Elaine T. Spiller

EDUCATION BEYOND SECONDARY SCHOOL

University of Colorado; Boulder, CO	B.S. in Applied Mathematics	June 2000
Northwestern University; Evanston, IL	M.S. in Applied Mathematics	December 2001
Northwestern University; Evanston, IL	Ph.D. in Applied Mathematics	August 2005

APPOINTMENTS

Marquette University	Associate Professor	2015 - present
Marquette University	Assistant Chair	2015-2017
Marquette University	Assistant Professor	2008-2015
Statistical and Applied Mathematical Sciences Institute	Postdoctoral Fellow	2006-2008
State University of New York at Buffalo	Visiting Asst. Prof.	2005-2006
Northwestern University	Teaching and Research Asst.	2001-2005

MEMBERSHIP IN PROFESSIONAL AND HONORARY SOCIETIES

Society of Industrial and Applied Mathematics	2006-present

OFFICES HELD IN PROFESSIONAL AND HONORARY SOCIETIES

Assistant Chair of SIAM Activity Group on Uncertainty Quantification	2017-2018

HONORS

– Way Klingler Sabbatical Fellowship, Marquette University	2018-2019
– Project NExT (New Experiences in Teaching) Fellow	2008-2009

SCHOLARLY PUBLICATIONS

A. Articles Published:

1. E.T. Spiller, R.L. Wolpert, S.E. Ogburn, E.S. Calder, J.O. Berger, A.K. Patra, and E.B. Pitman. *Volcanic hazard assessment during an eruption hiatus, or post-eruption unrest context: Modeling continued dome collapse hazards for Soufrière Hills Volcano*. **Frontiers in Earth Science Geohazards and Georisks**, (8) 396 doi=10.3389/feart.2020.535567, 2020.

2. Q. Yang, E.B. Pitman , E.T. Spiller, M.I. Bursik, and A. Bevilacqua. *Novel statistical emulator construction for volcanic ash transport model Ash3d with physically-motivated measures*, **Proceedings of the Royal Academy A**, (476) 20200161. doi=10.1098/rspa.2020.0161, 2020.

3. R. Rutarindwa, E.T. Spiller, A. Bevilacqua, M.I. Bursik, and A.K. Patra). *Dynamic probabilistic hazard mapping in the Long Valley Volcanic Region CA: integrating vent opening maps and statistical surrogates of physical models of pyroclastic density currents*. **Journal of Geophysical Research: solid earth**, (124) doi=10.1029/2019JB017352, 2019.

4. R.L. Wolpert, E.T. Spiller, E.S. Calder. *Dynamic Statistical Models for Pyroclastic Density Current Generation at Soufriere Hills Volcano.* **Frontiers in Earth Science** (6) doi=10.3389/feart.2018.00055, 2018.

5. S.E. Ogburn, J.O. Berger, E.S. Calder, D. Lopes, A. Patra, E.B. Pitman, R. Rutarindwa, E.T. Spiller, and R.L. Wolpert. *Pooling strength amongst limited datasets using hierarchical Bayesian analysis, with application to pyroclastic density current mobility metrics.* **Statistics in Volcanology** (2), 1–26, 2016.

6. M.J. Bayarri, J.O. Berger, E.S. Calder, E.T. Spiller, A.K. Patra, E.B. Pitman, and R.L. Wolpert. *A Method for Quantifying Volcanic Hazards.* **Int. J. for Uncert. Quant**. 5(4), 297–325, 2015.

7. L. Slivinski, E.T. Spiller, A. Apte, and B. Sandstede. *A Hybrid Particle-Ensemble Kalman Filter for Lagrangian Data Assimilation.* **Monthly Weather Review** 143(1), 195–211, 2015.

8. N. Santitissadeekorn, E.T. Spiller, C.K.R.T. Jones, R. Rutarindwa, L. Liu, and K. Ide. *Observing System Simulation Experiments of Cross-Layer Lagrangian Data Assimilation*, **Dynamics of Atmospheres and Oceans**, (66), 77–93, 2014.

