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EDUCATION

Massachusetts Institute of Technology Cambridge, MA
Ph.D., Hydrology, February 2005
Department of Civil and Environmental Engineering

University of Notre Dame Notre Dame, IN
B.S., Civil Engineering, Summa Cum Laude, June 1998
Department of Civil Engineering and Geological Sciences

EXPERIENCE

University of Delaware Newark, DE
Associate Director for Interdisciplinary Initiatives, Delaware Environmental Institute (September 2017-present)
Associate Professor, Department of Geological Sciences (September 2014-present)
Unidel Fraser Russell Chair for the Environment (September 2013-present)
Assistant Professor, Department of Geological Sciences (September 2008 – September 2014)
Joint Appointment, Department of Civil and Environmental Engineering
Joint Faculty, Department of Geography
Joint Faculty, School of Marine Science and Policy

Flinders University Adelaide, Australia
Visiting Professor, School of Earth Sciences (October 2014-May 2015)

Stanford University Stanford, CA
Postdoctoral Researcher, Departments of Geological and Environmental Sciences and Energy Resources
Engineering (January 2007-August 2008)

United States Geological Survey Reston, VA
National Research Council Postdoctoral Research Associate (December 2004 –December 2006)

HONORS and AWARDS

- Geological Society of America James B. Thompson, Jr. International Distinguished Lectureship (2018)
- National Academy of Engineering Kavli Fellow (2014)
- Water Resources Research Editor's Choice Award for Heiss and Michael (2014)
- Unidel Fraser Russell Career Development Chair in the Environment, University of Delaware (2013)
- National Science Foundation CAREER Award (2012)
- National Academy of Sciences Kavli Fellow (2012)
- Oak Ridge Associated Universities Ralph E. Powe Junior Faculty Award (2010)
- National Research Council RAP Postdoctoral Research Fellowship (2004-2006)
- National Science Foundation Graduate Research Fellowship (1998-2002)
- Massachusetts Institute of Technology Hydrology Fellowship (2001)
- Thomas A. Steiner Prize for excellence in the Notre Dame College of Engineering (1998)

- Walter L. Shilts Award for undergraduate achievement in Civil Engineering (1998)

RESEARCH INTERESTS

- Coastal groundwater dynamics
- Submarine groundwater discharge and associated chemical fluxes
- Groundwater-surface water interaction
- Groundwater flow and solute transport modeling
- Water supply sustainability
- Water resources in developing countries
- Geostatistical modeling of subsurface heterogeneity
- Hydro-economics

PROFESSIONAL MEMBERSHIPS

- American Geophysical Union
- Geological Society of America
- International Association of Hydrogeologists
- International Association of Mathematical Geosciences
- The Geochemical Society

PUBLICATIONS

*corresponding author

(I am generally listed last on publications for which *students or postdocs under my direction* are first author)

Published or In Press

*Russoniello, CJ, JW Heiss, HA Michael** (2018) Variability in benthic exchange rate, mixing zone depth, and residence time in a shallow coastal estuary, Journal of Geophysical Research – Oceans, doi: 10.1002/2017JC013568.

Koneshloo, M, P Kreyns, HA Michael* (2018) Combining process-based and surface-based models to simulate subsurface heterogeneity in volcanic aquifers, Stochastic Environmental Research and Risk Assessment, doi: 10.1007/s00477-018-1511-7.

*Geng, X, JW Heiss, HA Michael, MC Boufadel** (2017) Subsurface flow and moisture dynamics in response to swash motions: Effects of beach hydraulic conductivity and capillarity, Water Resources Research, 58, 10317–10335, 10.1002/2017WR021248.

Yang, J, H Zhang, X Yu, T Graf, HA Michael* (2017) Assessing the impact of subsurface properties on groundwater salinization due to storm surge inundation, Advances in Water Resources, doi: 10.1016/j.advwatres.2017.11.017.

*Heiss, JW, VEA Post, T Laatloe, CJ Russoniello, HA Michael** (2017) Physical controls on biogeochemical processes in intertidal zones of beach aquifers, Water Resources Research, 53(11), 9225–9244, doi: 10.1002/2017WR021110.

Kim, KH, JW Heiss, HA Michael, W-J Cai, VEA Post, T Laatloe, WJ Ullman* (2017) Spatial patterns of porewater reactivity in an intertidal beach aquifer, Journal of Geophysical Research – Biogeosciences, 122 (10), 2548-2562, doi: 10.1002/2017JG003943 (Selected for EOS Research Spotlight, Underwood, E. (2017), Sandy beaches are hotbeds of biochemical activity, Eos, 98, doi: 10.1029/2017EO087591).

Michael, HA*, VEA Post, AM Wilson, AD Werner (2017) Science, society, and the coastal groundwater squeeze, Water Resources Research, 53 (4), 2610-2617, doi: 10.1002/2017WR020851. (Part of the *Earth and Space Science* special collection, "Earth and Space Science is Essential for Society")

Michael, HA*, *MR Khan* (2016) Impacts of physical and chemical aquifer heterogeneity on basin-scale solute transport: Vulnerability of deep groundwater to arsenic contamination in Bangladesh, Advances in Water Resources, 98, 147-158, doi:10.1016/j.advwatres.2016.10.010.

Michael, HA*, *KC Scott, M Koneshloo, X Yu, MR Khan, K Li* (2016) Geologic influence on groundwater salinity drives large seawater circulation through the continental shelf, Geophysical Research Letters, 43, doi:10.1002/2016GL070863.

*Khan, MR, M Koneshloo, PSK Knappett, KM Ahmed, BC Bostick, BJ Mailloux, A Zahid, CF Harvey, A van Geen, and HA Michael** (2016) Mega-city pumping and preferential flow threaten groundwater quality, Nature Communications, 7:12833, doi: 10.1038/ncomms12833.

*Yu, X, J Yang, T Graf, M Koneshloo, MA O'Neal, HA Michael** (2016) Impact of topography on groundwater salinization due to ocean surge inundation, Water Resources Research, 52, 5794-5812, doi: 10.1002/2016WR018814. (Publication highlights: AGU Universe 7(15), AGU Universe 7(18). HydroGeoSphere Research Highlight: <http://www.aquanty.com/blog/2016/9/19/hgs-research-highlight-topographic-control-on-groundwater-salinization-due-to-ocean-surge-inundation>. Figure used as Cover Art)

Knappett, PSK, BJ Mailloux, I Choudhury, MR Khan, HA Michael, S Barua, DR Mondal, MS Steckler, H Akhter, KM Ahmed, B Bostick, CF Harvey, M Shamsudduha, I Mihajlov, MR Mozumder, and A van Geen* (2016) Vulnerability of intermediate and deep low-arsenic aquifers to municipal pumping in Bangladesh, Journal of Hydrology, doi: 10.1016/j.jhydrol.2016.05.035.

Sawyer, AH, HA Michael, AW Schroth* (2016) From soil to sea: The role of groundwater in coastal critical zone processes, WIREs Water, 3(5), 706–726, doi: 10.1002/wat2.1157. Figure used as Cover Art.

*Russoniello, CJ, LF Konikow, KD Kroeger, C Fernandez, AS Andres, and HA Michael** (2016) Hydrogeologic controls on groundwater discharge and nitrogen loads in a coastal watershed, Journal of Hydrology, 538, 783-793, doi:10.1016/j.jhydrol.2016.05.013.

*Heiss, JW, JA Puleo, WJ Ullman, and HA Michael** (2015) Coupled surface-subsurface hydrologic measurements reveal infiltration, recharge, and discharge dynamics across the swash zone of a sandy beach, Water Resources Research, 51, 8834-8853, doi:10.1002/2015WR017395.

*McAllister, SM, JM Barnett, JW Heiss, AJ Findlay, DJ MacDonald, CL Dow, GW Luther III, HA Michael, and CS Chan** (2015) Dynamic hydrologic and biogeochemical processes drive microbially enhanced iron and sulfur cycling within the intertidal mixing zone of a beach aquifer, Limnology & Oceanography, 60 (1), 329-345, doi:10.1002/lno.10029.

*Russoniello, CJ and HA Michael** (2015) Investigation of seepage meter measurements in steady flow and wave conditions, Groundwater, 53, 959-966, doi: 10.1111/gwat.12302.

*Heiss, JW and HA Michael** (2014) Saltwater-freshwater mixing dynamics in a sandy beach aquifer on tidal, spring-neap, and seasonal cycles, Water Resources Research, 50, 6747–6766, doi: 10.1002/2014WR015574. (Selected for EOS Research Spotlight, *EOS* 96, doi:10.1029/2015EO023175, 4 February 2015; WRR Editor's Choice Award 2014)

Li, J, HA Michael*, JM Duke, KD Messer, and JF Suter (2014) Impact of risk information in a spatially explicit groundwater environment with contamination risk: Experimental evidence, Water Resources Research, 50, 6390–6405, doi: 10.1002/2013WR015230.

