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**CHAPMAN
CONFERENCE**

Valencia, Spain • 21–24 October 2019

Chapman Conference on the Quest for Sustainability of Heavily Stressed Aquifers at Regional to Global Scales

Conveners

Jim Butler (Conference Co-Chair)

Kansas Geological Survey
University of Kansas
Lawrence, Kansas, USA

Jaime Gómez-Hernández (Conference Co-Chair)

Universitat Politècnica de València
Valencia, Spain

Debra Perrone

University of California Santa Barbara
Santa Barbara, California, USA

Tom Gleeson

University of Victoria
Victoria, British Columbia, Canada

David Hyndman

Michigan State University
East Lansing, Michigan, USA

Yoshihide Wada

International Institute for Applied Systems Analysis
Laxenburg, Austria

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University of Nebraska Lincoln
Lincoln, Nebraska, USA

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Birmingham, United Kingdom

Karen Villholth
International Water Management Institute
Pretoria, South Africa

Don Whitemore
Kansas Geological Survey
Lawrence, Kansas, USA

Scientific Program

MONDAY, 21 OCTOBER

- 8:30 a.m.– 9:00 a.m.** **Registration**
- 9:00 a.m.– 9:10 a.m.** **Introduction**
Auditorium of the Blue Cube
- 9:10 a.m.– 1:00 p.m.** **Oral Session I: Status of heavily stressed aquifers: regional scale**
Auditorium of the Blue Cube
Conveners: James Butler, Jaime Gómez-Hernández
- 9:10 a.m. –9:40 a.m. **James J Butler Jr | Overview**
- 9:40 a.m. –10:10 a.m. **Jaime Gómez-Hernández | Reversing trends on water decline at the La Mancha Oriental Aquifer system (Spain)**
(Invited)
- 10:10 a.m. –10:40 a.m. **Callist Tindimugaya | Sustaining Groundwater Systems in sub-Saharan Africa: Status, Challenges and Prospects**
(Invited)
- 10:40 a.m. –11:10 a.m. **Di Long | Evaluation of ongoing groundwater storage recovery in Beijing using both monitoring and modeling under the impacts of the South to North Water Diversion**
(Invited)
- 11:10 a.m. –11:40 a.m. Coffee Break
- 11:40 a.m. –12:00 p.m. **Alan M MacDonald | Taking the Long View: 120 Years of Groundwater Accumulation and Depletion in the World's Most Heavily Exploited Aquifer - the Indo Gangetic Basin**
- 12:00 p.m. –12:20 p.m. **Ali S Akanda | Integrated groundwater quantity and quality monitoring for sustainable management paths in the Arabian Peninsula**
- 12:20 p.m. –12:40 p.m. **Hugo Alberto Gutierrez-Jurado | Assessing the vulnerability of a tropical, seasonally stressed regional**

aquifer system to climate variability and agriculture expansion-driven deforestation

12:40 p.m. –1:00 p.m.

Claudia C Faunt | Sustainability of California's Central Valley Aquifer: Understanding Water Availability and Management Techniques

1:00 p.m.– 3:00 p.m.

Lunch and Free Time

Atrium

3:00 p.m.– 7:00 p.m.

Oral Session II: Knowledge gaps

Auditorium of the Blue Cube

Conveners: Thomas Gleeson, Debra Perrone

3:00 p.m. –3:30 p.m.

Thomas Gleeson | Overview

3:30 p.m. –3:45 p.m.

Burke W. Griggs | Effective Property: Integrating Geohydrological Science into American Groundwater Law *(Invited)*

3:45 p.m. –4:00 p.m.

Richard G Taylor | Aquifers as complex social ecological systems: revisiting the commons *(Invited)*

4:00 p.m. –4:15 p.m.

Ellen Hanak | Biggest Gaps: Adopting Economic Incentives to Sustainable Groundwater Management *(Invited)*

4:15 p.m. –5:15 p.m.

Debate on Biggest Gaps and Interactive Activities

5:15 p.m. –5:45 p.m.

Coffee Break

5:45 p.m. –6:05 p.m.

Timothy Foster | Monitoring groundwater irrigation from space: opportunities and challenges for policy

6:05 p.m. –6:25 p.m.

