Spencer H. Bryngelson

1 Basic information

Title: Assistant Professor, School of Computational Science & Engineering

Institution: Georgia Institute of Technology

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2 Education

- University of Illinois at Urbana–Champaign
  - (2017) Doctor of Philosophy, Theoretical & Applied Mechanics
  - (2015) Master of Science, Theoretical & Applied Mechanics
  - (2015) Graduate Certificate, Computational Science & Engineering
- University of Michigan–Dearborn
  - (2013) Bachelor of Science, Mechanical Engineering
  - (2013) Bachelor of Science, Engineering Mathematics

3 Research positions

- (2021–Present) Assistant Professor, School of Computational Science & Engineering, College of Computing, Georgia Institute of Technology
- (2018–21) Senior Postdoctoral Scholar, California Institute of Technology, with Tim Colonius
- (2019) Visiting Researcher, Massachusetts Institute of Technology, with Themis Sapsis
- (2017–18) Postdoctoral Researcher, XPACC (PSAAP II center), with Carlos Pantano, Dan Bodony, Jon Freund
- (2013–17) Graduate Research Fellow, University of Illinois at Urbana–Champaign, with Jon Freund
- (2012–13) Undergraduate Research Assistant, University of Michigan–Dearborn, with Eric Ratts

4 Teaching

4.1 Georgia Institute of Technology

Semester	Number	Course Title	Students	TAT
Fall 2021	CX 4640/MATH 4640	Numerical Analysis I	43	Yes

∗**TAT:** Thank a Teacher Award received

4.2 Other Institutions

Semester	Number	Course Title	Students	Institute
Fall 2015	ME 310	Fundamentals of Fluid Dynamics	82	UIllinois
Fall 2013	ME 3601	Design and Analysis of Machine Elements	35	UMichigan
Spring 2012	ME 364	Probability, Statistics, and Reliability in Design	32	UMichigan
Fall 2012	ME 230	Statics and Mechanics of Materials	61	UMichigan

5 Students

5.1 Graduate

- Jesus Arias, Ph.D. student (CSE, co-advised with L. Sankar)
- Fatima Ezahra Chrit, Ph.D. student (ME and CSE, co-advised with A. Alexeev)
- Anand Radhakrishnan, Ph.D. student (CSE)
- Scott Sims, M.S. student (CSE)

5.2 Undergraduate

- Ajay Bati (CS)
- Sriharsha Kocherla (CS)
- Yash Kothari (CS)
- Henry Le Berre (CS)
- Qi Zeng (CS and Math, co-advised with F. Schäfer)

5.3 Alumni

- Girish Ganesan, Rutgers University (UG, via XSEDE EMPOWER)

6 Awards

- (2022) Ralph E. Powe Junior Faculty Enhancement Award, Oak Ridge National Lab
- (2017) Stanley Weiss Outstanding Dissertation Award, University of Illinois at Urbana–Champaign
- (2016) Hassan Aref Award (research in fluid mechanics), University of Illinois at Urbana–Champaign
- (2015) Alumni Teaching Fellowship, University of Illinois at Urbana–Champaign
- (2010–13) Dean's List, University of Michigan–Dearborn
- (2011) Pi Tau Sigma (honor society, member), University of Michigan–Dearborn

7 Research support

7.1 Funded grants

- (2022–23) PI: DOE ORAU Powe, "*A methodologically coherent multi-scale model for multiphase flow*" ($10K)
- (2022–26) PI: DOD ONR 13517745, "*Stochastic framework for cavitating flows: mesoscale modeling and acceleration*" ($560K)
- (2022) PI: GT Seed Grant, Forming Teams "*Quantum computing for next-generation engineering simulation*" ($50K)
- (2022) PI: GTQA DE00013211, "*Quantum algorithms for lattice Boltzmann fluid flow simulation*" ($14.5K)
- (2022) co-PI: GTRI IRAD, "*Quantum optimization for lattice Boltzmann simulation (QOLBS)*" ($20K), PI B. Gard (GTRI)

7.2 Funded resource and hardware awards

- (2022) PI: AMD MI200-series GPU Server ($77K value)
- (2022) PI: Stanford CTR Summer Program "*Fast macroscopic forcing for operator recovery via locality and causality with application to compressible and multiphase flow*" ($10K, with F. Schäfer, SHB share $5K)
- (2022) PI: NVIDIA Academic Hardware Grant Program (2x A100 80GB PCIe, $30K value)
- (2021–22) PI: XSEDE TG-PHY210084, "*High-fidelity simulation of high-speed flowing dispersions*

via a stochastic sub-grid model" (200K Node Hours, $30K value)

