ADRIAN MOURE ROSENDE

CONTACT INFORMATION

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RESEARCH INTERESTS

Computational mechanics; Biomechanics; Phase-field modeling; Isogeometric Analysis; Large-Scale computing; Cellular motility; Mechanisms of tumor growth; Coupling flow and fracture dynamics; Multiphase flow; Snow hydrology; Soil carbon emissions; Geophysics; Flow in porous media; Electro-Thermo-Hydro-Mechanical coupling in geomechanics;

EDUCATION

Sept 2014 – Nov 2017	**Ph.D., Applied Mathematics Department** in the School of Civil Engineering, Universidade da Coruña, Spain. Thesis: "Phase-field modeling and isogeometric analysis of cell crawling." Advisor: Prof. Hector Gomez. Summa Cum Laude. International Doctor.
Sept 2013 – Jun 2014	**M.S. in Research in Civil Engineering.** Civil Engineering School, Universidade da Coruña, Spain.
Sept 2005 – Sept 2011	**Coupled B.S and M.S. in Civil Engineering.** Civil Engineering School, Universidad Politécnica de Madrid, Spain. Class rank 1.

EXPERIENCE

Feb 2024 – Present	**Computational R&D Geoscientist** at Eden Geopower, Somerville, MA, USA. Supervisors: Ehsan Haghighat, Rafael Villamor-Lora.
Nov 2023 – Feb 2024	**Research Scientist** in the Department of Mechanical and Civil Engineering, California Institute of Technology, USA. Supervisor: Prof. Ruby Fu.
Mar 2021 – Oct 2023	**Post-Doctoral Scholar Research Associate** in the Department of Mechanical and Civil Engineering, California Institute of Technology, USA. Supervisor: Prof. Ruby Fu.

Jan 2018 – Mar 2021	**Post-Doctoral Research Associate** in the School of Mechanical Engineering, Purdue University, USA. Supervisor: Prof. Hector Gomez.
May 2017 – Sept 2017	**Research Scholar** at School of Mechanical Engineering, Purdue University (under the supervision of Prof. Hector Gomez).
Nov 2013 – Nov 2017	**Predoctoral Researcher** in the School of Civil Engineering, Universidade da Coruña, Spain. Advisor: Prof. Hector Gomez.

JOURNAL ARTICLES

14. N.D. Jones, **A. Moure**, X. Fu. Pattern formation of freezing infiltration in porous media. *Phys. Rev. Fluids*, 9, 2024.
13. A.S. Paspunurwar, **A. Moure**, H. Gomez. Dynamic cluster field modeling of collective chemotaxis. *Sci. Rep.,* 14, 2024.
12. **A. Moure**, X. Fu. A phase-field model for wet snow metamorphism. *Cryst. Growth Des.*, 24(19), 2024.
11. A. Srinivasan, **A. Moure**, H. Gomez. Computational modeling of flow-mediated angiogenesis: Stokes-Darcy flow on a growing vessel network. *Eng. Comput.*, 2023.
10. **A. Moure**, N. Jones, J. Pawlak, C. Meyer, X. Fu. A thermodynamic nonequilibrium model for preferential infiltration and refreezing of melt in snow. *Water Resour. Res.,* 59, 2023.
9. **A. Moure**, G. Vilanova, H. Gomez. Inverting angiogenesis with interstitial flow and chemokine matrix-binding affinity. *Sci. Rep.,* 12, 4237, 2022.
8. E. Haghighat, M. Raissi, **A. Moure**, H. Gomez, R. Juanes. A physics-informed deep learning framework for inversion and surrogate modeling in solid mechanics. *Comput. Methods Appl. Mech. Eng.*, 379, 2021.
7. **A. Moure**, H. Gomez. Phase-field modeling of individual and collective cell migration. *Arch. Computat. Methods Eng.,* 28, 311–344, 2021.
6. **A. Moure**, H. Gomez. Influence of myosin activity and mechanical impact on keratocyte polarization. *Soft Matter*, 16, 5177–5194, 2020.
5. **A. Moure**, H. Gomez. Dual role of the nucleus in cell migration on planar substrates. *Biomech. Model Mechanobiol.,* 19, 1491–1508, 2020.
4. H. Gomez, M. Bures, **A. Moure**. A review on computational modelling of phase-transition problems. *Philosophical Transactions of the Royal Society A*, 377, 20180203, 2019.
3. **A. Moure**, H. Gomez. Three-dimensional simulation of obstacle-mediated chemotaxis. *Biomech. Model Mechanobiol.,* 17, 1243–1268, 2018.
2. **A. Moure**, H. Gomez. Phase-field model of cellular migration: Three-dimensional simulations in fibrous networks, *Comput. Methods Appl. Mech. Eng.*, 320, 162–197, 2017.

