REGIONAL GROUNDWATER FLOW COMMISSION

ANNUAL PROGRESS REPORT

(March 2015 – July 2016)

1. New Board Members

In the General Meeting at AQUA2015 a new officer was proposed for the RGFC Board to lead the task of research and developments in the Commission, into which Prof. Okke Batelaan (Flinders University, Adelaide, Australia) was elected. This activity group involves the broadening the circle of colleagues who consciously and habitually take flow systems into consideration when dealing with their own special hydrogeologic problem, and fostering the worldwide co-operation between reseachers and institutes dealing with theoretical and practical aspects of regional groundwater flow.

The General Meeting also promoted the idea to have a secretary in the Board, who would assist organization and management issues. Ádám Tóth (Eötvös Loránd University, Hungary) was elected for this position.

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2. Group Meetings

The Regional Groundwater Flow Commission held an annual meeting during the 42nd IAH Congress in Rome, Italy. Chair Judit Mádl-Szőnyi, Co-chairs José Joel Carrillo-Rivera, Xiao-Wei Jiang and Menggui Jin summarized the achievements in the past year and discussed the new tasks for the future year. During this meeting the cooperation with Groundwater Outreach Commission was suggested and accepted. The meeting was attended by around 25 people.

The RGFC Board in Rome

3. Sessions at Conferences

RGF Commission co-organised a session in Vienna at EGU General Assembly 2016 titled “Groundwater vulnerability and circulation” with 6 oral presentations and 17 posters. Chair Jim LaMoreaux and co-chairs Manuela Lasagna, Ducci Daniela, Bartolomé Andreo-Navarro, Judit Mádl-Szőnyi and Xiao-Wei Jiang coordinated the session highlighting the role of regional groundwater flow in vulnerability assessment and also social and economic aspects. Papers were invited to bring together scientists studying different aspects related to vulnerability and groundwater circulation.

Chair Jim LaMoreaux, co-chairs Manuela Lasagna and Judit Mádl-Szőnyi

The RGF Commission organised a session at AQUA2015, Rome titled “Discharge area: a fingerprint of groundwater flow conditions” with 11 oral presentations and 2 posters, focusing on various topics such as karst hydrogeology, wetland ecology, soil salinization, ore deposition and surface water interaction. In the session presenters from nine countries participated including United Kingdom, Australia, Hungary, Mexico, China, Italy, Slovakia, Canada and Japan. Chair Judit Mádl-Szőnyi and Co-chair Lucio di Matteo coordinated the session discussing the main issues facing regional groundwater flow research and highlighting the future challenges in this field. Papers were invited emphasizing the quantitative understanding of flow systems and concentrating on the shift of focus from recharge to discharge, and its economical and practical importance.

A highlight of the Congress was Prof. Richard Taylor’s (Co-Chair of the Commission of Groundwater and Climate Change) invited presentation in the RGFC Session. He had a talk in the topic of „Assessing the resilience of groundwater use at low latitudes: interrogating evidence from groundwater discharge observations”.

The importance of dealing with hydrogeology at a regional scale was a main issue during the entire Congress and it emerged clearly in the course of the debate, particularly in the session T3 on the “sustainable use of groundwater” and in the session T6 regarding “groundwater governance and policy”. Indeed, regional studies are fundamental for assessing groundwater resources and it is only at the regional scale that social, economic and ecological impacts can be integrated in order to provide significant solutions. In this framework, it seems clear that regional groundwater flow is an extremely important topic for the hydrogeological community worldwide and that more hydrogeologists should take part in the RGFC activities in the future.

