

CRITICAL ZONE SCIENCE

Current Advances & Future Opportunities

June 4-6, 2017 • Arlington Virginia

Hosted by
Critical Zone Observatories
U.S. NSF National Program

CZO

Location

All events are at the Hilton Arlington Hotel, adjacent to the Ballston Metro station.

Main goals

At this NSF-sponsored workshop, we will assess the current state of Critical Zone science and consider how the next iteration of a Critical Zone science program can address key scientific, societal and educational questions about the Critical Zone.

Signing in

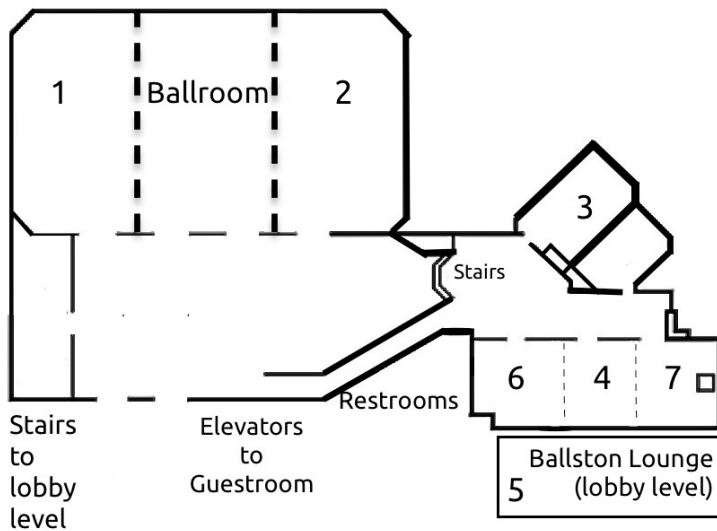
We ask that all participants sign in for each day of the conference. We are required to obtain a daily signature in order to provide confirmation of attendance. This will ensure that we can substantiate our travel and subsistence costs to our federal sponsors.

Those who have requested participant stipends to help offset travel costs will receive an email from Cornell Financial Affairs with a link to an online form that you will need to complete in order to receive funds. The funds will be transferred electronically, and treated as taxable income for tax purposes.

NSF Support

Support for this meeting was provided by the National Science Foundation via Award NSF-136070 to Cornell University. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.





Meeting Map

Most activities take place in and near the Gallery Ballroom on the second floor, although some are in the Ballston Lounge on the lobby level.

The hotel also uses the following room names:

- 3. Renoir
- 4. Da Vinci
- 5. Ballston Lounge
- 6. Picasso
- 7. Matisse

Breakout Group leaders

1	2	3	4	5
Diana Karwan Adam Ward	Asmeret Berhe Ashlee Dere	Wendy Yang Beth Herndon	Steven Hall Nikki West	Allison Goodwell Lin Ma

Agenda Committee

Bill McDowell - Luquillo CZO and Univ. of New Hampshire (Chair)

Pam Sullivan, Univ. of Kansas

Adam Wymore, Univ. of New Hampshire

Praveen Kumar, IML CZO and Univ. of Illinois

Jon Chorover, Jemez-Catalina CZO and Univ. of Arizona

Louis Derry, CZO National Office and Cornell University

Technical Committee

Sarah Sharkey, CZO National Office and Penn State University

David Lubinski, CZO National Office and Univ. of Colorado, Boulder

Mary Reinthal, CZO National Office and Cornell University

Alexandra Moore, CZO National Office and Paleontological Research Institution



OVERVIEW AGENDA

PM Sunday June 4		
3:00	Participant check in at the Hilton Arlington (Ends at 7:00pm, Pick up badge etc, Dinner <i>not</i> provided)	Ballston Lounge (early) Gallery Ballroom (later)
7:00	Introduction to CZ Science and CZOs – The NSF perspective	Richard Yuretich
7:15	Plenary address - Perspectives on CZ science	Sue Brantley
8:00	Icebreaker (ends at 9:30pm)	Ballston Lounge


Monday June 5		
7:00	Check in and breakfast buffet (provided)	Outside Gallery Ballroom
8:00	Welcome and introductions	G. Grant & W. McDowell
8:20	Scientific talks I	7 talks
9:45	Coffee break	
10:15	POSTER SESSION I	5 themed rooms
12:00	Working lunch (provided)	Discussion
1:00	Scientific talks II & intro to breakout groups	7 talks
2:30	Coffee break	
2:40	Breakout groups I	5 meeting rooms
4:00	Plenary discussion I	Incl group reports
5:15	POSTER SESSION II (ends 7:00)	5 themed rooms
5:30	Cash bar	
7:00	Dinner (provided, ends 9:00pm)	Incl discussion w/ NSF+

