

International Association of Hydrogeologists
COMMISSION ON GROUNDWATER & CLIMATE CHANGE
ANNUAL REPORT 2009

Chairs

Richard Taylor, University College London (UK)

Ian Holman, Cranfield University (UK)

Zaihua Liu, Institute of Geochemistry, Chinese Academy of Sciences (China)

<http://www.iah.org/gwclimate/>

1. Aims

The IAH Commission on Groundwater and Climate Change (IAH-CGCC) is dedicated to improving currently limited understanding of the relationship between climate change and groundwater resources. To achieve this goal, the IAH-CGCC has the following key objectives: (1) to promote international and inter-disciplinary research among hydrogeologists, climate scientists as well as physical, social, and health scientists regarding the relationship between groundwater and climate change; (2) to facilitate the dissemination of knowledge and exchanges of experiences related to groundwater and climate change through the organisation of conferences, lectures and meetings as well as the preparation of books, journal articles and popular articles; and (3) to coordinate research activities and knowledge dissemination pertaining to groundwater and climate change with allied global initiatives.

2. Progress on Commission objectives during 2009

re: objective 1 - to promote international and inter-disciplinary research among hydrogeologists, climate scientists as well as physical, social, and health scientists regarding the relationship between groundwater and climate change

The IAH-CGCC was actively involved in promoting international, inter-disciplinary research in 2009 which featured an international workshop at University College London and an intellectual exchange visit in Switzerland. Details regarding each of these activities are given below.

Impacts of Climate Change and Development of Water Resources at the Basin Scale

The IAH-CGCC held a workshop at UCL in April 2009, supported by the Natural Environment Research Council (UK) that enabled collaborative scientists from around the world (National Climate Centre, Beijing; Yangtze River Basin Commission; Rhodes University, South Africa; McMaster University, Canada; Universidade Federal do Rio Grande do Sul, Brazil) to discuss the results of climate change impacts on freshwater resources including groundwater under a range of emissions scenarios (IPCC SRES) and prescribed increases in global mean air temperature of between 1 and 6°C. A key aspect of this workshop was the interaction with key international stakeholders including UNESCO International Hydrological Programme (FRIEND, HELP, GRAHIC, G-WADI), Global Water System Project, Department for International Development (UK) and Department of Energy and Climate Change (UK). Papers from this meeting (*e.g.* see below) are being published in a special issue of the journal, *Hydrology and Earth System Sciences*, in 2010.

Kingston, D. and Taylor, R.G., 2010. Projected impacts of climate change on groundwater and stormflow in a humid, tropical catchment in the Ugandan Upper Nile Basin. *Hydrology and Earth System Science Discussions*, Vol. 7, 1913-1944.

China-Switzerland cooperation

Three researchers from the State Key Laboratory of Environmental Geochemistry in Guizhou (from the research group of Co-Chairman Zaihua Liu) visited the Centre of Hydrogeology and the University of Neuchatel (Switzerland) during September/October, 2009, to conduct joint research on the response of groundwater resources and the karst process-related carbon sink to ice/snow melting under global warming at the Tsanfleuron glacierised karst test site.

re: objective 2 - to facilitate the dissemination of knowledge and exchanges of experiences related to groundwater and climate change through the organisation of conferences, lectures and meetings as well as the preparation of books, journal articles and popular articles

The Commission was actively involved in three key publications which were published in 2009:

1. IAHS Volume 334: Groundwater and Climate in Africa. Wallingford: IAHS Press, pp. 272.
2. Special issue of Hydrological Sciences Journal, Volume 54, Number 4: “Groundwater and Climate in Africa” edited by Richard Taylor (IAH-CGCC Co-Chair), Antonis Koussis and Callist Tindimugaya, contains 12 papers spanning climate change, palaeohydrology, modelling and transboundary aquifer management.
3. IAH Selected Papers on Hydrogeology series (number 16): “Groundwater Response to Changing Climate” edited by Makoto Taniguchi (GRAPHIC) and Ian Holman (IAH-CGCC Co-Chair) contains 16 papers resulting from the IAH Congress in Toyama. The 16 papers report case studies from around the world using knowledge from contemporary field investigations, water balance assessments, numerical simulations, satellite data, palaeohydrology, stable and radioactive isotope analyses and monitoring studies are reported.

