



# AGU-SEG Hydrogeophysics Workshop

Stanford, California | 24–27 July



## Co-Chairs

**Rosemary Knight**

Stanford University

**Kristina Keating**

Rutgers University Newark

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**Kate Maher**

Stanford University

**Daniella Rempe**

University of Texas at Austin

**Kamini Singha**

Colorado School of Mines

# Scientific Program

MONDAY, JULY 24

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4:00 p.m.– 7:30 p.m.

## Registration

Rehnquist Courtyard

6:00 p.m.– 7:30 p.m.

## Ice Breaker Reception

Rehnquist Courtyard

TUESDAY, JULY 25

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9:00 a.m.– 9:10 a.m.

## Welcome

Convener(s): Rosemary Knight, Kristina Keating, Anja Klotzsche, Katharine Maher, Daniella Rempe, Kamini Singha

Paul Brest West

9:10 a.m.– 12:30 p.m.

## Interfaces in the Critical Zone

Convener(s): Daniella Rempe

Paul Brest West

9:10 a.m.– 9:35 a.m.

**Clifford S Riebe** | Exploring critical zone architecture and its influence on Earth surface processes using drilling, sampling, and geophysical imaging (*Invited*)

9:35 a.m.– 10:00 a.m.

**Martin A Briggs** | Geophysical Insight Into Multi-Scale Groundwater-Surface Water Exchange Processes (*Invited*)

10:00 a.m.– 11:00 a.m.

Introductions to Posters

T-1

**Jared D Abraham** | Airborne electromagnetic mapping of hydrogeological framework in areas of erosional bedrock remnants and its control on recharge and water quality within Sarpy County, Nebraska

- T-2                    **Gordon K Osterman** | Resolving spatial heterogeneity in the Kirkwood-Cohansey aquifer using electrical resistivity tomography and nuclear magnetic resonance
- T-3                    **Esben Auken** | An overview of new efficient electromagnetic methods to resolve the geological heterogeneity on hectare scale surveys
- T-4                    **AIDA LORENA Mendieta** | Seismic refraction and electrical resistivity tests for fracture induced hydraulic anisotropy in a mountain watershed
- T-5                    **Mustafa Saribudak** | Geophysical Imaging of Critical Zone of Trinity/Edwards Aquifer over Haby Fault of Balcones Fault Zones, Texas, USA
- T-6                    **Nate Lindsey** | Thermokarst-on-demand: Observations from a controlled permafrost warming experiment
- T-7                    **Timothy J Munday** | *Combining geophysics, near surface chemistry and environmental tracers to define a critical ecohydrological management zone for the Walyarta (Mandora Marsh) mound springs, Australia*
- T-8                    **Ulrike Werban** | Direct Push-Sensing in Wetlands
- T-9                    **Rouzbeh Nazari** | Applications of High Resolution Enhanced Hydrodynamic Modeling for Coastal Community Resiliency
- T-10                  **William Jesse Hahm** | Direct measurements of seasonal groundwater and rock moisture storage in the deep Critical Zone reveal how lithology controls water availability and thus ecosystem characteristics in the Northern California Coast Ranges
- T-11                  **Xavier Comas** | Understanding the architecture of the deep critical zone and its relation to knickpoint evolution in the Rio Icacos watershed (Luquillo Critical Zone Observatory, Puerto Rico) using hydrogeophysical methods.

- T-13 **Gregory Mount** | Shallow critical zone architecture of a headwater sandstone catchment quantified using near-surface geophysics
- T-14 **Gregory Mount** | Integrating geomorphological and time-lapse geophysical techniques to characterize hydrogeologic properties within shale and sandstone catchments at the Susquehanna Shale Hills Critical Zone Observatory, Pennsylvania, USA
- T-15 **Peter Dietrich** | Confirming observations examine the reliability of a conceptual site model
- T-16 **Geoff Pettifer** | Geophysics to assess impacts of a proposed pit dewatering disposal into a sensitive local creek and on shallow and deep aquifer interactions
- 11:00 a.m. –11:15 a.m. Break with Posters Available
- 11:15 a.m. –12:30 p.m. Poster Viewing and Discussions
- 12:30 p.m.– 1:30 p.m. **Lunch**  
Paul Brest East
- 1:30 p.m.– 4:30 p.m. **Critical Zone Physical Properties & Rock Physics**  
Convener(s): Rosemary Knight  
Paul Brest West
- 1:30 p.m. –1:55 p.m. **Alexis Navarre-Sitchler** | Insights into chemical weathering patterns from geophysical data (*Invited*)
- 1:55 p.m. –2:20 p.m. **W Steven Holbrook** | Fractures, Water and Weathering: Geophysical Insights into the Critical Zone by Steve Holbrook (*Invited*)
- 2:20 p.m. –3:00 p.m. Introduction to Posters
- T-17 **Mong-Han Huang** | Using shallow seismic surveys to test theory for critical zone depth variation across hillslopes

