Metropolitan Autonomous University, Mexico City, Mexico, on May 2-3 2012. Over 100 attendees (mostly from Mexico, some from the USA, Colombia and Spain) made 39 oral presentations and 9 posters.

39th Congress of IAH

- J. Tóth presented a plenary keynote: "The early days of the Canadian School of Hydrogeology"
- RGFC Technical Session number 4a-11: "Regional Groundwater Flow Systems: Theory and Applications. Conveners: J. Mádl-Szőnyi, J Carrillo Rivera with the contribution of J. Tóth.
- Technical session keynote talk: "Groundwater flow systems and modern hydrogeology: the story of half a century"
- Twenty-seven oral (with 6 invited speakers: O. Batelaan; L. Barbour; J. Gomez; X-W, Jiang; J. Tóth; C. Voss) and several poster presentations were made.



v) Collection and reprinting of published case studies and case histories

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vi) Publishing annotated abstracts/summaries/reviews of theories, case histories, case studies

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vii) Short courses and training courses

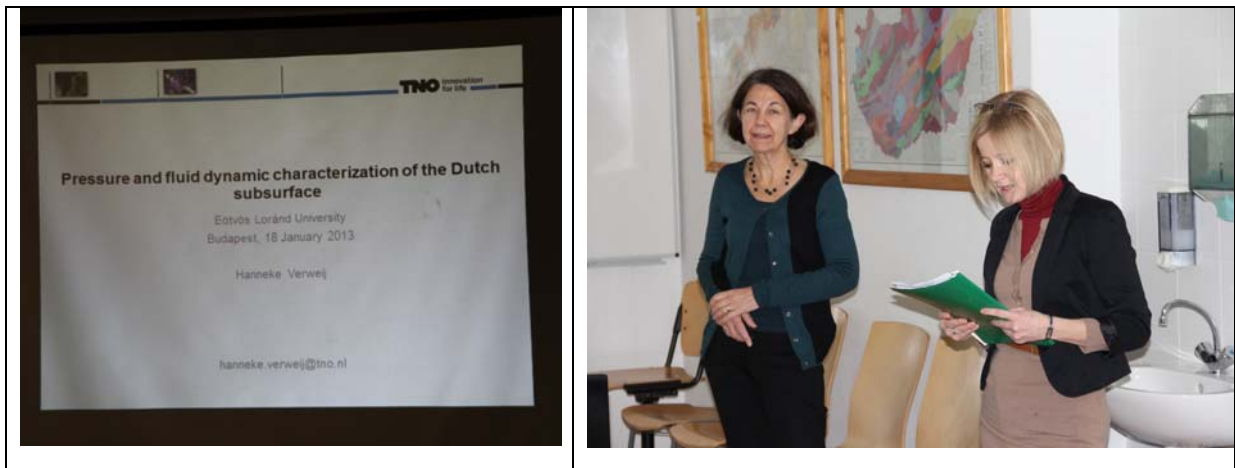
- *Groundwater Flow Systems in Sedimentary Basins.* – by J Mádl-Szőnyi at Eötvös Loránd University, Budapest. MSc Course 2012 Fall Semester (30 Hungarian and Kurdish students).
- *Analysis of groundwater flow system and its application.* – by Liang Xing. Training course for Jiangsu Geological Survey, China, December 10-13, 2012, more than 60 participants.



Lectures by Liang Xing, 2012.12.13

Invited Lectures

- *Numerical and field studies on accumulation of transported matter around stagnation points.* By Xiao-Wei Jiang at Department of Geological Sciences, University of Texas, Austin, Sept 26, 2012.
- *Theoretical and Field Studies on Basin-scale Groundwater Flow* by Xiao-Wei Jiang at the Department of Hydrology and Water Resources, University of Arizona, Tucson, October 3, 2012.
- *“Pressure and fluid dynamic characterization of the Dutch subsurface”* - by Dr. Hanneke Verweij (Basin Modeling Team Leader, senior research geoscientist - TNO ENERGY/Geological Survey of The Netherlands, Utrecht) at Eötvös Loránd University, Budapest, Hungary, 18 January, 2013.



