

## REGIONAL GROUNDWATER FLOW COMMISSION

### ANNUAL PROGRESS REPORT (April 2014 - March 2015)

#### 1. Visibility of RGFC-IAH and Election of a new Board of Officer

A survey by questionnaire was conducted during the 41th IAH congress. 34 questionnaire were received back. 27 of them showed that the researcher was familiar with the theory of regional groundwater flow, but only 15 of them knew of the RGFC Committee. At the IAH Congress in Morocco, a survey found that only 44% of people interested in regional groundwater flow knew about the IAH Commission. It is thus still a great challenge for the RGFC Board to involve more hydrogeologists in the activity of the Commission. The RGFC intends, therefore, to maintain its emphasis on building further the community of friends of regional groundwater flow.

The Board of Regional Groundwater Flow Commission was completed by an additional Co-Chair, Dr. Brian Smerdon (Canada) who was nominated by Professor József Tóth on the occasion of his retiring from administrative duties. The Members of the Board have voted unanimously for Dr. Smerdon's appointment as Co-Chair to the RGFC Board of officers. Dr. Brian Smerdon is interested in improving the organizational structure of RGFC and expanding the impact of RGFC across a broader group of IAH and other organizations. At the same time Prof. József Tóth was awarded the title of "Lifetime Honorary Chair of the Regional Groundwater Flow Commission". These changes were registered by the IAH Council, through IAH President Professor Ken Howard on 17 07 2014.

#### 2. Group Meetings

The Regional Groundwater Flow Commission (RGFC) held an annual meeting during the 41<sup>st</sup> IAH Congress in Morocco. Chair Judit Mádl-Szőnyi, Co-chairs José Joel Carrillo-Rivera and Xiao-Wei Jiang summarized the achievements in the past year and discussed the new tasks for the future year. The participants have decided to initiate more active discussion regarding regional groundwater flow via LinkedIn and to prepare for the upcoming IAH Congress in Rome. The Commission displayed its new logo which was approved by the IAH Council.



The members of the board of RGFC: Xiao-Wei Jiang, Judit Mádl-Szőnyi, José Joel Carrillo-Rivera in the 41<sup>st</sup> IAH Congress in Morocco



Logo of RGFC, IAH (created by Ádám Tóth)

### **3. Sessions at Conferences**

The RGFC Commission organized a Session at the 41<sup>st</sup> IAH Congress, namely, Theme 7: "Regional Groundwater Flow as a Geologic Agent and a Management Tool", on Tuesday afternoon. In addition to the seven oral presentations in the Session, about 20 delegates, including students from more than 10 countries contributed with their oral and poster presentations to the topic of regional groundwater flow during the congress. These presentations represented the latest results regarding the theoretical progress, research methods, application and the future development of regional groundwater flow studies.



### **4. Stand-alone Specialist Meeting/Symposia**

#### **5th International Student's Geological Conference sponsored by IAH ECHN & IAH RGFC in Budapest, Hungary**

Between 24-27 April 2014, the 5th International Student's Geological Conference was held at the Faculty of Science, Eötvös Loránd University, Budapest (Hungary). The Hydrogeology and Environmental Geology Sessions were sponsored by the International Association of Hydrogeologists. The professional background was ensured by Regional Groundwater Flow Commission of the IAH and Early Career Hydrogeologists' Network. 230 BSc, MSc and PhD students as well as young researchers from 3 continents and 20 countries participated at the conference. Approximately 10% of the presentations and posters from the 10 sessions related to the Hydrogeology and Engineering Geology Session.

- Carrillo-Rivera JJ 2014. Groundwater in the preserving national Inheritance. Invited talk. Postgraduate in Architecture, Master & PhD Programme, Postgraduate Unit, CU, UNAM, 27 May (Invited Conference).
- Carrillo-Rivera JJ, Peralta Higer A, Cardona A, Garcia R, Calva HD, Martínez Hernández JE, Ouyse S, Peñuela-Arévalo, LA, 2014. 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 Potosi-City, Mexico. Lecture on the 2<sup>o</sup> Research Coordination Meeting

on the Use of Environmental Isotopes to Assess Sustainability of Intensive Exploited Aquifers. Proyecto CRPF33019, Organismo Internacional de Energía Atómica, Vienna, Austria. 23-27 June.