9. E.T. Spiller, M.J. Bayarri, J.O. Berger, E.S. Calder, A.K. Patra, E.B. Pitman, and R.L. Wolpert. *Automating Emulator Construction for Geophysical Hazard Maps.* **SIAM/ASA J. Uncert. Quant** (2), 126–152, 2014.

10. E.T. Spiller, A. Apte and C.K.R.T. Jones. *Assimilating en Route Lagrangian Observations.* **Tellus A**, (65), 20319, 2013.

11. E.T. Spiller, and G. Biondini. *Importance Sampling for Dispersion-Managed Solitons.* **SIAM J. Appl. Dyn. Syst.** 9, 432–461, 2010.

12. M.J. Bayarri, J.O. Berger, E.S. Calder, K. Dalbey, S. Lunagomez, A.K. Patra, E.B. Pitman, E.T. Spiller and R.L. Wolpert. *Using Statistical and Computer Models to Quantify Volcanic Hazards.* **Technometrics** 51 (4), 402–413, 2009.

13. E.T. Spiller, and G. Biondini. *Phase Noise of Dispersion-managed Solitons.* **Phys. Rev. A** 80 011805:1–4, 2009.

14. E.T. Spiller, A. Budhiraja, K. Ide, and C.K.R.T. Jones. *Modified Particle Filter Methods for Assimilating Lagrangian Data into a Point-vortex Model.* **Physica D** 237 (10), 1498–1506, 2008.

15. E.T. Spiller, and W.L. Kath. *A Method for Determining the Most-Probable Errors in Nonlinear Lightwave Systems.* **SIAM J. on Appl. Dyn. Syst.** 7, 686–694, 2008.

16. J. Li, E.T. Spiller, and G. Biondini. *Noise-Induced Perturbations of Dispersion-Managed Solitons.* **Phys. Rev. A** 75, 053818:1–13, 2007.

17. E.T. Spiller, W.L. Kath, R.O. Moore, and C.J. Mckinstrie. *Computing Large Signal Distortions and Bit-Error-Ratios in DPSK Transmission Systems.* **Photon. Technol. Lett.** 17, 1022–1024, 2005.

B. Conference Proceedings:

1. H. Lee, E.T. Spiller, and S.E. Minkoff. *Dimension reduction and global sensitivity metrics using active subspaces for coupled flow and deformation modeling.* **SEG Technical Program Expanded Abstracts** : 3240-3244, 2019.

2. L. Slivinski, E.T. Spiller, and A. Apte. *A Hybrid Particle-Ensemble Kalman Filter for High Dimensional Lagrangian Data Assimilation* **Dynamic Data-driven Environmental Systems Science Conference Proceedings** 263–273, 2015.

3. E.T. Spiller, G.M. Donovan, and W.L. Kath. *Direct Determination of Range Extension Due to Phase Conjugation in a Soliton-Based DPSK Transmission System.* **Proceedings on the Conference of Lasers and Electro-optics**, 1786–1788, 2005.

4. G.M. Donovan, E.T. Spiller and W.L. Kath. *Non-Gaussian Optical Field Statistics in a Long-Haul Soliton-Based DPSK transmission system.***Proceedings on the Conference of Lasers and Electro-optics**, 1497–1499, 2005.

5. E.T. Spiller, W.L. Kath, R.O. Moore, and C.J. McKinstrie. *Predicting the Failure Modes in DPSK Transmission Systems.* **Proceedings on the Conference of Lasers: Postconference Edition**, 2004.

C. Other (Includes abstracts, dissertations, reviews, technical reports, etc.):

1. P. Tierz, A. Bevilacqua, S. Mead, E. Spiller Elaine, L. Sandri *Editorial: Field Data, Models and Uncertainty in Hazard Assessment of Pyroclastic Density Currents and Lahars: Global Perspectives* **Frontiers in Earth Science** (9), DOI=10.3389/feart.2021.665725, 2021.

