
CURRICULUM VITAE: Erica R. Siirila-Woodburn

CONTACT INFORMATION

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EDUCATION

Ph.D. 2013 Colorado School of Mines Hydrology	Golden, CO
M.S. 2010 Colorado School of Mines Hydrology	Golden, CO
B.A. 2009 University of Colorado Geology	Boulder, CO

PROFESSIONAL EXPERIENCE

May 2017 – Present	Research Scientist Seaborg Research Fellow Lawrence Berkeley National Laboratory	Berkeley, CA
Jan. 2015 – May 2017	Postdoctoral Fellow Lawrence Berkeley National Laboratory	Berkeley, CA
July 2013 – Dec. 2014	Postdoctoral Researcher Polytechnic University of Catalonia	Barcelona, Spain
Aug. 2011 – May 2013	Teaching Assistant, Instructor Colorado School of Mines	Golden, CO
Jan. 2010 – May 2013	Research Assistant Colorado School of Mines	Golden, CO

PUBLICATIONS

Peer-reviewed Journal Articles Under Review

- [11] Maina, F., **E.R. Siirila-Woodburn**, M. Newcomer, Z. Xu., C.I. Steefel, “Understanding the impacts of climate extremes on California Watersheds with integrated hydrologic modeling and remote sensing techniques.” Water Resour Res, under review.
- [10] Wainwright, H.M., Trutner, S.D., **Siirila-Woodburn, E.R.**, Williams, K.H., Hubbard, S.S., Carroll, R. “Seasonal effects of temperature and precipitation on snowmelt and streamflow in a headwater catchment in the western US.” Hydrol. Earth Syst. Sci., under review.

Peer-reviewed Journal Articles

- [9] **Siirila-Woodburn, E.R.**, Steefel, C.I., Williams, K.H., Birkholzer, J.T. (2018) “The impact of land management decisions on overland flow generation: Implications for cesium migration in forested Fukushima watersheds.” Adv Water Resour, **113**, 42-55, doi.org/10.1016/j.advwatres.2018.01.008.
- [8] **Siirila-Woodburn, E.R.**, Cihan, A., Birkholzer, J.T. (2017) “A risk map methodology to assess the spatial and temporal distribution of leakage into groundwater from Geologic Carbon Storage.” Int J Greenh Gas Control, **59**, doi.org/10.1016/j.ijggc.2017.02.003.
- [7] **Siirila-Woodburn, E.R.**, Fernàndez-Garcia, D., Sanchez-Vila, X. (2015). “Improving the accuracy of risk prediction from particle-based breakthrough curves reconstructed with kernel density estimators.” Water Resour Res, **51**. doi:10.1002/2014WR016394.
- [6] **Siirila-Woodburn, E.R.**, Sanchez-Vila, X., Fernàndez-Garcia, D. (2015). “On the formation of multiple local peaks in breakthrough curves.” Water Resour Res, **51**. doi:10.1002/2014WR015840.
- [5] **Siirila-Woodburn, E.R.** and Maxwell, R.M. (2015). “A heterogeneity model comparison of highly resolved statistically anisotropic aquifers.” Adv Water Resour, **75**, 53-66. doi:10.1016/j.advwatres.2014.10.011.
- [4] Navarre-Sitchler, A.K., Maxwell, R.M., **Siirila, E.R.**, Hammond, G.E., and Lichtner, P.C. (2013). “Elucidating geochemical response of shallow heterogeneous aquifers to CO₂ leakage using high-performance computing: implications for monitoring of CO₂ sequestration.” Adv Water Resour, **53**,45-55. doi:10.1016/j.advwatres.2012.10.005.
- [3] **Siirila, E.R.** and Maxwell, R.M. (2012). “A new perspective on human health risk assessment: Development of a time dependent methodology and the effect of varying exposure durations.” Sci Total Environ. **431**:221-232. doi:10.1016/j.scitotenv.2012.05.030.