Tuesday June 6		
7:00	Check in and breakfast buffet (provided)	Outside Gallery Ballroom
8:00	Scientific talks III - Invited session	4 talks
9:20	Scientific talks IV	4 talks
10:00	Coffee break	
10:30	Plenary discussion II	Panel
11:30	Scientific talks V	5 talks
12:30	Working Lunch (provided)	Speaker/Activity TBD
2:00	Breakout groups II	5 rooms
3:30	Breakout reports II	
4:00	Writing teams (meeting ends at 5:00)	

DETAILED AGENDA

PM - Sunday June 4, 2017		
3:00 to 7:00	Participant check in at the Hilton Arlington (Pick up badge etc, Dinner <i>not</i> provided)	Ballston Lounge (early) Gallery Ballroom (later)
7:00	Introduction to CZ Science and CZOs – the NSF perspective	Richard Yuretich <i>NSF EAR Program Officer</i>
7:15	Plenary address - Perspectives on CZ science	Sue Brantley <i>Penn State University</i>
8:00	Y Icebreaker Reception	Ballston Lounge
9:30	End of day	

AM - Monday June 5, 2017

7:00	 Check in and breakfast buffet (provided)	Outside Gallery Ballroom
8:00	Welcome & Introductions	
8:00	Welcome and introduction to conference	Gordon Grant <i>USDA Forest Service</i>
8:10	Meeting structure and objectives	Bill McDowell <i>Univ. of New Hampshire</i>
8:20	Scientific talks I	
8:20	Opportunities for integrating and leveraging LTER, NEON, and CZO Networks. [Invited]	Peter Groffman <i>Cary Institute of Ecosystem Studies</i>
8:40	Critical zone structure controls concentration-discharge relationships and solute generation in forested tropical montane watersheds.	Adam Wymore <i>Univ. of New Hampshire</i>
8:50	Describing Microbial Community of the Critical Zone with CZIMEA: Critical Zone Integrative Microbial Ecology Activity.	Emma Aronson <i>Univ. of California, Riverside</i>
9:00	Leveraging critical zone observation networks to inform and improve the NOAA National Water Model prediction system.	Aubrey Dugger <i>NCAR</i>
9:10	The Hakai Critical Zone Observatory: exploring critical zone connections from land to sea in the Pacific rainforest of Canada.	Ian Giesbrecht <i>Hakai Institute</i>
9:20	Predictive spatial geochemical modelling of the Australian Critical Zone from local to continental scales.	Elisabeth Bui <i>CSIRO</i>
9:30	Integrated science in AGU journals.	Hari Rajaram <i>Univ. of Colorado, Boulder</i>
9:35	Overview of poster sessions	Bill McDowell <i>Univ. of New Hampshire</i>
9:45	 Coffee Break	Presenters to posters
10:15 to 12:00	POSTER SESSION I 1. Evolution of the Critical Zone (<i>Rm. 6</i>) 2. Process Dynamics, Stores, and Fluxes in the CZ (<i>Rm. 5</i>) 3. Ecosystems and the Critical Zone (<i>Rm. 7</i>) 4. Response of CZ and CZ Processes to Land Use and Climate Change (<i>Rm. 3</i>) 5. New Approaches to Advancing CZ Science at Regional-to-Continental Scales (<i>Rm. 4</i>)	Five rooms. See room assignments and map on back of your name badge.