Lecture of Hanneke Verweij in Budapest, 18 January 2013

- *Surface and underground basins, do they coincide? Some implications.* Symposium: Política, economía y gestión del agua en México. Institute of Research in Economy, UNAM, México, 20 & 21 February 2013

viii) Introduction of RGF concept and its consequences at early levels of education, for decision makers and the public

“Courses on groundwater flow understanding” The courses are directed to teachers of Geography (Social Sciences) in bachelor schools of the National Autonomous University of Mexico (UNAM). The courses are under the Direction of General Affairs of the Academic Personal (DGAPA) of UNAM – by Joel Carrillo; 30th July to 3rd August 2012

ix) Transfer of knowledge of theoretical and practical aspects of RGF to other IAH Commissions and Networks and to IAH National Chapters

The Hungarian National Chapter of IAH organizes a conference: IAH Central European Groundwater Conference 2013, Geothermal Applications and Specialties in Groundwater Flow and Resources, May 8-10, 2013 Mórahalom, Hungary.

The RGFC and Karst Commission of IAH together with the Karst Hydrogeology and Speleogenesis Commission of the International Union of Speleology (UIS) organize a Training Course and Symposium on "International Symposium on Hierarchical Flow Systems in Karst Regions", to be held in Budapest, Hungary, on 2-7 September, 2013.

Preparations for the International Symposium on Regional Groundwater Flow: Theory, Applications and Future Development. 22-23 June 2013, Xi'an, China.

x) Creation of a Liaison Committee to communicate/collaborate with other IAH Commissions and organizations at the national and international levels

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xi) Promotion of the environmental and economic importance of the concept of RGF at the UN and National governments

Joel Carrillo-Rivera and the member of the Parliament of Kingdom of Saudi Arabia, Dr Sultan Hasan Al Sultan decided to encourage the teaching of Groundwater Flow Systems at all levels of society in the country.

Judit Mádl-Szőnyi cooperates with the organizers of the 2013 Budapest Water Summit to be held in Budapest, Hungary, October, 2013. (<http://budapestwatersummit.hu/>) (Partners are the World Water Council, UNESCO, the Hungarian Government, and the Hungarian Academy of Sciences.

xii) To communicate the “Activities and Tasks” of the Committee on the website of the RGF Commission (within the IAH website)

RGFC Internet Homepage launched <http://iah.org/regionalgwflow/index.html>. Dr. Anita Erőss is responsible for the communication. The website is used as a communication surface to inform active supporters and the general public about the activities of RGFC and to provide an opportunity to find information about regional groundwater flow systems. To accomplish the latter, the basic concept of regional groundwater flow is introduced, and its importance emphasized by means of a lecture by Judit Mádl-Szőnyi, as well as by 3 videos uploaded to the home page: i) Direct observation of

complex groundwater flow systems by Liang X, et al.; ii) understanding groundwater flow systems by Samira Ouysee; and iii) Tutorials in regional groundwater flow system analysis by Carlos Molano Cajigas.

Scientific activities under the aegis of RGFC in the form of research groups

Scientific activities of Hydrogeology and Geothermal Group, Eötvös Loránd University, Budapest
(Group members: Judit Mádl-Szőnyi, Anita Erőss, Szilvia Simon, Brigitta Czauner, Eszter Pulay, Timea Havril, Ferenc Zsemle)

Conference presentations:

- J Mádl-Szőnyi, E Pulay – *The Great Deal of Hungary? Possibilities and limitations in energetic use of thermal waters*. IAH Commission on Mineral and Thermal Waters. CMTW Meeting in Hungary. August 12-18. 2012.
- A Erőss, J Mádl-Szőnyi, A É Csoma – *Hypogenic karst development in a regional discharge area: Buda Thermal Karst, Hungary*. EGU General Assembly 14. in Wien. European Geosciences Union. April 23-27. 2012.
- Sz Simon, J Mádl-Szőnyi, T Weidinger – *Investigation of groundwater dependent ecosystems in a complex hydraulic situation*. EGU General Assembly 14. in Wien. European Geosciences Union. April 23-27. 2012.
- A Erőss, J Mádl-Szőnyi, H Surbeck, Á Horváth, N Goldscheider, A É Csoma – *Application of Radium and Uranium, as Natural Tracers for the Characterization of Thermal Waters in Budapest*. III. Terrestrial Radionuclides in Environment, International Conference on Environmental Protection. Veszprém, Hungary. May 16-18. 2012.
- A Erőss, J Mádl-Szőnyi, Á Horváth, N Goldscheider, A É Csoma – *Radionuclides as natural tracers for the characterization of fluids in regional discharge areas*. 39th International Association of Hydrogeologists Congress. Niagara Falls, Canada. September 16-21. 2012.
- J Mádl-Szőnyi, A Erőss, A K Borsodi – *Groundwater discharge induced hypogenic karstification in extreme geomicrobiological environment*. 39th International Association of Hydrogeologists Congress. Niagara Falls, Canada. September 16-21. 2012.
- T Havril, Á Tóth, J Mádl-Szőnyi, Sz Simon, S Palmer, I Müller – *Maar lakes in subsurface flow connection, Tihany Peninsula, Hungary*. 39th International Association of Hydrogeologists Congress. Niagara Falls, Canada. September 16-21. 2012.
- J Déri-Takács, A Erőss, J Kovács – *The chemical characteristics of thermal waters in Budapest, Hungary*. 39th International Association of Hydrogeologists Congress. Niagara Falls, Canada. September 16-21. 2012.
- Sz Simon, J Mádl-Szőnyi, K Jobbágy – *Comparative analysis of wetland ecosystems*. 39th International Association of Hydrogeologists Congress. Niagara Falls, Canada. September 16-21. 2012.

Papers:

- A Erőss, J Mádl-Szőnyi, H Surbeck, Á Horváth, N Goldscheider, A É Csoma (2012) – *Radionuclides as natural tracers for the characterization of fluids in regional discharge areas, Buda Thermal Karst, Hungary*. Journal of Hydrology 426-427: pp. 124-137.
- A Erőss, J Mádl-Szőnyi, A É Csoma (2012) – *Hypogenic karst development in a hydrogeological context, Buda Thermal Karst, Budapest, Hungary*. In: Piotr Maloszewski, Stanisław Witczak, Grzegorz Malina (eds) Groundwater Quality Sustainability: IAH Selected Papers on Hydrogeology. London: CRC Press - Taylor and Frances Group, 2012. (ISBN:9780415698412)

- K A Borsodi, M Knáb, G Krett, J Makk, K Márialigeti, A Erőss, J Mádl-Szőnyi (2012) – *Biofilm bacterial communities inhabiting the cave walls of the Buda Thermal Karst System, Hungary*. Geomicrobiological Journal 29: (7) pp. 611-627.

Research projects:

- Hungarian Research Foundation (OTKA) (101356)
Project manager: J Mádl-Szőnyi, Associate Professor of Hydrogeology
Duration of the project: 03. 2012 - 02. 2016

Abstract:

Hypogenic karst systems are in the focus of research interest in the last decades. The Buda Thermal Karst system is an active hypogenic karst area where fluids with their dynamics, effects and products can be studied directly. Hypogenic karst development and its manifestations caused by flowing groundwater will be interpreted in flow system context. The proposed comprehensive study will provide an overview about the controlling factors of hypogenic processes and will enhance our knowledge on microbially mediated speleogenesis. Generalization of the results may be applicable in similar settings worldwide.

PhD Thesis:

- Czauner, B. (2013): Regional hydraulic function of structural elements and low-permeability formations in fluid flow systems and hydrocarbon entrapment in eastern-southeastern Hungary. PhD Thesis, Eötvös Loránd University, Hungary (in English)

Scientific activities of UNAM, Mexico under the aegis of RGFC in 2012 (Group Leader : Prof. Joel Carrillo Rivera)

Conference presentations:

- JJ, Carrillo Rivera, LA Peñuela-Arévalo. Importance of groundwater discharge areas for environmental issues identification and decision making. 5th IPWE, Internacional perspective on water resources & the environment. Enero 4-7, 2012, Marrakech, Marruecos.
- S Ouyse, JJ Carrillo-Rivera, G. Hernández-García, N Laftouhi, I Kamil. Identification of Groundwater flow systems response in Drâa basin. Sesión especial de la Regional Flow Systems Commission. Canada IAH-2012 Congress, September 16-21, 2012, Niagara Falls, Ontario,)
- JJ Carrillo-Rivera. Why groundwater functioning is neglected by decision makers of Mexico? Sesión Especial Groundwater Outreach to decisión Makers. Canada IAH-2012 Congress, September 16-21, 2012, Niagara Falls, Ontario
- A González-Abraham, R Rodríguez-Estrella, JJ Carrillo-Rivera, JR Facundo- Castillo. Dynamics of groundwater flow in an arid region: The case of Loreto, BCS, Mexico” Poster 896, Canada IAH-2012 Congress, September 16-21, 2012, Niagara Falls, Ontario
- ZY Marchetti, JJ Carrillo-Rivera. Initial geochemical evidence of groundwater discharge in the floodplain of the Paraná River, Argentina, and its association with vegetation communities. Poster 544, Canada IAH-2012-Congress, September 16-21, 2012, Niagara Falls, Ontario
- Carrillo-Rivera, J Joel; Samira Ouyse y Guillermo Hernández-García. Integrative approach for studying water sources and their vulnerability to climate change in semi-arid regions (Drâa Basin, Morocco). International Conference on water Resources and Arid Environments. Riyadh, Reino de Arabia Saudita. Pp 496-506. Enero 7-9, 2013.