- [2] **Siirila, E.R.** and Maxwell, R.M. (2012). “Evaluating effective reaction rates of kinetically driven solutes in large-scale, statistically anisotropic media: human health risk implications.” *Water Resour Res* **48**(4):W04527. doi:10.1029/2011WR011516.
- [1] **Siirila, E.R.**, Navarre-Sitchler, A.K., Maxwell, R.M., and McCray, J.E. (2012). “A quantitative methodology to assess the risks to human health from CO₂ leakage into groundwater.” *Adv Water Resour*, **36**. doi:10.1016/j.advwatres.2010.11.005.

Conference Proceedings Articles

Siirila-Woodburn, E.R., A. Cihan, J.T. Birkholzer. The effect of leaky well permeability distribution on probabilistic risk maps in Geologic Carbon Storage. *Energy Procedia*, 114, 2017 4338-4334. doi.org/10.1016/j.egypro.2017.03.1584.

Siirila, E.R. and Maxwell, R.M. Effective reaction rates of kinetically driven solutes in large-scale, heterogeneous domains: human health risk implications. PSAM 11 & ESREL 2012 Conference, Helsinki, Finland, 25-29 June, 2012.

Siirila, E.R. and Maxwell, R.M. Evaluating effective reaction rates of kinetically driven solutes in large-scale, statistically anisotropic media: implications of pore scale mixing and preferential flow pathways at the field scale. 2012 CMWR International Conference, Urbana-Champaign, IL, 17-21 June, 2012.

Siirila, E.R. and Maxwell, R.M. Effective reaction rates of kinetically driven solutes in large-scale, heterogeneous domains: human health risk implications. MODEL CARE Conference, Leipzig, Germany, 18-22 Sept., 2011.

Atchley, A.L., **Siirila, E.R.**, Maxwell, R.M., Navarre-Sitchler, A.K., McCray, J.E. Using streamlines for highly-resolved reactive transport for CO₂ risk assessment simulations. MODEL CARE Conference, Leipzig, Germany, 18-22 Sept., 2011.

Siirila, E.R. and Maxwell, R.M. Effective reaction rates of kinetically driven solutes in large-scale, heterogeneous domains: human health risk implications. 2011 MODFLOW and More Conference, Golden, CO, 5-8 June, 2011.

Atchley, A.L., **Siirila, E.R.**, Maxwell, R.M., Navarre-Sitchler, A.K., McCray, J.E. Using streamlines for highly-resolved, reactive transport for CO₂ risk assessment simulations. 2011 MODFLOW and More Conference, Golden, CO, 5-8 June, 2011.

Dissertation and Thesis

Siirila, E.R. (2013). *On the interplay between scaling small-scale reactions, mixing, and aquifer heterogeneity: human health risk implications*. (Doctoral dissertation).

Siirila, E.R. (2010). *A quantitative methodology to assess the human health risks from CO₂ leakage into groundwater*. (Master's thesis).

INVITED TALKS

Siirila-Woodburn, E.R. A risk map methodology to assess the spatial and temporal distribution of leakage into groundwater from Geologic Carbon Storage, IEAGHG Modeling and Risk Assessment Meeting, Grand Forks, ND, 20 June, 2018. *Invited.*

Siirila-Woodburn, E.R. Using integrated modeling approaches for hydrologic prediction and risk assessment. Los Alamos National Laboratory, Earth and Environmental Science, Science Cafe, 9 March, 2017. *Invited.*

Siirila-Woodburn, E.R., Steefel, C.I., Williams, K.H., Kitamura, A., Birkholzer, J.T. Using Hydrologic Modeling to Evaluate Forest Remediation Strategies in the Fukushima Prefecture. Second International Symposium for Resilient Communities, Koriyama City, Japan 14-15 April, 2016. *Invited.*

Siirila, E.R., Sanchez-Vila, X., Fernández-García, D. On the non-monotonicity and localized peaks of breakthrough curves. 7th IAHR International Groundwater Symposium, Perugia, Italy, 22-24 Sept., 2014. *Invited key-note.*

CONFERENCE PRESENTATIONS

Maina, F., **Siirila-Woodburn, E.R.,** Maina, M. Newcomer, Z. Xu, C. Steefel, Assessing the impact of climate extremes on watershed dynamics, 2019 EGU, Vienna, Austria, 7-12 April, 2019.