PM - Monday June 5, 2017

12:00	 Working lunch (provided) Discussion at each table: <i>What are the most important fundamental and societally relevant Critical Zone science challenges?</i>	Each table should take informal notes of the most compelling ideas
1:00	Scientific talks II	
1:00	Geophysical constraints on deep CZ structure and processes. [Invited]	Steve Holbrook <i>Univ. of Wyoming</i>
1:20	Rock moisture dynamics in the critical zone: Direct observations from the Eel River Critical Zone Observatory.	Daniella Rempe <i>Univ. of Texas, Austin</i>
1:30	Measuring full suites of trace metals in plants, soils, rocks, and water: another person's treasure.	Justin Richardson <i>Cornell University</i>
1:40	Seasonality and disturbance: assessing microbial response in two adjacent high-alpine catchments in northern New Mexico.	Dawson Fairbanks <i>Univ. of Arizona</i>
1:50	Reevaluating the role of dust in mountain ecosystems using tracer isotopes, microbial genomics, and global databases.	Lindsay Arvin <i>Univ. of Wyoming</i>
2:00	Soil organic carbon dynamics in intensively managed landscapes.	Qina Yan <i>Univ. of Illinois at Urbana-Champaign</i>
2:10	CZ science within the GEO portfolio [Invited]	William Easterling <i>NSF Asst Director for GEO</i>
2:25	Introduction to breakout group questions	Praveen Kumar <i>Univ. of Illinois</i>
2:30	 Coffee Break	
2:40	Breakout groups I <i>What are the most important fundamental and societally relevant Critical Zone science challenges, and how can we address them?</i>	Five rooms. See room assignments and map on back of your name badge.
4:00 to 5:15	Plenary discussion I <i>What are the most important CZ questions, and what research framework would best address them?</i>	Includes five-minute report from each group leader with five minutes of discussion.

PM - Monday June 5, 2017

**5:15
to
7:00**

POSTER SESSION II


1. Evolution of the Critical Zone (*Rm. 6*)
2. Process Dynamics, Stores, and Fluxes in the CZ (*Rm. 5*)
3. Ecosystems and the Critical Zone (*Rm. 7*)
4. Response of CZ and CZ Processes to Land Use and Climate Change (*Rm. 3*)
5. New approaches to Advancing CZ Science at Regional-to-Continental Scales (*Rm. 4*)

Five rooms.
See room assignments
and map on back of your
name badge.

5:30

 **Cash Bar**

7:00

 Dinner (provided)

After dinner discussions
with Richard Yuretich and
other POs


9:00

End of day

AM - Tuesday June 6, 2017

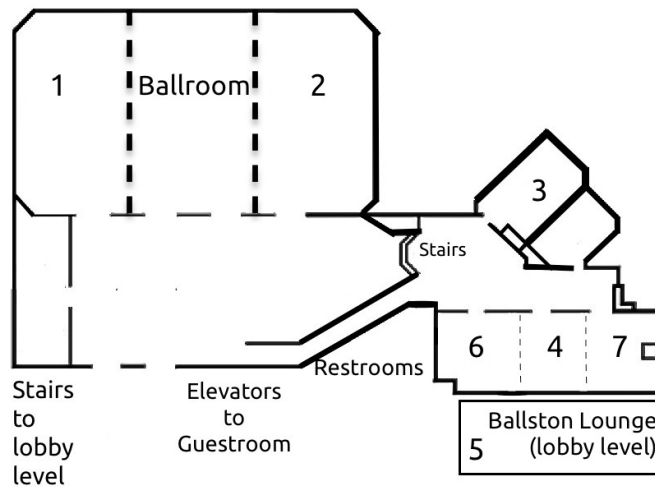
7:00	 Check in and breakfast buffet (provided)	Outside Gallery Ballroom
8:00	Scientific talks III – Invited session	
8:00	The practitioner's perspective: Value of critical zone science for environmental management and protection. [Invited]	Steve Hamburg <i>Environmental Defense Fund</i>
8:20	How can critical zone science and CZOs help to resolve landscape management and societal issues? [Invited]	Kitty Lohse <i>Idaho State University</i>
8:40	CZ science as a platform for science education reform. [Invited]	Don Duggan-Haas <i>Paleontological Research Institution</i>
9:00	A critical zone perspective on ecosystem services. [Invited]	Dave Breshears <i>Univ. of Arizona</i>
9:20	Scientific talks IV	
9:20	Urban ecosystems and CZOs.	Joel Moore <i>Towson University</i>
9:30	New directions in CZO biogeochemistry: Mechanisms controlling the fate and transport of nitrogen in the Colorado Front Range.	Eve-Lyn Hinckley <i>Institute of Arctic and Alpine Research</i>
9:40	The cross-scale influence of snowmelt rate, timing, and amount on runoff production across the western United States.	Theo Barnhart <i>Univ. of Colorado, Boulder</i>
9:50	Telling the story of a sediment particle: its source & pathway.	Thanos Papanicolaou <i>The Univ. of Tennessee</i>
10:00	 Coffee Break (ends 10:30)	
10:30 to 11:30	Plenary discussion II (panel) CZ Futures: building cross-network observatory opportunities (CZO, LTER, LTAR, ILTER) into a robust vision for CZ Science and Education.	Gene Kelly - <i>NEON</i> David Lesmes - <i>DOE</i> Lindsey Rustad - <i>USFS</i> Lou Kaplan – <i>NSF DEB</i> John Schade - <i>NSF BIO</i> Richard Yuretich - <i>NSF</i> Diane McKnight - <i>NSF GEO</i> Elisabeth Bui - <i>ILTER & ICZO</i>

