

# *International Workshop of* **Hydro-Biogeochemical Processes: Mechanisms, Coupling, and Impact**



**Organizer**



**October 27-31, 2015  
Wuhan, China**

**Sponsors**



# Introduction

The hydro-biogeochemical interactions between terrestrial land and aquatic systems are of critical importance to freshwater sustainability, food and energy security, and aquatic biodiversity. Humans increasingly alter the land and aquatic hydro-biogeochemical cycles directly by replacement of native vegetation with agricultural crops, applying fertilizers to increase crop yields and by the discharge of untreated sewage, and indirectly by altering the water cycle (e.g., through dams and water withdrawals) and impacting downstream surface water and groundwater quality. Climate change is also expected to significantly affect hydro-biogeochemical cycling. Research is critically needed to improve the understanding of the dynamic coupling between hydrologic and biogeochemical processes under natural and human-induced changes, and to use this understanding towards improved models that can serve as tools for sustainable management of earth critical zone, groundwater and surface water systems in the emergent Anthropocene.

This international workshop aims to bring together scientists from worldwide and various disciplines who share a common interest in addressing the challenges of understanding and managing the changing hydro-biogeochemistry in ecosystems under the pressure of diverse human impacts. The research goal is to gain holistic understanding of coupled hydrologic and biogeochemical processes across multiple spatiotemporal scales and to provide effective prediction and management solutions in an integrated fashion. This workshop will function as a platform to stimulate close collaborations, share ideas and visions, and conduct inter-comparison of data and models across various locations and scales from different disciplinary and societal perspectives. This conference makes a partial contribution to the PantaRhei initiative on Change in Hydrology and Society.

CUG is taking a major initiative to study hydrological and biogeochemical processes that affect water supply, elemental cycling, ecological life, and contaminant transport in Jiangnan plain where two world largest hydrological projects are operating: Three Gorge Dam, and China water supply project that transports water from South to North China (Beijing). There are various concerns regarding the impacts of these projects on ecology, environment, and economics. The Jiangnan plain is also viewed as an Earth critical zone that is complexly affected by natural and human activities. The workshop will greatly contribute to this CUG initiative as well by providing insights on the interactions of hydrological, geochemical, biological processes in aquatic systems, Earth Critical zones, surface and groundwater interaction zones, ecological hot spots, etc.

## **Organizer:**

China University of Geosciences

## **Sponsors:**

- International Association of Hydrological Sciences
- Pacific Northwest National Laboratory, USA
- Tsinghua University, China
- Basin Hydrology and Wetland Eco-restoration Innovation Base,  
China University of Geosciences

## **Meeting Affairs Group:**

General Secretary: Room 8105, First Floor of Yingbin Hotel in CUG

Contact: Yamin Deng: +86 17771782180

Jiarong Tong: +86 18771059732

Cong Xiao: +86 15926390133

# HBGC Workshop Agenda

October 26: On-site Registration

The Lobby on the First Floor of Yingbin Hotel in CUG (迎宾楼大厅)

**Conference Venue:**

Academic lecture hall, Yingbin Hotel (迎宾楼学术报告厅)

08:30-12:00 , Tuesday, October 27

## Opening Ceremony, Programmatic Perspectives, and Collaboration:

08:30	Chair: Chongxuan Liu, China University of Geosciences (Wuhan) and Pacific Northwest National Laboratory
08:40	Speech by Congqiang Liu, National Natural Science Foundation of China
08:50	Speech by Eryong Zhang, China Geological Survey
09:00	Speech by Murugesu Sivapalan, International Association of Hydrological Sciences
09:10	Speech by Hongyi Li, PantaRhei Working Group: Changing Biogeochemistry of Aquatic System under Emergent Anthropocene
09:20	Self-Introduction of all attendants
09:40	Group Photo and Coffee break

## GENERALSESSION

### Session Chair: Chongxuan Liu and Hongyi Li

Time	Topic
10:00	<b>Predictions in Catchment Biogeochemistry: Lessons Learned from Catchment Hydrology and PUB/PUC.</b> <i>Murugesu Sivapalan</i>

10:30	<b>Water from the Land Surface to the Coast: Deciphering Flow-Storage-Quality Changes and Their Drivers</b> <i>Georgia Destouni</i>
11:00	<b>CUG-conducted CZOs in Middle Yangtze Area</b> <i>Hongfu Yin</i>
11:30	<b>Groundwater Contamination and CZO Studies at Jiangnan Plain</b> <i>Yanxin Wang</i>
<b>12:00</b>	<b>Lunch (Buffet in Zhendan Restaurant/震旦园)</b>