Sarah Fletcher | Learning about groundwater resource uncertainty enables adaptive and reliable water supply infrastructure planning

6:25 p.m. –6:50 p.m.

Bruno Basso | Pathways to Sustainability Through Digital Agriculture Technologies *(Invited)*

6:50 p.m. –7:00 p.m.

Discussion

TUESDAY, 22 OCTOBER

- 8:00 a.m.– 9:00 a.m.** **Poster Session Setup**
Atrium
- 9:00 a.m.– 12:00 p.m.** **Oral Session III: Status of heavily stressed aquifers: continental to global scale**
Auditorium of the Blue Cube
Conveners: Yoshihide Wada, David Hyndman
- 9:00 a.m. –9:10 a.m. **Mikhail Smilovic** | Ice Breaking Exercise with IIASA Team
- 9:10 a.m. –9:30 a.m. **Yoshihide Wada** | Overview
- 9:30 a.m. –9:55 a.m. **Marc FP Bierkens** | Global hydrological modelling and groundwater sustainability (*Invited*)
- 9:55 a.m. –10:20 a.m. **James S Famiglietti** | The Global Groundwater Crisis as Revealed from Space: Implications for Human Security (*Invited*)
- 10:20 a.m. –10:50 a.m. Interactive Panel/Exercise/Discussion
- 10:50 a.m. –11:20 a.m. Coffee Break
- 11:20 a.m. –11:45 a.m. **Carole Dalin** | Water Debt Indicator Reveals Where Agricultural Water Use Exceeds Sustainable Levels
- 11:45 a.m. –12:00 p.m. Interactive Panel/Exercise/Discussion
- 12:00 p.m.– 1:00 p.m.** **Poster Session I**
Atrium
Conveners: James Butler, Jaime Gómez-Hernández
- Board 1 **Orlando Ramirez-Valle Sr** | ASSESSING THE SUSTAINABILITY AND HYDROLOGIC FUNCTIONING OF A SEMIARID ENDORHEIC BASIN WITH A HEAVILY STRESSED AQUIFER SUPPORTING A LARGE AGRICULTURAL COMMUNITY IN NORTHERN MEXICO.
- Board 2 **Erin M Haacker** | Estimating Aquifer Lifespan: A Comparative Case Study for the High Plains Aquifer

- Board 3 **Jean E Moran** | Addressing the Sustainability of Groundwater Extraction in California Using Chemical and Isotopic Tracers
- Board 6 **Viridiana Piña Gonzalez** | Study of the distribution of arsenic and fluoride in the groundwater of the northeast of the state of Guanajuato, Mexico
- Board 7 **Orlando Ramirez-Valle Sr** | IRRIGATION OPTIMIZATION WITH METEOROLOGICAL AND SATELLITE DATA TO IMPROVE WATER SAVINGS IN AN INTENSIVE-AGRICULTURE VALLEY WITH A HEAVILY STRESSED AQUIFER.
- Board 9 **Sayantana Majumdar** | A Machine Learning Approach for Estimating Groundwater Use with Satellite Data
- Board 10 **Jennifer A Burney** | Evaluation of water and heat stress alleviation effects across irrigated maize cropland with satellite data
- Board 11 **Jejung Lee** | Groundwater storage change of Ngadda catchment of Lake Chad Basin: A case study for better groundwater monitoring in a data poor region
- Board 12 **Mona Ahmad Morsy Mrs** | Rainfall data evaluation for more reliable water management of the stressed aquifers in El-Qaa Plain, Sinai, Egypt.
- Board 13 **Nurudeen Alowonle Oshinlaja** | Assessing Commensurability Errors in Aggregation of Groundwater Level Data for Large-Scale Groundwater Storage Variability Estimation
- Board 14 **Inge de Graaf** | Assessing the importance of lateral groundwater flow at the global scale
- Board 15 **Ayman Ali N. Albihani** | Assessing the Future of Fossil Groundwater in Wajid Aquifer.
- Board 16 **Thomas J Glose** | Simplifying Streambed Heterogeneity Representation for the Investigation of Streamflow Depletion
- Board 17 **Mario Alberto Hernandez Hernandez** | Assessing the effects of intensive exploitation in the hydrogeological units

associated with La Primavera forest (Guadalajara, Mexico): looking for a sustainable and alternative water management