AM/PM - Tuesday June 6, 2017

11:30	Scientific talks V	
11:30	Earthcasting controls of vegetation on solute fluxes and soil development in the Critical Zone. [Invited]	Pamela Sullivan <i>Univ. of Kansas</i>
11:50	Forward and backward evolution of the Calhoun CZO landscape.	Sara Bonetti <i>Duke University</i>
12:00	The control of critical zone architecture on water age and storage selection functions in hillslopes.	Ciaran Harman <i>Johns Hopkins University</i>
12:10	Considering the role of trees as Critical Zone architects.	Jill Marshall <i>UC Berkeley & CU Boulder</i>
12:20	Balancing reactivity and transport across the deep vadose zone.	Jenny Druhan <i>Univ. of Illinois Urbana Champaign</i>
12:30	 Working Lunch (provided)	Speaker or networking activity to be determined
2:00	Breakout groups II Key points for a 1-page white paper from each breakout group that addresses the following: 1) The Compelling Questions in CZ Science 2) Observatories and Networks of the Future 3) CZ Educational Initiatives of the Future	Five rooms. See room assignments and map on back of your name badge.
3:30	Breakout reports II	
4:00	Writing teams Writing teams polish work from their breakout groups and synthesize input for final write-up to be placed on CZO website	
5:00	End of meeting	Thanks for coming!

POSTER SESSION I – AM Monday June 5, 2017

10:15
to
12:00



Session I
Five rooms

1. Evolution of the Critical Zone	Rm. 6
2. Process Dynamics, Stores, and Fluxes in the CZ	Rm. 5
3. Ecosystems and the Critical Zone	Rm. 7
4. Response of CZ and CZ Processes to Land Use and Climate Change	Rm. 3
5. New Approaches to Advancing CZ Science at Regional-to-Continental Scales	Rm. 4

	1. Evolution of the Critical Zone	Rm. 6 (Session I)
24	Imaging subsurface properties along and across soil-mantled ridges	Mong-Han Huang <i>Jet Propulsion Laboratory</i>
25	Shallow critical zone architecture of a headwater sandstone catchment quantified using near-surface geophysics	Roman DiBiase <i>Penn State University</i>
26	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	Xavier Comas <i>Florida Atlantic University</i>
27	Implications of topographically induced variations in solar radiation for water balance, vegetation and soil development.	Mark Seyfried <i>USDA-ARS</i>
28	Using the Landlab modeling toolkit to understand earth surface dynamics in CZOs	Nicole Gasparini <i>Tulane University</i>
29	Weathering the hillscape: Water, rock, and soil on the move	Bob Anderson <i>Univ. of Colorado, Boulder</i>
30	Bedrock controls on mountain ecosystems evaluated using geophysics, geochemistry, and remote-sensing	Russell Callahan <i>University of Wyoming</i>

31	A service-oriented architecture for coupling web service models using the basic model interfaces (bmi)	Peishi Jiang <i>University of Illinois</i>
32	Impact of stochastic bioturbation and transport on the formation of argillic horizons at the Calhoun Critical Zone	Salvatore Calabrese <i>Duke University</i>
33	A probabilistic approach to quantifying soil physical properties using time-integrated effective energy and mass transfer (EEMT)	Christopher Shepard <i>University of Arizona</i>
34	Scaling magnesite dissolution rates versus time in heterogeneous porous media	Hang Wen <i>Penn State University</i>
2. Process Dynamics, Stores, & Fluxes in the CZ Rm. 5 (Session I)		
47	More rain and less snow at the Reynolds Creek CZO	Patrick Kormos <i>ARS-USDA</i>
48	Insights into chemical weathering patterns from hydrologic data in Gordon Gulch: Boulder Creek CZO	Alexis Navarre-Sitchler <i>Colorado School of Mines</i>
49	Short term fallout radionuclides track mixing and transport in the Critical Zone	Diana Karwan <i>University of Minnesota</i>
50	Concentration-flux relations in the vadose zone	Jon Chorover <i>University of Arizona</i>
51	Modeling the influence of preferential flow on the spatial variability and time-dependence of weathering rates	Hari Rajaram (copy) <i>Univ. of Colorado, Boulder</i>
52	Deep Soil Carbon in the Critical Zone: amount and nature of Carbon in weathered bedrock, and its implication for soil Carbon inventory	Asmeret Asefaw Berhe <i>University of California, Merced</i>
53	The potential for Iron reduction in upland soils in Calhoun CZO	Aaron Thompson <i>University of Georgia</i>
54	Toward a Global Network of Critical Zone Observatories	Henry Lin <i>Penn State University</i>
55	Fe and C cycling is modulated by O ₂ levels in redox-fluctuating environments	Christof Meile <i>University of Georgia</i>
56	Investigating the porosity development of shale to understand hydrologic controls on hillslope scale weathering	Xin Gu <i>Penn State University</i>
57	Extreme basalt weathering results from high soil CO ₂ , unsaturated conditions and organic acids	Alida Perez Fodich <i>Cornell University</i>
58	Hot spots and hot moments for redox, Iron and Carbon cycling in soils across Luquillo and Calhoun CZOs	Diego Barcellos <i>University of Georgia</i>
59	Uranium and Strontium isotope tracers of water rock interactions and biogeochemical processes in the critical zone	Alissa White <i>University of Arizona</i>