Siirila-Woodburn, E.R., F. Maina, M. Newcomer, Z. Xu, C. Steefel, Watershed responses to climate extremes: impacts on groundwater storage and stakeholder water management planning, 2018 Fall Meeting, AGU, Washington, DC. 10-14 Dec., 2018.

F. Maina, **Siirila-Woodburn, E.R.,** M. Newcomer, Z. Xu, C. Steefel, Watershed dynamics and connectivity from headwaters to groundwater, 2018 Fall Meeting, AGU, Washington, DC. 10-14 Dec., 2018.

T. Maavara, N. Bouskill, B. Arora, **E.R. Siirila-Woodburn,** J. Sample, R.M. Coutoure, M. Newcomer, L. Foster, K. Williams, C. Steefel, Modeling Nitrogen Sources, Sinks and Transformations in a Mountain Watershed Under Changing Climate, 2018 Goldschmidt, Boston, MA. 12-17 Aug., 2018.

F. Maina, M. Newcomer, Z. Xu, **Siirila-Woodburn, E.R.,** “Using high resolution integrated hydrologic models and uncertainty quantification tools to understand dynamic watershed behavior across scales” Gordon Research Conferences, Flow and Transport in Permeable Media, Newry, ME, 8-13 July, 2018.

Siirila-Woodburn, E.R., F. Maina, M. Newcomer, C. Steefel, A new approach to predicting the effects of climate extremes on California’s water supply, Computational Methods in Water Resources 2018, Saint-Malo, France, 5 June, 2018.

Xu, Z., **E.R. Siirila-Woodburn**, D. Dwivedi, C. Steefel, R. Carroll, A Reactive Transport Modeling Approach for Understanding Concentration-Discharge, Computational Methods in Water Resources 2018, Saint-Malo, France, 5 June, 2018.

Wainwright, H.M., S. Trutner, **E.R. Siirila-Woodburn**, M. Newcomer, K.H. Williams, S. Hubbard, B.J. Enquist, H. Steltzer, R. Carroll, Quantifying Temperature Effects on Snow, Plant and Streamflow Dynamics in Headwater Catchments, 2017 Fall Meeting, AGU, New Orleans, LA, Dec 2017.

Wainwright, H., B. Dafflon, N. Falco, B. Arora, **E.R. Siirila-Woodburn**, K. Williams, C. Steefel, S. Hubbard, Digital Watershed: Advanced Watershed Characterization across Scales, Computational Methods in Water Resources 2018, Saint-Malo, France, 5 June, 2018.

Moulton, D., **E.R. Siirila-Woodburn**, D. Dwivedi, C.I. Steefel, D. Svyatskiy, R.M. Maxwell, L. Condon. Integrated Hydrology Model Intercomparison with High-resolution Data at the East River, Colorado. MODFLOW and More 2017, Golden, CO, 21-24 May, 2017.

Siirila-Woodburn, E.R., Steefel, C.I., Moulton, J.D., Dwivedi, D. Anthropogenic triggers on the hyporheic zone: quantifying groundwater-surface water interaction and the impact on water quality. 2016 Fall Meeting, AGU, San Francisco, CA Dec 2016.

Siirila-Woodburn, E.R., Cihan, A., Birkholzer, J. The effect of leaky well permeability distribution on probabilistic risk maps in Geologic Carbon Storage. GHGT-13, Lausanne, Switzerland, 14-18 Nov, 2016.

