

The online article is the official version and may contain additional content not available in this print issue. To access the full article, including multimedia, enhanced figures, supporting information, and other nonprinted content, go to <http://wrr.agu.org>.

Editorial

- 5869** *Alberto Montanari, Jean Bahr, Günter Blöschl, Ximing Cai, D. Scott Mackay, Anna Michalak, Harihar Rajaram, and Graham Sander*
Appreciation of peer reviewers for 2014 (doi 10.1002/2015WR017828)

Review Articles

- 5888** *Peter K. Kitanidis*
Persistent questions of heterogeneity, uncertainty, and scale in subsurface flow and transport*
(doi 10.1002/2015WR017639)
***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 5905** *Jay R. Lund*
Integrating social and physical sciences in water management* (doi 10.1002/2015WR017125)
***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 5919** *T. P. Burt and J. J. McDonnell*
Whither field hydrology? The need for discovery science and outrageous hydrological hypotheses*
(doi 10.1002/2014WR016839)
***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 5929** *Martyn P. Clark, Ying Fan, David M. Lawrence, Jennifer C. Adam, Diogo Bolster, David J. Gochis, Richard P. Hooper, Mukesh Kumar, L. Ruby Leung, D. Scott Mackay, Reed M. Maxwell, Chaopeng Shen, Sean C. Swenson, and Xubin Zeng*
Improving the representation of hydrologic processes in Earth System Models* (doi 10.1002/2015WR017096)
***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 5957** *M. J. Asher, B. F. W. Croke, A. J. Jakeman, and L. J. M. Peeters*
A review of surrogate models and their application to groundwater modeling (doi 10.1002/2015WR016967)
- 5974** *Ellen Wohl, Stuart N. Lane, and Andrew C. Wilcox*
The science and practice of river restoration* (doi 10.1002/2014WR016874)
***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**

Research Articles

- 5998** *Lawrence C. Murdoch, Clay E. Freeman, Leonid N. Germanovich, Colby Thrash, and Scott DeWolf*
Using in situ vertical displacements to characterize changes in moisture load (doi 10.1002/2015WR017335)
- 6017** *Ganming Liu, Franklin W. Schwartz, Kuo-Hsin Tseng, and C. K. Shum*
Discharge and water-depth estimates for ungauged rivers: Combining hydrologic, hydraulic, and inverse modeling with stage and water-area measurements from satellites (doi 10.1002/2015WR016971)
- 6036** *Xavier Zapata-Rios, Jennifer McIntosh, Laura Rademacher, Peter A. Troch, Paul D. Brooks, Craig Rasmussen, and Jon Chorover*
Climatic and landscape controls on water transit times and silicate mineral weathering in the critical zone
(doi 10.1002/2015WR017018)

- 6052** *Christopher T. Green, Michelle A. Walvoord, Brian J. Andraski, Robert G. Striegl, and David A. Stonestrom*
Multimodel analysis of anisotropic diffusive tracer-gas transport in a deep arid unsaturated zone
(doi 10.1002/2014WR016055)
- 6074** *Todd H. Buxton, John M. Buffington, Elowyn M. Yager, Marwan A. Hassan, and Alexander K. Fremier*
The relative stability of salmon redds and unspawned streambeds (doi 10.1002/2015WR016908)
- 6093** *J. C. Manceau, J. Tremosa, P. Audigane, C. Lerouge, F. Claret, Y. Lettry, T. Fierz, and C. Nussbaum*
Well integrity assessment under temperature and pressure stresses by a 1:1 scale wellbore experiment
(doi 10.1002/2014WR016786)
- 6110** *Casey M. Brown, Jay R. Lund, Ximing Cai, Patrick M. Reed, Edith A. Zagona, Avi Ostfeld, Jim Hall, Gregory W. Characklis, Winston Yu, and Levi Brekke*
The future of water resources systems analysis: Toward a scientific framework for sustainable water management* (doi 10.1002/2015WR017114)

***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**

- 6125** *Robert L. Runkel*
On the use of rhodamine WT for the characterization of stream hydrodynamics and transient storage*
(doi 10.1002/2015WR017201)