2. E.T. Spiller, E.S. Calder, E.B. Pitman, M.J. Bayarri, A.K. Patra, J.O. Berger, and R.L. Wolpert. *Uncertainty Quantification 2012: Simulation-based Volcanic Hazard Assessment.* Ed. Gail Corbett. Philadelphia, PA: **SIAM News**, 2012. 1.

D. Under review:

1. P.K. Aikaterini, A.A. Taflanidis, M. Plumlee, T.G. Asher, E.T. Spiller, R.A. Luettich, B. Blanton, T.L. Kijewski-Correa, A. Kennedy, L. Shmied. *Improvements in storm surge surrogate modeling for synthetic storm parameterization, node condition classification and implementation to small size databases* (submitted to *Natural Hazards* 2/21)

2. J. Maclean and E.T. Spiller *A surrogate based approach to nonlinear, non-Gaussian joint state-parameter data assimilation* (submitted to *Foundations of Data Science* 11/20, resubmitted 4/21)

E. In progress:

1. E.T. Spiller, R.W. Wolpert, and P. Tierz *The zero problem: Gaussian process emulators for range constrained computer models.*

OTHER SCHOLARLY ACTIVITIES

A. Recent Invited Addresses at Meetings, Colloquia, Seminars, etc. (previous 5 years)

1. *Assessing and forecasting uncertain hazards*, Applied Math Seminar, University of New Mexico, April 4, 2021.

2. *Uncertainty Quantification for Coupled Multi-Physics Systems*, SIAM Conference on Computational Science and Engineering, March 4, 2021.

3. *Challenges in particle filtering** NRL Atmospheric Data Assimilation/ONR Workshop. November 17, 2020. (*postponed from March 2020 due to COVID-19)

4. *Uncertainty Quantification for Coupled Multi-Physics Systems*, Joint Statistical Meetings, August 5, 2020.

5. *All models are wrong...how can they be useful? how useful can the be?*, Joint Statistical Meetings, August 3, 2020.

6. *Assessing and forecasting hazards in an uncertain future** SIAM Conference on Uncertainty Quantification, invited plenary talk. Munich, Germany, March 26, 2020. (*cancelled due to COVID-19)

7. *Assessing and forecasting hazards in an uncertain future* MSSC Colloquium, Marquette University. Milwaukee, WI, February 28, 2020.

8. *Hazard forecasts with uncertainty* Soufriére Hills Volcano Scientific Advisory Committee 2019 Meeting, Monserrat (skype lecture and discussion) November 13, 2019.

9. *Forecasting volcanic hazards with uncertainty:is it over? is it safe?* Isaac Newton Institute, Cambridge, United Kingdom, July 26, 2019.

10. *A surrogate based approach to nonlinear, non-Gaussian joint state-parameter data assimilation* International Congress on Industrial and Applied Mathematics, Valencia, Spain, July 15, 2019.

11. *Forecasting volcanic hazards with uncertainty:is it over? is it safe?* International Congress on Industrial and Applied Mathematics, Valencia, Spain, July 15, 2019.

12. *A coupled parallel partial emulator for flow and deformation modeling* SAMSI-MUMS Transition Workshop, Chapel Hill, NC, May 15, 2019.

13. *Quantifying uncertainty in hazard forecasting* SAMSI MUMS Undergraduate Research Meeting, RTP, NC, February 26, 2019.

14. *Short-term probabilistic hazard mapping – forecasting catastrophe without stationary assumptions* SAMSI Postdoc Seminar, RTP, NC, October 3, 2018.

15. *Emulators: probabilistic hazard mapping and uncertainty quantification* Cities On Volcanoes; Workshop on Critical Facilities, Naples, Italy, September 8, 2018.

16. *An overview of reduced-order models and emulators* SAMSI MUMS Opening Workshop, Durham, NC, August 20, 2018.