- (2021–22) PI: Oak Ridge National Lab CFD154, Director's Discretionary, "*Accelerated sub-grid multi-component flow physics*" (10K Node Hours)
- (2019–20) co-PI: XSEDE TG-CTS120005, "*Advanced immersed boundary and interface-capturing methods for simulations of complex flows*" (9M Node Hours, $1.35M value)

7.3 Pending grants

- (2023–25) PI: DOE INCITE, "*The First Full-Resolution Liquid–Gas Disperse Flow Simulations*" (500K Summit Node Hours, 2M Frontier Node Hours, $1M value)
- (2023–24) PI: Google Collabs, "*Enabling subgrid-scale modeling of multiphase flows using differentiable CFD and machine learning models*" ($90K)
- (2022–24) PI: DOE ASCR DE-FOA-0002717, "*Split, Prune, Unify: A Quantum Algorithm Development Strategy*" (SHB share: $200K, Total: $400K)
- (2022–24) co-PI: DOE ASCR DE-FOA-0002717, "*Sharing and combining SciML models, robustly and securely*" (SHB share: $200K, Total: $400K)
- (2022–25) co-PI: NSF OAC CORE 21-616, "*Enabling rapid, targeted optimization of PDE solvers via hardware–software coupled autotuning for novel architectures*" (SHB share: $300K, Total: $600K)
- (2022–23) co-PI: NOAA SBIR OAR-TPO 2007117 "*Using bubbles to reduce underwater noise from ships and ferries*" (SHB share: $39K, Total: $125K)
- (2022) PI: Georgia Tech TechFee "*ARM HPC Dev Kits for next-generation supercomputing*" (8x NVIDIA HPC Dev. Kits, $700K value)

8 Professional activity

8.1 Referee

- AIAA Journal
- Fluids
- International Journal of Multiphase Flow
- International Journal of Offshore and Polar Engineering
- Journal of Computational Physics
- Journal of Fluid Mechanics
- Physical Review E
- Physical Review Fluids
- PLOS Computational Biology
- Symposium of Naval Hydrodynamics
- Theoretical and Computational Fluid Dynamics

8.2 Appointments and memberships

- (2021–22) NATO Science & Technology Organization, Technical Team Member
- (2015–Present) Society of Industrial and Applied Mathematics, Member
- (2014–Present) American Physical Society, Member

9 Service and outreach

9.1 Georgia Tech

9.1.1 Institute-level

- (2022–Present) Georgia Tech *Scientific Software Engineering Center*, Advisory Board

- (2021–Present) Georgia Tech *HPC Hackathon*, initiator and organizer, recruited sponsors Oak Ridge National Lab and NVIDIA

9.1.2 CoC-level

- (2022) Organizer, Georgia Scientific Computing Symposium (with E. Chow and X. Zhang)
- (2022) Judge, CS Junior Design Capstone Expo
- (2021–Present) TSO advisory committee representative
- (2021–Present) Seminar series organizer (with F. Schäfer and R. Vuduc)
- (2021–Present) Graduate student admissions committee

9.1.3 Student examination committees

- (2022) Ph.D. defense, Achyut Panchal (CoE AE)
- (2021) Qualifying exam, Bradley Baker (CoC CSE)
- (2021) Qualifying exam, Conlain Kelly (CoC CSE)
- (2021) Qualifying exam, Sam Swanson (CoC CSE)

9.2 External

- (2022) Grant Panel Reviewer, National Science Foundation
- (2021–Present) Research mentor, XSEDE EMPOWER (Expert Mentoring Producing Opportunities for Work, Education, and Research; program received HPCwire 2021 Editors' Choice Award in Workforce Diversity and Inclusion Leadership)
- (2021–Present) Mentor, GPU Hackathons (with Oak Ridge National Lab and NVIDIA)
- (2021) Poster judge, American Physical Society, Division of Fluid Dynamics
- (2021) Session chair, American Physical Society, Division of Fluid Dynamics
- (2021) Mini-symposium organizer and session chair, "Machine learning for multiphase flows", IACM Conference on Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology (MMLDT-CSET)
- (2020) Research mentor, Schmidt Academy for Software Engineering
- (2019) Research mentor, WAVE undergraduate research program for under-represented students, Caltech
- (2015–16) Judge, Illinois State-wide Math Competition
- (2014) Organizer, Science Night, Illinois Middle Schools

10 Publications

10.1 Preprints

[P3] Panchal, A., S. H. Bryngelson, and S. Menon (2022). "A seven-equation diffused interface method for resolved multiphase flows". arXiv: 2204.08637.

