



**Side event on
Groundwater & Climate
World Climate Conference-3**

Geneva, Switzerland
1 September 2009, 17:30-19:30, Room 2

Groundwater is the world's largest, accessible store of freshwater. Groundwater is also the primary source of drinking water to nearly half of the world's population and, as the dominant source of water to irrigated land, is critical to global food security. Despite this dependence, our understanding of the impacts of climate change on groundwater resources remains very limited as highlighted by *both* the Third (2001) and Fourth (2007) Assessment Reports of the Inter-governmental Panel on Climate Change (IPCC):

*“groundwater is the major source of drinking water across much of the world...
but there has been very little research on the potential effects of climate change”.*

Groundwater & Adaptation to Climate Change

As air temperatures rise, precipitation intensities are predicted to increase, particularly in the tropics. Let alone changes in the total volume of precipitation, the shift in the distribution of rainfall will itself result in more variable river discharge and soil moisture. The former will exacerbate intra-annual freshwater shortages and the risk of flooding whereas the latter threatens food security through reduced crop yields. Strategies to adapt to more variable freshwater resources will, in many environments, increase dependence upon groundwater. At present, few climate impact models explicitly consider how climate variability and change affect groundwater recharge and the sustainable development of groundwater despite its central role in enabling adaptation in key sectors such as food security, water availability and health.

Groundwater & Advancing Climate Prediction and Information Science

As the global hydrological cycle is a central component of the Earth's climate system, effective representation and quantification of hydrological fluxes is important to improve climate simulations and prediction. At present, groundwater is poorly represented in the land-surface models (LSMs) incorporated in GCMs. Groundwater fluxes operating at a range of spatio-temporal scales require consideration. These fluxes include: (1) capillary flow from the water table to root zone to sustain evapotranspiration during dry periods; (2) shallow groundwater discharges to local

stream networks and other surface water bodies (lakes, wetlands); (3) deeper regional groundwater discharges to downstream river networks and wetlands; and (4) submarine discharges in coastal areas. Failure to consider groundwater fluxes, particularly (2) and (3) above, can lead to errors in simulated river discharge and soil moisture in LSMs and offline hydrological models.

Fundamental constraints to both the representation of groundwater in climate models and the consideration of climate impacts on groundwater include: (1) the limited coverage and duration of groundwater observations and (2) the difficulty of accessing available data. Concerted global action is urgently required to address these shortcomings; there are excellent lessons from the climate community of how this can be done.

Aims of the Groundwater & Climate side event

The **Groundwater & Climate** side event at the 3rd World Climate Conference in Geneva will contribute directly to two of the conference sub-themes, namely “*Climate impacts and adaptive strategies*” and “*Advancing climate prediction and information science*” through the pursuit of its two primary aims:

- (1) 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 latter is expected to lead to improved consideration of groundwater in climate adaptation and science and to initiate a global campaign to collate existing groundwater observations and expand groundwater monitoring networks. The side event will be led and coordinated by the UNESCO-IHP GRAPHIC programme.

Anticipated outcomes of the Groundwater & Climate side event

Anticipated outcomes from the **Groundwater & Climate** side event include: (1) improved collaboration between climate and groundwater scientists in the development of adaptive strategies to climate impacts, hydrological monitoring, and modelling of hydrological systems, including formal participation of climate scientists in the UNESCO-IHP GRAPHIC programme; and (2) increased participation of groundwater scientists in global climate change initiatives including the IPCC 5th Assessment Report, UNFCCC Nairobi Work Programme, and UN Framework Convention on Climate Change (COP-15).

Facilitator: Andras Szollosi-Nagy, Secretary, UNESCO-IHP

Panelists: Richard Harding, CEH Wallingford, UK
Bruce Hewitson, University of Cape Town, South Africa
Kevin Hiscock, University of East Anglia, UK
Neno Kukuric, IGRAC
Upmanu Lall, Columbia University, USA
Taikan Oki, University of Tokyo, Japan
Bridget Scanlon, University of Texas, USA
Kapil Dev Sharma, National Rainfed Area Authority, New Delhi, India
Willi Struckmeier, BGR, Germany
Richard Taylor, University College London, UK
Martin Todd, University of Sussex, UK
Holger Treidel, UNESCO-IHP