17. *Multi-objective sequential design for hazard mapping* SIAM Conference on Uncertainty Quantification, Garden Grove, CA, April 19, 2018.

18. *Emulators for forecasting and UQ of natural hazards* Surrogate models for UQ in complex systems, Isaac Newton Institute, Cambridge UK, February 7, 2018.

19. *Short-term probabilistic hazard mapping – forecasting catastrophe without stationary assumptions* Math Dept Colloquium, Montclair State University, Montclair, NJ, November 13, 2017.

20. *Short-term probabilistic hazard mapping – forecasting catastrophe without stationary assumptions* Math Dept Colloquium, Tulane University, New Orleans, LA, October 19, 2017.

21. *Uncertainty in hazard forecasting; Or where will you go when the volcano blows?* PHM Conference, Luminary Talk, Tampa, FL, October 3, 2017.

22. *A probabilistic hazard mapping tool for the Long Valley volcanic region* IAVCEI, Portland, OR, August 14, 2017.

23. *A hybrid filter for assimilating Lagrangian data into a high-dimensional model* SIAM Meeting on Controls, Pittsburgh, PA. July 12, 2017.

24. *Short-term probabilistic hazard mapping – forecasting catastrophe without stationary assumptions* ISI Word Statistics Congress, Marrakech, Morocco. July 19, 2017.

25. *An Overview of Uncertainty Quantification in Geophysical Hazard Analyses.* SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland. April 7, 2016.

26. *Lagrangian Data Assimilation.* Workshop on Mathematical Issues in Sea-Ice Modeling and Data Assimilation. Bergen, Norway. March 17, 2016.

27. *A hybrid particle-ensemble Kalman filter for assimilating Lagrangian data into a high-dimensional model.* Ocean Sciences, New Orleans, LA. February 25, 2016.

28. *Emulators and Hazard Analysis.* Uncertainty in Geo-science: A Workshop on Hazard Analysis. University at Buffalo, Buffalo NY. March 15, 2016.

B. Funded Research Support (major awards, external):

- NERC "Ixchel: Building understanding of the physical, cultural and socio-economic drivers of risk for strengthening resilience in the Guatemalan cordillera", $28,491 (Total Direct Costs: $28,491 Total Indirect Costs: N/A) April 2021-March 2024. Co-PI, NERC, GCRF Multi-Hazards Risk, NE/T010517

- FEMA (DHS), "Coastal Probabilistic Hazard Assessment", $28,339 (Total Direct Costs: $18,522, Total Indirect Costs: $9,817) October 2019-September 2020. Co-PI, DHS 5115356

- NSF PREEVENTS Track 1, "Coupling Uncertain Geophysical Hazards: Bringing together Geoscientists, Computational Mathematicians, and Statisticians to Advance Hazard Forecasting," $39,490 (Total Direct Costs: $36,513, Total Indirect Costs: $2,977). PI, NSF-GEO 1850742.

- NSF Computational and Data Enabled Science and Engineering, "Collaborative Research: Using Precursor Information to Update Probabilistic Hazard Maps" for $80,000 (Total Direct Costs:$53,399 Total Indirect Costs:$26,601). September 2018-August 2020. PI, NSF-DMS 1821338

- NSF Computational and Data Enabled Science and Engineering, "Collaborative Research: Advancing Statistical Surrogates for Linking Multiple Computer Models with Disparate Data for Quantifying Uncertain Hazards" for $100,000 (Total Direct Costs: $68,843, Total Indirect Costs: $31,157). August 2016 – July 2018. PI, NSF-DMS 16224679

- NSF SEES Hazards, "Hazards SEES: Persistent volcanic crises resilience in the face of prolonged and uncertain risk" for $184,472 (Total Direct Costs: $127,392, Total Indirect Costs: $57,080), September 1 , 2015 – August 31, 2018. Co-PI NSF-EAR 1521855.