Audience of the RGFC’s session

Lecture of Prof. Alfonso Rivera

4. Stand-alone Specialist Meeting/Symposia

The dissemination of knowledge of flow system approach is one of the main tasks of RGFC. It seemed to be evident at the first EAGE/TNO Basin Hydrodynamic Systems workshop (Utrecht, The Netherlands, May 2015) that petroleum hydrodynamics, including unconventional resources, the principles of hydraulic continuity and cross-formational vertical flow on basinal scale, should be implemented into the approach for better understanding. Prof. Hanneke Verweij focused on vertical leakage and hydraulic continuity related to the position of petroleum accumulations. Professor Richard Swarbrick (University of Durham and Swarbrick GeoPressure, UK) highlighted the need for the exchange of hydrogeological knowledge. There was an excellent and fruitful workshop in Utrecht with interactive debates, wrap up sessions and round table discussions. Supporters of the RGFC-IAH were very active in the dissemination of knowledge with lectures and remarks by Professor József Tóth (University of Alberta, Edmonton, Canada); Prof. Jim Underschultz (University of Queensland, Australia); Prof. René Lefebvre (INRS, Quebec, Canada); Prof. Wouter Zijl (Vrije University Brussel, Belgium); Prof. Judit Mádl-Szonyi (University of ELTE, Budapest, Hungary) with the scientific group of ELTE, Hungary and with eminent professionals such as Udo Weyer and Dan Palombi etc. The prominent experts of oil companies such as Hugh Dennis (Cairn Energy) who was a keynote speaker, Johannes Wendebourg and Jean-Jacques Biteau (TOTAL, France) and Y. Yang from Saudi Aramco outlined the state of the art of petroleum hydrodynamics. Professor Ann Muggeridge (Imperial College, UK) had an extraordinary lecture about reservoir compartmentalization. The hydrodynamic aspects of geothermal energy utilization and CO_2 sequestration were also concerned. The discussion should be continued to proceed with the understanding of subsurface hydrodynamic systems as a whole. Thanks to Prof. Hanneke Verweij for organising the event.

The Hungarian attendants and the organisor of the First EAGE/TNO Workshop:
Prof. Judit Mádl-Szőnyi, Szilvia Simon, Ádám Tóth, Prof. József Tóth, Prof. Hanneke Verweij (TNO, Utrecht), Petra Bodor and Timea Havril

A three day National Colloquium on Groundwater in Mexico, held (Nov 11-13) in the Senate Building in Mexico City addressed the importance of having scientific understanding of regional groundwater flow concepts as a basis for groundwater management. The meeting venue, inside the Mexican Senate building, provided a great opportunity to increase legislator awareness of the vulnerability of Mexico's aquifers to over pumping.

The program was organized by the Instituto de Geografia, UNAM (National Autonomous University of Mexico) and several Mexican Water Agencies. The event was attended by approximately 100 politicians, political advisors, municipal officials, water and groundwater agencies and academics. The event was co-sponsored by two IAH Commissions, Regional Groundwater Flow and Groundwater Outreach.

RGFC representatives: José Joel Carrillo-Rivera (Mexico), Organiser, Judit Mádl-Szőnyi (Hungary) and Xiao-Wei Jiang (China)

Colloquium presenters: Andrew Stone (USA) Director, Commission on Groundwater Outreach Judit Mádl-Szőnyi and Elisabet Wehncke Secretary, IAH Mexican Chapter

5. Training workshops, short courses

A successful Groundwater Workshop for Middle East & North Africa (MENA) was organised in partnership with the Institute of Geography of UNAM (Igg-UNAM), Mexico; the National School of Engineers of Tunis (ENIT); the Faculty of Sciences of Tunis (FST); The World Academy of Sciences (TWAS); the Research Institute for Development (IRD), and the commissions of the International Association of Hydrogeologists: Regional Groundwater Flow (RGFC), and Groundwater Outreach (GOC); financed by the Igg-UNAM and TWAS; and hosted by ENIT.

The principal aim of the Workshop was to introduce modern hydrogeological concepts to define, manage and control groundwater and its related environmental issues, with special emphasis on sharing expertise and perspectives related to groundwater flow systems.

The co-chair of RGFC and GOC Dr. José Joel Carrillo-Rivera gave around 26 presentations and one public lecture which highlighted the practical application of the regional groundwater flow systems methodology through the case studies from Mexico, Argentina, Cuba and Colombia. Moreover, four PhD students presented and discussed their research advancement.

The Workshop included two field visits as well. The objective of the first one was to be acquainted with the Kamech permanent experimental of monitoring surface water and shallow groundwater to understand mechanisms of recharge. The other site was the Thermal Spring of Korbous situated in Cap Bon region. A field monitoring of this regional groundwater flow manifestation was proposed to understand its overall functioning.

The Workshop was attended by PhD and MSc students, as well as early career researchers, of whom 84% were women. Participants came from different research institutes and universities across Tunisia. At the end of the Workshop, participants took an exam and the results were very satisfactory. They evaluated the niveau of the Workshop regarding relevance of its content, coaching, discussion, quality of lecturing and material distributed. The overall result was 85%. Most participants expressed their interest to have a second Workshop with emphasis on hydrogeological and geochemical modelling, and the use of isotope content to understand groundwater functioning at regional and local scales.

Thanks and recognition are given to Drs L. Guellouz and F. Slama from ENIT, and to S. Ouysse from Igg-UNAM. Special thanks are to be addressed to Dr. F. Hamzaoui (FST) for launching this initiative, and to Dr. R. Bouhlila and the LMHE-ENIT laboratory staff for allowing the premises of the ENIT as venue and to the disposal of the participants.

Field visit to the Korbous thermal spring (~60°C) in Northern Tunis

- René Lefebvre (INRS Quebec, Canada): Characterization and remediation of NAPL-contaminated sites; and Example of Montérégie Est (Canada) – April 2015, Eötvös Loránd University, Budapest
- John Molson (Laval University, Canada Quebec City): A ‘’Warm-Up’’ Seminar: Numerical Modelling of Heat Transport in Porous and Discretely-Fractured Porous Media – May 2015, Eötvös Loránd University, Budapest
- Heinz Surbeck (Nucfilm GmbH, Cordast, Switzerland): Aeroradiometry with a drone aircraft to look for uranium hotspots in a former wetland – June 2015, Eötvös Loránd University, Budapest
- Neville Robinson (Flinders University, Australia): Tóthian flow system topics – October 2015, Eötvös Loránd University, Budapest
- Richard Martel (INRS Quebec, Canada) Characterisation of groundwater of military range training areas – October 2015, Eötvös Loránd University, Budapest
- René Lefebvre (INRS Quebec, Canada): Coupled transfer processes controlling gas flow applied to waste rock piles; and Novel granular aquifer characterization methods applied to contaminant migration – April 2016, Eötvös Loránd University, Budapest

6. Exchange of Knowledge

Books and Book chapters in the subject of Regional Groundwater Flow are basic tools to achieve the exchange of knowledge:

- József Tóth 2009 (translated by Zhang Renquan, Liang Xing, Jin Menggui et al, 2015): Gravitational system of groundwater flow: Theory, evaluation, utilization. Beijing: Geological Publishing House. 210 pages.

- Liang Xing, Zhang Renquan, Jin Menggui 2015: Groundwater flow: Theory, application and investigation. Beijing: Geological Publishing House. 159 pages

- Á Tóth, J Mádl-Szőnyi 2016: Scale-dependent evaluation of an unconfined carbonate system - Practical application, consequences and significance. In: Z Stevanovic , N Kresic , N Kukuric (eds.) Karst without Boundaries. London: CRC Press - Taylor and Francis Group, 2016. pp. 199-214.

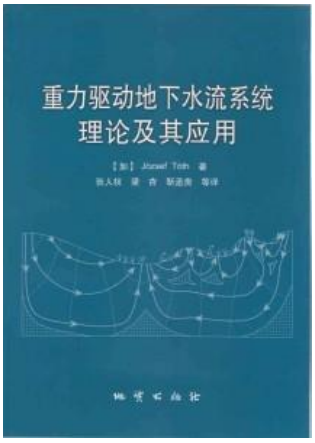
Each year five articles from among the annual crop of about 150 published in Hydrogeology Journal are designated as “Editors’ Choice”. These articles are ones that the Editors believe readers will find particularly interesting or useful. These articles were selected for one or more of several good reasons including: outstanding science, innovative approach, potentially important conclusions, interesting field area or phenomenon, unusual topic, political, social, historical, philosophical interest, etc. One of these Editors’ Choice articles of 2015 is: Brian D. Smerdon, Chris Turnadge 2015:

Considering the potential effect of faulting on regional-scale groundwater flow: an illustrative example from Australia's Great Artesian Basin. Hydrogeology Journal 23/5, 949–960.Springer, is making these articles freely accessible to all readers for two months from the publication of this editorial message. Congratulations to Brian and his co-author!