3. Ecosystems and the Critical Zone **Rm. 7 (Session I)**

14	Local and non-local information flow along an elevation gradient	Allison Goodwell <i>University of Illinois</i>
15	Stable microbial biomass and soil hydrolytic enzyme potential despite dynamic Carbon exchange during summer in a Chihuahuan desert shrubland	Anthony Darrouzet-Nardi <i>Univ. of Texas at El Paso</i>
16	Using LiDAR to reveal patterns of above-ground biomass from deciduous trees and shrubs in the Critical Zone	Kristen Brubaker <i>Hobart & William Smith Colleges</i>
17	Phosphorus biogeochemical transformation and effects of aeolian dust deposition during long-term soil development in semi-arid ecosystems	Mike Zhu <i>University of Wyoming</i>
18	Parameterization of nitrogen limitation for a dynamic ecohydrological model: a case study from the Luquillo Critical Zone Observatory	Satish Bastola <i>Georgia Institute of Technology</i>
19	Forest thinning in Sierra Nevada mixed-conifer headwater forests: evapotranspiration, runoff and drought resiliency	Martha Conklin <i>Univ. of California, Merced</i>
20	Observing and simulating spatial variations of forest Carbon fluxes and stocks in complex terrain	Yuting He <i>Penn State University</i>
21	Over half of potential soil extracellular enzyme activity occurs below 20 cm	Nicholas Dove <i>Univ. of California, Merced</i>
22	Soil organic matter stabilization by Fe-C interactions in temperate and tropical soils: A cross-CZO comparison	Liz Coward <i>University of Pennsylvania</i>
23	Estimating the rate of release of base cations via chemical weathering in soils in the Catskills Region	Sara Alesi <i>Syracuse University</i>

4. Response of CZ and CZ Processes to Land Use and Climate Change **Rm. 3 (Session I)**

1	Application of near surface geophysics to constrain coal bed and biogenic methane releases in an acid mine drainage wetland in Western Pennsylvania	Greg Mount <i>Indiana University of Pennsylvania</i>
2	Plant accessible water in the subsurface of mountain landscapes within Mediterranean climate-types: Insights gained from the Southern Sierra CZO	Zion Klos <i>UC Santa Barbara & UC Merced</i>
3	Clay mineral alterations in response to land-use change in the kaolinite dominated residual soil of the Calhoun CZO	Jay Austin <i>Duke University</i>
4	Dynamic assessment of current management in an intensively managed agroecosystem	Christopher G. Wilson <i>The Univ of Tennessee</i>
5	Variability in nitrate concentration-discharge relationships in forested and urban watersheds: towards a unified conceptual model of Critical Zone controls	Jon Duncan <i>UNC, Penn State</i>