- DOD/ONR Multidisciplinary University Research Initiative Renewal, "Dynamical Systems Theory and Lagrangian Data Assimilation in 4D Geophysical Fluid Dynamics," for $166,829 (Total Direct Costs, $121,541, Total Indirect Costs, $45,288). January 2014 – December 2015. PI, N000141110087

- NSF SEES Hazards, "Hazards SEES Type 1: Persistent Volcanic Crises in the USA: From Precursors to Resilience" for $54,790 (Total Direct Costs: $38,813, Total Indirect Costs: $15,977), September 2013 – August 2014. Co-PI NSF-EAR 1331353.

- NSF Computational and Data Enabled Science and Engineering, "Collaborative Research: Statistical and Computational, Models and Methods for Extracting Knowledge from Massive Disparate Data for Quantifying Uncertain Hazards" for $73,602 (Total Direct Costs: $52,184, Total Indirect Costs: $21,418). September 2012-August 2014. PI NSF-DMS 1228265.

- DOD/ONR Multidisciplinary University Research Initiative, "Dynamical Systems Theory and Lagrangian Data Assimilation in 4D Geophysical Fluid Dynamics," for $211,834 (Total

Direct Costs, $148,188, Total Indirect Costs, $63,196). October 2010 – September 2013. PI, N000141110087

- – Pacific Institute of Mathematical Sciences Summer School Proposal for $20,000; submitted October 2008, funded August 2010.
- – NSF FRG: "Collaborative Research: Prediction and Risk of Extreme Events Utilizing Mathematical Computer Models of Geophysical Processes" for $219,468 (Total Direct Costs: $151,599, Total Indirect Costs, $67,869). September 2008-August 2011. Co-PI, NSF-DMS 0757527.

C. Funded Research Support (under review):

- – CDS&E: Collaborative Research: Surrogates and Reduced Order Modeling for High Dimensional Coupled System. $146k request (submitted to NSF 9/15/20)
- – Collaborative Research: GCR: Integrated Approaches to Analysis and Mitigation of Impacts of Landslides and Debris Flows Consequent to Fire. $307k requested (submitted to NSF 2/1/21)

Graduate Student Training

A. Essays or Thesis Directed at Marquette:

2017	PhD	Computational Sciences	Regis Rutarindwa
2016	MS	Computational Sciences	Adam Mallen

B. Essay or Thesis Committee Member at Marquette:

2019	PhD Thesis	Computational Sciences	Xuyong Yu
2018	PhD Thesis	Civ Eng	Matthew Thomas
2018	PhD Thesis	ECE	Michele Malinowski
2016	PhD Thesis	ECE	Juan Tapiero Bernal
2014	PhD Thesis	Computational Sciences	Sampson Kiware

C. Essay or Thesis Committee Member Elsewhere:

2017	PhD Thesis	Duke University	Statistics	Ksenia Kyzyurova
2014	PhD Thesis	Brown University	Applied Mathematics	Laura Slivinski
2013	PhD Thesis	Duke University	Statistics	Jianyu Wang

SERVICE ACTIVITIES DATA

A. On Campus Activities

Core Curriculum Implementation Committee, Appointed	2017-2018
Core Curriculum Review Committee, Appointed	Fall 2016

Department Activities:

Co-Director of Data Science	2019-2020	Appointed
Search Committee, Appointed	2019	Chair
Graduate Committee	2009-11, 12-16, 17-18	Member
Undergraduate Committee,	2016-17	Member
Search Committees, Appointed	2011, 15	Member
Assistant Chair, elected	2015-17	
Executive Committee, Ex-officio	2015-17	Member
Executive Committee, Elected	2013-15 , 19-21	Member