1. **A. Moure**, H. Gomez. Computational model for amoeboid motion: coupling membrane and cytosol dynamics, *Phys. Rev. E*, 94, 042423, 2016.

AWARDS AND HONORS

2019 Outstanding PhD Thesis Award in Civil Engineering, Universidade da Coruña.

2017 SEMNI award to the Best PhD Thesis 2017.

2017 SeMA candidate for the ECCOMAS award to the Best PhD Thesis 2017 on Computational Methods in Applied Sciences and Engineering.

2012 Premio Escalona Award ranked 1 of its class.

2012 FCC Construcción Award ranked 1 of its class.

2012 Fundación Agustín de Betancourt Award ranked 1 of its class.

CONFERENCES

19. A. Moure, X. Fu. "Pore-scale three-phase model for water phase transitions: impact of melt film generation on wet snow metamorphism" (presentation), *76th Annual Meeting of the APS Division of Fluid Dynamics*, Washington, DC (USA), November 19-21, 2023.

18. A. Moure, X. Fu. "Pore-scale modeling of wet snow metamorphism" (presentation), *15th International Conference on the Physics and Chemistry of Ice*, Sapporo, Japan, September 3-8, 2023.

17. A. Moure, N. Jones, X. Fu. "Multiphase model for preferential infiltration and refreezing of meltwater in snow" (presentation), *James K. Knowles Lectures and Caltech Solid Mechanics Symposium*, Pasadena, California (USA), May 19, 2023.

16. A. Moure, N. Jones, J. Pawlak, C. Meyer, X. Fu. "Preferential meltwater infiltration and refreezing: a multiphase model" (poster), *AGU Fall Meeting 2022*, Chicago, Illinois (USA), December 12-16, 2022.

15. A. Moure, N. Jones, J. Pawlak, C. Meyer, X. Fu. "Preferential meltwater infiltration and refreezing: a multiphase model" (presentation), *4th California Geophysical Fluid Dynamics Meeting,* Pasadena, California (USA), August 18-19, 2022.

14. A. Moure, N. Jones, J. Pawlak, C. Meyer, X. Fu. "Nonequilibrium thermodynamics of meltwater infiltration" (poster), *Flow and Transport in Permeable Media (GRC)*, Les Diablerets, Switzerland, July 17-22, 2022.

13. A. Moure, N. Jones, J. Pawlak, C. Meyer, X. Fu. "A thermodynamic nonequilibrium model for meltwater infiltration and refreezing" (presentation), *Flow and Transport in Permeable Media (GRS)*, Les Diablerets, Switzerland, July 16-17, 2022.

12. A. Moure, X. Fu. “Dry and wet snow metamorphism: a phase-field model of pore-scale phase change dynamics” (presentation), *So Cal Fluids XV*, Los Angeles, California (USA), April 23, 2022.

11. A. Moure, X. Fu. “Pore-scale modeling of wet snow metamorphism” (presentation), *AGU Fall Meeting 2021*, New Orleans, Louisiana (USA), December 13-17, 2021.

10. A. Moure, H. Gomez. “A computational model to unveil the role of the nucleus in 2D cell migration” (poster), *63rd Annual Meeting of the Biophysical Society*, Baltimore, Maryland (USA), March 2-6, 2019.

9. A. Moure, H. Gomez. “Three-dimensional simulation of obstacle-mediated chemotaxis**”** (presentation), *2nd Toledo CellulART Meeting,* Toledo, Ohio, (USA), September 14, 2018.

8. A. Moure, H. Gomez. “Three-dimensional simulation of obstacle-mediated chemotaxis” (presentation), *13th World Congress on Computational Mechanics (WCCM XIII),* New York City, New York (USA), July 22-27, 2018.

7. A. Moure, H. Gomez. “Phase-field modeling and isogeometric analysis of amoeboid motion: 3D simulation of obstacle-mediated chemotaxis” (presentation), *18th Conference of the Spanish-French School***,** Las Palmas de Gran Canaria, Spain, June 25-29, 2018.

6. P. Dominguez-Frojan, A. Moure, H. Gomez. “Isogeometric simulations of glioma growth on precise brain geometries based on the proliferation-invasion-hypoxia-necrosis-angiogenesis model” (poster), *Congress on Numerical Methods in Engineering CMN2017,* Valencia, Spain, July 03-05, 2017.

5. A. Moure, H. Gomez. “Computational modeling of amoeboid motion: *Dictyostelium* in chemotactic environments” (presentation), *5th International Conference on Computational and Mathematical Biomedical Engineering,* Pittsburgh, Pennsylvania (USA), April 10-12, 2017.

4. A. Moure, H. Gomez. “Computational modeling of amoeboid motion: Chemotaxis and free movement in different environments” (presentation), *Mechanobiology across Networks,* Barcelona, Spain, October 6-7, 2016.