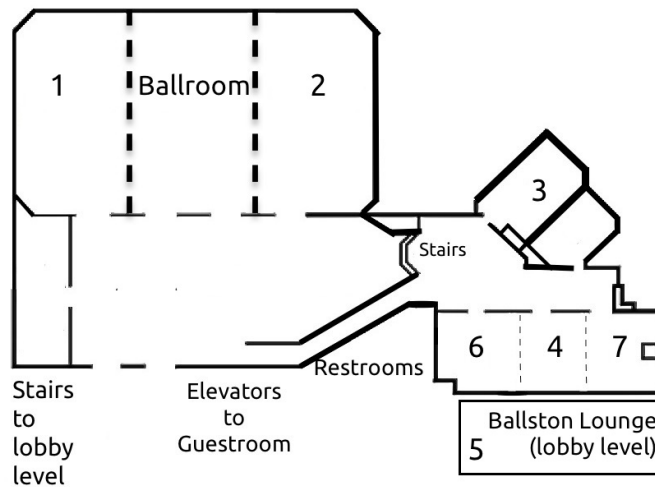
6	Dynamics of the water/ soil system in an agricultural catchment of the Midwestern U.S.	Liliana Lefticariu <i>Southern Illinois University</i>
7	High-intensity rainstorm delivers water and sediment to channels in a steep semi-arid catchment	Suzanne Anderson <i>University of Colorado</i>
8	Spatial and temporal variability of nitrate loads from groundwater in nested urban watersheds	Claire Welty <i>University of Maryland, Baltimore County</i>
9	Using a paleo perspective to demonstrate climate control of critical zone processes	Nathan Schachtman <i>University of Oregon</i>
10	Modeling water and solute transport in a watershed with diverse landuses and lithologies	Callum Wayman <i>Penns State University</i>
11	Understanding controls of hydrologic processes across two monolithological catchments using model data synthesis	Dacheng Xiao <i>Penn State University</i>
12	Impact of gullyng on hillslope hydrology at the Calhoun CZO	Xing Chen <i>Duke University</i>
13	Potential carbon transport: linking soil aggregate stability and sediment enrichment for updating the soil active layer of Intensely Managed Landscapes (IMLs)	Shengnan Zhou <i>University of Tennessee</i>
<div> <div> 5. New Approaches to Advancing CZ Science at Regional-to-Continental Scales </div> <div> Rm. 4 (Session I) </div> </div>		
35	Texas Water Observatory- utilizing advanced observing system design for understanding water resources sustainability across climatic and geologic gradients of Texas	Aline Jaimes <i>Texas A&M University</i>
36	The cascading effects of hillslope aspect on the dynamics of water and energy fluxes of the Critical Zone: onto novel instrumental approaches for dryland research.	Hugo Gutierrez-Jurado <i>University of Texas at El Paso</i>
37	Hydrological controls on weathering rates across Critical Zone Obervatoriess	Amilcare Porporato <i>Duke University</i>
38	"Where Rock Meets Life," a film series by WSKG and CZONO	Alex Moore <i>Paleontological Research Institution</i>
39	Integrating data, models, and disciplines in Critical Zone Science using process-based modeling	Li Li <i>Penn State University</i>
40	Enhancing continental-scale understanding of soils: Integrating the National Ecological Observatory Network (NEON) with existing research networks to address global change	Gene Kelly <i>Colorado State Univ. & NEON</i>
41	TeenShale Network: combining hands-on field experience with data-driven hydrology education tools	Jennifer Z Williams <i>Penn State University</i>
42	Big Whorls have little Whorls which feed into the runoff velocity all of which affect Aggregate Stability: The break -up of Macroaggregates to Microaggregates	Ken Wacha <i>USDA ARS</i>

43	The Investigation of Thermogeology in the Critical Zone	Yu-Feng Lin <i>University of Illinois at Urbana-Champaign</i>
44	Rebuilding the Critical Zone: a case for Detroit and the Great Lakes Region	Shirley Papuga <i>University of Arizona</i>
45	Model-data learning to identify runoff generation mechanisms in a small forested Piedmont watershed	Shane Putnam <i>Johns Hopkins University</i>
46	Using an integrated hydrologic model to assess the ecohydrologic impacts of change on a mountain headwaters Critical Zone	Caitlin Collins <i>Colorado School of Mines</i>

END OF POSTER SESSION I

POSTER SESSION II – PM Monday June 5, 2017

**5:15
to
7:00**



Session II
Five rooms

Evolution of the Critical Zone	Rm. 6
Process Dynamics, Stores, and Fluxes in the CZ	Rm. 5
Ecosystems and the Critical Zone	Rm. 7
Response of CZ and CZ Processes to Land Use and Climate Change	Rm. 3
New Approaches to Advancing CZ Science at Regional-to-Continental Scales	Rm. 4