- Board 18 **Mario Alberto Hernandez Hernandez** | A Contribution to the Mexico City Master Plan for Drinking Water, Drainage, and Sanitation Using Groundwater Flow and Transport Models.
- Board 19 **John L Sabo** | Assess sustainability of water resources in the Indus River Basin using integrated groundwater surface-water model
- Board 20 **Olivia LaHaye** | Data and Modeling-Based Aquifer Storage and Recovery Regional Suitability Analysis: Application in Louisiana, USA
- Board 21 **Jennifer Burney** | Vegetation Water Demand, Subsidence, and Groundwater in California's Central Valley
- Board 23 **Wanshu Nie** | Assimilating GRACE into a Land Surface Model in the presence of an irrigation-induced groundwater trend
- Board 24 **Wenting Yang** | Modelling of groundwater storage using High-resolution Community Water Model coupled with MODFLOW in the North China Plain
- Board 25 **Michele L Reba** | Passive Managed Aquifer Recharge in the Mississippi River Valley Alluvial Aquifer of the US
- Board 26 **Adrian A Borsa** | New observations of groundwater recharge pathways in California's Central Valley and implications for water management
- Board 27 **Jaeyoung Choi** | Development of Groundwater Monitoring for Natural Attenuation by Water Quality Measurement Automation System.
- Board 28 **Thomas Harter** | Implementation of Agricultural Managed Aquifer Recharge in the Central Valley: Assessing Large Scale Long-term Groundwater Storage Gains and Impacts to Streamflow
- Board 29 **Douglas Germond Tolley III** | Sensitivity Analysis and Calibration of an Integrated Hydrologic Model in an Irrigated

Agricultural Basin with a Groundwater-Dependent Ecosystem

Board 30

Mikhail Smilovic | *From global to local groundwater modeling: Increasing the resolution of CWATM*

Board 32

Rich Pauloo | Groundwater Development Induced Basin Closure: An Unrecognized Threat to Water Quality Sustainability

1:00 p.m.– 3:00 p.m.

Lunch and Free Time

Atrium

3:00 p.m.– 7:00 p.m.

Oral Session IV: Integrated systems modeling

Auditorium of the Blue Cube

Conveners: David Hyndman, Yoshihide Wada

3:00 p.m. –3:30 p.m.

David W Hyndman | Overview

3:30 p.m. –4:00 p.m.

Gretchen R Miller | Pushing the Boundaries (or the Boundary Conditions): Baseflow and Recharge as Key to Integrated Modeling for Sustainable Groundwater Management (*Invited*)

4:00 p.m. –4:30 p.m.

Yadu Pokhrel | Simulating climate-groundwater-human interactions in the major US aquifers using Community Land Model version 5 (CLM5) (*Invited*)

4:30 p.m. –4:50 p.m.

Josiah M Heyman | Lifetimes for a Trans-Boundary Aquifer: Drivers of Change and Proposals for Response

4:50 p.m. –5:10 p.m.

Chelsea N Peters | Behavioral Responses to Spatially-Variable Salinization Risks in Vulnerable Coastal Aquifers

5:10 p.m. –5:40 p.m.

Coffee Break

5:40 p.m. –6:10 p.m.

Stefan J Kollet | Integrated Modeling over the European continent using the Terrestrial Systems Modeling Platform, TSMP (*Invited*)

6:10 p.m. –6:40 p.m.

Laura E Condon | Using models to evaluate human impacts on groundwater surface water interactions (*Invited*)

6:40 p.m. –7:00 p.m.

Discussion

8:00 p.m.– 9:30 p.m.

Choir Concert

Centre Cultural la Beneficència - Sala Alfons el Magnànim

WEDNESDAY, 23 OCTOBER

8:00 a.m.– 9:00 a.m.

Poster Session Setup

Atrium

9:00 a.m.– 12:00 p.m.

Oral Session V: Identifying paths toward groundwater sustainability

Auditorium of the Blue Cube

Conveners: Debra Perrone, Thomas Gleeson

9:00 a.m. –9:20 a.m.

Debra Perrone | Overview

9:20 a.m. –9:40 a.m.

Thomas Harter | Groundwater Sustainability as a Catalyst for Fully Integrated Water and Land Management: The California Experiment

9:40 a.m. –10:00 a.m.