B. TEACHING ACTIVITIES DATA

A. Regular Courses Taught at Marquette (last 5 years):

Year	Semester	Course # and Title	Credit	Enrollment
2016	Spring	MSCS 6020 Simulation	3	29
	Fall	MATH 4500 Theory of Diff Eqns	3	24
2017	Spring	MATH 3100 Linear Algebra	3	28
	Fall	MATH 1450 Calculus 1	4	116
		MATH 3100 Linear Algebra	3	29
		MATH 4995 Independent Study	1	1
2018	Spring	MATH 3100 Linear Algebra	3	24
		MATH 3100 Linear Algebra	3	20
		MATH 4995 Independent Study	1	1
	Fall	Sabbatical		
2019	Spring	Sabbatical		
	Fall	MATH 4540 Numerical Analysis	3	15
		CORE 1929 Foundations Methods of Inquiry	3	225 (75×3)
2020	Spring	Grant buyout		
	Fall	MATH 4540 Numerical Analysis	3	15 (in-person, hyflex))
		CORE 1929 Foundations Methods of Inquiry	3	245 (online, asynchronous)
2021	Spring	MATH 3100	3	10 (in-person, hyflex)

C. Off Campus Activities:

i. Editorial Activities

1. Associate Editor, the SIAM/ASA *Journal of Uncertainty Quantification*, January 2020-Decmeber 2021.
2. Guest Editor, *Frontiers* Special Issue in Volcanology and Hazards, Research Topic: Field Data, Models and Uncertainty in Hazard Assessment of Pyroclastic Density Currents and Lahars: Global Perspectives March 2020.
3. Guest Editor, *Foundations of Data Science* Special Issue on Data Assimilation. September 2020.

ii. Recent Reviews: Papers and Grants (previous 5 years)

1. Panelist for grant proposals, NSF, March 2021.

2. Refereed paper for Monthly Weather Review, December 2020.
3. Refereed paper for SIAM/ASA Journal on Uncertainty Quantification, June 2020.
4. Refereed paper for Quarterly Journal of the Royal Meteorological Soc., January 2020.
5. Panelist for grant proposals, NSF, December 2019.
6. Refereed paper for Monthly Weather Review, January 2019.
7. Ad-hoc reviewer for grant proposal, NSF, June 2019.
8. Panelist for grant proposals, NSF, December 2018.
9. Ad-hoc reviewer for grant proposal, NSF, November 2018.
10. Panelist for grant proposals, NSF, May 2018.
11. Refereed paper for Chaos, July 2017.
12. Panelist for grant proposals, NSF, March 2017.
13. Refereed paper for Quarterly Journal of the Royal Meteorological Soc., March 2017.
14. Reviewed grant proposals for DOE, February 2017.
15. Refereed paper for Monthly Weather Review, February 2017.
16. Refereed paper for SIAM Review, December 2016.
17. Refereed paper for Simulation and Modeling Practice and Theory, June 2016.
18. Panelist for grant proposals, NSF, May 2016.

iii. Recent and Upcoming Scholarly Event Organizing
1. Organizing the SIAM Annual Meeting, July 2021 (*Originally scheduled to be in Spokane, WA now planned fully online)
2. Post-fire Debris Flow Forecasting + UQ Zoom Meeting (*Originally scheduled as 1.5 day workshop in Boulder, CO; modified due to COVID-19), April 16, 2020
3. *Organized a mini-symposium, SIAM Conference on Uncertainty Quantification, Munich, Germany, March 2020 (*cancelled due to COVID-19)
4. Co-organized of the SIAM Conference on Applied Dynamical Systems, Snowbird, UT, May 2019
5. Organized the SAMSI-MUMS transition workshop and Statistical Perspectives on Uncertainty Quantification, May 2019
6. Organized the Workshop on Coupling Uncertain Geophysical Hazards: Bringing together Geoscientists, Computational Mathematicians, and Statisticians to Advance Hazard Forecasting, Raleigh, NC, March 2019
7. Co-organized a year-long SAMSI program: Model Uncertainty: Mathematical and Statistical, 2018-19
8. Organized a mini-symposium, SIAM Conference on Uncertainty Quantification, Garden Grove, CA, April 2018
9. Organized a mini-tutorial, SIAM Conference of Applied Dynamical Systems, Snowbird, UT, May 2017
10. Organized a mini-tutorial, SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland, April 2016