	1. Evolution of the Critical Zone	Rm. 6 (Session II)
23	Microclimate controls on the evolution of critical zone architecture in the Susquehanna Shale Hills CZO	Nicole West <i>Central Michigan Univ.</i>
24	Geophysical techniques for revealing subsurface structure and processes in the critical zone	Li Guo <i>Penn State University</i>
25	Water-regolith-energy interaction in landscape evolution and its influence on forming asymmetric landscape: model development and application in the Shale Hills CZO	Yu Zhang <i>Duke University</i>
26	Arborturbation rates in the Appalachian Mountains	Tim White <i>Penn State University</i>
27	Life in the slow lane - Tectonic controls on soils, nutrients, and tree canopies	Jane Willenbring <i>Univ of Calif., San Diego</i>
28	Biotic controls on deep Critical Zone evolution reflect persistent susceptibility to change with ecosystem disturbance at the Calhoun CZO	Sharon Billings <i>University of Kansas</i>
29	Spatial variation in the development of the Critical Zone at Hubbard Brook Experimental Forest, New Hampshire	Scott Bailey <i>USFS</i>

30	Comparison of soil moisture dynamics and preferential flow occurrence between two forested catchments with contrasting geology and soils	Qicheng Tang <i>Pennsylvania State University</i>
31	Characterization of water sources and flowpaths and their influence on groundwater geochemical evolution and mineral weathering rates in a high elevation mountain catchment	Ravindra Dwivedi <i>University of Arizona</i>
32	Ordering interfluvies: landscape patterns in Critical Zone structure and evolution	Zach Brecheisen <i>Duke University</i>
33	Architecture of the deep critical zone, Jemez River Basin CZO, Valles Caldera National Preserve, Northern New Mexico	Bryan Moravec <i>University of Arizona</i>
2. Process Dynamics, Stores, & Fluxes in the CZ		Rm. 5 (Session II)
46	River particulate load transport, drivers and yields in the Luquillo CZO	KC* Clark <i>University of Pennsylvania</i>
47	Finding the “missing” cations: biogeochemical mechanisms that liberate occluded nutrients from highly weathered soils	Steven Hall <i>Iowa State University</i>
48	Evaluation of the effects of landscape attributes on overland flow using a conceptual modeling framework that accounts for the spatiotemporal evolution of flow resistance	Dimitrios Dermisis <i>McNeese University</i>
49	The impact of O ₂ concentrations and organic matter on Fe(II) oxidation and the resulting Fe(III) solids in the presence of Fe/Al oxide sorbents	Chunmei Chen <i>University of Georgia</i>
50	Tracking water through the critical zone: models and isotope tracers at the Southern Sierra CZO	Ate Visser <i>Lawrence Livermore</i>
51	Predicting soil thickness and total organic Carbon on soil mantled hillslopes	Nick Patton <i>Idaho State University</i>
52	Quantifying mineral transformations in the Calhoun Critical Zone Observatory (CCZO): What is it and how much is there?	Paul Schroeder <i>University of Georgia</i>
53	Gilbert's soil production paradigm and the critical zone's fractionation of particle sizes	Dan Richter <i>Duke University</i>
54	Influences of kerogen-rich bedrock on the molecular and isotopic composition of soils; implications for the Carbon cycle	Bill Hockaday <i>Baylor University</i>
55	Lithologic control on critical zone development and the consequences for the persistence and spatial extent of wetted channels during the summer dry season	Bill Dietrich <i>University of California, Berkeley</i>
56	Iron loss promotes SOC destabilization on a Hawaiian soil gradient	Katie Grant <i>Cornell University</i>
57	Metal transport Enhanced by Dissolved Organic Carbon (DOC) at the watershed scale	Wei Zhi <i>Penn State University</i>
58	Quantifying the changes of soil surface microroughness due to rainfall-induced erosion on a smooth surface	Benjamin Abban <i>University of Tennessee</i>
59	Modeling structural controls on sub-surface flow in a 2-D Hillslope	Cassandra Cosans <i>Johns Hopkins University</i>

3. Ecosystems and the Critical Zone **Rm. 7 (Session II)**

14	Rapid recovery of gross production and respiration in a mesic mountain big sagebrush site following prescribed fire	Aaron Fellows <i>USDA-ARS</i>
15	Magnesium isotopes reveal a decoupling of Mg sources to the vegetation and the stream at the Luquillo CZO	María Chapela <i>UNH & University of Bristol</i>
16	Using a spatially-distributed hydrologic biogeochemistry model to study the spatial variation of Carbon processes in a Critical Zone Observatory	Yuning Shi <i>Pennsylvania State University</i>
17	Critical Zone Observations in the Tropical Andes	Giova Mosquera <i>Universidad de Cuenca</i>
18	The biological Si filter in temperate hardwood forest ecosystems	Chris Johnson <i>Syracuse University</i>
19	Responses of CO ₂ , CH ₄ , and N ₂ O fluxes from soils to temperature and Nitrogen availability	Jim Tang <i>Ecosystems Center - Marine Biological Laboratory</i>
20	Seasonal water and carbon fluxes at ecosystem scales in sagebrush steppe ecosystems	Harmandeep Sharma <i>Idaho State University</i>
21	How soil water storage moderates climate changes effects on transpiration, across the different climates of the Critical Zone Observatories	Christopher Heckman <i>University of California, Santa Barbara</i>
22	Variable Critical Zone water storage capacity constrains ecosystem productivity and resilience to drought in the Northern California Coast Ranges	Jesse Hahm <i>University of California, Berkeley</i>