Karen G. Villholth | Local to Global Paths towards Groundwater Sustainability (*Invited*)

10:00 a.m. –10:20 a.m.

Juan Carlos Castilla-Rho | Culture and Collaboration: The missing ingredients towards groundwater sustainability (*Invited*)

10:20 a.m. –10:50 a.m.

Coffee Break

10:50 a.m. –11:20 a.m.

Panel

11:20 a.m. –12:00 p.m.

Breakout Sessions

12:00 p.m.– 1:00 p.m.

Poster Session II

Atrium

Conveners: James Butler, Jaime Gómez-Hernández

Board 1

Valeriy Khokhlov | Modern hydro-ecological regime of lagoons in north-western part of Black Sea and issues of their water management under climate change

- Board 2 **Landon Marston** | Feedbacks between increasing farm size and groundwater depletion
- Board 3 **Encarna Esteban** | Ecosystems shifts: implications for groundwater management
- Board 6 **ALI Salem** | Conjunctive Management of Groundwater and Surface Water Resources Using MODFLOW in Drava Basin, Hungary
- Board 7 **Douglas Germond Tolley III** | Evaluating Prediction Uncertainty in an Integrated Hydrologic Model: Changes in Late Summer Streamflow from Conjunctive Use Management
- Board 9 **Marc Muller** | Trust, uncertainty and the emergence of international groundwater agreements
- Board 11 **Paul Joseph Ruess** | Trade Openness and the Groundwater Use and Depletion of Nations
- Board 12 **W Peter Balleau** | Aquifer Systematics for Planning and Policy
- Board 13 **Alvar Escriva-Bou** | Designing Groundwater Policies to Minimize Agricultural Investment Risks: an Analysis in California's San Joaquin Valley
- Board 14 **Thomas Harter** | Nitrate Contamination of Groundwater from Agriculture and Other Land Uses in California's Central Valley: An Evolving Regulatory Landscape
- Board 15 **Lucila Candela** | THE NEED TO LINK GROUNDWATER SCIENCE TO SOCIAL AND POLITICAL SCIENCES FOR THE LARGE TRANSBOUNDARY AQUIFERS SUSTAINABILITY
- Board 17 **Nisha Marwaha** | Likelihood Analysis of Water Scarcity Remediation for Disadvantaged Communities in Tulare Lake Basin, CA, USA
- Board 18 **Miguel Mejía** | Groundwater Contamination Sources in a Mexican Sugarcane Agrosystem
- Board 19 **Shan Zuidema** | Irrigation Water Reuse Reduces Effectiveness of Modernizing Irrigation Technologies

Coupled with Enhanced Aquifer Recharge: Example from the Upper Snake River Basin, Idaho, USA

- Board 21 **William Graham Burgess** | Potential Mis-interpretation of Groundwater Hydrographs and False Optimism on Recharge and Sustainable Yields in Fluvio-deltaic Aquifer Systems of South and South-East Asia
- Board 22 **Rudra Mohan Pradhan** | Structural and geophysical study for mapping deep-seated aquifers in Aravalli terrane, India
- Board 23 **John T Reager II** | California's groundwater future: Relating subsidence and consumption in the Central Valley for SGMA
- Board 24 **Daniel J. Goode** | Unsustainable Depletion of Non-Renewable Groundwater Accelerating - the Jordan Case
- Board 25 **Nafiseh Salehi** | 3-D GROUNDWATER MODELLING OF LAKE CHAD BASIN: CHALLENGES AND SUCCESS OF REGIONAL SCALE MODELLING FOR A DATA POOR REGION IN SUB-SAHARAN AFRICA
- Board 26 **Anne Van Loon** | Assessing the long-term impact of Managed Aquifer Recharge in the heavily stressed California Central Valley aquifer
- Board 27 **Adel Shirmohammadi** | Stressed Aquifers in the Coastal Plain of Maryland
- Board 28 **Samuel C Zipper** | Lots of Streams, Not Much Time or Money? Rapid and Accurate Analytical Tools for Evaluating Groundwater Pumping Impacts on Streamflow and Ecosystems
- Board 29 **Emine Tanır Kayıkçı** | Ground Water Levels and Temperature Correlation in the Spring in Black Sea Region of Turkey: Case Study for Trabzon, Giresun and Rize Provinces
- Board 30 **Aakash Ahamed** | Remote Sensing-Based Estimation of Groundwater Storage Changes in California's Central Valley