Sawyer, AH*, LA Kaplan, O Lazareva, and **HA Michael** (2014) Hydrologic dynamics and geochemical responses within a floodplain aquifer and hyporheic zone during Hurricane Sandy, Water Resources Research, 50, 4877–4892, doi: 10.1002/2013WR015101.

Liu, Z, KD Messer*, JM Duke, **HA Michael**, and JF Suter (2014) Strategic entry and externalities in groundwater resources: Evidence from the lab, Resource and Energy Economics, 38, 181-197, 10.1016/j.reseneeco.2014.07.002.

Sawyer, AH*, O Lazareva, KD Kroeger, K Crespo, CS Chan, T Stieglitz, and **HA Michael** (2014) Stratigraphic controls on fluid and solute fluxes across the sediment-water interface of an estuary, Limnology & Oceanography, 59, 997–1010, doi: 10.4319/lo.2014.59.3.0997.

Heiss, JW, WJ Ullman, and **HA Michael*** (2014) Swash zone moisture dynamics and unsaturated infiltration in two sandy beach aquifers, Estuarine, Coastal and Shelf Science, 143, 20-31, doi: 10.1016/j.ecss.2014.03.015.

Khan, MR, CI Voss, W Yu, and **HA Michael*** (2014) Water resources management in the Ganges Basin: A comparison of three strategies for conjunctive use of groundwater and surface water, Water Resources Management, 28, 1235-1250, doi: 10.1007/s11269-014-0537-y.

Michael, HA* (2013) An arsenic forecast for China, Science, 341, 852-853, doi: 10.1126/science.1242212.

Russoniello, CJ, C Fernandez, JF Bratton, DE Krantz, JF Banaszak, AS Andres, LF Konikow, and **HA Michael*** (2013) Geologic effects on groundwater salinity and discharge into an estuary, Journal of Hydrology, 498, 1-12, doi: 10.1016/j.jhydrol.2013.05.049.

Michael, HA*, CJ Russoniello, and LA Byron (2013) Global assessment of vulnerability to sea-level rise in topography-limited and recharge-limited coastal groundwater systems, Water Resources Research, 49, 2228–2240, doi: 10.1002/wrcr.20213.

Sahu, P*, **HA Michael**, CI Voss, and PK Sikdar (2013) Impacts on groundwater recharge areas of megacity pumping: Analysis of potential contamination of Kolkata, India, water supply, Hydrological Sciences, 58, 1340-1360, doi: 10.1080/02626667.2013.813946.

Sawyer, AH*, F Shi, J Kirby, and **HA Michael** (2013) Dynamic response of surface water-groundwater exchange to currents, tides, and waves in a shallow estuary, Journal of Geophysical Research – Oceans, 118, 1-10, doi: 10.1002/jgrc.20154.

Konikow, LF*, M Akhavan, CD Langevin, **HA Michael**, and AH Sawyer (2013) Seawater circulation in sediments driven by interactions between seabed topography and fluid density, Water Resources Research, 49, 1-14, doi 10.1002/wrcr.20121.

Suter, J*, K Messer, J Duke, and **HA Michael** (2012) Behavior in a spatially-explicit groundwater resource: Evidence from the lab, American Journal of Agricultural Economics, 94, 1094-1112, doi: 10.1093/ajae/aas058.

Radloff, KA*, Y Zheng, **HA Michael**, M Stute, BC Bostick, I Mihajlov, M Bounds, MR Huq, I Choudhury, MW Rahman, P Schlosser, KM Ahmed, and A van Geen (2011) Arsenic migration to deep groundwater in

Bangladesh influenced by adsorption and water demand, Nature Geoscience, 4, 793-798, doi: 10.1038/NGEO1283.

Michael, HA*, MA Charette, and CF Harvey (2011) Patterns and variability of groundwater flow and radium activity at the coast: a case study from Waquoit Bay, Massachusetts, Marine Chemistry, 127, 100-114, doi: 10.1016/j.marchem.2011.08.001.

Fendorf, SF*, **HA Michael**, and A van Geen (2010) Factors controlling the spatial and temporal variations of arsenic in groundwater of South and Southeast Asia, Science, 328, 1123-1127, doi: 10.1126/science.1172974.

Michael, HA*, H Li, A Boucher, T Sun, J Caers, and SM Gorelick (2010) Combining geologic-process models and geostatistics for conditional simulation of 3-D subsurface heterogeneity, Water Resources Research, 46, W05527, doi: 10.1029/2009WR008414. (Selected for EOS Research Spotlight, *EOS* 9, doi:10.1029/EO091i028p00252-05, 13 July 2010)

Burgess WG*, MA Hoque, **HA Michael**, CI Voss, GN Breit, and KM Ahmed (2010) Vulnerability of deep groundwater in the Bengal Aquifer System to contamination by arsenic, Nature Geoscience, 3, 83-97, doi: 10.1038/ngeo750.

Michael, HA* and CI Voss (2009) Controls on groundwater flow in the Bengal Basin of India and Bangladesh: regional modeling analysis, Hydrogeology Journal, 17, 1561-1577, doi:10.1007/s10040-008-0429-4.

Michael, HA* and CI Voss (2009) Estimation of regional-scale groundwater flow properties in the Bengal Basin of India and Bangladesh, Hydrogeology Journal, 17, 1329-1346, doi:10.1007/s10040-009-0443-1.

Michael, HA* and CI Voss (2008) Evaluation of the sustainability of deep groundwater as an arsenic-safe resource in the Bengal Basin, Proceedings of the National Academy of Sciences, 105, 8531-8536, doi: 10.1073/pnas.0710477105. (Selected for PNAS 'In This Issue' and Nature Research Highlight, *Nature*, 453, 19 June, 2008).

Harvey, CF*, AN Khandaker, W Yu, ABM Badruzzaman, MA Ali, PM Oates, **HA Michael**, RB Neumann, R Beckie, S Islam, and MF Ahmed (2006) Groundwater dynamics and arsenic contamination in Bangladesh, Chemical Geology, 228, 112-136, doi: 10.1016/j.chemgeo.2005.11.025.

Michael, HA, AE Mulligan, and CF Harvey* (2005) Seasonal oscillations in water exchange between aquifers and the coastal ocean, Nature, 436, 1145-1148, doi: 10.1038/nature03935.

Michael, HA, JS Lubetsky, and CF Harvey* (2003) Characterizing submarine groundwater discharge: a seepage meter study in Waquoit Bay, Massachusetts, Geophysical Research Letters, 30, 1297, doi: 10.1029/2002GL016000.

Submitted

Provost, AM*, AD Werner, VEA Post, **HA Michael**, CD Langevin, Rebuttal to "The case of the Biscayne Bay and aquifer near Miami, Florida: density-driven flow of seawater or gravitationally driven discharge of deep saline groundwater?" by Weyer (Environ Earth Sci 2018, 77:1-16), in review.

Suter, JF*, S Collie, JM Duke, KD Messer, and **HA Michael**, Common pool resource management at the extensive and intensive margins: Experimental evidence, *Environmental and Resource Economics*, revised manuscript in review.

REFEREED CONFERENCE PROCEEDINGS AND REPORTS

Andres, AS, **HA Michael**, *CJ Russoniello, C Fernandez, C He, and J Madsen* (2017) Investigation of submarine groundwater discharge at Holts Landing State Park, Delaware: Hydrogeologic framework, groundwater level and salinity observations, Delaware Geological Survey Report of Investigations 80, 37 pp.

Cross, VA, JF Bratton, **HA Michael**, KD Kroeger, A Green, and E Bergeron (2013) Continuous resistivity profiling and seismic-reflection data collected in April 2010 from Indian River Bay, Delaware, US Geological Survey Open-File Report 2011-1039, 23 p., <http://dx.doi.org/10.3133/ofr20111039>.

Yu, W, CI Voss, **HA Michael**, KM Ahmed, L Feinson, *MR. Khan*, and A Tuinhof (2010), Implications of climate change on fresh groundwater resources in coastal aquifers in Bangladesh, Report of the World Bank, South Asia Reg., 2010, 105 pp.

Michael, HA, H Li, T Li, A Boucher, SM Gorelick, and J Caers (2008) Combining methods for geologically-realistic reservoir simulation, In: Proceedings of the Eighth International Geostatistics Congress, JM Ortiz and X Emery (eds.), Gecamin Ltd., Santiago, 1167-1172.

SPONSORED RESEARCH and EDUCATION

Connecting Hydrology, Biology, and Geochemistry in a Coastal Wetland: Feedbacks between Ecosystem Processes toward Predictive Understanding, **National Science Foundation Hydrologic Sciences** (EAR1759879, 8/1/18-7/31/20), Lead PI H Michael, PI Angelia Seyfferth (UD).