Arora, B., Steefel, C.I., **Siirila-Woodburn, E.R.**, Dwivedi, D., Kallemov, B., Newcomer, M. Benchmarking integrated surface-subsurface models along a hillslope transect. 2016 SesBench V Subsurface Environmental Simulation Benchmarking Workshop, Coruña, Spain, Oct 13-15, 2016.

Dwivedi, D., Arora, B., Newcomer, M., **Siirila-Woodburn, E.R.**, Steefel, C.I., Moulton, D. Modeling Integrated Surface Subsurface Water Flow and Biogeochemical Cycling in the Hyporheic Zone. 2016 SesBench V Subsurface Environmental Simulation Benchmarking Workshop, Coruña, Spain, Oct 13-15, 2016.

Siirila-Woodburn, E.R., Steefel, C.I., Williams, K.H., Birkholzer, J.T. An integrated hydrologic modeling approach to cesium-137 transport in forested Fukushima watersheds. 2015 Fall Meeting, AGU, San Francisco, CA, 14-18 Dec, 2015.

Siirila-Woodburn, E.R., Cihan, A., Birkholzer, J.T. Determining the Area of Review (AoR) in Carbon Capture and Storage: A tiered, probabilistic methodology to generate risk maps. 2015 Fall Meeting, AGU, San Francisco, CA, 14-18 Dec, 2015.

Siirila-Woodburn, E.R. Fernández-García, D. Sanchez-Vila, X. The effect of heterogeneity models and parameterization on plume distribution and breakthrough curves. 2015 AGU Chapman Conference, Valencia, Spain, 5-8 Oct, 2015.

Siirila, E.R., Fernàndez-Garcia, D. Sanchez-Vila, X. The use of kernel density estimators in breakthrough curve reconstruction and advantages in risk analysis. 2014 Fall Meeting, AGU, San Francisco, CA, 15-19 Dec, 2014.

Siirila, E.R., Sanchez-Vila, X., Fernàndez-Garcia, D. On the non-monotonicity and localized peaks of breakthrough curves. 2014 CMWR International Conference, Stuttgart, Germany, 10-13 June, 2014.

Siirila, E.R., Sanchez-Vila, X., Fernàndez-Garcia, D. On the non-monotonicity and localized peaks of breakthrough curves. 2014 Meeting, EGU, Vienna, Austria, 28 April-2 May, 2014.

Siirila, E.R. and Maxwell, R.M. Propagating uncertainty from hydrology into human health risk assessment. 2013 Fall Meeting, AGU, San Francisco, CA, 9-13 Dec, 2013.

Siirila, E.R. and Maxwell, R.M. Interplay between local and macro dispersive processes resulting from different modeling approaches of aquifer heterogeneity. 2012 Fall Meeting, AGU, San Francisco, CA, 3-7 Dec, 2012.

Siirila, E.R. and Maxwell, R.M. Effective reaction rates of kinetically driven solutes in large-scale, heterogeneous domains: human health risk implications. PSAM 11 & ESREL 2012 Conference, Helsinki, Finland, 25-29 June, 2012.

Siirila, E.R. and Maxwell, R.M. Evaluating effective reaction rates of kinetically driven solutes in large-scale, statistically anisotropic media: implications of pore scale mixing and preferential flow pathways at the field scale. 2012 CMWR International Conference, Urbana-Champaign, IL, 17-21 June, 2012.

Siirila, E.R. and Maxwell, R.M. The effect of macro-kinetic solutes on human health risk with time-dependent exposure. 2012 CMWR International Conference, Urbana-Champaign, IL, 17-21 June, 2012.

Siirila, E.R. and Maxwell, R.M., Evaluating effective reaction rates of kinetically driven solutes in large-scale, anisotropic media: human health risk implications in CO₂ leakage, Abstract H21C-1118. 2011 Fall Meeting, AGU, San Francisco, CA, 5-9 Dec, 2011.

Siirila, E.R. and Maxwell, R.M. Effective reaction rates of kinetically driven solutes in large-scale, heterogeneous domains: human health risk implications. MODEL CARE Conference, Leipzig, Germany, 18-22 Sept, 2011.