Papers:

- Peñuela-Arévalo LA & JJ Carrillo-Rivera, capítulo Agua Subterránea y los Ecosistemas en el libro Impactos ambientales a la cuenca de México. Instituto de Geografía, UNAM (2011). Accepted
- Liliana A Peñuela-Arévalo y J Joel Carrillo-Rivera. 2012. Definición de zonas de recarga y descarga

de agua subterránea a partir de indicadores superficiales, centro-sur de la Mesa Central, México. Revista Investigaciones Geográficas. Aceptado Octubre 26.

- Peñuela-Arévalo y JJ Carrillo-Rivera. 2012. Discharge areas as a useful tool for understanding recharge areas, study case: Mexico Catchment. Publicado en línea. Accepted 18th June, 2012. Environmental Earth Sciences; DOI 10.1007/s12665-012-1803-z
- Carrillo-Rivera JJ y A Cardona. 2012. Groundwater Flow Systems and Their Response to Climate Change: A Need for a Water-System View Approach American Journal of Environmental Sciences 8(3):220-235, ISSN 1553-345X © 2012, Science Publications
- Marchetti, ZY y Carrillo-Rivera, JJ. 2013. Initial geochemical evidence of groundwater discharge in the floodplain of the Parana River, Argentina; implications for its biological communities. River Research and Applications. published online: 4 Jan 2013; DOI:10.1002/rra.2629

Research projects:

- Project Manager JJ Carrillo Rivera. International Atomic Energy Agency, Vienna, Austria: *“Isotopic approaches in defining regional recharge-discharge processes related to groundwater quality and flow patterns response in a catchment subject to intensive extraction: San Luis Potosí-City, Mexico”*. Vienna, Austria. Research Contract no 17478, November, 2012.

PhD Thesis:

- Ouyse, S. (2012): Groundwater flow simulation in the High and Middle sub-basins, Drâa River, Morocco (in French). Université Cadi Ayyad, Marrakech, PhD, Thèse soutenue. Pp 254.
- Peñuela Arévalo L. (2013): Characterization of groundwater flow systems functioning in part of Central-South México (in Spanish). Doctor in Geography, Postgraduate Programme in Geography, UNAM, México, Pp 227.

Scientific activities of China University of Geosciences-Wuhan under the aegis of RGFC in 2012
(Group members: Menggui Jin, Xing Liang, Renquan Zhang, Sun Ronglin, Li Jing, Niu Hong)

Conference presentations:

- Liang X. Groundwater flow patterns and their transformation and dominant factors. National conference on strategies of hydrogeology in China, Xiamen, China, May 9-12, 2012.
- Liang X., Jin MG. Comparison of given head and flux upper boundary in numerical simulation of groundwater flow patterns. September 16-21, 2012. IAH 2012 Congress, Niagara Falls, Canada
- Jin MG. Groundwater Governance in the Zhengzhou Region. “Groundwater Governance: A Global Framework for Action” Fourth Regional Consultation: Asia and Pacific Region. 3–5 December 2012, Shijiazhuang, China.

