Erich L Foster

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Research Interests

Finite Element Methods, Climate/Ocean Modeling, Computational Fluid Dynamics, Hydrogeology.

Education

Virginia Tech Blacksburg, Virginia - United States
Ph.D., Applied Mathematics **2013**

- Dissertation Topic: "Finite Elements for the Quasi-geostrophic Equations of the Ocean"
- Advisor: Traian Iliescu

Virginia Commonwealth University Richmond, Virginia - United States
M.Sc., Mathematics **2009**

- Thesis Topic: "An Agent Based Gene Flow Model for *Cornus florida*"
- Advisor: David Chan

University of Nevada Reno Reno, Nevada - United States
M.Sc., Hydrogeology **2006**

- Thesis Topic: "An Improved Numerical Result for Henry's Problem of Seawater Intrusion"
- Advisor: Stephen Wheatcraft

B.Sc., Applied Mathematics **2003**
Selected Course Work: Partial Differential Equations, Numerical Methods, Linear Algebra, Computer Science, Physics, and Chemistry.

Honors and Awards

SIAM CSE 4th BGCE Student Paper Prize Finalist, Boston, MA, 2013

Skills

Operating Systems: Linux, Mac OS X.
Programming: FORTRAN 95, Python, Matlab, C++, LaTeX, Perl, Java.
Software: FEniCS/DOLFIN, GMSH, Matlab, COMSOL, Excel, MODFLOW, Aquifer Win32, ArcGIS 9.X.

Publications

[P5] E. L. Foster, T. Iliescu, and D. Wells. "A conforming finite element discretization of the streamfunction form of the quasi-geostrophic equations". *Submitted* (2013).

[P4] E. L. Foster and J. R. Overfelt. "Clipping of Arbitrary Polygons with Degeneracies". *Submitted* (2013).

[P3] Erich L Foster, Traian Iliescu, and Zhu Wang. "A Finite element discretization of the streamfunction formulation of the stationary quasi-geostrophic equations of the ocean". *Computer Methods in Applied Mechanics and Engineering* 261-262(0) (2013), pp. 105–117. DOI: 10.1016/j.cma.2013.04.008.

[P2] Erich L. Foster, Traian Iliescu, and David R. Wells. "A two-level finite element discretization of the streamfunction formulation of the stationary quasi-geostrophic equations of the ocean". *Computers & Mathematics with Applications* 66(7) (2013), pp. 1261–1271. DOI: 10.1016/j.camwa.2013.07.025.

[P1] E. L. Foster, D. Chan, and R. Dyer. "Gene Flow Modeling by Correlated Random Walk". *Submitted* (2012).

Invited Talks

[I3] E. L. Foster. Computer Technolog Laboratory Seminar. KTH Royal Institute of Technology. Stockholm, 2013.

[I2] E. L. Foster. Computational Science and Engineering. SIAM. Boston, MA, 2013.

[I1] E. L. Foster. Computer Science and Mathematics Division Seminar. Oak Ridge National Laboratory. Oak Ridge, TN, 2012.

Contributed Talks

[C7] E. L. Foster. SIAM Student Conference. SIAM. Clemson, SC: Clemson/Pitt/UTK/VT, 2013.

[C6] E. L. Foster. Student Conference. SIAM. Blacksburg, VA: Virginia Tech, 2012.

[C5] E. L. Foster. Fall Western Section Conference, Special Session of Geophysical Fluid Dynamics. AMS. Tucson, AZ, 2012.

[C4] E. L. Foster. Southeastern Atlantic Regional Conference on Differential Equations. Wake Forest, NC: Wake Forest University, 2012.

[C3] E. L. Foster and J. R. Overfelt. Student Intern Program Poster Session. Sandia. Albuquerque, NM, 2012.

[C2] E. L. Foster. Student Chapter Colloquium. SIAM. Blacksburg, VA: Virginia Tech, 2011.

[C1] E. L. Foster, S. W. Wheatcraft, and A. S. Telyakovskiy. Poster Presentation. AGU. San Francisco: AGU Fall Meeting, 2005.

Professional Experience

Basque Center for Applied Mathematics Bilbao, Basque Country - Spain
NUMERIWAVES Postdoctoral Fellow **2013 – present**
Residual based adaptive DNS/LES for a global ocean circulation model based on FEniCS/DOLFIN/Unicorn.

Virginia Tech Blacksburg, Virginia - United States
Teaching Assistant **2009 – 2011, 2013**
- Math 1205: Calculus I — Fall 2010, Spring 2011
- Math 1224: Vector Geometry — Fall 2009, Spring 2010, Spring 2013

Research Assistant **2011 – 2012**
Developed a C^1 conforming FE formulation of the Pure Streamfunction form of the Quasigeostrophic Equations. Developed an optimal error estimate for a high order finite element discretization (Argyris Finite Element) of the Pure Streamfunction formulation of the Quasigeostrophic Equations.

Sandia National Labs Albuquerque, New Mexico - United States
Graduate Student Intern **Summer 2012**
Developed a polygon clipping algorithm, which effectively dealt with degeneracies, for use in the Community Climate System Model (CCSM). The associated FORTRAN code was developed to take advantage of High Performance Computing/Parallel Computing.

Virginia Commonwealth University Richmond, Virginia - United States
Research Assistant **2008 – 2009**
Developed an agent based model to simulate the gene flow in *Cornus florida*.

Teaching Assistant **2008**
- Math 131: Introduction to Contemporary Mathematics — Spring 2008

Virginia DEQ Richmond, Virginia
Groundwater Modeller **2006 – 2008**
Analyzed regional aquifer response to groundwater withdrawals, calculating areas of impact and the

response of the seawater toe, along the Coastal Plane and Eastern Shore of Virginia using MODFLOW and SHARP (a sharp interface seawater intrusion model).

INTERA Inc. Las Vegas, Nevada - United States
Groundwater Modeller **2005 – 2006**
Wrote scripts to parse out and collect data for pre and post processing of Monte Carlo simulations of large scale flow and transport models, for the DOE's Nevada Test Site, across multiple computer nodes.

University of Nevada Reno Reno, Nevada - United States
Research Assistant **2004 – 2005**
Developed code to solve the Henry's Problem of Seawater Intrusion.

Teaching Assistant **2003 – 2004**
- Math 128: Trig and Algebra Fall 2003, Spring 2004

United States Navy Norfolk, Virginia
Nuclear Electrician's Mate **1996 – 1998**
Operated the electrical plant and propulsion system aboard a nuclear submarine; maintaining proper load balance, and preventing loss of power.

Professional Societies

Society for Industrial and Applied Mathematics (SIAM)
American Mathematical Society (AMS)
Mathematical Association of America (MAA)

Referees

Enrique Zuazua
Chair in PDEs
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CSRI, Sandia National Labs
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