***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**

- 6143** *Roberto Greco and Rudy Gargano*
A novel equation for determining the suction stress of unsaturated soils from the water retention curve based on wetted surface area in pores (doi 10.1002/2014WR016541)
- 6156** *D. Scott Mackay, David E. Roberts, Brent E. Ewers, John S. Sperry, Nathan G. McDowell, and William T. Pockman*
Interdependence of chronic hydraulic dysfunction and canopy processes can improve integrated models of tree response to drought (doi 10.1002/2015WR017244)
- 6177** *Tim Johnson, Roelof Versteeg, Jon Thomle, Glenn Hammond, Xingyuan Chen, and John Zachara*
Four-dimensional electrical conductivity monitoring of stage-driven river water intrusion: Accounting for water table effects using a transient mesh boundary and conditional inversion constraints
(doi 10.1002/2014WR016129)
- 6197** *Edward Park and Edgardo M. Latrubesse*
Surface water types and sediment distribution patterns at the confluence of mega rivers: The Solimões-Amazon and Negro Rivers junction (doi 10.1002/2014WR016757)
- 6214** *Kaniska Mallick, Eva Boegh, Ivonne Trebs, Joseph G. Alfieri, William P. Kustas, John H. Prueger, Dev Niyogi, Narendra Das, Darren T. Drewry, Lucien Hoffmann, and Andrew J. Jarvis*
Reintroducing radiometric surface temperature into the Penman-Monteith formulation
(doi 10.1002/2014WR016106)
- 6244** *Sanjeev Kumar Jha, Gregoire Mariethoz, Jason Evans, Matthew F. McCabe, and Ashish Sharma*
A space and time scale-dependent nonlinear geostatistical approach for downscaling daily precipitation and temperature (doi 10.1002/2014WR016729)
- 6262** *Joshua S. Rice, Ryan E. Emanuel, James M. Vose, and Stacy A. C. Nelson*
Continental U.S. streamflow trends from 1940 to 2009 and their relationships with watershed spatial characteristics (doi 10.1002/2014WR016367)
- 6276** *Katia Cugerone and Carlo De Michele*
Johnson SB as general functional form for raindrop size distribution (doi 10.1002/2014WR016484)
- 6290** *Shohei Watanabe, Isabelle Laurion, Stiig Markager, and Warwick F. Vincent*
Abiotic control of underwater light in a drinking water reservoir: Photon budget analysis and implications for water quality monitoring (doi 10.1002/2014WR015617)
- 6311** *Yong Zhang, Mark M. Meerschaert, Boris Baeumer, and Eric M. LaBolle*
Modeling mixed retention and early arrivals in multidimensional heterogeneous media using an explicit Lagrangian scheme (doi 10.1002/2015WR016902)
- 6338** *Samuel C. Zipper, Mehmet Evren Soylu, Eric G. Booth, and Steven P. Loheide II*
Untangling the effects of shallow groundwater and soil texture as drivers of subfield-scale yield variability
(doi 10.1002/2015WR017522)
- 6359** *Bin Xu, Ping-An Zhong, Renato C. Zambon, Yunfa Zhao, and William W.-G. Yeh*
Scenario tree reduction in stochastic programming with recourse for hydropower operations
(doi 10.1002/2014WR016828)