Characterizing global variability in groundwater arsenic, **USGS Powell Center** (10/1/18-7/31/20), PI M Stahl (Union College), Co-PIs B Bostick (Lamont-Doherty Earth Observatory), C Voss (USGS), H Michael.

Water Sustainability Challenges Graduate Student Symposia, **University of Delaware Office of Graduate and Professional Education Grand Challenges** (2/1/18-6/15/19), PI H Michael, PIs J Miller, DL Sparks, D Vlachos, Y Yan, S Inamdar, S Ali, K Messer, Y Chin, A Razdan, S Freilich (UD), D Arscott (Stroud Water Research Center), T Keyser, Ed Hale (Delaware Department of Natural Resources and Environmental Control).

Using surface information for quantitative modeling of the subsurface, **National Science Foundation Hydrologic Sciences** (EAR1719638, 9/1/17-8/31/20), Lead PI P Passalacqua (University of Texas), PIs H Michael and C Paola (University of Minnesota).

CNH: Competing demands and future vulnerability of groundwater: Drinking water quality and food security in arsenic-impacted South and Southeast Asia, **National Science Foundation Coupled Natural Human Systems** (ICER1414131, 9/1/14-8/31/19), PI A van Geen (Columbia University), co-PIs B Bostick, W Schlenker, P Schlosser (Columbia University), C Harvey (MIT), H Michael (UD), J Duxbury (Cornell University).

Delaware EPSCoR: Meeting Delaware's 21st Century Water and Energy Challenges through Research, Education, and Innovation, **National Science Foundation EPSCoR RII and the State of Delaware** (EAR1301765, 6/1/2013-5/31/2018), Lead PI D Sparks, H Michael co-lead Research Theme 1.

Hydrological control of particle entrainment and nitrogen cycling in beach aquifer mixing and reaction zones, **National Science Foundation Hydrologic Sciences** (EAR1246554, 1/1/2013-12/31/16). Lead PI H Michael, PI W Ullman (UD).

CAREER: Quantitative education and analysis toward integrating scales of water exchange between land and sea, **National Science Foundation Hydrologic Sciences** (EAR1151733, 9/1/2012 – 8/31/2017). PI H Michael.

Health Effects and Geochemistry of Arsenic and Manganese, **NIEHS Superfund Research Program** (4/1/2012-3/31/2017), Lead PIs J Graziano and A van Geen (Columbia University), H Michael co-PI on Hydrogeology Core D (Michael subcontract).

Christina River Basin CZO: a whole watershed approach to integrating feedbacks between water, mineral and carbon fluxes in human landscapes, **National Science Foundation** (EAR1331856), Lead PI J Pizzuto, co-PIs A Aufdenkampe, K Yoo, H Michael, J Kan.

WSC Category 1 Water Sustainability in Coastal Environments: Exploratory Research for an Integrated Study of the Effect of Anticipated Sea Level Rise on Contaminated Site Risk, **National Science Foundation Water Sustainability and Climate** (SES1204672, 8/1/2012-7/31/2013). Lead PI J Duke, PIs D Sparks, H Michael, K Messer (UD).

Microbial Fe oxidation and carbon cycling in aquifers of the Christina River Critical Zone Observatory, **Delaware EPSCoR Seed Grant** (2/1/12 – 1/31/13), Lead PI C Chan (UD), PI H Michael.

An experimental economics investigation of groundwater resource dynamics, **National Science Foundation Decision, Risk, and Management Science**, co-supported by **Hydrologic Sciences**, Environment, Society, and the Economy (ESE) (SES1024889, 9/1/2010 – 8/31/2013), Lead PI J Suter (Oberlin College) PIs K Messer, J Duke, and H Michael (UD).

Improving groundwater modeling in the Bengal Basin aquifer to support local and transboundary water-resources management in the lower Ganges River, **The World Bank** (8/1/2010-4/30/2012), PIs H Michael and C Voss (USGS), \$131,647 (Michael portion).

Investigation of tidal effects on nitrogen chemistry in subsurface mixing zones of coastal estuaries, **Oak Ridge Associated Universities Ralph E. Powe Junior Faculty Award** (6/1/2010-5/31/2011), PI H Michael.

Quantifying Temporal and Geologic Controls on Water and Chemical Exchange between Groundwater and Surface Water in Coastal Estuarine Systems, **National Science Foundation Hydrologic Sciences** (EAR0910756, 10/1/2009-9/30/2013), Lead PI H Michael, PIs J Bratton and L Konikow (USGS), AS Andres (Delaware Geological Survey), D Krantz (University of Toledo).

CZO: Spatial and temporal integration of carbon and mineral fluxes: a whole watershed approach to quantifying anthropogenic modification of critical zone carbon sequestration, **National Science Foundation** (NSF0724971, 10/1/2009-9/30/2014), funded Collaborator with Lead PI Donald Sparks and PIs K Yoo, J Pizzuto (UD), L Kaplan, A Aufdenkampe (Stroud Water Research Center).

Recovering uncompromised samples of aquifer sands with in-situ groundwater from up to 300-m depth in South and Southeast Asia, **International Continental Scientific Drilling Program**, one of 10 lead proponents on a workshop proposal with lead PI A van Geen (Columbia University).

Fluid and fine-grained particle dynamics in the variably-saturated zone of sandy estuarine beachfaces, **Delaware EPSCoR Seed Grant** (2/1/2009 – 1/31/2011), Lead PI H Michael, PI W Ullman (UD).

Modeling dynamic effects of climate change on coastal groundwater systems, **University of Delaware Research Foundation** (6/1/2008 – 12/31/2009), PI H Michael.

Climate change implications on salt-water intrusion and groundwater resources in coastal aquifer systems in Bangladesh, **The World Bank** (4/1/2008 – 12/31/2009), PIs H Michael and C Voss (USGS).

Support for collaboration on groundwater modeling in Bangladesh and India and a MODFLOW workshop, **UNICEF** (2005-2006), PIs H Michael and C Voss (USGS).

Support for collaboration on groundwater modeling in Bangladesh and India and a MODFLOW workshop, **Department for International Development, UK** (2005), PIs H Michael and C Voss (USGS).

CONFERENCE SESSIONS ORGANIZED

HA Michael, C Hatch, Advances, breakthroughs, and challenges in hydrogeologic sciences, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.

K Carroll, **HA Michael**, P Mishra, B Malama, Recent advances in groundwater hydrology, American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16, 2016.

HA Michael, K Carroll, C Brown, Water resources, climate change, and sustainability, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015.

K Carroll, **HA Michael**, P Mishra, B Malama, Advances and breakthroughs in Hydrogeology, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015.

Sanford, W, **HA Michael**, C Welty, Delivery of nutrients and contaminants by groundwater to estuaries and their watersheds, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

Custodio, E, A Jeuken, SA Khan, **HA Michael**, G Oude Essink, Fresh Water Management, Deltas in Times of Climate Change II, Rotterdam, The Netherlands, September 24-26, 2014 (invited).

Michael, HA, KB Moffett, AH Sawyer, and T Bianchi, Hydrologic controls on biogeochemical and ecosystem processes at the land-sea interface, American Geophysical Union Fall Meeting, San Francisco, CA, December 9-13, 2013.

Bhattacharya, P, A Mukherjee, DK Nordstrom, **HA Michael** and J Bundschuh, Recent Advances in Studies of Dissolved Arsenic and Other Metals in Global Hydrologic Systems, Geological Society of America Annual Meeting, Minneapolis, MN, October 9 - 12, 2011.

Andres, AS and **HA Michael**, Submarine Discharge of Groundwater and Nutrients into Estuaries and the Ocean, National Ground Water Association Ground Water Summit, Baltimore, MD, May 1-5, 2011.

Zheng, Y, and **HA Michael**, Sustainable Management of Safe Aquifers in Areas Affected by High Arsenic, Goldschmidt Conference on Earth, Energy, and the Environment, Knoxville, TN, June 13-18, 2010.