- Board 31 **Timothy Foster** | Assessing the costs and performance of diesel pump irrigation systems in the Eastern Gangetic Plains
- Board 33 **Jacob Fritton** | Resilience of social ecological systems to drought in technology-intensive, irrigated agriculture
- 1:00 p.m.– 3:00 p.m. **Lunch and Free Time**
Atrium
- 3:00 p.m.– 4:40 p.m. **Oral Session VI (a): Pathways to sustainability: modeling and monitoring**
Auditorium of the Blue Cube
Conveners: James Butler, David Hyndman
- 3:00 p.m. –3:20 p.m. **Wolfgang Kinzelbach** | *A Path Towards Sustainable Use of an Overpumped Aquifer: Example the North China Plain*
- 3:20 p.m. –3:40 p.m. **James Rigby** | What lies beneath: next-generation geophysical mapping of aquifer structure in the Mississippi Alluvial Plain for groundwater management
- 3:40 p.m. –4:00 p.m. **Corey Scher** | Monitoring Sustainability of Shared Groundwater Resources using Satellite Measurement of Transboundary Aquifer Compaction
- 4:00 p.m. –4:20 p.m. **Daniel B Abrams** | The risk to water supply of the Cambrian-Ordovician Sandstone Aquifer system in the Midwestern United States: Insight from 150 years of data collection in a deep confined aquifer
- 4:20 p.m. –4:40 p.m. **Peter Knappett** | Rising Arsenic Concentrations in an Intensively Pumped, Geothermally Influenced Aquifer System in Central Mexico
- 3:00 p.m.– 4:40 p.m. **Oral Session VI (b): Pathways to sustainability: policy and management**
Auditorium of the Red Cube
Conveners: Debra Perrone, Yoshihide Wada
- 3:00 p.m. –3:20 p.m. **Sandra Pool** | Modelling the Spatio-Temporal Effects of a Gradual Irrigation Modernization on Groundwater Recharge

- 3:20 p.m. –3:40 p.m. **Josselin Rouillard** | Water Rights, Institutions and Groundwater Management in California, France and Spain: a Comparative Assessment of User Involvement in Allocation Decisions
- 3:40 p.m. –4:00 p.m. **Taher Kahil** | An Integrated Modeling Framework for Assessing the Economics of Groundwater Sustainability: Application to the Zambezi transboundary river basin
- 4:00 p.m. –4:20 p.m. **Sarah Shalsi** | Can collective action address the “tragedy of the commons” in groundwater management? Insights from an Australian case study
- 4:20 p.m. –4:40 p.m. **Mark O Cuthbert** | Yielding safer, more renewable and less stressfully depleting definitions of groundwater use?
- 8:00 p.m.– 11:00 p.m.** **Banquet** (*Additional Fee Required*)

THURSDAY, 24 OCTOBER

- 9:00 a.m.– 1:00 p.m.** **Oral Session VII: Prospects for a more sustainable and resilient future**
Auditorium of the Blue Cube
Conveners: Jaime Gómez-Hernández, James Butler
- 9:00 a.m. –9:30 a.m. **Graham E Fogg** | The Unanticipated Threat of Groundwater Basin Closure on Sustainability
- 9:30 a.m. –10:00 a.m. **Megan Konar** | Groundwater depletion embedded in domestic transfers and international exports of the United States
- 10:00 a.m. –10:30 a.m. **David W Hyndman** | Combining Remote Sensing Data and Crop Models to Assess the Sustainability of Stakeholder-Driven Groundwater Management in the US High Plains Aquifer
- 10:30 a.m. –11:00 a.m. **Anne Van Loon** | Groundwater sustainability on short time scales: groundwater drought in the UK and Europe
- 11:00 a.m. –11:30 a.m. Coffee Break

- 11:30 a.m. –1:00 p.m. Final Panel
- 1:00 p.m.– 2:00 p.m. **Lunch and Free Time**
Atrium
- 2:00 p.m.– 6:00 p.m. **Working Group Meetings**

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