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Shyla Rae Kupis
NSF GRFP Fellow, PhD Student
Environmental Engineering
& Earth Sciences

Objective

I am interested in collaborating on a research project at Sandia National Laboratories that is related to my research in hydrogeophysical imaging and modeling beginning August 2018 or later.

Education

Ph.D., Environmental Engineering
Clemson University
Clemson, SC
May 2020, 4.0/4.0 GPA

Bachelor of Science, Mathematics, Hydrology Emphasis
New Mexico Institute of Mining and Technology (NMT)
Socorro, NM
December 2015, ∼3.93/4.0 GPA

Experience

National Science Foundation (NSF) Graduate Research Fellow, Aug. 2017-Present
Clemson University, Environmental Engineering and Earth Sciences Department

The main problem is to address data sparsity from point measurements by coupling geophysical data inversion with hydrologic models. The goal of this research project is to better understand flow and transport processes through improved predictive capabilities of local state variables. A Bayesian inversion framework is being developed for the electrical impedance tomography (EIT) problem. Prior information from hydrologic training images is implemented into the wavelet basis functions to constrain inverted electrical resistivity images. Multipoint geostatistics will characterize the distribution of wavelet coefficients from the training images. The applied problem under investigation is density-driven flow from seawater intrusion (SWI). For the regional-scale study, the inversion framework will be (i) tested using EIT to image part of South Carolina's coastal aquifer system and (ii) validated from a 2D imaging tank experiment simulating SWI.

Graduate Areas of Assistance in National Need (GAANN) Fellow, Jan. 2016-Aug. 2017
Clemson University, Environmental Engineering and Earth Sciences Department

Applying the complete electrode model (CEM) to solve the electrical impedance tomography forward problem. Implementing the CEM in the Gauss-Newton method. Resolution analysis of physically-constrained geophysical inversion images of a subsurface contaminant plume. CT experiments to image lab-scale flow and transport. Wavelet decomposition of subsurface images and statistical analysis of wavelets coefficients.

Undergraduate Research Assistant, Aug. 2015-Dec. 2015
NMT, Geophysics Department

Modeled the effects of excessive groundwater pumping and seasonal recharge on subsidence and uplifting at the Albuquerque Basin in Albuquerque, New Mexico using applications from Interferometric Satellite Aperture Radar (InSAR). Created interferograms using InSAR from Envisat and ERS satellite images of the Albuquerque Basin.

Undergraduate Research and Field Assistant, Oct. 2014-Dec. 2015
NMT, Hydrology Department

Modeled thermal resistivity and seepage velocity data from one-dimensional vertical temperature profiles using time series analysis of streambed thermal records in MatLab. Collected and calibrated Water Quality Sondes (WQS) and pressure transducers from monitoring wells. Collected samples and created grain size distribution curves of streambed sediment samples.

Geographical Information Systems (GIS) Intern, May 2015-Aug. 2015
County of Hawaii Department of Environmental Management, Wastewater Division

Linked sewer systems from construction plans in the software package ArcMap. Georeferenced multiple Zone oF Mixing (ZOM) and outfall maps in ArcMap. Created map books and data driven pages in ArcMap for each distrct in the County of Hawaii's sewer collection system.

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Publications

Li, B., Pales, A.R., Clifford, H.M., **Kupis, S.R.**, Henessey, S., Liang, W.Z., Moysey, S.M.J., Powell, B., Finneran, K.T., and C.J.G. Darnault, 2017, Preferential Flow in the Vadose Zone and Interface Dynamics: Impact of Microbial Exudates, *Journal of Hydrology*, 2018.

Pales, A.R., Li, B., Clifford, H.M., **Kupis, S.R.**, Edayilam, N., Montgomery, D.A., Liang, W.Z., Dogan, M., Tharayil, N., Martinez, N.E., Moysey, S.M.J., Powell, B.A., and C. Darnault, 2017, Preferential Flow Systems Amended with Biogeochemical Components: Imaging of a Two-Dimensional Study, *Journal of Hydrology and Earth System Sciences*, (Under Review).

Kupis, S.R., S.M.J. Moysey, and T. Khan, 2017, Resolution Analysis of POD-Constrained Hydrogeophysical Imaging; SIAM Conference on Computational Science 2017; Atlanta, Georgia (Poster).

Awards

NSF Graduate Research Fellowship, 2017-Present

Clemson DAISE GAANN Fellowship, 2016-2017

NMT Competitive Scholarship for Transfer Students, 2013-2016

Computer Skills

Programming Languages	MatLab, Python
Scientific & Modeling	MODFLOW Groundwater Modeling System (GMS), COMSOL, ArcGIS
Document Preparation	Latex, Beamer, Microsoft Word, Microsoft Powerpoint