- 6381** *Laura K. Read and Richard M. Vogel*
Reliability, return periods, and risk under nonstationarity (doi 10.1002/2015WR017089)
- 6399** *B. Merz, S. Vorogushyn, U. Lall, A. Viglione, and G. Blöschl*
Charting unknown waters—On the role of surprise in flood risk assessment and management* (doi 10.1002/2015WR017464)
- *This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 6417** *Matthias Cuntz, Juliane Mai, Matthias Zink, Stephan Thober, Rohini Kumar, David Schäfer, Martin Schrön, John Craven, Oldrich Rakovec, Diana Spieler, Vladyslav Prykhodko, Giovanni Dalmaso, Jude Musuuza, Ben Langenberg, Sabine Attinger, and Luis Samaniego*
Computationally inexpensive identification of noninformative model parameters by sequential screening (doi 10.1002/2015WR016907)
- 6442** *Y. Elshafei, J. Z. Coletti, M. Sivapalan, and M. R. Hipsey*
A model of the socio-hydrologic dynamics in a semiarid catchment: Isolating feedbacks in the coupled human-hydrology system (doi 10.1002/2015WR017048)
- 6472** *Joseph Holden, Sheila M. Palmer, Kerrylyn Johnston, Catherine Wearing, Brian Irvine, and Lee E. Brown*
Impact of prescribed burning on blanket peat hydrology (doi 10.1002/2014WR016782)
- 6485** *Zhanming Wan, Ke Zhang, Xianwu Xue, Zhen Hong, Yang Hong, and Jonathan J. Gourley*
Water balance-based actual evapotranspiration reconstruction from ground and satellite observations over the conterminous United States (doi 10.1002/2015WR017311)
- 6500** *Wei Liang, Dan Bai, Feiyu Wang, Bojie Fu, Junping Yan, Shuai Wang, Yuting Yang, Di Long, and Minquan Feng*
Quantifying the impacts of climate change and ecological restoration on streamflow changes based on a Budyko hydrological model in China's Loess Plateau (doi 10.1002/2014WR016589)
- 6520** *Zhenlei Yang and Binayak P. Mohanty*
Effective parameterizations of three nonwetting phase relative permeability models (doi 10.1002/2014WR016190)
- 6532** *Rafael L. Bras*
Complexity and organization in hydrology: A personal view* (doi 10.1002/2015WR016958)
- *This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 6549** *Markus Duschl, Petrik Galvosas, Timothy I. Brox, Andreas Pohlmeier, and Harry Vereecken*
In situ determination of surface relaxivities for unconsolidated sediments (doi 10.1002/2014WR016574)
- 6564** *L. Minatti*
A well-balanced FV scheme for compound channels with complex geometry and movable bed (doi 10.1002/2014WR016584)
- 6586** *Xun Sun, Upmanu Lall, Bruno Merz, and Nguyen Viet Dung*
Hierarchical Bayesian clustering for nonstationary flood frequency analysis: Application to trends of annual maximum flow in Germany (doi 10.1002/2015WR017117)
- 6602** *Laura E. Condon and Reed M. Maxwell*
Evaluating the relationship between topography and groundwater using outputs from a continental-scale integrated hydrology model* (doi 10.1002/2014WR016774)
- *This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 6622** *A. Fiori, A. Bellin, V. Cvetkovic, F. P. J. de Barros, and G. Dagan*
Stochastic modeling of solute transport in aquifers: From heterogeneity characterization to risk analysis* (doi 10.1002/2015WR017388)
- *This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 6649** *Efi Foufoula-Georgiou, Zeinab Takbiri, Jonathan A. Czuba, and Jon Schwenk*
The change of nature and the nature of change in agricultural landscapes: Hydrologic regime shifts modulate ecological transitions* (doi 10.1002/2015WR017637)
- *This article is part of a Special Section—The 50th Anniversary of Water Resources Research**
- 6672** *A. Revil, A. Binley, L. Mejus, and P. Kessouri*
Predicting permeability from the characteristic relaxation time and intrinsic formation factor of complex conductivity spectra (doi 10.1002/2015WR017074)

- 6701** *Joseph S. Walder, Richard M. Iverson, Jonathan W. Godt, Matthew Logan, and Stephen A. Solovitz*
Controls on the breach geometry and flood hydrograph during overtopping of noncohesive earthen dams
(doi 10.1002/2014WR016620)
- 6725** *Diane M. McKnight, Karen Cozzetto, James D. S. Cullis, Michael N. Gooseff, Christopher Jaros, Joshua C. Koch, W. Berry Lyons, Roseanna Neupauer, and Adam Wlostowski*
Potential for real-time understanding of coupled hydrologic and biogeochemical processes in stream ecosystems: Future integration of telemetered data with process models for glacial meltwater streams*
(doi 10.1002/2015WR017618)

***This article is part of a Special Section—The 50th Anniversary of Water Resources Research**

- 6739** *Muhammad Muniruzzaman and Massimo Rolle*
Impact of multicomponent ionic transport on pH fronts propagation in saturated porous media
(doi 10.1002/2015WR017134)
- 6756** *O. D. L. Strack and B. K. Ausk*
A formulation for vertically integrated groundwater flow in a stratified coastal aquifer
(doi 10.1002/2015WR016887)

Technical Reports: Methods

- 6776** *S. Frei and B. S. Gilfedder*
FINIFLUX: An implicit finite element model for quantification of groundwater fluxes and hyporheic exchange in streams and rivers using radon (doi 10.1002/2015WR017212)
- 6787** *Daniel T. Birdsell, Harihar Rajaram, and Greg Lackey*
Imbibition of hydraulic fracturing fluids into partially saturated shale (doi 10.1002/2015WR017621)