Atchley, A.L., **Siirila, E.R.**, Maxwell, R.M. Navarre-Sitchler, A.K., McCray, J.E. Using streamlines for highly-resolved reactive transport for CO₂ risk assessment simulations. MODEL CARE Conference, Leipzig, Germany, 18-22 September, 2011.

Siirila, E.R. and Maxwell, R.M. Effective reaction rates of kinetically driven solutes in large-scale, heterogeneous domains: human health risk implications. 2011 MODFLOW and More Conference, Golden, CO, 5-8 June, 2011.

Siirila, E.R., Navarre-Sitchler, A.K., Maxwell, R.M., Bearup, L.A. and McCray, J.E. A quantitative methodology to assess the risks to human health from CO₂ leakage into groundwater: implications of scaling reaction rates. 10th Annual Carbon Capture and Sequestration Conference, Pittsburgh, PA, May, 2011.

Siirila, E.R., Navarre-Sitchler, A.K., Maxwell, R.M. and McCray, J.E., A quantitative methodology to assess the risks to human health from CO₂ leakage into groundwater, Abstract H53E-1078. 2010 Fall Meeting, AGU, San Francisco, CA, 5-9 Dec, 2010.

Siirila, E.R., Navarre-Sitchler, A.K., Maxwell, R.M., McCray, J.E. A quantitative methodology to assess the risks to human health from CO₂ leakage into groundwater. Geological Society of America, Denver, CO, Oct, 2010.

Atchley, A.L., **Siirila, E.R.**, Navarre-Sitchler, A.K., Maxwell, R.M., McCray, J.E. Improving the assessment of Carbon Capture and Storage risk analysis by proper representation of hydraulic conductivity and dispersive properties. Geological Society of America, Denver, CO, Oct, 2010.

Siirila, E.R., Navarre-Sitchler, A.K., Maxwell, R.M., McCray, J.E. A quantitative methodology to assess the risks to human health from CO₂ leakage into groundwater. Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI) Inc., Boulder, CO, July, 2010.

Maxwell, R.M., **Siirila, E.R.**, Wunsch, A., Peters, L., Atchley, A., Navarre-Sitchler, A.K. and McCray, J. A quantitative methodology to assess the risks to human health from CO₂ leakage into groundwater. 2010 Carbon Capture & Sequestration Conference, Simulation and Risk Assessment session, Pittsburgh PA, 23-25 March, 2010.

McCray, J., Navarre-Sitchler, A.K., Peters, L., **Siirila, E.R.**, Mouzakis, K., Wunsch, A. and Maxwell, R.M. Identifying Aquifers Susceptible to Impacts from CO₂ leakage, 2010 Carbon Capture & Sequestration Conference, Simulation and Risk Assessment session, Pittsburgh PA, 23-25 March, 2010.

FUNDED GRANTS

- 2018: University of California Laboratory Fees Research Program, funded from UC office of the president (UCOP). “Headwaters to groundwater: resources in a changing climate”, \$692,000 (LBNL *Proxy-PI*)¹
- 2017: Early Career Laboratory Directed Research Development (LDRD), Lawrence Berkeley National Laboratory. “A new approach to predicting the effect of climate extremes on California’s water supply”, \$584,000 (*PI*)

2017: Early Career Development Grant, Earth and Environmental Science Area, Lawrence Berkeley National Laboratory. “Integrated Hydrologic Modeling of Stormwater Banking into Groundwater”, \$25,000 (*PI*)

TEACHING EXPERIENCE

Spring 2013	Instructor, Colorado School of Mines Subsurface Contaminant Transport, 3 credits, 24 students
Fall 2012	Instructor, Colorado School of Mines Environmental Risk Analysis, 3 credits, 19 students
Fall 2011	Teaching Assistant, Colorado School of Mines Environmental Risk Analysis, 3 credits, 13 students

INVITED LECTURES

Siirila-Woodburn, E.R. Watershed-scale Transport: Applications. University of California Berkeley, Nuclear Engineering Department Seminar (NE290E), 6 Feb., 2019.