In addition, Commission members have published many individual papers dealing with groundwater and climate change in international journals. We provide three examples:

- Vaeret, L; Kelbe, B; Haldorsen, S., *et al.* (2009). A modelling study of the effects of land management and climatic variations on groundwater inflow to Lake St Lucia, South Africa. *Hydrogeology Journal* 17(8), 1949-1967
- Owor, M; Taylor, R.G.; Tindimugaya, C, *et al* (2009). Rainfall intensity and groundwater recharge: empirical evidence from the Upper Nile Basin. *Environmental Research Letters* 4(3): 035009
- Holman I.P., Tascone D., Hess T.M. (2009). A comparison of stochastic and deterministic downscaling methods for modelling potential groundwater recharge under climate change in East Anglia UK– implications for groundwater resource management. *Hydrogeology Journal* 17(7), 1629-1641

re: objective 3 - to coordinate research activities and knowledge dissemination pertaining to groundwater and climate change with allied global initiatives

The IAH-CGCC was actively involved in the organisation of inter-disciplinary research meetings and knowledge dissemination activities at several major, international events in 2009. Details regarding each of these activities are given below.

Copenhagen Climate Summit (COP15)

At the COP15, the IAH-CGCC Co-Chair Taylor was invited by UNESCO-IHP office of The Netherlands to participate and co-organise a side event, *Groundwater, Climate Change & Adaptation*. The side event included a series of speakers and open discussion from conference delegates. The role of groundwater in adaptation to current and projected water scarcity as a result of climate change, particularly in relation to agriculture was debated robustly but overall participation (~20) in the event was disappointing and reflected overall limited interest in discussions of adaptation to climate change at COP15.

World Climate Conference 3 - Geneva

The IAH-CGCC together with the UNESCO-IHP GRAPHIC (Groundwater Resources Assessment under the Pressures of Humanity and Climate Change) programme led a conference side event, *Groundwater and Climate*, at the World Climate Conference 3 in Geneva in September 2009. The aim of the side event was to discuss the constraints to improved representation of groundwater in models and in the use of climate and groundwater information to inform adaptation; and (2) to initiate dialogue between groundwater and climate scientists at the global level. The side event featured input from leading hydrologists, climatologists, modellers, water managers and policy makers at the global level about the key limitations inhibiting improved representation of groundwater in models and in the use of climate and groundwater information to inform adaptation. A jointly authored paper detailing key aspects of the side event will be published in IAHS Publication in June 2010:

Taylor, R., Longuevergne, L., Harding, R., Todd, M., Hewitson, B., Lall, U., Hiscock, K., Treidel, H., Dev Sharma, K., Kukuric, N., Struckmeier, W. and Shamsudduha, M., 2010. Groundwater and global hydrological change – current challenges and new insight. IAHS Publication

World Water Forum 2009 - Istanbul

Working with the UNESCO-IHP GRAPHIC, the IAH-CGCC also led and organised an approved session at the 5th World Water Forum in Istanbul, *Can groundwater enable communities to adapt to water scarcity caused by climate change?* in March 2009. This session placed centrally the role of groundwater in the development of policies to mitigate and adapt to freshwater scarcity as a result of rapid development and climate change. This session involved all of the major international scientific organisations (IAH, IAHS, UN agencies) and policy makers in the water sector via the Commonwealth Science and Technology Parliamentary Committees and African Ministerial Committee on Water (AMCOW).

The IAH-CGCC was also engaged in knowledge dissemination through a series of keynote and invited presentations in 2009:

- African Initiative Congress on *Climate Change, Climate Change impacts on Water Resources in Uganda*, Kampala (Uganda)
- UK Geological Society Meeting: *Groundwater Recharge: Are we any closer to the answer?* University of East Anglia (UK)
- Danish National Chapter of the International Association of Hydrogeologists: *Climate Change and Adaptive Water Management in EU and Beyond*, Vingsted (Denmark)
- DFID workshop: *Assessing the potential impacts of climate change on the Millennium Development Goals for water and sanitation*, University of Surrey (UK)

3. Future Plans and Meetings

- IAH XXXVIII Congress (2010) in Krakow - 12-17 September 2010
- *Methods for the study of long-term groundwater dynamics*, Tozeur, Tunisia (November 1-5th, 2010), jointly organized by the INQUA Group on Palaeogroundwater, UNESCO IHP GRAPHIC and the IAH Commission on Groundwater and Climate Change