[P2] Zeng, Q., S. H. Bryngelson, and F. Shäfer (2022). "Competitive physics informed networks". arXiv: 2204.11144.

[P1] Bryngelson, S. H., R. O. Fox, and T. Colonius (2021). "Conditional moment methods for polydisperse cavitating flows". arXiv: 2112.14172.

10.2 Journal papers

[J15] Charalampopoulos, A., S. H. Bryngelson, T. Colonius, and T. P. Sapsis (2022). "Hybrid quadrature moment method for accurate and stable representation of non-Gaussian processes and their dynamics". *Philosophical Transactions of the Royal Society A* **380** 2229. DOI: 10.1098/rsta.2021.0209.

[J14] Bryngelson, S. H., K. Schmidmayer, V. Coralic, K. Maeda, J. Meng, and T. Colonius (2021). "MFC: An open-source high-order multi-component, multi-phase, and multi-scale compressible flow solver". *Computer Physics Communications* **266**, 107396. DOI: 10.1016/j.cpc.2020.107396.

[J13] Spratt, J.-S., M. Rodriguez, K. Schmidmayer, S. H. Bryngelson, J. Yang, C. Franck, and T. Colonius (2021). "Characterizing viscoelastic materials via ensemble-based data assimilation of bubble collapse observations". *Journal of the Mechanics and Physics of Solids* **152**, 104455. DOI: 10.1016/j.jmps.2021.104455.

[J12] Bryngelson, S. H., A. Charalampopoulos, T. P. Sapsis, and T. Colonius (2020). "A Gaussian moment method and its augmentation via LSTM recurrent neural networks for the statistics of cavitating bubble populations". *International Journal of Multiphase Flow* **127**, 103262. DOI: 10.1016/j.ijmultiphaseflow.2020.103262.

[J11] Bryngelson, S. H. and T. Colonius (2020). "Simulation of humpback whale bubble-net feeding models". *Journal of the Acoustical Society of America* **147** 2, 1126–1135. DOI: 10.1121/10.0000746.

[J10] Bryngelson, S. H., T. Colonius, and R. O. Fox (2020). "QBMMlib: A library of quadrature-based moment methods". *SoftwareX* **12**, 100615. DOI: 10.1016/j.softx.2020.100615.

[J9] Schmidmayer, K., S. H. Bryngelson, and T. Colonius (2020). "An assessment of multicomponent flow models and interface capturing schemes for spherical bubble dynamics". *Journal of Computational Physics* **402**, 109080. DOI: 10.1016/j.jcp.2019.109080.

[J8] Trummler, T., S. H. Bryngelson, K. Schmidmayer, S. J. Schmidt, T. Colonius, and N. A. Adams (2020). "Near-surface dynamics of a gas bubble collapsing above a crevice". *Journal of Fluid Mechanics* **899**, A16. DOI: 10.1017/jfm.2020.432.

[J7] Bryngelson, S. H. and J. B. Freund (2019). "Non-modal Floquet stability of a capsule in large amplitude oscillatory extension". *European Journal of Mechanics B* **77**, 171–176. DOI: 10.1016/j.euromechflu.2019.04.012.

[J6] Bryngelson, S. H., F. Guéniat, and J. B. Freund (2019). "Irregular dynamics of cellular blood flow in a model microvessel". *Physical Review E* **100**, 012203. DOI: 10.1103/PhysRevE.100.012203.

[J5] Bryngelson, S. H., K. Schmidmayer, and T. Colonius (2019). "A quantitative comparison of phase-averaged models for bubbly, cavitating flows". *International Journal of Multiphase Flow* **115**, 137–143. DOI: 10.1016/j.ijmultiphaseflow.2019.03.028.

[J4] Bryngelson, S. H. and J. B. Freund (2018). "Floquet stability analysis of capsules in viscous shear flow". *Joural of Fluid Mechanics* **852**, 663–677. DOI: 10.1017/jfm.2018.574.