INVITED ABSTRACTS

*presenting author

Michael, HA*, Vulnerability of coastal aquifers to salinization by seawater: Influence of sea-level rise, storm surges, and geologic structure, Indo-US Bilateral Workshop on Coastal Groundwater Dynamics Combining Future Climate Change and Human Development, Pondicherry University, India, June 7-9, 2018. (Invited)

Michael, HA*, *KH Kim, JA Guimond, JW Heiss, WJ Ullman, A Seyfferth*, Hydrologic influence on redox dynamics in estuarine environments, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017. (Invited)

Michael, HA*, *C Duque, X Geng, J Guimond, JW Heiss, KH Kim, M Koneshloo, P Kreyns, CJ Russoniello, KC Scott, X Yu*, Submarine groundwater discharge across scales from marsh to shelf, Geological Society of America Annual Meeting, Seattle, WA, October 22-25, 2017. (Invited)

Michael, HA*, *KC Scott, X Yu, MR Khan, M Koneshloo*, Continental shelf-scale aquifer-ocean interactions: The impact of geological heterogeneity, Australasian Groundwater Conference, Sydney, Australia, July 11-13th, 2017. (Keynote)

Michael, HA*, *C Duque, JW Heiss, KH Kim, KC Scott, CJ Russoniello, TW Brooks, WJ Ullman*, Physical-biogeochemical linkages controlling land-sea solute fluxes from beach to shelf, American Society of Limnology and Oceanography Meeting, Honolulu, Hawaii, February 26-March 3, 2017. (Invited)

Michael, HA*, *X Yu, J LeMonte, DL Sparks, KH Kim, J Heiss, WJ Ullman, J Guimond, A Seyfferth*, Geochemical response to hydrologic change along land-sea interfaces, American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16, 2016. (Invited)

Michael, HA*, *J Heiss, KH Kim, WJ Ullman, CJ Russoniello, C Duque, TW Brooks*, The influence of groundwater flowpaths and mixing on nutrient fluxes to estuaries and the ocean, Geological Society of America Annual Meeting, Denver, CO, September 25-28, 2016. (Invited)

Michael, HA*, The influence of geologic heterogeneity on large-scale groundwater flow and solute transport: Continental shelves and mega-cities, Gordon Research Conference on Flow and Transport in Permeable Media, Girona, Spain, July 31-August 5, 2016. (Invited)

Michael, HA*, *KC Scott, M Koneshloo, MR Khan*, Geological Influence on Salinity Distributions and Submarine Groundwater Discharge on the Continental Shelf, 24th Salt Water Intrusion Meeting, Cairns, Australia, July 4-8, 2016 (Keynote).

Michael, HA*, *KC Scott, M Koneshloo, MR Khan, K Li*, The influence of geologic heterogeneity on groundwater salinity and aquifer-ocean exchange along the continental shelf, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015. (Invited)

Vargas, R*, **HA Michael**, Z Sanchez, A Seyfferth, Ecohydrology of greenhouse gas fluxes in a temperate estuary, American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19, 2014. (Invited)

*AH Sawyer**, *O Lazareva, CS Chan, K Crespo, TC Stieglitz, HA Michael*, Shallow stratigraphic controls on fluid and solute fluxes across the sediment-water interface of an estuary, American Geophysical Union Fall Meeting, San Francisco, CA, December 9-13, 2013. (Invited)

Michael, HA*, *LA Byron, LS Feinson, CI Voss, CJ Russoniello*, Vulnerability of topography-limited and recharge-limited groundwater systems to sea-level rise-induced salinization, American Geophysical Union Fall Meeting, San Francisco, CA, December 7, 2012. (Invited)

*Sawyer, AH**, *F Shi, JT Kirby, HA Michael*, Dynamic response of surface water-groundwater exchange to currents, tides, and waves in a shallow estuary, American Geophysical Union Fall Meeting, San Francisco, CA, December 7, 2012. (Invited)

Michael, HA*, Impacts of small-scale geologic heterogeneity on large-scale groundwater flow: Implications for sustainable arsenic-safe water supply in the Bengal Basin, The Geological Society of London, Water Futures Conference, London, England, March 6-7, 2012. (Invited)

Michael, HA*, Transport of Solutes through Hydraulically and Chemically Heterogeneous Sediments of the Bengal Basin, Goldschmidt Conference, Prague, Czech Republic, August 14-19, 2011. (Keynote)

Michael, HA*, CI Voss, KA Radloff, and Y Zheng, Assessment of the physical and chemical sustainability of deep, low-arsenic groundwater in the Bengal Basin: Regional- and local-scale considerations, American Geophysical Union Fall Meeting, San Francisco, CA, December 13-17, 2010. (Invited)

Michael, HA*, CI Voss, KA Radloff, and Y Zheng, Evaluation of water supply sustainability in the Bengal Basin through regional modeling of flow patterns and arsenic sorption, Geological Society of America Annual Meeting, Denver, CO, October 31 - November 3, 2010. (Invited)

Michael, HA* and CI Voss, Regional modeling of groundwater flow and arsenic transport in the Bengal Basin: challenges of scale and complexity, American Geophysical Union Fall Meeting, San Francisco, CA, December 14, 2009. (Invited)

Michael, HA* and CI Voss, Is deep groundwater a sustainable source of arsenic-safe water in the Bengal Basin? Management insights from a regional modeling analysis, AGU Chapman Conference on arsenic in groundwater of southern Asia, Siem Reap, Cambodia, March 24-27, 2009. (Invited)

Michael, HA*, Driving Mechanisms of Submarine Groundwater Discharge: Review of Recent Advancements and Observations in a Cape Cod Estuary, Geological Society of America Annual Meeting, Houston, TX, October 5-9, 2008. (Invited)

CONTRIBUTED ABSTRACTS

*presenting author

2018 Yu, X, **HA Michael***, Effects of offshore pumping on groundwater resources in coastal aquifers, 25th Salt Water Intrusion Meeting, Gdansk, Poland, June 17-22, 2018.

Duque, C*, **HA Michael**, The subterranean estuary: Descriptive term or confusing jargon?, 25th Salt Water Intrusion Meeting, Gdansk, Poland, June 17-22, 2018.

Duque, C*, S Jenssen, TW Brooks, **CJ Russoniello**, P Engesgaard, **HA Michael**, Hydrogeological flow paths in coastal areas: A dismissed factor for the delivery of nutrients?, 25th Salt Water Intrusion Meeting, Gdansk, Poland, June 17-22, 2018.

Kiro, Y*, **HA Michael**, **C Duque**, Y Yechieli, Estimating the potential role of long-term seawater circulation in aquifers in ocean chemistry, European Geophysical Union Meeting, Vienna, Austria, April 8-13, 2018.

2017 **Guimond, J***, A Seyfferth, **HA Michael**, Hydrologically mediated iron reduction/oxidation fluctuations and dissolved organic carbon exports in tidal wetlands, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.

Geng, X*, **P Kreyns**, **M Koneshloo**, **HA Michael**, Impacts of preferential flow on coastal groundwater-surface water interactions: The heterogeneous volcanic aquifer of Hawaii, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.

Kim, KH, HA Michael, W-J Cai, WJ Ullman, Spatial distributions of biogeochemical reactions in freshwater-saltwater mixing zones of sandy beach aquifers, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.*

Harvey, CF, HA Michael, What drives saline circulation cells in coastal aquifers? An energy balance for density-driven groundwater systems, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.*

Tan, F, K Yoo, P Imhoff, HA Michael, The impact of organo-mineral complexation on mineral weathering in the soil zone under unsaturated conditions, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.*

Russoniello, CJ, JW Heiss, HA Michael, Variability in benthic exchange rate, depth, and residence time beneath a shallow coastal estuary, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.*

Yu, X, HA Michael, Impact of heterogeneity on groundwater salinization due to coastal pumping, American Geophysical Union Fall Meeting, New Orleans, LA, December 11-15, 2017.*

Guimond, J, HA Michael, Spatial and temporal impacts of crab burrows on groundwater-surface water interactions and redox conditions in a tidal wetland, Geological Society of America Annual Meeting, Seattle, WA, October 22-25, 2017.*

Kim, KH, HA Michael, W-J Cai, WJ Ullman, Dynamic migration of biogeochemical reaction zones in an intertidal beach aquifer, Geological Society of America Annual Meeting, Seattle, WA, October 22-25, 2017.*

Russoniello, CJ, HA Michael, Spatial and temporal variability of global wave pumping, Geological Society of America Annual Meeting, Seattle, WA, October 22-25, 2017.*

Kiro, Y, HA Michael, C Duque, Y Yechieli, Identifying long-term seawater circulation in coastal aquifers and its potential role in ocean chemistry, Geological Society of America Annual Meeting, Seattle, WA, October 22-25, 2017.*

Field, EK, KL Hoppes, KH Kim, HA Michael, TE Hanson, CS Chan, The microbial role in nutrient cycling in a dynamic coastal aquifer system, Goldschmidt Conference, Paris, France, August 13-18, 2017.*

2016 *Guimond, J*, X Yu, C Duque, C Medlock, S Gangrade, HA Michael, Spatial patterns in salt marsh porewater dissolved organic matter over a spring-neap tidal cycle: insight to the impact of hydrodynamics on lateral carbon fluxes, American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16, 2016.*

Stuckey, J, JJ LeMonte, X Yu, M Schaefer, BD Kocar, SG Benner, J Rinklebe, R Tappero, HA Michael, SE Fendorf, DL Sparks, HA Michael, Hydrologically Controlled Arsenic Release in Deltaic Wetlands and Coastal Riparian Zones, American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16, 2016.*

Passalacqua, P, C Paola, HA Michael, Linking Delta Surface Patterns and Subsurface Architecture, American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16, 2016.*

*Yu, X**, JJ LeMonte, DL Sparks, JG Cargill, **CJ Russoniello, HA Michael**, Hydrologic control on arsenic cycling due to tidal fluctuation, American Chemical Society, Philadelphia, PA, August 21-25, 2016.