- Carrillo-Rivera, JJ & S Ouyse, 2014. Use Of Flow Systems Understanding To Control Water Quality In Extraction Boreholes. Congreso 41 de la Asociación Internacional de Hidrogeólogos, Marrakech, Morocco 15-19 September, Session T3133.
- Carrillo-Rivera, JJ & Ouyse S, 2014. Importance of defining the flow systems to control water quality deterioration obtained by wells. The V Colombian Congress of Hydrogeology – 1st International Seminar on Current Topics in Groundwater Hydrology; 22 & 23 September 2014. Faculty of Engineering National University of Colombia at Medellín, (in Spanish) Botanic Garden, Medellín, Colombia. (in Spanish)
- Carrillo-Rivera, JJ, & Ouyse, S 2014. Is it feasible to control obtained water in a borehole? The V Colombian Congress of Hydrogeology – 1st International Seminar on Current Topics in Groundwater Hydrology; 22 & 23 September 2014. Faculty of Engineering National University of Colombia at Medellín, (in Spanish) Botanic Garden, Medellín, Colombia. (Key-note talk)
- Carrillo-Rivera, JJ. 2014. Drought and the flow Systems. In International Seminar Drought and risks of groundwater and surface water usage. Postgraduate programme, Faculty of Engineering, La Salle University, Chapinero, Bogotá, Colombia. 29 & 30 September, (Key-note guest). (in Spanish)
- Carrillo-Rivera, JJ. 2014. Drought in the context of the flow systems. Faculty of Economics and Administration Sciences, Catholic University of Colombia, Bogotá Colombia. 29 & 30 September, 2014. (Key-note guest). (in Spanish)
- Carrillo-Rivera, JJ. 2014. Drought in the context of the flow systems of groundwater. Seminar designed for the Academy and General Public in the Municipal Conservatoire, La Triada of Yopal, Colombia, 1<sup>st</sup> October (Key-note guest) (in Spanish)
- Carrillo-Rivera, JJ. 2014. Drought in the context of the flow systems. Seminar designed by the Faculty of Environmental Engineering, San Gil University, Yopal Colombia, 2<sup>nd</sup> October (Key-note guest). (in Spanish)

## **5. Training workshops, short courses**

- Short courses and Colloquium co-managed by Prof. J.J. Carrillo Rivera, Institute of Geography, UNAM, Mexico: Course “Groundwater Flow Systems Definition: Natural Manifestations and Controls”, 12-24 April, 2014. China University of Geosciences (Beijing). China
- Lectures on Training for 1:50, 000 hydrogeological survey, organized by China Geological Survey, April 2014. Lectures: Zhang Renquan: Some ideas and suggestions on Regional hydrogeological survey; Liang Xing: Groundwater flow system and case studies.



- Short course in Budapest, at Eötvös Loránd University, Hungary in 29-30 May, 2014 by Prof. Carlos Molano: Groundwater Spreadsheets highlighting the importance of regional groundwater flow.
- Short course in Zigui, Hubei (73 participants) 16-20, June 2014 was held under the aegis of RGFC. Lectures by Liang Xing: The theory of groundwater flow system and applications; Liang Xing: The theory of groundwater flow system and case studies.
- Course-Diploma. Groundwater and its flow systems: definition and application as integrative approach. Academic Unit in Engineering, University of Zacatecas, Mexico. 40 hours-live & 40 hours distance, August 18 to 29 2014
- Prof. Carlos Molano. Short course during the 41th IAH Congress about Groundwater Spreadsheets, highlighting the importance of regional groundwater flow. Marrakech, Morocco, 15-19 de September, Short Courses.
- Short Course by JJ Carrillo-Rivera “Flujos Regionales” (Regional flows), in the framework of the V Colombian Congress of Hydrogeology – 1st International Seminar on Current Topics in Groundwater Hydrology; 22 & 23 September 2014. Faculty of Engineering National University of Colombia at Medellín, Colombia.(in Spanish)
- Short Course & talk by Dr. KU Weyer, de WDA Consultants Inc. Calgary, Canada was held at UNAM. Key-note Talk and short Course “Dynamics of Subsurface Flow of Groundwater, Hydrocarbons and Sequestered CO<sub>2</sub>: Physics and Field Examples”. 3-7 de Nov. 2014
- Short course in 21 November 2014; National Chiao-tung University, Hsinchu, Taiwan and in Xinjiang Agricultural University, 24 November, 2014 Lecturer: Liang Xing: The theory of groundwater flow system and case studies.
- Short course in 27-28 November at Eötvös Loránd University Budapest, Hungary by John Molson (Université Laval, Department of Geology and Geological Engineering): „Numerical flow and transport modeling” with the involvement of flow system theory.



Short course of John Molson at ELTE

- Short course in Taipei City, at Sinotech Engineering Consultants, Inc., Taiwan 18 November, 2014; by Liang Xing: The theory of groundwater flow system and case studies.
- Training course in Guangxi Geological Survey, 4 January 2015 by Liang Xing: Aquifer systems and groundwater flow systems: theory and case studies.

## 6. Exchange of Knowledge

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

- Peñuela-Arévalo LA; Garcia-Rubio, G y Carrillo-Rivera JJ. 2014. "Groundwater in the preservation of ecosystems". Chapter 2. Physical Framework, Social y Culture. Book "Biodiversity in the Distrito Federal: Study of the State" edited by the Government of the DF, Zoo General Direction and Wild Life (DGZVS), and the Commission of knowledge and usage of the Biodiversity (CONABIO). In press
- Jiang XW, Wan L, Wang XS. 2013. Advances in the Theory of Regional Groundwater Flow. Geological Publishing House, Beijing. (In Chinese)
- Mádl-Szőnyi J. et al: Hydrodynamic Interaction between Gravity-Driven and Over-pressured Groundwater Flow and its Consequences on Soil and Wetland Salinization In: Luís Riberio, Tibor Y. Stigter, António Chambel, M. Teresa Condesso de Melo, José Paulo Monteiro, Albino Medeiros (eds.) (2013): Groundwater and Ecosystems: International Association of Hydrogeologists Selected Papers 18. London: CRC Press - Taylor and Francis Group, 2013. pp.267-280. ISBN: [978-1-138-00033-9](https://doi.org/10.1002/9781118000339)
- An important book in regional groundwater flow written by József Tóth: "Gravitational systems of groundwater flow: theory, evaluation, utilization" has been translated into Chinese by Zhang Renquan, Liang Xing, Jin Menggui et al. (It will be)
- Liang X, Zhang RQ, Jin MG. 2015. Groundwater flow systems: theory, application and investigation. Beijing: Geological Publishing House. (In Chinese)
- Tóth J. 2014. Hydrogeological Field Notes by Dr. József Tóth 1964-1969, Central and Southern Alberta. Alberta Geological Survey Information Series 143 and accompanying digital data points (DIG 2014-0013, DIG 2014-0014, DIG 2014-0015). [http://www.ags.gov.ab.ca/publications/abstracts/INF\\_143.html](http://www.ags.gov.ab.ca/publications/abstracts/INF_143.html)

- Mádl-Szőnyi J 2015. Genesis and Utilization of Thermal Flow in Deep Carbonate Systems. In: Zoran Stevanovic (ed) 2015: Karst aquifers – Characterization and Engineering. Springer 654-667. (ISBN:978-3-319-12849-8)

## **7. Dissemination of Knowledge**

This goal can be achieved by the introduction of RGF concept and its consequences at early levels of education, for decision makers and general public. Media stage: by Prof. J.J. Carrillo Rivera, Institute of Geography, UNAM, Mexico:

“Distribution and use of water in the world”, (in Spanish) TV-project *Water: an unlimited natural source*. Programa Mirador Universitario and Edusat, with Instituto de Ecología y Coordinación Universidad Abierta y Educación a Distancia de la UNAM. 3 June, 2014. Mexico

“Water for everybody and forever: Management for sustainable water use in México”, *Water: an unlimited natural source*. Programa Mirador Universitario and Edusat, with Instituto de Ecología y Coordinación Universidad Abierta y Educación a Distancia de la UNAM, 10 June, 2014. Mexico.

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.

## **8. Research**

The detailed list of most important scientific papers published in the subject of regional groundwater flow can be found in the Appendix of the Annual Report of RGFC, 2014.