- T-18 **Kristina Keating** | Estimating water content and soil texture using nuclear magnetic resonance
- T-19 **Thomas Hermans** | The Effect of Initial Water Distribution and Spatial Resolution on the Interpretation of ERT Monitoring of Water Infiltration
- T-20 **Tino Radic** | Increasing the Signal-to-Noise Ratio of Field NMR (SNMR) Data by means of Pre-Polarization.
- T-21 **Patrick Nkemakonam Dikedi** | Garba Subsurface fracture assessment for near-surface water infiltration, flow and geotechnical process monitoring
- T-22 **Hiroataka Saito** | In-situ Characterization of the Infiltration Process using Time-Lapse Multi-Offset Gather Collected with an Array Antenna Ground Penetrating Radar
- T-23 **Ulrike Werban** | Calibration of Electromagnetic Induction Data based on Geoelectrical Subsurface Models
- T-24 **Zhengchao Tian** | Relating Water Retention to Transient Soil Bulk Density
- T-25 **Gianluca Fiandaca** | Hydraulic permeability determined directly from logging-while-drilling Induced Polarization data
- T-27 **Ulrike Werban** | Repeated electromagnetic induction measurements for mapping soil moisture at the field scale: validation with data from a wireless soil moisture monitoring network
- T-28 **Peter Dietrich** | Comparison of two data-driven approaches enabling the probabilistic integration of geophysical tomograms and hydrologic logging data for the prediction of spatially continuous hydrologic parameter distributions fully accounting for tomographic ambiguity and scale differences
- T-29 **Dulcie Aileen Head** | 3-D Printing as a Novel Tool for Rock Physics Investigations

3:00 p.m. –3:15 p.m.	Break with Posters Available
3:15 p.m. –4:30 p.m.	Poster Viewing and Discussions
4:30 p.m.– 5:30 p.m.	<p><b>Interfaces in the Critical Zone and Critical Physical Properties &amp; Rock Physics Panel Discussions</b></p> <p>Convener(s): Daniella Rempe, Rosemary Knight, Clifford Riebe, Martin Briggs, Alexis Navarre-Sitchler, W Steven Holbrook</p> <p>Paul Brest West</p>

## WEDNESDAY, JULY 26

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9:00 a.m.– 12:30 p.m.	<p><b>Hydro-bio-geo-chemical processes in the Critical Zone</b></p> <p>Convener(s): Katharine Maher</p> <p>Paul Brest West</p>
9:00 a.m. –9:25 a.m.	<p><b>Kathleen A Lohse</b>   Challenges of quantifying short-term hydrobiogeochemical processes in the critical zone (<i>Invited</i>)</p>
9:25 a.m. –9:50 a.m.	<p><b>Eve-Lyn S Hinckley</b>   A Scope for the Subsurface: How Geophysics Can Inform Hydro-biogeochemical Studies in Managed and Unmanaged Systems (<i>Invited</i>)</p>
9:50 a.m. –10:35 a.m.	Introduction to Posters
W-1	<p><b>John Holloway Bradford</b>   Geophysical Investigations of Shallow and Deep Critical Zone Processes at the Reynolds Creek Critical Zone Observatory</p>
W-2	<p><b>Cassandra Cosans</b>   Weathering-Permeability Feedback Controls on Lateral Flow Partitioning and the Weathering Front Advance Rate</p>

- W-3 **Jr-Chuan Huang** | Characteristics of Chemical Weathering in Small Mountainous Watersheds, Taiwan
- W-4 **Emily I Burt** | The Role of Soil Water Storage in Catchment Hydrology and Biogeochemistry Across the Andes-Amazon Transition
- W-5 **Xiaole Han** | Measurement of hydrological connectivity between hillslopes and streams in humid areas of southeast China
- W-6 **Alex Furman** | Geophysical measurements to track soil water and biochemical dynamics
- W-7 **John R Nimmo** | Beyond Images: Innovating for Geophysical Investigation of Unsaturated-Zone Hydraulics
- W-8 **Alexandria Kuhl** | Estimating Soil and Root Parameters using a Hydrogeophysical Inversion
- W-9 **Lixin Jin** | Developing Hydrogeophysical Tools to Study Hydro-bio-geo-chemical Processes in Dryland Agricultural Fields at the Nexus of Food, Water and Soils
- W-10 **Chava Bobb** | Water Quality Responses to Seasonal, Hydrologically-driven Redox Cycling in a Floodplain Aquifer
- W-11 **Adrian Mellage** | Linking Transition-Zone Geophysical Signals to Governing Reactive Processes in the Capillary Fringe
- W-12 **Eron Raines** | Carbon cycle driven critical zone evolution in a terrestrial carbonate system
- 10:35 a.m. –10:45 a.m. Break with Posters Available
- 10:45 a.m. –11:15 a.m. Introduction to Posters
- W-13 **Ian Gottschalk** | Building Flow and Transport Models with Electrical Resistivity Tomography Data