7. Dissemination of Knowledge

The RGFC-IAH with cooperation of ELTE Hungary made an electronic catalogue of the valuable reprint collection of József Tóth, "father of the Flow System Theory". The collection can be reached from Eötvös Loránd University, Budapest, Hungary but it can be also shared with the large scientific community.

The book of József Tóth "Gravitational systems of groundwater flow: theory, evaluation, utilization" has been translated into Chinese to spread the basics of gravity-driven regional groundwater flow and related phenomena among Chinese hydrogeologists: József Tóth, 2009 (translated by Zhang Renquan, Liang Xing, Jin Menggui et al, 2015). Gravitational system of groundwater flow: Theory, evaluation, utilization. Beijing: Geological Publishing House. 210 pages. 2000 printed copies; first edition, September 2015.



RGFC launched its LinkedIn page, which is a forum for scientific discussion, in autumn of 2014 and since then the number of members reached 187. RGFC also launched its new website in autumn of 2015, it has links to videos and other resources, as well as fresh news and announcements.

The RGFC with the support of the IAH Executive and ECHN initiated a competition in the AQUA Congress on regional groundwater flow. The RGFC received 18 applications for the Best Research Paper on Regional Groundwater Flow Competition. There were a preliminary assessment based on submitted abstracts, and relevance of regional groundwater flow. During the Congress, a panel of experts evaluated the oral or poster presentations based on technical quality, presentation and also relevance of regional groundwater flow.

Four prizes were awarded during the closing ceremony for the best oral or poster presentations addressing either theoretical or practical aspects of regional groundwater flow. Shared 1st prize was given to Jiale Wang (China University of Geosciences, Wuhan, China) and Ádám Tóth (Eötvös Loránd University, Budapest,

Hungary), shared 2nd prize was given to Giorgia Lucianetti (Roma Tre University, Rome, Italy) and Szilvia Simon (Eötvös Loránd University, Budapest, Hungary).

Szilvia Simon, Jiale Wang, Giorgia Lucianetti, Prof. Ken Howard (President of the IAH), Ádám Tóth and Prof. Judit Mádl-Szőnyi (Chair of the RGFC) at award ceremony

8. Publications

Papers and books

József Tóth 2009 (translated by Zhang Renquan, Liang Xing, Jin Menggui et al, 2015): Gravitational system of groundwater flow: Theory, evaluation, utilization. Beijing: Geological Publishing House. 210 pages.

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Ádám Tóth, Tímea Havril, Szilvia Simon, Attila Galsa, Fernando A Monteiro dos Santos, Imre Müller, Judit Mádl-Szőnyi 2016: Groundwater flow pattern and related environmental phenomena in complex geologic setting based on integrated model construction. JOURNAL OF HYDROLOGY 539: pp. 330-344.

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Á Tóth, J Mádl-Szőnyi 2016: Scale-dependent evaluation of an unconfined carbonate system - Practical application, consequences and significance. In: Z Stevanovic, N Kresic, N Kukuric (eds.) Karst without Boundaries. London: CRC Press - Taylor and Francis Group, 2016. pp. 199-214.

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Wang Jiale, 2016. Analysis and Identification of Hierarchical Groundwater Flow System in Jinan. PhD dissertation, China University of Geosciences, Wuhan, May 2014. (in Chinese with English abstract)

Budapest, 5 August 2016

Judit Mádl-Szőnyi, Chair of RGFC

Ádám Tóth, Secretary of RGFC