### **Scientific activities under the aegis of RGFC in the form of individuals or research groups**

- a) Scientific activities of Hydrogeology and Geothermal Group, Eötvös Loránd University, Budapest  
Hypogenic karst systems with main focus on flow systems and microbial mediation. Hungarian Research Foundation (OTKA) Project manager: J Mádl-Szőnyi, 2012 - 2016.  
Hydrodynamics of deep carbonate systems (MOL) Project manager: J Mádl-Szőnyi, 2013 - 2014.
- b) Scientific activities of UNAM, Mexico under the aegis of RGFC (Group Leader: Prof. J Joel Carrillo Rivera)  
Organismo Internacional de Energía Atómica, Viena, Austria. Project Manager: JJ Carrillo Rivera, Researcher Institute of Geography, UNAM November 2012 to September 2015 “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.
- c) Scientific activities of China University of Geosciences-Wuhan under the aegis of RGFC  
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. Project manager: Menggui Jin. 2012-2015.  
Study of groundwater flow pattern and recharge and discharge in an arid inland basin. Funded by National Natural Science Foundation of China (U1403282). Project manager: Menggui Jin. 2015-2018
- d) Scientific activities of China University of Geosciences-Beijing under the aegis of RGFC  
The relationship between groundwater circulation and temperature in drainage basins. Funded by the Fok Ying Tung Education Foundation. PI: Xiao-Wei Jiang. 2014-2016.

Groundwater age distribution in groundwater basins. Funded by the Program for New Century Excellent Talents in Universities. PI: Xiao-Wei Jiang. 2014-2016.

e) Scientific activities of Alberta Geological Survey under the aegis of RGFC

Provincial scale mapping of saline and non-saline groundwater resources with scientific support to the Alberta Energy Regulator. Main project for 2014-2016: Hydrogeological characterization of the Fox Creek area (surface water/groundwater interaction; shallow aquifer characterization; deep aquifer mapping).

## **9. Liaison/Interaction with other groups/organizations**

The LinkedIn Group of RGFC was established on October 16, 2014 to improve the efficiency of communication in the subject of regional groundwater flow. The RGFC, IAH Group intends to foster the research, practical application, communication and education of regional groundwater flow. The Commission group motivates new basic research such as mathematical analyses, field and GIS methods, understanding geological agency of regional groundwater flow. Moreover this group aims to show the relevance of basin scale gravitational groundwater flow systems to various disciplines. The LinkedIn group creates a forum for international communication in this field. The LinkedIn Group of the RGFC is used to share activities, news with members. There are 83 members of the Group. This is a private professional group. Those can join who are interested in regional groundwater flow.

This forum was used to continue discussion of different aspects of regional Groundwater flow from October, 2014. The questions were initiated on an approximately monthly basis by Brian Smerdon:

- What does "regional scale" mean to you? (posted February 2015 – 2 comments)
- Our day-to-day profession: In your current projects, how is regional groundwater considered? Or it is? (posted January 2015 – 3 comments)
- A look to the future: In what ways can the theory of regional groundwater flow be further developed? (posted December 2014 – 12 comments)
- A trip down memory lane: How did you first learn of the regional groundwater flow concept, and how has it shaped your professional work since? (posted November 2014 – 17 comments)

## **10. Interaction with other groups/ organizations**

Cooperation with the Atomic Energy Agency: 2014 Research Coordination Meeting on the Use of Environmental Isotopes to Assess Sustainability of Intensive Exploited Aquifers. Vienna, Austria. 23-27 June.

## **11. Education**

The Board of Regional Groundwater Flow Commission formulated an opinion about the education related to IAH. This suggestion was sent to the IAH Council on 22 May, 2014. These views are in good agreement with the proposed plan of the RGFC accepted by the IAH Executive.

*The importance of regional groundwater flow systems in education:* The basic mission of the Regional Groundwater Flow Commission is internationally foster not only the research and practical application but also the *education in regional groundwater flow systems*. It is undoubted that this theory is *the core concept of modern hydrogeology*. Understanding of the operation of basin-scale groundwater flow systems gives the base to such disciplines as regional water resource assessment, land use

planning and management, groundwater related ecosystems, geotechnics, geothermics, mineral exploration, petroleum exploration (conventional-unconventional), landscape architecture, environment protection, soil and groundwater salinization and amelioration, forestry and agriculture, urban environment, quality control of extracted water, etc. Recognition and use of the flow system theory can give a comprehensive broad view and comprehensive approach to handle all groundwater related issues. Therefore *education is the way where we can encourage most efficiently the understanding on groundwater flow systems*. The main target groups are university students, Early Career Hydrogeologists, but education at a basic level and directly to society are also important to help in understanding and solve groundwater related environmental issues.

## **12. Expert Advice e.g. to UN / Governments**

*The steps done by the RGFC to disseminate of information about related issues in the IAH and in the society:* The RGFC has informed the IAH members about courses, seminars, sessions worldwide via LinkedIn and its homepage: <http://regionalgwflow.iah.org/news.html>. The RGFC provides additional teaching materials related to regional groundwater flow: <http://regionalgwflow.iah.org/education.html>.

J Joel Carrillo-Rivera and a member of Parliament of Saudi Arabia Kingdom, Dr Sultan Hasan AlSultan elaborate a programme to encourage the teaching of Groundwater Flow Systems at all levels of society in the Saudi Arabia.

## **13. Creation of a Global Inventory of Individuals and Research Groups interested in and/or actively working on any aspect of regional groundwater flow**

The list of individuals interested in and/or actively working on *any* aspect of regional groundwater flow contains 166 scientists and professionals worldwide (March, 2015).

Budapest, Hungary, April 2015

Judit Mádl-Szőnyi, Chair,  
and  
József Tóth, Lifetime Honorary-Chair

Regional Groundwater Flow Commission  
International Association of Hydrogeologists



Appendix of the Annual Report of RGFC, 2014.  
Publication list

**Papers**

- Albert G, Virág M, Erőss A. 2015. A Karst porosity estimations from archive cave surveys - studies in the Buda Thermal Karst System (Hungary) *International Journal of Speleology* 44:(2) p. xx.
- An R, Jiang XW, Wang JZ, Wan L, Wang XS, Li HL. 2014. A theoretical analysis of basin-scale groundwater temperature distribution. *Hydrogeology Journal*, 23(2): 397-404, DOI: 10.1007/s10040-014-1197-y. (Published March 2014)
- Déri-Takács J, Erőss A, Kovács J. 2015. The chemical characterization of the thermal waters in Budapest, Hungary by using multivariate exploratory techniques. *Environmental Earth Sciences* DOI: 10.1007/s12665-014-3904-3 (Published online January 2015)
- Erőss A, Surbeck H, Csondor K, Horváth Á, Mádl-Szőnyi J, Lénárt L,(2014) Radionuclides in the waters of the Bükk region, Hungary *Journal of Radioanalytical and Nuclear Chemistry* 303: 2529-2533. (2014)
- Fagundo-Castillo, JR; M Alconada-Magliano; JJ Carrillo-Rivera & P González-Hernández, 2014. Caracterización de los flujos de agua subterránea a partir de su salinidad. (Groundwater flow System Characterization base on their salinity). *Tecnología y Ciencias del Agua Journal*, México. V5 (May-June) No3, pp63-80, ISSN 0187-8336 (in Spanish)
- Győri O, Orbán R, Mindszenty A, Fodor L, Poros Z, Erőss A, Benkó Z, Molnár F. 2014. Red calcite: an indicator of paleo-karst systems associated with bauxitic unconformities *Geofluids* 14:(4) pp. 459-480.
- Jiang XW, Wan L, Wang JZ, Yin BX, Fu WX, Lin CH. 2014. Field identification of groundwater flow systems and hydraulic traps in drainage basins using a geophysical method. *Geophysical Research Letters*, 41(8): 2812-2819, DOI: 10.1002/2014GL059579. (Published April 2014,)
- Li Xianwen, Jin Menggui, Huang Jinou, Yuan Jingjing, 2014. The soil-water flow system beneath a cotton field in arid north-west China, serviced by mulched drip irrigation using brackish water. *Hydrogeology Journal*. DOI: 10.1007/s10040-014-1210-5 (Published online November 2014)
- Marchetti, ZY & Carrillo-Rivera, JJ. 2014. Tracing groundwater discharge in the floodplain of the Parana River, Argentina; implications for its biological communities. *River Research and Applications*. Vol 30, No 2. pp166-179; DOI:10.1002/rra.2629. ISSN: 1535-1459; ISSN electronic: 1535-1467.
- Niu Hong, Liang Xing, Zhang Renquan, 2014. Comparison of flux upper boundary and given head boundary in simulation of groundwater flow systems. *Journal of Jilin University: Earth Science Edition*, 44(3): 977-985. DOI: 10.13278/j.cnki.jjuese.201403208.
- Turnadge C, Smerdon BD. 2014. A review of methods for modelling environmental tracers in groundwater: Advantages of tracer concentration simulation. *Journal of Hydrology* 519(D): 3674-3689. DOI: 10.1016/j.jhydrol.2014.10.056
- Smerdon BD, Smith LA, Harrington GA, Gardner WP, Delle-Piane C, Sarout J. 2014. Estimating the hydraulic properties of an aquitard from in situ pore pressure measurements. *Hydrogeology Journal*, 22(8): 1875-1887, DOI: 10.1007/s10040-014-1161-x (Published December 2014)

