Unsaturated Zone
UZ IG
Interest Group

September 2014
Issue 17

The semi-annual Unsaturated Zone Interest Group (UZIG) newsletter highlights current topics concerning the unsaturated zone. Its purpose is to enhance communication within UZIG. It is not an official publication and should not be cited. Please contact authors or members of the newsletter committee with any questions, comments, and/or suggestions. Send desired changes in the mailing list to jtrost@usgs.gov.

Contents

Articles
pages 1-5

Letter from the UZIG Chair
page 2

Webinars
pages 3-4

Visit the website
mn.water.usgs.gov/uzig/

Newsletter Committee

Spring 2015

Submission deadline:
Friday, Feb. 27
Distribution date:
Friday, March 27
e-mail kt.aurand@gmail.com

Participation request: Compiling UZ field projects

By Randy Bayless
USGS Research Hydrologist
ebayless@usgs.gov

During 1995, Newell Trask (USGS Office of Groundwater; OGW) compiled a list of existing and recently completed unsaturated zone (UZ) field investigations as a means of facilitating communication between active UZ scientists. The results were issued as OGW Technical Memorandum 95.07 (available **here**).

The UZIG Steering Committee has expressed interest in compiling a similar list of information from 1995 to present. The list will include general focus of the study, the methods being used, and a short synopsis. The survey will be sent out through the UZIG listserv and the compilation will be posted on the UZIG website. If you have questions or suggestions, please contact Randy Bayless (ebayless@usgs.gov). Be watching for directions and please consider participating.

Field projects. (Left) Heat dissipation probes installed in shallow playa sediments and used to estimate shallow water fluxes, Dixie Valley, NV. Photo by Amanda Garcia, March 2009. (Right) Temperature sensors deployed in a bank piezometer and beneath the canal and used to estimate canal seepage in the Walker River Basin, NV. Photo by David W. Smith, June 2012.

Letter from the UZIG Chair:

Quality assurance for unsaturated zone measurements?

By Randy Bayless
USGS Research Hydrologist
ebayless@usgs.gov

At a recent meeting dedicated to creating a statewide real-time soil-moisture network, I was asked about the quality-assurance practices that should be implemented for such a network. Quality-assurance breeds confidence in our data and establishes limits on its interpretations. In the unsaturated zone, where the range of conditions is extreme and correlations between variables are exponential, it is essential to understand the limits of accuracy in our data.

Procedures for evaluating measurement precision and accuracy are well-recognized in related disciplines. Water-quality professionals use blanks, spikes and replicate samples to evaluate the impacts of field and laboratory methods. Groundwater-level measurements are usually repeated to quantify precision and e-tapes are calibrated to quantify accuracy. There may be value in applying these approaches to field measurements of unsaturated zone properties. What procedures are required for field-measured values of soil-moisture?

I contacted scientists at two state and two federal agencies and determined that strict QA protocols to evaluate soil-moisture data are uncommon. High-profile programs by two Federal agencies had no documented QA plans or activities except for factory calibration of their time-domain reflectometry (TDR) probes. The Soil Climate Analysis Network (SCAN) network, managed by the National Resource Conservation Service (NRCS), uses monthly visual examination of soil-moisture hydrographs to identify suspicious data and faulty devices are replaced as soon as possible. Neither State agency had an established QA plan but one did collect occasional cores in the vicinity of their TDR nests and used lab-measured soil moisture in core samples to evaluate sensor performance. All agencies followed manufacturer or agency established protocols for calibration and deployment.

The American Society for Testing and Materials (ASTM) provides guidance for most unsaturated zone field and lab methods. This guidance includes information about instrument calibration and repeat measurements are encouraged for quality assurance. Acceptable values of measurement variance are provided. The USEPA guides for sampling and monitoring in the unsaturated zone direct the reader to ASTM for QA guidance. The Soil Science Society of America (SSSA) also addresses instrument accuracy in Methods of Soil Analysis.

From my quick survey, there appears to be a need for standardized and institutionally accepted QA procedures. As we move forward on this idea, I would be very interested in receiving copies of procedural documents that you use to assess QA in your unsaturated-zone studies. Please email your QA plans to ebayless@usgs.gov or use the UZIG listserv.

UZIG to help celebrate the International Year of Soils in 2015

By Dave Stonestrom
USGS Research Hydrologist
dastones@usgs.gov

On 24 April 2013, the governing body of the United Nation's Food and Agriculture Organization (FAO) proclaimed 2015 to be the "International Year of Soils" under the framework of the Global Soil Partnership (GSP). In connection with this, members of the steering committee are proposing that UZIG identify unsaturated-zone research needed to achieve resource-sustainability objectives including preventing soil erosion and degradation, promoting terrestrial uptake of atmospheric carbon, managing nitrogen fluxes at all scales, and averting damaging depletion of groundwater resources.

Please share ideas about implementation with the chair. For more information about the International Year of Soils, visit the Soil Science Society of America's website at https://www.soils.org/IYS.