4. Response of CZ and CZ Processes to Land Use and Climate Change **Rm. 3 (Session II)**

1	Impacts of dryland irrigation and land use changes on inorganic Carbon dynamics in southwest USA	Lin Ma <i>Univ. of Texas at El Paso</i>
2	Modeling Critical Zone controls on ecohydraulics and stream temperature in a Mediterranean watershed	David Dralle <i>Univ of California, Berkeley</i>
3	Nutrient export from intensively managed landscapes integrates human and natural forcing	Adam Ward <i>Indiana University</i>
4	Land use change in four dimensions: Groundwater as a vector for the lateral transmission of ecohydrological impacts	Sam Zipper <i>McGill University</i>
5	Investigating weathering and solute fluxes in Intensively managed critical zones	Ashlee Dere <i>Univ. of Nebraska - Omaha</i>
6	Hot spots and hot moments for redox, Iron and Carbon cycling in soils across Luquillo and Calhoun CZOs	Neal Blair <i>Northwestern University</i>
7	Luquillo loco! Insights on hot moments from in-stream optical sensors in the Puerto Rico wet forest	Jamie Shanley <i>U.S. Geological Survey</i>

8	Understanding water movement, nitrogen dynamics and fate of atrazine in the vadose zone of a wastewater irrigated critical zone observatory	Blanca Prado <i>Instituto de Geologia, Universidad Nacional Autónoma de México</i>
9	Evapotranspiration and land-cover response to multi-year dry periods in the semi-arid Western United States	Joe Rungee <i>University of California, Merced</i>
10	Impact of subsurface tile drainage on distribution of concentration and age of inorganic soil nitrogen	Dong Kook Woo <i>University of Illinois at Urbana–Champaign</i>
11	Seasonal variation in the potential for iron reduction in soils of the Calhoun CZO	Caitlin Hodges <i>University of Georgia</i>
12	Accounting for travel times and sediment delivery in intensively managed landscapes using a Bayesian Framework	Christos Giannopoulos <i>The Univ. of Tennessee</i>
13	Mapping depth to the clay horizon on historically farmed soils within the Piedmont Region of the Southeastern United States	Rachel Ryland <i>University of Georgia</i>
5. New Approaches to Advancing CZ Science at Regional-to-Continental Scales		Rm. 4 (Session II)
34	CZO common measurement network data products and a cross-czo data repository proof of concept	Miguel Leon <i>University of Pennsylvania</i>
35	Streams as integrators of landscape processes: An example from the Upper Colorado River Basin	Scott Hynek <i>USGS</i>
36	Measuring ⁷ Be with AMS and the potential for large datasets	Alan Hidy <i>Lawrence Livermore</i>
37	Biochemical and environmental studies in Utopia CZO (Colombia)	Rosalina Gonzalez <i>La Salle University</i>
38	Effects of filling gullies to create farmland on water table rise and soil salinization in the Loess Plateau of China	Zhao Jin <i>Inst. of Earth Environment, Chinese Acad. of Sciences</i>
40	Climatic influences on hydrologic baselines in the Critical Zone during the Quaternary	Bryan Shuman <i>University of Wyoming</i>
41	The National Water Model as a hydrologic modeling framework for the Critical Zone	Rick Hooper <i>Tufts University</i>
42	Insolation-driven, monsoon-mediated changes in Earth Surface Processes in mid-latitude China since the late deglacial interval	Selvaraj Kandasamy <i>Xiamen University</i>
43	Progress toward an international CZO soil Carbon data survey and synthesis	Timothy Filley <i>Purdue University</i>
44	Improving microbial metagenomic data standards for Critical Zone research	Lee Stanish <i>NEON</i>
45	Concentration- discharge relationships across sites in the Critical Zone Network	Arnulfo Aguirre <i>Cornell University</i>