Smerdon BD, Turnadge C. 2015. Considering the potential effect of faulting on regional-scale groundwater flow: an illustrative example from Australia's Great Artesian Basin. *Hydrogeology Journal* DOI: 10.1007/s10040-015-1248-z (Published online March 2015)

Wang JZ, Jiang XW, Wan Li, Wang XS, Li HL. 2014. An analytical study on groundwater flow in drainage basins with horizontal wells. *Hydrogeology Journal*, 22(7): 1625-1638, DOI: 10.1007/s10040-014-1146-9. (Published November 2014)

### Conference presentation

Jin Menggui, Groundwater flow patterns in the north slope of Tai mountain, China. The 8th conference of groundwater resource and water protection associated with the 2014 across-Strait symposium on the applications of groundwater and hydrogeology, Tainan, Taiwan, China. The Centennial Challenge and Sustainable Strategy of Groundwater Resources.

T Havril, Á Tóth, J Mádl-Szőnyi, Sz Simon, I Müller, J Molson – Different hydraulic position of paleo-maar lakes in subsurface flow systems, Tihany Peninsula, Hungary. In: Gabriella B Kiss (ed.) *Acta Mineralogica-Petrographica, Abstract Series 8: 5th International Students Geological Conference*. Budapest, Hungary, 2014.04.24-2014.04.27. p. 41.

Á Tóth, T Havril, J Mádl-Szőnyi, Sz Simon, I Müller, A Galsa, F A Monteiro dos Santos – The importance of electromagnetic methods to build numerical groundwater flow model for an area with complex geology in the case of Tihany Peninsula. In: Gabriella B Kiss (ed.) *Acta Mineralogica-Petrographica, Abstract Series 8: 5th International Students Geological Conference*. Budapest, Hungary, 2014.04.24-2014.04.27. p. 126.

Á Tóth, J Mádl-Szőnyi, J Kovács, G Hornyák – Relationship between springs, structures and hydrostratigraphy in different scales on the example of Transdanubian Range, Hungary. In: N Kukurić, Z Stevanović, N Krešić (ed.) *International Conference and Field Seminar "Karst Without Boundaries" (2014; Trebinje, Dubrovnik): Proceedings / International Conference and Field Seminar "Karst Without Boundaries", 11-15 June 2014*, 431 p.

Á Martinecz, J Mádl-Szőnyi, T Havril, J Molson, Sz Simon – *Numerical interpretation of groundwater flow in the Buda Thermal Karst, Hungary*. In: N Kukurić, Z Stevanović, N Krešić (ed.) *International Conference and Field Seminar "Karst Without Boundaries" (2014; Trebinje, Dubrovnik): Proceedings / International Conference and Field Seminar "Karst Without Boundaries", 11-15 June 2014*, 229 p.

Anita Erőss, Heinz Surbeck, Judit Mádl-Szőnyi, Katalin Csondor, Ákos Horváth, László Lénárt – Characterisation of karst waters by radionuclides in the Bükk Karst Region, Hungary. In: N. Kukuric, Z. Stevanovic, N Kresic (ed.) *International Conference and Field Seminar "Karst Without Boundaries" (2014; Trebinje, Dubrovnik): Proceedings/ International Conference and Field Seminar "Karst Without Boundaries", 11-15 June 2014, Trebinje (Bosnia & Herzegovina), Dubrovnik (Croatia)*. p. 188.