Field, EK*, KL Hoppes, **KHK Kim, HA Michael**, TE Hanson, CS Chan, Just another day at the beach? The microbial role in iron and sulfur cycling in a beach aquifer system, International Society for Microbial Ecology, Montreal, CA, August 21-26, 2016.

Duque, C*, *CJ Russoniello, TW Brooks, HA Michael*, Spatial variability of submarine groundwater discharge: Field experiments and numerical modelling, CUAHSI Biennial Meeting, Shepherdstown, WV, July 24-27, 2016.

Medlock, C*, *J Guimond, HA Michael, S Gengrade*, Assessing spatial variations in pore water salinity across a tidal salt marsh: Insights into groundwater-surface water interactions, CUAHSI Biennial Meeting, Shepherdstown, WV, July 24-27, 2016.

Kim, KHK*, **HA Michael**, WJ Ullman, Spatial patterns of aerobic respiration in an intertidal beach aquifer, CUAHSI Biennial Meeting, Shepherdstown, WV, July 24-27, 2016.

*Yu, X**, **HA Michael**, Big data and models for coastal communities, CUAHSI Biennial Meeting, Shepherdstown, WV, July 24-27, 2016.

Brown, R*, *C Duque, CJ Russoniello, M Sherif, UA Risha, K Knee, NC Sturchio, HA Michael*, Assessing methods for studying submarine groundwater discharge: pre-filling of bags in seepage meters, tidal impact over measured fluxes, and use of radon, CUAHSI Biennial Meeting, Shepherdstown, WV, July 24-27, 2016.

2015 Khan, MR*, **HA Michael**, Vulnerability of deep groundwater in the Bengal Basin to contamination: the role of physical and chemical aquifer heterogeneity and pumping, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015.

Shuai, P, A Hossain, K Rhodes, PSK. Knappett, N Dimova, MB Cardenas, KM Ahmed, **HA Michael**, R Mozumder, A van Geen, Modeling arsenic mobilization in a riverbank aquifer under the influence of tidally fluctuating river and irrigation pumping, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015.

Heiss, JW*, JA Puleo, WJ Ullman, **HA Michael**, Temporal and spatial variability of sediment saturation and patterns of groundwater-surface water exchange in the intertidal zone at swash and tidal time scales, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015.

*Yu, X**, J Yang, T Graf, **M Koneshloo, HA Michael**, Assessing the impact of topography on groundwater salinization due to storm surge inundation, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015.

Russoniello, CJ*, LF Konikow, **HA Michael**, Estimating groundwater transit times through a coastal aquifer using MODPATH, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

*Yu, X**, JJ LeMonte, DL Sparks, JG Cargill, **HA Michael**, Potential impacts of sea-level rise on contaminant mobility and groundwater pollution, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

*Heiss, JW**, **HA Michael**, The effects of transient oceanic and terrestrial forcing and beach topography on flow and solute transport in coastal aquifers, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

*Koneshloo, M**, *KC Scott*, **HA Michael**, Which connectivity metrics can be used to predict salinity patterns in heterogeneous coastal aquifers?, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

*Kim, KH**, **HA Michael**, WJ Ullman, Sediment and porewater oxygen demand in a sandy beach aquifer, Cape Henlopen, Delaware, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

*Khan, MR**, B Nath, B Huhmann, I Choudhury, M Chakraborty, A Mukherjee, KM Ahmed, CF Harvey, A van Geen , **HA Michael**, Origin of arsenic-rich, young groundwater in deep tubewells in the central southwestern Bengal Basin, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

Nath, B*, *MR Khan*, B Huhmann, I Choudhury, T Ellis, M Chakraborty, A Mukherjee, KM Ahmed, **HA Michael**, CF Harvey, B Bostick, B Mailloux, P Schlosser, A van Geen, Groundwater chemistry of deep (>300 feet) high-As aquifers across the India-Bangladesh border, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

Hoppe, K*, CS Chan, K Cabaniss, KH Williams, M Moore, **HA Michael**, J Caplan, Microbial iron oxidation and contribution to Fe oxide coatings in aquifer sediment, Geological Society of America Annual Meeting, Baltimore, MD, November 1-4, 2015.

A van Geen*, *MR Khan*, B Nath, B Huhmann, I Choudhury, M Chakraborty, C Harvey, **HA Michael**, B Bostick, B Mailloux, P Schlosser, A Mukherjee, KM Ahmed, Young high-arsenic groundwater confirmed to 250 m depth across the India-Bangladesh border, Goldschmidt Conference, Prague, Czech Republic, August 16-21, 2015.

Duke, J, Z Liu*, KD Messer, **HA Michael**, J Suter, Optimal taxes and welfare in a spatially explicit aquifer: Experimental evidence, NAREA & CAES Joint Annual Meeting and Workshop, Newport, RI, June 27-30, 2015.

Graf, T*, **HA Michael**, I Neuweiler, A Peche, T Ptak, J Yang, X Yu, M Walther, Integrated hydrosystem modeling of coastal and urban areas, Integrated Hydrosystem Modeling 2015 Conference, Tubingen, Germany, April 7-10, 2015.

2014 *Tan, F**, E Lunn, B Fisher, K Yoo, PT Imhoff, **HA Michael**, The evolution of soil hydrological and physical properties under the impact of mineral weathering and organic matter sequestration, American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19, 2014.

*Calhoun, KC**, M Koneshloo, **HA Michael**, Effects of the geometry of heterogeneous hydraulic conductivity fields on aquifer-ocean exchange processes, Geological Society of America Annual Meeting, Vancouver, BC, Canada, October 19-22, 2014.

*Khan, MR**, M Koneshloo, PK Knappett, MRH Mozumder, B Mailloux, KM Ahmed, BC Bostick, CF Harvey, A van Geen, **HA Michael**, Effect of aquifer heterogeneity on the sustainability of deep groundwater resources in the Bengal Delta near a mega-city pumping center, Geological Society of America Annual Meeting, Vancouver, BC, Canada, October 19-22, 2014.

*Kim, KHK**, **HA Michael**, WJ Ullman, Relationship between the physical and biogeochemical dynamics in the shallow freshwater-saltwater mixing zone of an intertidal beach aquifer (Cape Henlopen, Delaware), Geological Society of America Annual Meeting, Vancouver, BC, Canada, October 19-22, 2014.

Knappett, PSK*, SH Akhter, I Choudhury, M Steckler, **HA Michael**, CF Harvey, KM Ahmed, BC Bostick, M Shamsudduha, A van Geen, Impact of over-pumping from deep aquifer in Dhaka City on the safe water supply for surrounding rural population, Geological Society of America Annual Meeting, Vancouver, BC, Canada, October 19-22, 2014.

Michael, HA*, L Feinson, CI Voss, *CJ Russoniello, L Byron, MR Khan, K Calhoun, M Koneshloo*, Vulnerability of groundwater to salinization: the case of the Bengal Delta, Deltas in Times of Climate Change II, Rotterdam, The Netherlands, September 24-26, 2014.

*Sawyer, AH, K Kroeger, O Lazareva, K Crespo, CS Chan, T Stieglitz, HA Michael**, Geologic and hydrodynamic effects on shallow groundwater-surface water exchange and chemical fluxes to an estuary, CUAHSI Biennial Meeting, Shepherdstown, WV, July 28-30, 2014.

Sawyer, AH, LA Kaplan, O Lazareva, HA Michael*, Insights into hydrogeochemical dynamics in a floodplain aquifer during Hurricane Sandy from multiple sensor technologies, CUAHSI Biennial Meeting, Shepherdstown, WV, July 28-30, 2014.

Lunn, E, F Tan, P Imhoff, HA Michael*, Impact of mineral weathering and organic matter on soil water retention, CUAHSI Biennial Meeting, Shepherdstown, WV, July 28-30, 2014.

Suter, J*, S Collie, J Duke, K Messer, **HA Michael**, Experiments on groundwater policy at the extensive and intensive margins, WAEA Annual Meeting, Colorado Springs, CO, June 23, 2014.

Chan, CS*, K Cabaniss, K Williams, M Moore, **HA Michael**, J Caplan, C Lin, Fe-oxidizing microorganisms in microscopic model aquifer systems: feedbacks between flow and biomineralization, ISSM, Pacific Grove, CA, October 5-10, 2014.