Siirila-Woodburn, E.R. Watershed-scale Transport: Applications. University of California Berkeley, Nuclear Engineering Department Seminar (NE290E), 15 Sept., 2015.

Siirila, E.R. CO₂ leakage and risk assessment. Colorado School of Mines, Civil Engineering Department, Geologic Carbon Sequestration (ESGN 598) Seminar, 19 Oct., 2011.

SUPERVISEES

Undergraduate interns:

- Ved Bhoot (University of California, Berkeley): 2018
- Lilian Holmes (University of California, Berkeley): 2018
- Sarah Trutner (Oberlin College): 2016-2017

Postdoctoral Fellows:

- Fadji Maina: 2018-present

ACADEMIC ACHIEVEMENTS AND AWARDS

2017 Seaborg Research Fellowship: Early Career Development Award and selection into the Early Career Enrichment Program. Selection made by laboratory directorate, awarded to only ten scientists from across the laboratory.^{2,3}

- 2017 Early Career Development Award, Earth and Environmental Sciences Area, Lawrence Berkeley National Laboratory.
- 2015 American Geophysical Union Early Career Travel Grant, Chapman Conference: The MADE Challenge for Groundwater Transport in Highly Heterogeneous Aquifers, Valencia, Spain.
- 2014 *Advances in Water Resources* #1 Top Cited Paper 2012-2013: “A quantitative methodology to assess the risks to human health from CO₂ leakage into groundwater”.
- 2013 Student teaching fellowship, Colorado School of Mines Hydrologic Science and Engineering Program.
- 2012 First place oral presentation, Carbon Capture and Storage (CCS) Symposium at the Colorado School of Mines.
- 2010-11 Outstanding M.S. student of the year award, Colorado School of Mines Hydrologic Science and Engineering Program.
- 2005 Multicultural Engineering Program (MEP) Scholarship, University of Colorado, Boulder.

PROFESSIONAL ACTIVITIES

Scientific Conference Session Convener:

- 2018 American Geophysical Union Fall Meeting “Hydrological Connectivity Between Headwaters to Groundwaters in a Changing Climate”
- 2017 American Geophysical Union Fall Meeting “Understanding the Extent and Impacts of Land Use/Land Cover Change on Water Resources”
- 2016 Second International Symposium for Resilient Communities, Koriyama City, Fukushima “Radiological and Seismic Resilience”
- 2015 American Geophysical Union Fall Meeting “Biogeoscience processes governing radioisotope transfers after Fukushima and other nuclear accidents”

Journal Reviewer: *Advances in Water Resources, Environmental Modeling and Software, Environmental Research, Environmental Science and Technology, Journal of Hydrology, Stochastic Environmental Research and Risk Analysis, Vadose Zone Journal, Water Resources Research*

Member: Institute for Resilient Communities, American Geophysical Union, Lawrence Berkeley National Laboratory Women Scientists Engineers Council (WSEC)

Scientific Expert for Media Inquiries: KCRA (Sacramento)⁴, NPR (KCBX Central Coast Public Radio)⁵

PRESS RELEASES AND NEWS ARTICLES

¹ <http://newscenter.lbl.gov/2018/03/21/understanding-effects-of-climate-change-on-california-watersheds/>

² <http://today.lbl.gov/2017/11/30/lab-launches-early-career-development-ldrds-and-early-career-enrichment-program/>

³ <http://newscenter.lbl.gov/2018/07/06/scientists-dig-deep-to-track-down-californias-ever-changing-groundwater-supply/>

⁴ <https://www.kcra.com/article/is-this-the-answer-to-california-s-water-whiplash/20056887>

⁵ <https://www.kcbx.org/post/oil-and-water-arroyo-grande-oil-field-and-nearby-domestic-drinking-wells#stream/0>