14:30-18:00 , Tuesday, October 27

**SESSION 1: Earth Critical Zone**

<b>Session Chair: Roy Haggerty &amp; Dawen Yang</b>	
<b>Time</b>	<b>Topic</b>
14:30	<b>Top-down, Bottom-up, and Longer-term Views of Critical Zone Evolution Based on Isotopic Tracers</b> <i>Julie Pett-Ridge</i>
14:50	<b>Hydrological and Biogeochemical Links across Mixed Land Cover Landscapes: Insights from Watershed Modeling Approaches</b> <i>Heather Golden</i>
15:10	<b>The Role of Streams in Watershed Carbon Fluxes</b> <i>Roy Haggerty</i>
15:30	<b>Dynamics of Spring Dissolved Organic Carbon Yield from Glacier Covered Catchments in the Upper Indus River Basin on the Third Pole</b> <i>Fan Zhang</i>
<b>15:50</b>	<b>Coffee Break</b>
16:10	<b>Temporal Variation and Scaling of Hydro-Chemical Processes in Watershed</b> <i>You-Kuan Zhang</i>
16:30	<b>A Unified Framework for Modeling Solute Transport at the Catchment Scale</b>

	<i>Ciaran Harman</i>
16:50	<b>Saturated-Unsaturated Water Movement and Soil Salinity Control in a Large-Scale Irrigation District</b> <i>Jinzhong Yang</i>
17:10	<b>In-situ Mobilization and Transformation of Fe Oxides-Adsorbed Arsenate in Natural Groundwater in the Hetao Basin, China</b> <i>HuamingGuo</i>
<b>18:00</b>	<b>Banquet (Zhendan Restaurant/震旦园)</b>
<b>20:00</b>	<b>Traditional Chinese Music Performance by CUG Students (Concert Hall in CUG/北区多功能音乐厅)</b>

08:30-12:00 , Wednesday, October 28

**SESSION 2: Groundwater-Surface Water Interaction Zone**

<b>Session Chair: John Zachara &amp; Aaron Packman</b>	
<b>Time</b>	<b>Topic</b>
08:30	<b>A Multi-disciplinary Investigation of Coupled Hydrologic and Biogeochemical Dynamics in the Groundwater-Surface Water Interaction Zone of the Columbia River, a Major US River System</b> <i>John Zachara</i>
08:50	<b>Biogeochemistry and Microbial Ecology of the Columbia River Hanford Reach Groundwater-Surface Water Interaction Zone</b> <i>Jim Fredrickson</i>
09:10	<b>Impact of Surface Water-Groundwater Interactions on Arsenic Transport in Shallow Aquifer in Jiangnan Plain</b> <i>Yamin Deng</i>
09:30	<b>Surface Water and Groundwater in a Permafrost Zone, Northwestern China</b> <i>Rui Ma</i>
09:50	<b>Multiscale Simulation of Hydrologic and Biogeochemical Processes in the Groundwater-Surface Water Interaction Zone</b> <i>Xiaofan Yang</i>

<b>10:10</b>	<b>Coffee Break</b>
10:30	<b>Modeling Emergent Archetypical Biogeochemical Response Patterns over Nested Time Scales</b> <i>James Jawitz</i>
10:50	<b>System Approaches for Modeling Biogeochemical Processes and Integration with Hydrology in Hyporehic Zones</b> <i>Chongxuan Liu</i>
11:10	<b>Upscaling of Carbon and Nitrogen Dynamics in Rivers</b> <i>Aaron Packman</i>
11:30	<b>Mathematical Scaling of Biotic and Abiotic Interactions in Biogeochemical Modeling for Climate-Biogechemistry Interactions</b> <i>Jinyun Tang</i>
<b>12:00</b>	<b>Lunch (Buffet in Zhendan Restaurant/震旦园)</b>