*Sawyer, AH, HA Michael**, K Kroeger, O Lazareva, K Crespo, *C Russoniello, F Shi, J Kirby, CS Chan, T Stieglitz*, Geologic and hydrodynamic effects on shallow groundwater-surface water exchange and chemical fluxes to an estuary, 23rd Salt Water Intrusion Meeting, Husum, Germany, June 16-20, 2014.

*Heiss, JW**, **HA Michael**, Tidal, spring-neap, and seasonal dynamics of a saltwater-freshwater mixing zone in a beach aquifer, 23rd Salt Water Intrusion Meeting, Husum, Germany, June 16-20, 2014.

Michael, HA*, *AH Sawyer, KD Kroeger, CJ Russoniello, LF Konikow*, Stratigraphic controls on submarine groundwater discharge, groundwater-surface water mixing, and associated chemical fluxes to an estuary, Ocean Sciences Meeting, Honolulu, HI, February 25, 2014.

*McAllister, SM**, JM Barnett, GW Luther III, **HA Michael**, CS Chan, Interplay between iron- and sulfur- cycling microbial communities and geochemistry along ecosystem gradients in the intertidal mixing zone of a beach aquifer Ocean Sciences Meeting, Honolulu, HI, February 25, 2014.

2013 Michael, HA*, KD Kroeger, *C Fernandez, LF Konikow, AH Sawyer, CJ Russoniello, JF Bratton*, Impact of Groundwater Flowpaths on Subsurface Denitrification and Nutrient Loading to an Estuary, American Geophysical Union Fall Meeting, San Francisco, CA, December 9-13, 2013.

*Sawyer, AH**, LA Kaplan, *O Lazareva, HA Michael*, Storm-associated hydrodynamics drive transient solute and redox chemistry within the floodplain aquifer and hyporheic zone of a piedmont stream, American Geophysical Union Fall Meeting, San Francisco, CA, December 9-13, 2013.

Li, J., J Duke, HA Michael, K Messer, D Sparks, The Joint Risks of Anticipated Sea Level Rise and Coastal Contaminated Sites: Economic and Scientific Evidence, The Northeast Agricultural and Resource Economics Association (NAREA) Annual Meeting, Ithaca, NY, June 23-25, 2013.

Li, J., HA Michael, J Duke, K Messer, J Suter, Impact of Risk Information in a Spatially Explicit Groundwater Environment with Contamination Risk: Experimental Evidence, The Northeast Agricultural and Resource Economics Association (NAREA) Annual Meeting, Ithaca, NY, June 23-25, 2013.

Knappett, PS*, BJ Mailloux, I Choudhury, S Barua, DR Mondal, M Steckler, H Akter, KM Ahmed, B Bostick, **HA Michael**, C Harvey, A van Geen, Investigating sources and sinks for water in deep aquifers in Bangladesh, , National Ground Water Association Ground Water Summit, San Antonio, Texas, April 28-May 2, 2013.

Andres, AS*, **HA Michael**, J Madsen, *C Russoniello, C Fernandez*, J Bratton, V Cross, Integration of multiple geophysical techniques to image a submarine groundwater discharge zone, National Ground Water Association Ground Water Summit, San Antonio, Texas, April 28-May 2, 2013.

2012 Konikow, LF*, *M Akhavan, AH Sawyer, HA Michael*, CD Langevin, Bathymetry-density interaction as a driver for seawater recirculation in submarine groundwater discharge, American Geophysical Union Fall Meeting, San Francisco, CA, December 7, 2012.

Russoniello, CJ, M Kereszi, HA Michael*, Exploring wave-induced artifacts and asymmetry in seepage meter measurements, Geological Society of America Annual Meeting, Charlotte, NC, November 4-7, 2012.

*Khan, Md MR**, **HA Michael**, CI Voss, Water resources management in the Ganges Basin: A comparison of three strategies for conjunctive use of groundwater and surface water, Geological Society of America Annual Meeting, Charlotte, NC, November 4-7, 2012.

*Heiss, JW**, *AH Sawyer, WJ Ullman, HA Michael*, Seasonal water table effects on tide-induced saltwater-freshwater mixing in sandy beaches, Geological Society of America Annual Meeting, Charlotte, NC, November 4-7, 2012.

*Sawyer, AH**, *O Lazareva, K Crespo, HA Michael*, Shallow stratigraphic controls on surface water-groundwater mixing and geochemical fate in the benthic zone of an estuary, Geological Society of America Annual Meeting, Charlotte, NC, November 4-7, 2012.

JF Bratton*, KD Kroeger, SA Ruberg, **HA Michael**, DE Krantz, Comparison of methods and results in recent studies of direct groundwater discharge to the Atlantic coast and Great Lakes, Goldschmidt Conference, Montreal, Canada, June 24-29, 2012.

Michael, HA*, *CJ Russoniello, C Fernandez, LF Konikow, AS Andres, JF Bratton, JF Banaszak, DE Krantz*, Geologic effects on subsurface salinity distributions, groundwater flowpaths, and aquifer-estuary exchange in Indian River Bay, Delaware, USA, 22nd Salt Water Intrusion Meeting, Buzios, Brazil, June 17-22, 2012.

Liu, Z*, J Suter, K Messer, J Duke, **HA Michael**, Spatial Externalities and Strategic Behavior in Accessing Groundwater Resource: Evidence from the Lab, Northeastern Agricultural and Resource Economics Association meeting, Lowell, MA, June 10-12, 2012.

Kroeger, KD*, *C Fernandez, CJ Russoniello*, AS Andres, JF Bratton, JK Bohlke, L Konikow, **HA Michael**, Denitrification and nitrogen loading at the aquifer/estuary interface: The role of coastal hydrology and implications for management of nitrogen loads, American Society of Limnology and Oceanography Annual Meeting, Salt Lake City, UT, February 20-24, 2012.

2011 *Heiss, J**, WJ Ullman, and **HA Michael**, Swash-Induced Infiltration in a Sandy Beach Aquifer, Cape Henlopen, Delaware, American Geophysical Union Fall Meeting, San Francisco, CA, December 4-9, 2011.

*Russoniello, CJ**, *C Fernandez, JF Bratton, D Krantz, J Banaszak, AS Andres, LF Konikow, and HA Michael*, Control of submarine groundwater discharge patterns and salinity by a low-permeability paleochannel cap at Indian River Bay, Delaware, American Geophysical Union Fall Meeting, San Francisco, CA, December 4-9, 2011.

Michael, HA*, CI Voss, KA Radloff, and Y Zheng, Multi-scale modeling of physical and chemical effects on arsenic transport to deep wells in the Bengal Basin, Conference on Arsenic in Groundwater in Southern Asia, Hanoi, Vietnam, November 14-17, 2011.

Radloff, KA*, Y Zheng, **HA Michael**, M Stute, KM Ahmed, A van Geen, Arsenic adsorption influences safe drinking water options in Bangladesh, Society of Environmental Toxicology and Chemistry Annual Meeting, Boston, MA, November 13-17, 2011.

Konikow, LF*, *M Akhavan, HA Michael*, and C Langevin, Coastal recirculation of saltwater due to coupled effect of variable bathymetry and density, Geological Society of America Annual Meeting, Minneapolis, MN, 9-12 October, 2011.

Michael, HA*, *C Fernandez, CJ Russoniello, AS Andres, KD Kroeger, DE Krantz, JF Banaszak, A Musetto, K Myers, LF Konikow, and JF Bratton*, Geologic and Hydrologic Control of Porewater Chemistry and Submarine Groundwater Discharge into Indian River Bay, Delaware, Goldschmidt Conference, August 14-19, 2011, Prague, Czech Republic.

Suter, J*, **HA Michael**, K Messer, and J Duke, An Experimental Investigation of Groundwater Resource Dynamics, Agricultural & Applied Economics Association & Northeastern Agricultural and Resource Economics Association Joint Annual Meeting, Pittsburgh, PA, July 24-26, 2011.

Suter, J*, **HA Michael**, KD Messer, JM Duke, An Experimental Investigation of Groundwater Resource Dynamics, International Water Resource Economics Consortium Conference, Banff, Canada, June 2011.

Michael, HA*, *CJ Russoniello, C Fernandez, A Musetto, K Myers, JF Bratton, AS Andres, DE Krantz, JF Banaszak, KD Kroeger, and LF Konikow*, Spatial patterns in subsurface salinity and submarine groundwater discharge into Indian River Bay, Delaware, National Ground Water Association Ground Water Summit, Baltimore, MD, May 1-5, 2011.