3. A. Moure, H. Gomez. “Computational modeling of amoeboid motion: Chemotaxis and free movement in different environments” (presentation), *12th World Congress on Computational Mechanics (WCCM XII),* Seoul, Republic of Korea, July 24-29, 2016.

2. A. Moure, H. Gomez. “Computational modeling of cellular motility: Chemotaxis and movement in confined environments” (presentation), *21th Congress of the European Society of Biomechanics*, Prague, Czech Republic, July 5-8, 2015.

1. H. Gomez, G. Vilanova, A. Moure. “An overview of our work on modeling and simulation on cancer growth” (presentation), *Kick-off Meeting – Spanish Network of Excellence in Mechanobiology,* Barcelona, Spain, February 24-25, 2015.

RESEARCH PROJECTS

2024 – Present Electric-based Mechanical & Thermal Stimulation to Increase Geologic Hydrogen Reaction Rates in the Samail Ophiolite, Oman. Advanced Research Projects Agency – Energy (ARPA-E). PI: Rafael Villamor-Lora

2024 – Present Electro-Hydraulic Fracturing for Enhanced Geothermal Systems. Advanced Research Projects Agency – Energy (ARPA-E). PI: Paris Smalls.

2024 – 2025 Integrated Electro-Hydraulic Fracturing and Real-Time Monitoring for Carbon Negative In-Situ Mining. Advanced Research Projects Agency – Energy (ARPA-E). PI: Wencheng Jin.

2023 – 2024 "Predictive modeling of robotic interactions with icy porous analogs under phase change dynamics". PDRDF - NASA Jet Propulsion Laboratory. PI: Ruby Fu.

2022 – 2024 "The Caltech Critical Zone Initiative". Caltech's Resnick Sustainability Institute. PI: Ruby Fu.

2021 – 2024 "Tracing the fate of water through snow: a cryohydrologic model for meltwater percolation". Caltech's Resnick Sustainability Institute. PI: Ruby Fu.

2020 – 2021 "Unveiling the role of interstitial flow in angiogenesis through phase-field simulations". National Science Foundation (NSF). PI: H. Gomez.

2012 – 2017 "Modeling and Simulation of Cancer growth (MuSIC)". European Research Council (ERC). PI: H. Gomez.

2014 – 2016 "Computational models of cancer microvasculature: Unveiling the topology and transport capacity of tumor-induced capillary networks". Ministerio de Economía y Competitividad de España (MINECO). PI: H. Gomez.

INVITED TALKS

3. "Multiphase models for snow hydrology: from pore-scale snow metamorphism to Darcy-scale meltwater infiltration", *Mathematics on Ice Forum,* Webinar, April 3, 2023.
2. "Phase-field modeling and simulation in biomechanics: cell migration and other applications", *PDE & Applied Math Seminar – UC Riverside,* Riverside, California (USA), May 11, 2022.
1. "Phase-field modeling and simulation in biomechanics: cell migration and other applications", *Mechanical and Civil Engineering Seminar Series – Caltech,* Pasadena, California (USA), April 1, 2021.

GRANTS

2017 "Ayudas para estancias predoctorales Inditex-UDC 2017". Entity: Inditex S.A. €5,115.

2005 – 2011 "Becas de Excelencia de la Comunidad de Madrid". Entity: Comunidad Autónoma de Madrid. €27,000.

OTHER PUBLICATIONS

Book chapter: M. Bures, **A. Moure**, H. Gomez. Computational treatment of interface dynamics via phase-field modeling, *Numerical simulation in physics and engineering: Trends and applications*, Springer, 2021.

Ph.D. thesis: **A. Moure**. Phase-field modeling and isogeometric analysis of cell crawling, *Ph.D. thesis*, Universidade da Coruña, 2017.

JOURNAL REVIEWER

Frontiers in Applied Mathematics and Statistics. Journal of Fluid Mechanics. Scientific Reports. Journal of Biomechanical Engineering. Biomechanics and Modeling in Mechanobiology.

INTERNATIONAL COURSES

2014 "Mechanobiology of cells and tissues: motility and morphogenesis". International Centre for Mechancial Sciences (CISM), Udine, Italy, June 16-20, 2014.

2013 "Phase-field modeling of phase change phenomena". Instituto de Matemáticas de la Universidad de Sevilla (IMUS), Sevilla, Spain, December 17-19, 2013.

AFFILIATIONS

2023 – 2024 Member of the American Physical Society (APS).

2021 – 2024 Member of the American Geophysical Union (AGU).

2019 Member of the Biophysical Society.

2015 – 2017 Member of the European Society of Biomechanics (ESB).

2014 – 2017 Member of the Group of Numerical Methods in Engineering.

LANGUAGES

Spanish Native.

Galician Native.

English C1 level.

Portuguese B2 level.