[J3] Bryngelson, S. H. and J. B. Freund (2018). "Global stability of flowing red blood cell trains". *Physical Review Fluids* **3** 7, 073101. DOI: 10.1103/PhysRevFluids.3.073101.

[J2] Bryngelson, S. H. and J. B. Freund (2016). "Buckling and its effect on the confined flow of a model capsule suspension". *Rheologica Acta* **55** 6, 451–464. DOI: 10.1007/s00397-015-0900-9.

[J1] Bryngelson, S. H. and J. B. Freund (2016). "Capsule-train stability". *Physical Review Fluids* **1** 3, 033201. DOI: 10.1103/PhysRevFluids.1.033201.

10.3 Refereed conference papers

[C11] Bryngelson, S. H., A. Charalampopoulos, T. P. Sapsis, R. O. Fox, and T. Colonius (2022). "Representing statistics of dispersions via moment methods and recurrent neural networks with application to cavitating bubbles". *34rd Symposium on Naval Hydrodynamics*. Washington D.C., USA.

[C10] Rodriguez, M., S. H. Bryngelson, and T. Colonius (2022). "Bubble dynamics with phase change near a compliant object". *34rd Symposium on Naval Hydrodynamics*. Washington D.C., USA.

[C9] Bryngelson, S. H. and T. Colonius (2021). "Closure of phase-averaged bubbly, cavitating flow models". *XXV International Congress of Theoretical and Applied Mechanics*. Milano, Italy. URL: https://vimeo.com/640932583/0ae772bf00.

[C8] Bryngelson, S. H., F. O'Meally, T. Colonius, and R. O. Fox (2021). "Conditional moment method for fully-coupled phase-averaged cavitation models". *11th International Symposium on Cavitation*. Daejeon, Korea. URL: https://vimeo.com/640931949/a6cd12fc05.

[C7] Rodriguez, M., S. H. Bryngelson, S. Cao, and T. Colonius (2021). "A unified Eulerian multiphase framework for fluid-structure interaction problems including cavitation". *XXV International Congress of Theoretical and Applied Mechanics*. Milano, Italy.

[C6] Rodriguez, M., S. H. Bryngelson, S. Cao, and T. Colonius (2021). "Acoustically-induced bubble growth and phase change dynamics near compliant surfaces". *11th International Symposium on Cavitation*. Daejeon, Korea.

[C5] Spratt, J.-S., M. Rodriguez, S. H. Bryngelson, S. Cao, and T. Colonius (2021). "Eulerian framework for bubble-cloud-kidney stone interaction". *11th International Symposium on Cavitation*. Daejeon, Korea.

[C4] Bryngelson, S. H. and T. Colonius (2020). "Phase- and mixture-averaged techniques for general bubbly flows". *33rd Symposium on Naval Hydrodynamics*. Osaka, Japan. URL: https://vimeo.com/640930931/6e57ccfd89.

[C3] Bryngelson, S. H. and T. Colonius (2019). "A comparison of ensemble- and volume-averaged bubbly flow models". *10th International Conference on Multiphase Flow*. Rio de Janeiro, Brazil.

[C2] Bryngelson, S. H. and J. B. Freund (2016). "Buckling and the rheology of an elastic capsule suspension". *XXIV International Congress of Theoretical and Applied Mechanics*. Montreal, Canada.

[C1] Freund, J. B. and S. H. Bryngelson (2016). "The stability of flowing trains of confined red blood cells". *XXIV International Congress of Theoretical and Applied Mechanics*. Montreal, Canada.

10.4 Other publications

[O2] Bryngelson, S. H., C. Pantano, D. Bodony, and J. B. Freund (2018). *Adjoint-based sensitivity for flows with shocks*. Technical Report, XPACC.

[O1] Bryngelson, S. H. (2017). "Stability and transition of capsule-flow systems". Ph.D. Thesis. University of Illinois at Urbana–Champaign.

11 Talks

11.1 Invited talks

[I22] Arizona State University, *Fluids Seminar* (2022).

[I21] Brown University, *Center for Fluid Mechanics, Applied Math and Engineering* (2022).

[I20] CRNCH Summit (2022). URL: https://mediaspace.gatech.edu/media/CRNCH+Summit+2022+-+Spencer+Bryngleson+-+Quantum+Computing+for+Continuum+Mechanics/1_23u8ou36.