2015
International
Year of Soils

UZIG web seminar series - upcoming presentations

By Mindy Erickson
USGS Hydrologist
merickso@usgs.gov

Since September 2013, USGS has hosted a bi-monthly UZIG web-based seminar series (webinar). In the latest of this series on September 19, Crystal Ng, Assistant Professor in the University of Minnesota Department of Earth Sciences and former USGS postdoc, presented "A Shrub Grows in the Mojave: Integrating Ecohydrological Modeling and Data." She described her coupled ecohydrological modeling approach for soil moisture and vegetation dynamics, and explained what the results show about the response of desert ecosystems to changes in climate and land use.

The webinar series provides an easily-accessible (and virtually free) forum for UZIG members to introduce themselves to one another and to share their research results. Ever-changing government travel restrictions and increasing travel costs are making conference attendance more challenging than in the past. But keeping in touch and keeping up with current research is critical - personal connections and knowledge of current work is crucial for building collaborations. Past webinar information is archived on our **web page**.

UZIG webinars will be advertised via email announcement prior to each talk. The UZIG webinar series is coordinated by Minnesota Water Science Center hydrologist and groundwater specialist Mindy Erickson (merickso@usgs.gov). If you would like to present your work at an upcoming webinar or suggest someone else as a possible webinar presenter, please contact Mindy. A webinar schedule with presenter and topic information is provided on the UZIG web page.

We look forward to 'seeing' you at future webinars.

November

Friday, Nov. 7, 2014 Noon Central Time (17:00 UT)

"Thirty eight years of desert unsaturated-zone research: What have we learned at the USGS Amargosa Desert Research Site?" "

David Stonestrom, USGS

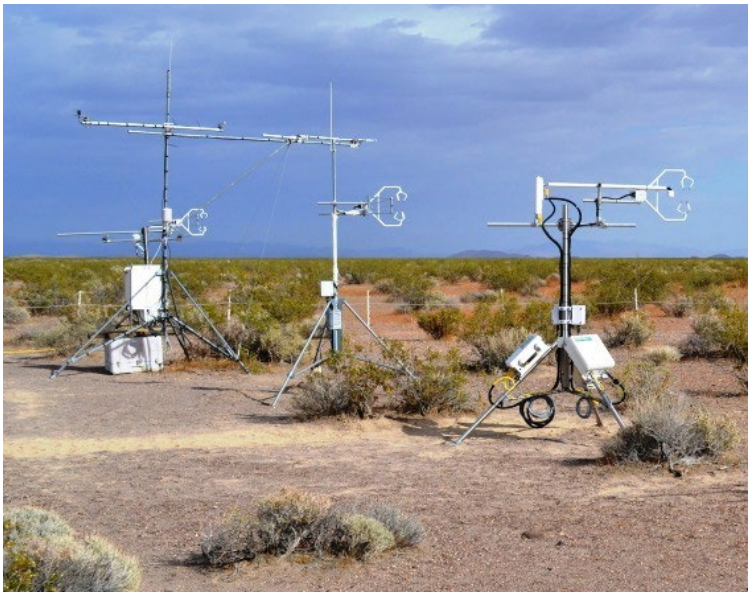
Presenter: Dave Stonestrom is a research hydrologist with the USGS National Research Program in Menlo Park, CA. He holds a BS in geology from Dickinson College and an MS and PhD in hydrology from Stanford University. He has studied unsaturated zones in settings ranging from tropical rain forests to deserts in relation to soil formation, groundwater recharge, contaminant transport, and responses to land-use and climate change. He was a founding member of UZIG.

See pictures from the Amargosa Desert Research Site on page 4 (next page).

Summary: The Toxics Substances Hydrology Program and Groundwater Resources Program's Amargosa Desert Research Site (ADRS), in Nye County, Nevada is the longest operating desert hydrology observational platform in existence. Situated between Death Valley and former nuclear weapons proving facilities at the Nevada Test Site, the ADRS is adjacent to the Nation's first disposal facility for commercial radioactive waste. Multi-decadal hydrometeorological data and multi-year flux studies have advanced understanding of desert evapotranspiration by separating E from T during wet and dry ENSO phases. Modeling of deep unsaturated-zone data show that the lowermost portion of the 110-m thick unsaturated-zone is still responding to major climatic shifts that ended the Pleistocene. Gas-phase contaminants including tritium, radiocarbon, mercury, and over sixty volatile organic compounds are migrating through the unsaturated zone surrounding low-level radioactive waste burial trenches. Disposed, microbially produced, and phyto-generated organic compounds all mediate radionuclide transport. Although unknown quantities of perchlorate were disposed in the radioactive waste trenches and large quantities in adjoining hazardous chemical disposal cells, the sizeable stockpile of perchlorate present in soils and plants around the facility is from natural atmospheric deposition.