Papers:

- Liang X, Niu H, Zhang RQ, Liu Y, Jin MG. 2012. Basinal groundwater flow patterns and their transformation and dominant factors. Earth Science 37(2): 269-275. (Chinese with English abstract).
- Liang X, Quan DJ, Jin MG, Liu Y, Zhang RQ. 2012. Numerical simulation of groundwater flow patterns using flux as upper boundary. Hydrological processes. (wileyonlinelibrary. com, August 2,2012) DOI: 10.1002/hyp.9477.
- Liang X, Zhang RQ, Jin MG, Niu H, Sun RL. 2012. Development of the theory and research method of groundwater flow system. Geological Science and Technology Information. 31(5): 143-151. (Chinese with English abstract).
- Zhang Renquan, Liang Xing, Jin Menggui. 2013. The evolution of groundwater flow systems in the Quaternary of Hebei Plain since the Last Glacial Maximum. Earth Science Frontiers. Vol. 20,1-

10. (Chinese with English abstract) <http://www.cnki.net/kcms/detail/11.3370.P.20130329.1717.001.html>.

Research projects:

- *Application guide of the theory and method on groundwater flow system*. Funded by China Geological Survey (No. 12120733908). Project manager: Xing Liang. Duration of the project: 2008-2012.
- The project will summarize the theory and method of groundwater flow system and focus on their application. The application procedures will be compiled and representative case studies will be provided for different geological conditions such as the areas of karst, fractured medium and unconsolidated materials.
- *Coordinate regulation mechanism of water, salinity and trace elements in a cotton field with film mulched drip irrigation using brackish water*. Funded by National Natural Science Foundation of China (41172218). Project manager: Menggui Jin. Duration of the project: 2012-2015.
- This project will investigate the patterns of soil water flow system in cotton field with mulched drip irrigation using brackish water and their effects on water flow, distribution and consumption of nutrients, salt transport and accumulation, and so on. The study will find proper controlling modes on water, salt and nutrient for mulched drip irrigation with saline water for the purpose of more efficient use of water and nutrients. The results will be of significance for spreading saline water irrigation and prevention and cure of soil salinization in arid areas.

Scientific activities of China University of Geosciences-Beijing under the aegis of RGFC in 2012 (Group members: Xiao-Wei Jiang, Li Wan, Xu-Sheng Wang, Ran An)

Conference presentations:

- Li Wan: Recent advances in the theory of regional groundwater flow. International Groundwater Forum 2012: Groundwater and Global Environmental Change. Baoding, China. July 5~7, 2012.
- Xiao-Wei Jiang: A study on accumulation of age mass around stagnation points in nested flow systems. 34th International Geological Congress, Brisbane, Australia, August 5-10, 2012.
- Xiao-Wei Jiang: Numerical and field studies on accumulation of transported matter around stagnation points. 39th IAH Congress, Niagara Falls, Canada, Sept 16-21, 2012.
- Ran An: Distribution of groundwater temperature in nested flow systems. 39th IAH Congress, Niagara Falls, Canada, Sept 16-21, 2012.

Papers:

- Jiang XW, Wan L, Wang XS, Li HL. 2012. Distribution of groundwater age in drainage basins. *Hydrogeology and Engineering Geology*, 39(4): 1-6. (In Chinese with English Abstract)
- Jiang XW*, Wan L, Ge S, Cao GL, Hou GC, Hu FS, Wang XS, Li HL, Liang SH. 2012. A quantitative study on accumulation of age mass around stagnation points in nested flow systems. *Water Resources Research*, 48(12), W12502, DOI: 10.1029/2012WR012509.

Books:

- Jiang XW, Wan L, Wang XS. 2013. *Advances in the Theory of Regional Groundwater Flow*. Beijing: Geological Publishing House. (In press, In Chinese)

Research Projects:

- The Mechanism of Formation and Evolution of Groundwater in the Ordos Basin. 2011-2015. Funded by China Geological Survey. 6000 000 RMB. PI: Li Wan, CO-PI: Xiao-Wei Jiang.
- The Mechanism and Consequences of Seasonal Fluctuations of Groundwater Flow Systems in Semi-arid Regions. 2013-2015. Funded by National Natural Science Foundation of China. 230 000 RMB. PI: Xiao-Wei Jiang.
- Hydraulics and Hydrochemistry of Groundwater in Three Dimensional Groundwater Flow Systems. 2013-2015. Funded by the Research Fund for the Doctoral Program of Higher Education of China. 40 000 RMB. PI: Xiao-Wei Jiang.

Budapest, Hungary

April 2013

Judit Mádl-Szőnyi, Chair,

and

József Tóth, Vice-Chair

Regional Groundwater Flow Commission

International Association of Hydrogeologists