14:30-18:00 , Wednesday, October 28

**SESSION 3: Land-Atmosphere, Land-Ocean and Human-Nature Interaction**

<b>Session Chair: Ruby Leung &amp; Qiuhong Tang</b>	
<b>Time</b>	<b>Topic</b>
14:30	<b>Long-range Transport of Dust and Impacts on Clouds and Precipitation</b> <i>Ruby Leung</i>
14:50	<b>Assessing the Effect of Climate Change on Hydrological and Coastal Processes using a Coupled Modeling Approach</b> <i>Zhaoqing Yang</i>
15:10	<b>The Toxic Outcome of Land-use and Climate Change in Lakes - a Modeling Perspective from Within and from Above</b> <i>Klaus Joehnk</i>
15:30	<b>Impact of Urban Land Uses on Coastal Environmental Quality</b> <i>Tao Yan</i>
<b>15:50</b>	<b>Coffee Break</b>

16:10	<b>Estimating Submarine Groundwater Discharges into Laizhou Bay using Radium and Salinity as Tracers</b> <i>Hailong Li</i>
16:30	<b>Quantifying the Impact of Changing Hydro-Biogeochemical Cycle on Water Resources Management under Deep Uncertainties</b> <i>Yi-Chen Yang</i>
16:50	<b>Jiangnan Basin Formation, Evolution, and Human-Nature Interaction</b> <i>Zhongping Lai</i>
17:10	<b>Combining Satellite and Ground Observations for Hydrological Monitoring and Forecasting in China</b> <i>Qihong Tang</i>
<b>18:00</b>	<b>Dinner (Buffet in Optics Valley Kingdom Plaza, Wuhan)</b> 武汉光谷金盾大酒店

08:30-12:00 , Thursday, October 29

#### **SESSION 4: Aquatic Systems**

<b>Session Chair: Michael Rode &amp; Mathew Hipsey</b>	
<b>Time</b>	<b>Topic</b>
08:30	<b>Anthropogenic Nitrogen Input and Its Impact on the Stream Water Quality in the Upper Yangtze River Basin</b> <i>Dawen Yang</i>
08:50	<b>Detecting the Nitrogen Export in Different Runoff Components from an Experimental Forest Watershed</b> <i>Lihua Tang</i>
09:10	<b>Continuous In-Stream Assimilatory Nitrate Uptake from High Frequency Sensor Measurements</b> <i>Michael Rode</i>
09:30	<b>Determining the Multiple Controls over Nutrient Supply, Demand, and Limitation</b> <i>Tim Covino</i>



09:50	<b>Temporal and Spatial Dynamics of Ephemeral Streams and Stream Biogeochemistry</b> <i>Dingbao Wang</i>
<b>10:10</b>	<b>Coffee Break</b>
10:30	<b>Rivers in Human-Earth Dialogue – An Earth System Modeling Perspective</b> <i>Hongyi Li</i>
10:50	<b>The Role of Groundwater in Streamflow in a Headwater Catchment with Semi-Arid Climate</b> <i>Fuqiang Tian</i>
11:10	<b>Potential Use of Diagnostic and Dynamic Coupling of Models for Hydro-Biochemistry</b> <i>Yonas Demissie</i>
11:30	<b>Modeling the Health of Aquatic Systems: the Changing Role of Prediction</b> <i>Matthew Hipsey</i>
<b>12:00</b>	<b>Lunch (Buffet in Zhendan Restaurant/震旦园)</b>

14:30-18:00 , Thursday, October 29

<b>DISCUSSION SESSION</b>	
<b>Time</b>	<b>Topic</b>
14:30	<b>Individual session: Critical challenges and path forward for each session theme</b> Session1 : Academic lecture hall, Yingbin Hotel (迎宾楼学术报告厅) Session 2: Meeting Room 2, Yingbin Hotel (迎宾楼 2 号会议室) Session 3: Meeting Room 3, Yingbin Hotel (迎宾楼 3 号会议室) Session 4: Octagonal Lecture Hall (八角楼学术报告厅)
<b>16:40</b>	<b>Coffee Break</b>
17:00	<b>Report to General Audience</b> Octagonal Lecture Hall (八角楼学术报告厅)

18:00	<b>Adjourn</b>
<b>18:30</b>	<b>Round Table Dinner in Zhendan Restaurant/震旦园</b>

## October 30-31 Field Trip

A field trip to visit the Three Gorges Dam and Xiling Gorge will be arranged after the workshop. Participation is optional.