[I19] Emory University, *Scientific Computing Seminar Series* (2022).

[I18] Georgia Scientific Computing Symposium (2022).

[I17] Massachusetts Institute of Technology, *SAND Group* (2022).

[I16] Office of Naval Research, *Basic Research Challenge Guest Talks* (2022).

[I15] California Institute of Technology, *Mechanical and Civil Engineering Seminar Series* (2021).

[I14] OpenACC Annual Summit (2021). URL: https://youtu.be/DgX6ssX2yrg.

[I13] University of California, San Diego, *Fluid Mechanics, Combustion, & Engineering Physics Seminar Series* (2021). URL: https://vimeo.com/640930056/b1a6c0dc62.

[I12] Georgia Institute of Technology, *Computational Science & Engineering Seminar Series* (2020).

[I11] Massachusetts Institute of Technology, *SAND Group* (2019).

[I10] University of Michigan–Ann Arbor, *Mechanical Engineering Seminar Series* (2019).

[I9] University of Michigan–Dearborn, *Mechanical Engineering Seminar Series* (2019).

[I8] University of Utah, *Mechanical Engineering Seminar Series* (2019).

[I7] University of Vermont, *Mechanical Engineering Seminar Series* (2019).

[I6] University of Washington, *Mechanical Engineering Seminar Series* (2019).

[I5] California Institute of Technology, *Computational Flow Physics Group* (2018).

[I4] California Institute of Technology, *Flow Mechanics Research Conference* (2018).

[I3] ETH Zurich, *Computational Science & Engineering Lab* (2017).

[I2] University of Illinois at Urbana–Champaign, *Fluid Mechanics Seminar* (2017).

[I1] University of Illinois at Urbana–Champaign, *Biology Interest Group* (2015).

11.2 Conference talks

[T27] Bryngelson, S. H. (2022). "Fast integration methods for averaging bubble dynamics at sub-grid scales". *19th U.S. National Congress on Theoretical and Applied Mechanics*.

[T26] Rodriguez, M., S. H. Bryngelson, and T. Colonius (2022). "Numerical simulations of cavitation near an elastic object". *ECCOMAS Congress*.

[T25] Rodriguez, M., J.-S. Spratt, S. H. Bryngelson, and T. Colonius (2022). "Numerical simulations of cavitation bubble growth and collapse near a viscoelastic object". *19th U.S. National Congress on Theoretical and Applied Mechanics*.

[T24] Zeng, Q., S. H. Bryngelson, and F. Shäfer (2022). "Competitive physics informed networks". *ICLR workshop "Gamification and Multiagent Solutions"*.

[T23] Bryngelson, S. H., A. Charalampopoulos, R. O. Fox, T. Sapsis, and T. Colonius (2021). "Bypassing quadrature moment method instability via recurrent neural networks with application to cavitating bubble dispersions". *American Physical Society*. URL: https://vimeo.com/650700675/06006b48de.

[T22] Bryngelson, S. H., A. Charalampopoulos, T. Sapsis, and T. Colonius (2021). "Machine learned model for non-Gaussian cavitation statistics". *International Association for Computational Mechanics MMLDT-CSET*.

[T21] Bryngelson, S. H. and T. Colonius (2021). "Statistical model for cavitating polydisperse bubble clouds". *Journal of the Acoustical Society of America*. URL: https://vimeo.com/640933361/4f9d1469ce.

[T20] Bryngelson, S. H. and T. Colonius (2021). "Sub-grid population balance model for cavitating flows". *14th Southern California Flow Physics Symposium*.

[T19] Bryngelson, S. H., Q. Wang, E. Cisneros-Garibay, and T. Colonius (2021). "GPU-accelerated quadrature moment methods". *SIAM Annual Meeting*.

[T18] Rodriguez, M., S. H. Bryngelson, and T. Colonius (2021). "Acoustically induced bubble growth with phase change". *14th Southern California Flow Physics Symposium*.

[T17] Rodriguez, M., S. H. Bryngelson, and T. Colonius (2021). "Vapor and gas bubble growth with phase transition near a wall". *American Physical Society*.

[T16] Spratt, J.-S., M. Rodriguez, S. H. Bryngelson, S. Cao, and T. Colonius (2021). "High fidelity single framework simulations of acoustic wave–bubble cloud–elastic solid interactions". *American Physical Society*.