UZIG web seminar series (cont'd)

Amargosa Desert Research Site (Nov. webinar topic). Tritiated water vapor sampling from unsaturated-zone borehole #3 at the Amargosa Desert Research Site, NV. Photo by Justin Mayers, May 2004.



Amargosa Desert Research Site (Nov. webinar topic). Evapotranspiration and CO_2 flux towers at the Amargosa Desert Research Site, NV. Photo by Michael T. Moreo, June 2011.

January 2015

Date TBD, Jan. 2015 Noon Central Time (17:00 UT)

"Rock moisture dynamics in the Eel River CZO: Field observations of unsaturated moisture storage in weathered, fractured bedrock under steep hillslopes."

Daniella Rempe, University of California, Berkeley

Summary: Due to subsurface weathering processes, hillslopes are often underlain by a considerable thickness of weathered, fractured bedrock. Increased bedrock porosity and permeability due to weathering allows water to infiltrate into the weathered, fractured bedrock creating a hydrologically dynamic zone that extends into the rock. Though it is commonly assumed that moisture availability to plants is limited to soil, our research in the Eel River Critical Zone Observatory (ERCZO) in Northern California indicates that the fractured weathered bedrock zone may serve as an important source of moisture to vegetation. Rock moisture also recharges seasonal groundwater within the hillslope and this water serves as baseflow during seasonally dry summers. Here, we present direct observations of the spatial and temporal distribution of rock moisture within the ERCZO and implications of this moisture source on local ecosystems.

March

Ramon Naranjo, USGS

May

Professor John Nieber, University of Minnesota

September

Kim Perkins, USGS

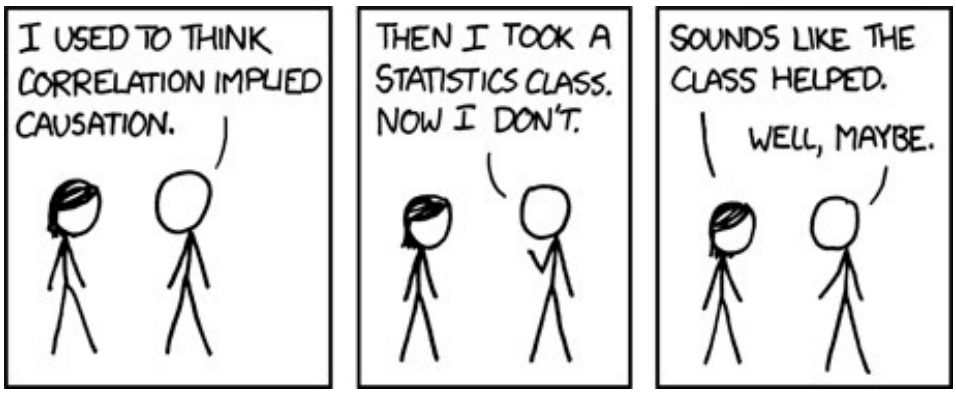
UZIG themed happenings at GSA

By Dave Stonestrom
USGS Research Hydrologist
dastones@usgs.gov

The Geological Society of America (GSA) 2014 annual meeting in Vancouver, British Columbia (Oct. 19–22) will host numerous sessions with content of interest to UZIG members. The newly formed Soils and Soil Processes GSA Interdisciplinary Interest Group (IIG) will meet on Monday, October 20, at the Hyatt Regency Vancouver Plaza Ballroom A (11:30-1:00). The following sessions contain unsaturated-zone content. Those marked by an asterisk are sponsored by the Soils IIG. Search or browse technical sessions at https://gsa.confex.com/gsa/2014AM/webprogram/start.html.

T39. Aeolian Processes and Landscapes: From Dust to Dunes
T42. Landscape Evolution through the Lens of Cosmogenic Nuclides
T44. Progress and Challenges in Developing Tools and Approaches Used in Sediment Budgets
*T45. Tracking Sediment Movement across Earth's Surface
*T47. Soil Development: Its Role in Geological Processes
T95. Frontiers in Environmental and Engineering Geology
T103. Mining and the Environment: Addressing Common Challenges Faced across the Mining Industry
T118. Frontiers in Non-Traditional Stable Isotopes
*T120. Proxies for Paleoprecipitation
T124. Trace Elements and Organics in Environmental and Urban Geochemistry
*T128. Geological and Geomorphological Applications of Digital Terrain Analysis
T154. Groundwater and Surface-Water Arsenic: From Source to Sink
*T156. Agricultural Impacts on Water Quality: Are We Making Progress?
T161. Application of Isotopes of Water to Characterize Hydrogeological Processes in Mine Environments
T166. Gas-Water Interactions in the Subsurface
T169. It's a Cold, Cold World: Permafrost and Glacial Hydrogeology
T170. Physical and Biogeochemical Measurements That Characterize Groundwater–Surface Water Interactions: Where to Go from Here?
T172. Terminal Lakes—In Honor of Blair Jones

Humor corner



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