*Fernandez, C**, KD Kroeger, JF Bratton, *CJ Russoniello, A Musetto, AS Andres, and HA Michael*, Porewater Salinity Distribution and Geochemical Characterization of the Subsurface of Indian River Bay, Delaware, National Ground Water Association Ground Water Summit, Baltimore, MD, May 1-5, 2011.

Russoniello, CJ*, **HA Michael**, AS Andres, and LF Konikow, Construction of a watershed-scale model towards an understanding large-scale influences on submarine groundwater discharge to the Inland Bays Watershed, Sussex Co., Delaware, National Ground Water Association Ground Water Summit, Baltimore, MD, May 1-5, 2011. Won NGWA Farvolden Award for best student presentation.

Andres, AS*, PS McCreary, **CJ Russoniello**, **C Fernandez**, **K Myers**, **A Musetto**, and **HA Michael**, Case study of use of offshore wells for monitoring submarine groundwater discharge, Indian River Bay, Delaware, National Ground Water Association Ground Water Summit, Baltimore, MD, May 1-5, 2011.

Heiss, JW*, **HA Michael**, and WJ Ullman, Characterization of Fluid Flow and Seawater Infiltration through the Beachface Saltwater/Freshwater Mixing Zone, National Ground Water Association Ground Water Summit, Baltimore, MD, May 1-5, 2011.

2010 Voss, CI*, **HA Michael**, and P Aggarwal, Simply-structured groundwater model analysis for informing management of Transboundary aquifers: Examples from Bengal Aquifer System (Bangladesh, India) and Nubian Sandstone Aquifer System (Chad, Egypt, Libya, Sudan), International Conference “Transboundary Aquifers: Challenges and New Directions” (ISARM 2010), December 6-8, 2010.

Michael, HA*, LS Feinson, **L Byron**, and CI Voss, Climate and human impacts on the vulnerability of coastal groundwater resources to salinization by seawater, Sixth International Conference on Sustainable Water Environment, “Water Infrastructures in Time of Climate Change”, Newark, DE, July 29-31, 2010.

Michael, HA*, LS Feinson, and CI Voss, Mechanisms of seawater intrusion in Bangladesh and the potential impacts of sea-level rise on coastal groundwater resources, 21st Salt Water Intrusion Meeting, Azores, Portugal, June 21-26, 2010.

Michael HA*, CI Voss, KA Radloff, and Y Zheng, Regional modeling of groundwater flow and arsenic transport in the Bengal Basin: Effects of sorption on safe groundwater use, Goldschmidt Conference on Earth, Energy, and the Environment, June 13-18, 2010, Knoxville, TN.

Radloff, KA*, Y Zheng, **HA Michael**, M Stute, I Mihajlov, and KM Ahmed, Evaluating arsenic adsorption in a low arsenic aquifer in Bangladesh using *in situ* and laboratory methods, Goldschmidt Conference on Earth, Energy, and the Environment, June 13-18, 2010, Knoxville, TN.

Michael, HA*, MA Charette, and CF Harvey, Mechanisms Driving Submarine Groundwater Discharge and Associated Radium Flux, 3rd Radium-Radon Meeting, March 15-18, 2010, Jerusalem, Israel.

2009 **Michael, HA***, Investigating Fluxes between Aquifers and the Sea on Multiple Spatial and Temporal Scales through Modeling, International Conference on Aquatic Resources, Nov 20, 2009, Alexandria, Egypt.

Bratton, J*, J Crusius, K Kroeger, JK Bohlke, D Krantz, **H Michael**, S Baldwin, and A Green, Coastal groundwater discharge from both sides of the Delmarva Peninsula, Atlantic Estuarine Research Society Meeting, 5-7 March 2009, Ocean City, MD.

2008 **Michael, HA***, H Li, T Li, A Boucher, SM Gorelick, and J Caers, Combining methods for geologically-realistic reservoir simulation, Eighth International Geostatistics Congress, December 2008, Santiago, Chile.

Michael, HA*, MA Charette, and CF Harvey, Mechanisms Driving Submarine Groundwater Discharge and Associated Radium Flux: Implications for Use of Radium as a Tracer, 20th Salt Water Intrusion Meeting, Naples, FL June 23-27, 2008.

Michael, HA and CI Voss*, Hydrogeologic Analysis and Evaluation of Sustainable Management Alternatives in the Bengal Basin Aquifer System in the Face of Data Sparsity, National Ground Water Association Ground Water Summit, Memphis, TN, April 2, 2008.

2007 Michael, HA and CI Voss*, Modelling evaluation of sustainable management alternatives in the high-Arsenic region of the Bengal Delta Aquifer (India and Bangladesh), MODEL CARE 2007, Copenhagen, Denmark, September 9-13, 2007.

2006 Michael, HA and CI Voss*, Transboundary hydrogeologic analysis of the Bengal Delta aquifer of India and Bangladesh, International Association of Hydrogeologists (IAH) 34th Congress, Beijing, China, October 2006.

Michael, HA*, AE Mulligan, and CF Harvey, Saline water exchange between aquifers and the coastal ocean driven by the seasonal hydrologic cycle, First International Joint Salt Water Intrusion Conference, Cagliari, Italy, September 24-29, 2006.

Michael, HA and CI Voss*, Hydrogeologic analysis of the Bengal Delta aquifer of India and Bangladesh, IAH Symposium, "Aquifer Systems Management", Dijon, France, May 30 – June 1, 2006

2005 Michael, HA*, AE Mulligan, and CF Harvey, The seasonal hydrologic cycle: A driver of saline water exchange between aquifers and the coastal ocean, Geological Society of America Annual Meeting, Salt Lake City, UT, October 16-19, 2005.

Michael, HA* and CI Voss*, Hydrogeologic analysis of the Bengal Delta: Numerical modeling of groundwater flow, Symposium on Behavior of Arsenic in Aquifers, Soils and Plants: Implications for Management, Dhaka, Bangladesh, January 16-18, 2005.

2001 Michael, HA*, MA Charette, JS Lubetsky, and CF Harvey, Assessing rates and mechanisms of submarine groundwater discharge: A combined approach using seepage meters and radium isotopes, American Geophysical Union Spring Meeting, Boston, MA, May 29, 2001.

2000 Michael, HA*, JS Lubetsky, and CF Harvey, Groundwater discharge into Waquoit Bay on Cape Cod, American Geophysical Union Fall Meeting, San Francisco, CA, December 19, 2000.

INVITED PRESENTATIONS to Universities and Organizations

*presenting author

2017 Woods Hole Oceanographic Institution, May 24, 2017.

University of Minnesota, May 5, 2017.

University of Minnesota, May 4, 2017.

K. Douglas Nelson Colloquium Series, Syracuse University, April 27, 2017.

University of South Carolina, April 13, 2017.

Center for Environmental & Applied Fluid Mechanics, Johns Hopkins University, April 7, 2017.

University of Hawaii, February 24, 2017.

2016 Lamont-Doherty Earth Observatory, Columbia University, October 21, 2016.

Challenges and Innovation in Civil and Environmental Engineering and Earth Sciences Seminar

Series, *University of Notre Dame*, September 15, 2016.

Weston Roundtable on Sustainability, *University of Wisconsin*, April 21, 2016.

Weeks Lecture, *Department of Geoscience, University of Wisconsin*, Madison, WI, April 22, 2016.
University of Maryland Baltimore County, April 1, 2016.
Vanderbilt University, January 22, 2016.

2015 *New Jersey Institute of Technology*, December 11, 2015.
USGS MD-DE-DC Water Science Center, November 20, 2015.
Pennsylvania State University, Department of Geosciences, November 17, 2015.
University of North Carolina, September 24, 2015.
CSIRO Land and Water, Floreat, Australia, May 12, 2015.
CSIRO Land and Water, Floreat, Australia, May 11, 2015.
University of Queensland, St. Lucia, Australia, April 28, 2015.
Southern Cross University, Coffs Harbour, Australia, April 23, 2015.
National Centre for Groundwater Research and Training, Adelaide, Australia, February 13, 2015.
CSIRO Land and Water, Adelaide, Australia, January 23, 2015.