[T15] Spratt, J.-S., M. Rodriguez, S. H. Bryngelson, S. Cao, and T. Colonius (2021). "Numerical Simulations of burst-wave lithotripsy in an Eulerian framework". *14th Southern California Flow Physics Symposium*.

[T14] Spratt, J.-S., M. Rodriguez, S. H. Bryngelson, S. Cao, and T. Colonius (2021). "Single-framework simulations of acoustic-wave–bubble cloud–stone interactions". *Journal of the Acoustical Society of America*.

[T13] Bryngelson, S. H., R. Fox, and T. Colonius (2020). "Conditioned quadrature moment methods for cavitating bubble dispersions". *American Physical Society*. URL: https://vimeo.com/640933407/2830fcf3e0.

[T12] Rodriguez, M., S. H. Bryngelson, and T. Colonius (2020). "Cavitation bubble growth with phase transition near a rigid wall". *American Physical Society*.

[T11] Spratt, J.-S., M. Rodriguez, S. H. Bryngelson, and T. Colonius (2020). "A fully Eulerian simulation framework for cavitating bubble-clouds near viscoelastic materials". *American Physical Society*.

[T10] Bryngelson, S. H., A. Charalampopoulos, T. P. Sapsis, and T. Colonius (2019). "Neural-network-augmented Gaussian moment method for the statistics of cavitating bubble populations". *American Physical Society*.

[T9] Bryngelson, S. H. and T. Colonius (2019). "Annular and spiral bubble nets: A simulation-focused analysis of humpback whale feeding strategies". *Journal of the Acoustical Society of America, 146(4) 2771*.

[T8] Bryngelson, S. H. and T. Colonius (2019). "Simulations and acoustics of humpback whale bubble-net feeding". *13th Southern California Flow Physics Symposium*.

[T7] Trummler, T., K. Schmidmayer, S. H. Bryngelson, and T. Colonius (2019). "Simulations of a collapsing gas bubble above a crevice". *13th Southern California Flow Physics Symposium*.

[T6] Bryngelson, S. H. and T. Colonius (2018). "Modeling approaches for bubbly, cavitating flows". *American Physical Society*.

[T5] Bryngelson, S. H. and J. B. Freund (2017). "Floquet stability of tank-treading and tumbling capsules in viscous shear flow". *American Physical Society*.

[T4] Bryngelson, S. H. and J. B. Freund (2017). "Global stability of fully coupled capsule flow systems". *SIAM Computational Science and Engineering*.

[T3] Bryngelson, S. H. and J. B. Freund (2017). "Stability of flowing red blood cell trains". *Blood Flow*.

[T2] Bryngelson, S. H. and J. B. Freund (2016). "Stability and transition to chaos of regular capsule trains". *American Physical Society*.

[T1] Bryngelson, S. H. and J. B. Freund (2015). "Buckling and its effect on the confined flow of a capsule suspension". *American Physical Society*.

12 Software

[S5] Bryngelson, S. H., E. Cisneros-Garibay, Q. Wang, R. O. Fox, and T. Colonius (2020). *PyQBMMlib: A library of quadrature-based moment methods*. URL: https://github.com/comp-physics/PyQBMMlib.

[S4] Bryngelson, S. H., R. O. Fox, and T. Colonius (2020). *QBMMlib: A library of quadrature-based moment methods*. URL: https://github.com/comp-physics/QBMMlib.

[S3] Bryngelson, S. H., A. Radhakrishnan, H. Le Berre, M. Rodriguez, J.-S. Spratt, K. Schmidmayer, V. Coralic, K. Maeda, J. Meng, and T. Colonius (2019). *MFC: Multi-component Flow Code*. URL: https://mflowcode.github.io.

[S2] Schmidmayer, K., B. Dorschner, E. Daniel, S. Le Martelot, S. H. Bryngelson, and F. Petitpas (2019). *ECOGEN: Multiphase and capillary flow solver*. URL: https://code-mphi.github.io/ECOGEN/.

[S1] Campbell, M., E. Cisneros, S. H. Bryngelson, D. Buchta, M. Anderson, M. Diener, and M. Smith (2018). *PlasCom2: Multi-physics turbulent flows*. URL: https://xpacc-dev.bitbucket.io/PlasCom2/.