Judit Mádl-Szőnyi – Deep carbonate systems in regional groundwater flow context, theoretical and practical consequences. In: N. Kukuric, Z. Stevanovic, N Kresic (ed.) *International Conference and Field Seminar "Karst Without Boundaries" (2014; Trebinje, Dubrovnik): Proceedings/ International Conference and Field Seminar "Karst Without Boundaries", 11-15 June 2014, Trebinje (Bosnia & Herzegovina), Dubrovnik (Croatia)*. p. 79

Á Martinecz, T Havril, J Mádl-Szőnyi, J Molson, S Simon Numerical Interpretation Of Flow Fields In Deep Carbonates - Case Study Of The Buda Thermal Karst, Hungary In: International Association of Hydrogeologists (szerk.) 41st IAH International Congress "Groundwater : Challenges and Strategies": Abstracts. Konferencia helye, ideje: Marrakech, Marokkó, 2014.09.15-2014.09.19. *Paper T7269*

Ádám Tóth, Judit Mádl-Szőnyi, John Molson Comparison of simulated flow fields and clustering of springs for understanding deep carbonate groundwater systems In: International Association of Hydrogeologists (szerk.) 41st IAH International Congress "Groundwater : Challenges and Strategies": Abstracts. Konferencia helye, ideje: Marrakech, Marokkó, 2014.09.15-2014.09.19. *Paper T7270*.

A Erőss, J Mádl-Szőnyi, H Surbeck, K Csondor, Á Horváth, L Lénárt Hydrogeochemical studies in the Bükk karst region, Hungary In: International Association of Hydrogeologists (szerk.) 41st IAH International Congress "Groundwater : Challenges and Strategies": Abstracts. Konferencia helye, ideje: Marrakech, Marokkó, 2014.09.15-2014.09.19. *Paper T4130*.

Mádl-Szőnyi, A. Erőss Groundwater Flow as a Geologic Agent in Hypogene karsts In: International Association of Hydrogeologists (szerk.) 41st IAH International Congress "Groundwater : Challenges and Strategies": Abstracts. Konferencia helye, ideje: Marrakech, Marokkó, 2014.09.15-2014.09.19. *Paper T7162*.

J Mádl-Szőnyi, S Simon, B Czauner, E Pulay Influences Of Flow Regimes And Pressure Conditions On The Thermal Water Utilization In A Hydraulically Continuous Basin In: International Association of Hydrogeologists (szerk.) 41st IAH International Congress "Groundwater : Challenges and Strategies": Abstracts. Konferencia helye, ideje: Marrakech, Marokkó, 2014.09.15-2014.09.19. *Paper T7192*.

Simon Szilvia, Biró Marianna, Balogh Viktor Groundwater flow controlled wetland vegetation pattern, Hungary In: International Association of Hydrogeologists (szerk.) 41st IAH International Congress "Groundwater : Challenges and Strategies": Abstracts. Konferencia helye, ideje: Marrakech, Marokkó, 2014.09.15-2014.09.19. *Paper T7273*.

JJ Carrillo Rivera: Groundwater in preserving natural heritage (in Spanish) Postgraduate Programme in Architecture National Autonomous University of Mexico, 27 April. 2014. Mexico

JJ Carrillo Rivera: Groundwater and its flow systems (in Spanish) Use and appropriation of surface and groundwater: spaces of tension and conflict. (Round Table) Faculty of Philosophy and Literature, UNAM. 11 June, 2014. Mexico

## **Dissertations**

Jia Baojie, Hierarchical Model of Groundwater Flow Systems on Typical Section from North Slope of Tai Mountains to Qiguang Fault, China. Master dissertation, China University of Geosciences, Wuhan, May 2014. (in Chinese with English abstract)

Li Xianwen, Soil water flow system of mulched drip irrigation with brackish water and its application in an arid region. PhD dissertation, China University of Geosciences, Wuhan,, May 2014. (in Chinese with English abstract)