### Oct. 30

Time	Activity
08:00	<b>Travel to Zigui County by Bus from CUG (4.5 hours)</b>
<b>12:30</b>	<b>Check-in and Round Table Lunch in Changlin Hotel</b>
15:00	<b>Visit Three Gorges Dam</b>
<b>18:30</b>	<b>Round Table Dinner in Changlin Hotel /秭归县长林宾馆</b>

### Oct. 31

Time	Activity
08:30	<b>Visit Xiling Gorge by Boat</b>
<b>11:30</b>	<b>Round Table Lunch in Changlin Hotel /秭归县长林宾馆</b>
13:00	<b>Return to CUG by Bus</b>
<b>18:30</b>	<b>Round Table Dinner in Zhendan Restaurant/震旦园</b>

### ◆ Three Gorges Dam

The Three Gorges Dam is the largest dam in the world with purposes to control the floods in the areas along the Yangtze River, and to generate hydropower for much of the eastern and central China. The Three Gorges Dam is a hydroelectric dam that spans the Yangtze River by the town of Sandouping, located in Yiling District, Yichang, Hubei province, China (Figure 1). The Three Gorges Dam is the world's largest power station in terms of installed capacity (22,500 MW) (Figure 2 and Figure

3). The dam has the largest operating hydroelectric facility in terms of annual energy generation, generating 83.7 TWh in 2013 and 98.8 TWh in 2014. The dam is also intended to increase the Yangtze River's shipping capacity and reduce the potential for floods downstream by providing flood storage space.

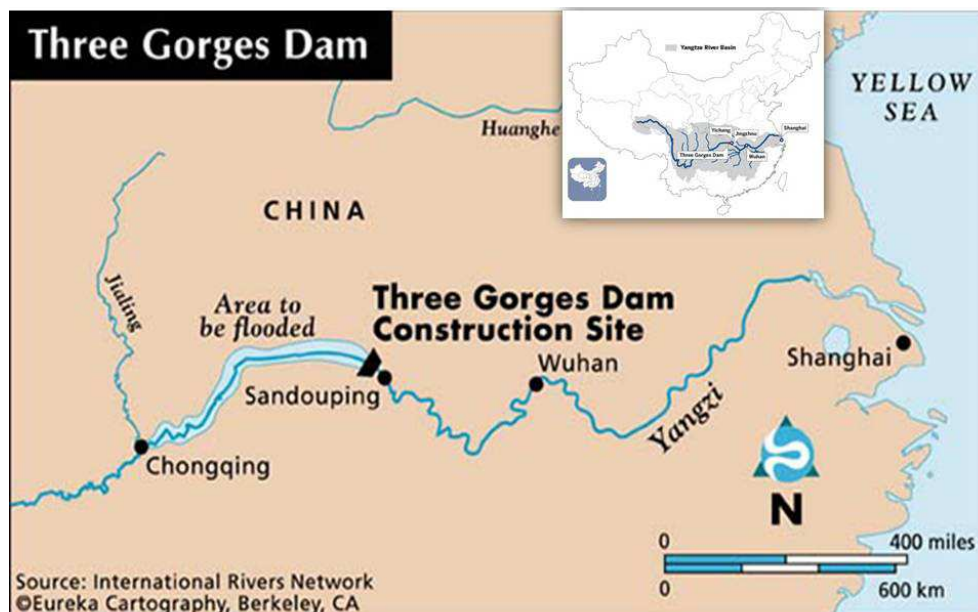


Figure1. Location of the Three Gorges Dam

Made of concrete and steel, the dam is 2,335 meters long and the top of the dam is 185 meters above sea level. The project used 27.2 million cubic meters of concrete (mainly for the dam wall), 463,000 tonnes of steel (enough to build 63 Eiffel Towers) and removed about 102.6 million cubic meters of earth. The concrete dam wall is 181 meters high above the rock basis.

When the water level is at its maximum of 175 meters above sea level, which is 110 meters higher than the river level downstream, the dam reservoir is on average about 660 kilometers in length and 1.12 kilometers in width. It contains 39.3km<sup>3</sup> of water and has a total surface area of 1,045 square kilometers.



Figure 2.The Three Gorges Dam



Figure 3. Panorama of the Three Gorges Dam

The Three Gorges, one of the world's most famous scenic sites around Qutang, Wuxian and Xiling, features breathtaking scenery which attracts hundreds of thousands of domestic and international tourists every year. The charming scenery is left untouched following the damming of the mid-section of the Xiling Gorge.



Figure 4. The scenery of Xiling Gorge in Yangtze River