Prior to 2014:

Simon Fraser University, Vancouver, Canada, October 28, 2014.
Institute of Fluid Mechanics and Environmental Physics in Civil Engineering, Leibniz University, Hannover, Germany, June 24, 2014.
Delaware National Estuarine Research Reserve Research Symposium, Dover, DE, March 21, 2014.
University of Delaware Physical Ocean Sciences and Engineering Seminar, Newark, DE, March 1, 2013.
West Chester University, West Chester, PA, October 31, 2012.
Delaware Center for the Inland Bays Scientific and Technical Advisory Committee Meeting, Lewes, DE, September 2012.
The World Bank, Washington, DC, April 24, 2012.
University of Maryland Horn Point Laboratory, February 1, 2012.
Columbia University, New York, NY, November 30, 2011.
University of Texas at Austin, Austin, TX, October 28, 2011.
University of Texas at Austin, Austin, TX, Distinguished Oliver Lecture, October 27, 2011.
Tulane University Department of Earth and Environmental Sciences, New Orleans, LA, October 11, 2011.
Millersville University Department of Earth Sciences, Millersville, PA, September 15, 2011.
Rutgers University Newark, Department of Earth and Environmental Sciences, Newark, NJ, March 23, 2011.
Pennsylvania State University Department of Geosciences, State College, PA, March 1, 2011.
Temple University Department of Civil and Environmental Engineering, Philadelphia, PA, November 12, 2010.
World Bank, Washington, DC, November 24, 2009.
Temple University Department of Earth and Environmental Science, Philadelphia, PA, September 18, 2009.
University of Delaware Environmental Engineering Seminar, May 2009.
Delaware Center for the Inland Bays Scientific and Technical Advisory Committee Meeting, Lewes, DE, December 2008.
University of Delaware, Geography Department Seminar, Newark, DE, September 2008.
US Geological Survey, Menlo Park, CA, May 2007.
Stanford University, Department of Geological and Environmental Sciences, Hydrogeology Seminar, Stanford, CA, November 2007.
Massachusetts Institute of Technology, Department of Civil and Environmental Engineering, Hydrology Seminar, Cambridge, MA, December 2006.
Department of Public Health and Engineering, Dhaka, Bangladesh, November 2006.
Indian Institute of Social Welfare and Business Management, Calcutta, India, November 2006.
US Geological Survey, Reston, VA, October 2006.

Columbia University, New York, NY, October 2006.
US Geological Survey, Fort Lauderdale, FL, May 2006.
University of Dhaka, Department of Geology, Dhaka, Bangladesh, September 2005.
Indian Institute of Social Welfare and Business Management, Calcutta, India, September 2005.
Geological Survey of India, Calcutta, India, January 2005.
Department of Public Health and Engineering, Calcutta, India, January 2005.
US Geological Survey, Reston, VA, September 2004.

TEACHING

University of Delaware

	<i>Course Number</i>	<i>Course Title</i>	<i>Enrollment</i>
S2018	GEOL 428/628	Hydrogeology	19/7
F2017	GEOL 667	Advanced Topics in Hydrology (online)	3
S2017	GEOL 630	Groundwater-Surface Water Interactions	4
	GEOL 203	Earth Surface Processes (with J Pizzuto)	18
F2016	GEOL 603	Groundwater Modeling	5
S2016	GEOL 203	Earth Surface Processes (with J Pizzuto)	18
F2015	GEOL 428/628	Hydrogeology	15/15
S2014	GEOL 203	Earth Surface Processes (with J Pizzuto)	22
F2013	GEOL 667	Classic Papers in Hydrogeology Seminar	7
S2013	GEOL 659/STAT 659	Spatial Statistics (with D Legates)	7
	GEOL 203	Earth Surface Processes (with J Pizzuto)	18
F2012	GEOL 428/628	Hydrogeology	8/4
S2012	GEOL 467/667	Groundwater Modeling	1/4
F2011	GEOL 428/628	Hydrogeology	14/6
S2011	GEOL 667	Mathematical Modeling for Geoscientists (with J Pizzuto)	6
	GEOL 467/667	Coastal Hydrogeology Seminar	1/5
F2010	GEOL 428/628	Hydrogeology	7/5
S2010	GEOL 467/667	Groundwater Modeling	1/6
F2009	GEOL 428/628	Hydrogeology	3/13
S2009	GEOL 428/628	Hydrogeology	9/5

University of Cagliari

Practical Modeling of Seawater Intrusion Course, Sept 20-23, 2006

Cagliari, Italy

University of Dhaka, Department of Geology

MODFLOW Groundwater Modeling Workshop, September 11-15, 2005

Dhaka, Bangladesh

MIT, Department of Civil and Environmental Engineering

Teaching Assistant, Computing and Data Analysis for Environmental Applications, 2001-2003

Cambridge, MA

MIT, Department of Athletics

Assistant Varsity Women's Lacrosse Coach, 1999-2004

Cambridge, MA

RESEARCH and GRADUATE ADVISING

Postdoctoral Researchers

- Xiaolong Geng, 2017-present
- Xuan Yu, 2014-present
- Carlos Duque Calvache, 2015-2017 (Marie Curie Postdoctoral Fellow; now faculty at)
- Mohammad Koneshloo, 2013-2015

- Jingyuan Li, 2012-2013
- Olesya Lazareva, 2012 (2 months of funding)
- Audrey Sawyer, 2011-2012 (now faculty at Ohio State University)

PhD Students

- Zhongyuan Xu, Water Science and Policy, in progress
- Julia Guimond, Geological Sciences, in progress
- Kyra Han Kyul Kim, Geological Sciences, in progress
- Fang Tan, Water Science and Policy, in progress (co-advised with P. Imhoff, CEE)
- Christopher Russoniello, Geological Sciences, 2018 (now postdoc at Syracuse University)
- James Heiss, Geological Sciences, December 2016 (now faculty at UMASS-Lowell)
- Mahfuzur Khan, Geological Sciences, May 2016 (now faculty at University of Dhaka)

MS Students

- Pieter Kreyns, in progress
- Kaileigh Calhoun, Civil and Environmental Engineering, May 2015
- Christopher Russoniello, Geological Sciences, August 2012
- Cristina Fernandez, Geological Sciences, May 2012
- James Heiss, Geological Sciences, May 2011

Undergraduate Researchers

- Caitlyn Sarno, Chemistry, 2016
- Shailja Gangrade, Civil and Environmental Engineering and Marine Biosciences, 2016
- Catherine Medlock, CZO REU & continuing, 2016
- Riley Brown, CZO REU, 2016
- Samuel Dever, Civil Engineering, 2015-2016
- Katie Li, CZO REU, 2015
- Eric Lunn, CZO REU, 2014
- Nathan Veale, DENIN Environmental Scholar, 2013-2014
- Kyle Crespo, Environmental Engineering, 2012
- Matthew Kereszi, Civil Engineering, 2012
- Deon Knights, Geology, 2011
- Andrew Musetto, Environmental Science, 2010-2011
- Emily Olson, Marine Biosciences, 2008-2010

Visiting Students and Researchers

- Jie Yang, Leibniz University Hannover, Germany, 2014
- Sophie Ravel, Ecole Polytechnique, France, 2013

PROFESSIONAL ACTIVITIES and SERVICE (selected)

Service to Professional Organizations

- Board of Directors (elected), Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) (2013-present)
- Associate Editor: Water Resources Research (2014-present)
- Geological Society of America Hydrogeology Division Birdsall-Dreiss Lecture Award Committee (2017-2019)
- CUAHSI representative to the Geological Society of America Hydrogeology Division (2014-present)
- Chair, American Geophysical Union Groundwater Technical Committee (2017-present)
- Deputy Chair, American Geophysical Union Groundwater Technical Committee (2015-2017)
- American Geophysical Union Groundwater Technical Committee member (2013-present)
- Associate Editor: Hydrogeology Journal, the journal of the International Association of Hydrogeologists (2009-2013)
- University of Delaware representative to CUAHSI (2011-present)
- Salt Water Intrusion Meeting (SWIM) Scientific Committee (2008, 2010, 2016, 2018), Organizing Committee (2016)

Service to Government Agencies

- Delaware Sea Level Rise Technical Committee (2015-2018)
- Search committee member for Delaware Department of Natural Resources and Environmental Control Director of Coastal Programs (Fall 2016)
- Participated, by invitation, in NSF EarthCube Early Career Strategic Visioning Workshop (2012)
- Participated, by invitation, in NSF-sponsored workshop on *Marine Constituent Dynamics in Coastal Egypt* as part of the 3rd International Conference on Aquatic Resources (ICAR) conference in Alexandria, Egypt (2009)
- USGS Colleague Reviewer for 3 manuscripts, one book foreword, and many conference abstracts

Other Activities

- Board of Directors, Stroud Water Research Center (2016-present)
- Invited participant and speaker for first Indo-US Bilateral Workshop on Coastal Groundwater Dynamics Combining Future Climate Change and Human Development, Pondicherry University, India (2018)
- Instructor for NCED2 Summer Institute on Earth-surface Dynamics (2017)
- Invited participant in ONE-Delta (synthesizing Observational, Numerical, and Experimental data to unravel the complex dynamics of deltas and margin sequences) STEPPE (Sedimentary geology, Time, Environment, Paleontology, Paleoclimatology, and Energy) consortium workshop, Vanderbilt University (2016)
- Local organizing committee member and panel co-chair for the Sixth International Conference on Sustainable Water Environment, “Water Infrastructures in Time of Climate Change”, Newark, DE (2010)