- W-14                    **Alexander Kendrick** | Studying Porosity Domains  
Using NMR Relaxation and Flow Experiments
- W-15                    **Xue Feng** | Trees as Sensors: Signatures of  
Belowground Moisture through Aboveground Water Use
- W-16                    **Kamini Singha** | Examining Diel Patterns of Soil and  
Xylem Moisture From the Single-Tree to Hillslope Scale
- W -17                   **Yuxin Wu** | Investigating the Coupling of Root Zone and  
Hillslope Thermo-Hydro-Bio-Geo-Chemical Dynamics in  
a Mountainous Watershed using Multi-scale Approaches
- W-18                    **Christine M Downs** | Time-lapse Electric Resistivity  
Imaging of Subsurface Salt Mobilization in an Impounded  
Mangrove Forest.
- W-19                    **Timothy J Munday** | Monitoring Changes to  
Freshwaters Lens Systems in a “Sea” of Saline  
Groundwater across the Murray River Floodplain in SE  
Australia using Multi-date Airborne EM
- W-20                    **Kazuaki Yorozu** | Development of Integrated Surface-  
Subsurface Flow Model Considering Evapotranspiration  
and its Application to Small Forest Catchment
- W-21                    **Mei Yu** | Landscape Configuration and Composition  
Modulate Freshwater Supply and Flooding Risk of  
Tropical Watersheds
- 11:15 a.m. –12:30 p.m.                    Poster Viewing and Discussion
- 12:30 p.m.– 1:30 p.m.                    **Lunch**  
Paul Brest East
- 1:30 p.m.– 2:00 p.m.                    **Hydro-Bio-Geo-Chemical Panel  
Discussion**  
Convener(s): Katharine Maher, Kathleen Lohse, Eve-Lyn  
Hinckley  
Paul Brest West
- 2:00 p.m.– 5:00 p.m.                    **Afternoon Group Activity**



Convener(s): Rosemary Knight, Kristina Keating

6:00 p.m.– 8:00 p.m.

## **Conference Dinner**

Rehnquist Courtyard

# **THURSDAY, JULY 27**

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9:00 a.m.– 12:00 p.m.

## **Scaling up of Geophysical Data to Address Critical Zone Science Questions**

Convener(s): Kamini Singha

Paul Brest West

9:00 a.m. –9:25 a.m.

**Laura E Condon** | Hydrology at the Continental Scale: Evaluating Groundwater Surface Water Interactions Across the U.S. with an Integrated Hydrologic Model (*Invited*)

9:25 a.m. –9:50 a.m.

**Jef Caers** | Groundwater management in Denmark: downscaling decision objectives and upscaling uncertainty models (*Invited*)

9:50 a.m. –10:30 a.m.

Introduction to Posters

H-1

**Effi Tripler** | Field Representative Elementary Volume (FREV) for Water Content in Regularly Irrigated Soils: A Case Study in an Arid Loamy-Sand Soil.

H-2

**Jessica Schmaeck** | GPR full-waveform inversion at different scales to image the critical zone

H-3

**Ryan Harmon** | Electrical resistivity imaging to link evapotranspiration and groundwater fluxes in the critical zone

H-4

**Okeson Rae Morgan** | Elucidating the controls of hillslope hydrologic connectivity and the degree of chemical weathering on soil development in vertisols: Using electromagnetic induction (EMI) to illuminate spatial and temporal patterns in soil moisture and total dissolved solids

H-5	<b>Anders Vest Christiansen</b>   Efficient and Transparent Construction of 3D Hydro-stratigraphy from Geophysical and Geological Data
H-6	<b>Roelof Versteeg</b>   An Enabling Software Framework For Monitoring and Modeling Hydro Geophysical Processes in The Critical Zone Across Different Spatial And Temporal Scales
H-7	<b>Susan S. Hubbard</b>   Monitoring, Scaling and Predicting Interactions Across Critical Zone Compartments using Geophysical Data
H-8	<b>Shuhui Gao</b>   Mapping Permafrost Features that Influence the Hydrological Processes in the two forked valley in the Source Area of the Yellow River (SAYR), NE Qinghai-Tibet Plateau, China
H-9	<b>Thomas Hermans</b>   The Prediction-Focused Approach: an Opportunity for Hydrogeophysical Data Integration and Interpretation in the Critical Zone
10:30 a.m. –10:45 a.m.	Break with Posters Available
10:45 a.m. –12:00 p.m.	Poster Viewing and Discussion
12:00 p.m.– 12:30 p.m.	<b>Scaling up of Geophysical Data to Address Critical Zone Science Questions Panel Discussion</b>  Convener(s): Kamini Singha, Laura Condon, Jef Caers Paul Brest West
12:30 p.m.– 1:30 p.m.	<b>Lunch</b> Paul Brest East
1:30 p.m.– 4:30 p.m.	<b>Workshop Wrap-Up: State of the Practice/State of the Science Whitepaper</b>  Convener(s): Rosemary Knight, Kristina Keating Paul Brest West



The workshop organizers acknowledge the following sponsors for their generous support:

