DENIS ASLANGIL, Ph.D.
Assistant Professor at the Department of Aerospace Engineering and Mechanics
The University of Alabama, Tuscaloosa AL

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Research Interest:

Spatiotemporal modeling, physics informed machine learning, hydrodynamic instabilities in nuclear fusion, multi-material/phase mixing, compressible reactive/non-reactive turbulence, turbulence theory, direct numerical & large-eddy simulations, high-performance computing, quantum computational fluid dynamics

Work Experience:

The University of Alabama — Tuscaloosa, AL
Assistant Prof. The Department of Aerospace Eng. and Mechanics — **08/2021 – present**

Los Alamos National Laboratory (LANL) — Los Alamos, NM
Post-doctoral fellow — **2019 – 08/2021**

Los Alamos National Laboratory (LANL) — Los Alamos, NM
Graduate Student Research Assistant — **2015 – 2019**

Lehigh University — Bethlehem, PA
Graduate Research Assistant — **2012 – 2019**

Education:

Ph.D. in Mechanical Engineering — August 2019
Lehigh University, Bethlehem, PA
Dissertation: Dynamics of Buoyancy-Driven Variable-Density Non-Boussinesq Turbulence
Advisor: Prof. Arindam Banerjee, **co-advisor:** Dr. Daniel Livescu (LANL)

M.Sc. in Mechanical Engineering — August 2015
Lehigh University, Bethlehem, PA
Thesis: Exploring Initial Condition Effects on Variable Acceleration Rayleigh Taylor Instability using Implicit Large Eddy Simulations
Advisor: Prof. Arindam Banerjee, **co-advisor:** Prof. Andrew Lawrie

B.Sc. in Mechanical Engineering and Industrial Engineering (double major) — 2012
Istanbul Technical University, Istanbul, Turkey

Awarded Computational Allocation Grants:

- Denis Aslangil (PI) and M. Wong, "Compressibility effects in two-dimensional Rayleigh-Taylor Instability", US NSF - XSEDE Startup allocation 2020-2022.
- D. Livescu, A. Banerjee and Denis Aslangil, "Non-Boussinesq effects on buoyancy-driven variable-density turbulence", Argonne Leadership Computing Facility Award, 60 Million processor hours.
- D. Livescu and Denis Aslangil, "Variable-density turbulence", Institutional Computing Program at Los Alamos National Laboratory Award, 15 Million processor hours.
- D. Livescu and Denis Aslangil, "Variable-density under variable acceleration histories" Institutional Computing Program at Los Alamos National Laboratory Award, 8 Million processor hours.

Publications and Invited Talks

Published Journal Papers (Peer Reviewed)

1) **Denis Aslangil**, Andrew Lawrie, and Arindam Banerjee, *"Effects of variable deceleration periods on Rayleigh-Taylor instability with acceleration reversals"*, Phys. Rev. E **105**, 065103 (2022).
2) Juan A. Saenz, **Denis Aslangil** and Daniel Livescu, *"Filtering, averaging and scale dependency in homogeneous variable-density turbulence"*, Phys. of Fluids, 33, 025115 (2021).
3) **Denis Aslangil**, Daniel Livescu and Arindam Banerjee, *"Effects of Atwood and Reynolds numbers on the evolution of buoyancy-driven homogeneous variable-density turbulence"*, J. Fluid Mech. **895**, A12 (2020).
4) **Denis Aslangil**, Zachary Farley, Arindam Banerjee and Andrew Lawrie *Rayleigh-Taylor Instability with varying periods of zero acceleration"*, J. Fluids Engineering, **142** (12) (2020).
5) **Denis Aslangil**, Daniel Livescu and Arindam Banerjee, *"Acceleration reversal effects on buoyancy-driven variable-density turbulence"*, Proceedings of 22nd Australasian Fluid Mechanics Conference AFMC2020, Brisbane, Australia, 7-10 December, Published by The University of Queensland, Editors H. Chanson and R. Brown, Paper 125, (DOI: 10.14264/a55b8c2) (ISBN 978-1-74272-341-9).
6) **Denis Aslangil**, Daniel Livescu and Arindam Banerjee, *"Buoyancy-driven homogeneous variable-density turbulence with asymmetric initial density distributions"*, Physica D: Nonlinear Phenomena **406**, 132444 (2020).
7) **Denis Aslangil**, Daniel Livescu and Arindam Banerjee, *"Flow regimes in buoyancy-driven variable-density turbulence"*, in: Örlü R., Talamelli A., Peinke J., Oberlack M. (eds) Progress in Turbulence VIII. iTi 2018. Springer Proceedings in Physics, vol 226. Springer, Cham.
8) Nairita Pal, Susan Kurien, Timothy Clark, **Denis Aslangil** and Daniel Livescu, *"Two-point spectral model for variable-density homogeneous turbulence"* Phys. Rev. Fluids **3**, 124608 (2018).
9) **Denis Aslangil**, Arindam Banerjee, and Andrew Lawrie "*Numerical investigation of initial condition effects on Rayleigh Taylor instability with acceleration reversals*" Phys. Rev. E **94**, 053114 (2016).

Journal Articles (under review)

10) Yen Ting Lin, Robert B. Lowrie, **Denis Aslangil**, Yiğit Subaşı, and Andrew T. Sornborger *"Challenges for quantum computation of nonlinear dynamical systems using linear representations"* under review at Phys. Rev. Research (2022) arXiv:2202.02188.
11) **Denis Aslangil** and ManLong Wong, *"Strongly isothermally Stratified Multimode Rayleigh-Taylor instability"* to be submitted Physics of Fluids (2022).

Published Conference Papers and Extended Abstracts

12) Tyler Prine, **Denis Aslangil** and ManLong Wong, *"Study of iso-thermal stratification strength on 2D multi-mode compressible Rayleigh-Taylor instability",* to be presented at AIAA SciTech Forum 2023.
13) **Denis Aslangil** and ManLong Wong, *"Study of iso-thermal stratification strength on 2D multi-mode compressible Rayleigh-Taylor instability",* presented at AIAA SciTech Forum 2022.
14) ManLong Wong and **Denis Aslangil** *" Direct numerical simulations of 2D multi-mode compressible Rayleigh-Taylor instability to explore the effects of different iso-thermal stratification strengths",* presented at 17th IWPCTM Atlanta GA, 2022.
15) Tyler Prine, **Denis Aslangil** and ManLong Wong *"Numerical investigation of compressibility and Atwood number effects on the single-mode iso-thermally stratified Rayleigh-Taylor Instability",* presented at the 17th International Workshop on the Physics at Compressible Turbulent Mixing, Atlanta GA, 2022.
16) **Denis Aslangil**, Andrew Lawrie, and Arindam Banerjee *"Rayleigh-Taylor instability with variable acceleration reversal(s)",* presented at the 17th International Workshop on the Physics at Compressible Turbulent Mixing, Atlanta GA, 2022.
17) **Denis Aslangil**, Daniel Livescu, and Arindam Banerjee *" Different initial composition ratio effects on variable-density turbulent mixing",* presented at the17th IWPCTM Atlanta GA, 2022.

18) Xingyu Su, Robin Walters, **Denis Aslangil**, Rose Yu, *"Forecasting variable-density 3D turbulent flow"*, accepted, to be presented at Simulation with Deep Learning (SimDL) International Conference on Learning Representations (ICLR) Workshop, 2021.
19) Elif Ecem Bas, **Denis Aslangil** and M. Ali Moustafa, *"Predicting the non-linear seismic response of structural braces using machine learning"* ASME International Mechanical Engineering Congress and Exposition, 2020.
20) **Denis Aslangil**, Daniel Livescu, Arindam Banerjee, *"Variable-density effects on turbulent mixing."*, presented at the 16th International Workshop on the Physics at Compressible Turbulent Mixing, Marseille, France, 2018.
21) **Denis Aslangil**, Daniel Livescu, and Arindam Banerjee *"High-Atwood number effects on buoyancy-driven variable density homogeneous turbulence",* presented at the 16th European Turbulence Conference, Stockholm, Sweden 2017.
22) **Denis Aslangil**, Daniel Livescu, and Arindam Banerjee *"High-Atwood number effects on buoyancy-driven variable density homogeneous turbulence",* presented at the 15th European Turbulence Conference, Delft Netherlands, 2015.

Invited Talks

23) **Denis Aslangil** *"Buoyancy-Driven Variable-Density Turbulence"*, Department of Aerospace Engineering and Mechanics, the University of Alabama, Tuscaloosa AL, 2021
24) **Denis Aslangil** *"Buoyancy-Driven Variable-Density Turbulence"*, Department of Mathematics, the University of Alabama, Tuscaloosa AL, 2022
25) **Denis Aslangil** *"Reynolds and Atwood number effects on the evolution of buoyancy-driven homogeneous variable density turbulence",* Computational Physics and Methods, Los Alamos National Laboratory, Los Alamos, 2018.
26) **Denis Aslangil** *"Homogeneous variable-density turbulence",* Arizona-Los Alamos Days, The University of Arizona, Tucson, AZ, 2018.

Conference Talks (first authors only)

27) **Denis Aslangil,** *"Buoyancy-Driven Variable-Density Turbulence"*, ICCMAE 2022: The Second International Conference on Computational Methods and Applications in Engineering (May 2022).
28) **Denis Aslangil**, Daniel Livescu, Arindam Banerjee, Q08:10, *"Buoyancy-driven homogeneous turbulence with large density fluctuations"*, American Physical Society - Division of Fluid Dynamics, Chicago (virtual), IL (November 2020).
29) **Denis Aslangil**, Juan A. Saenz and Daniel Livescu, L04.00005, *"Filter-width and Atwood number effects in filtered homogeneous variable density turbulence"*, American Physical Society - Division of Fluid Dynamics, Seattle, WA (November 2019).
30) **Denis Aslangil**, Daniel Livescu, Arindam Banerjee, M01.00040, *"Homogeneous variable-density turbulence with asymmetric initial density distributions"*, American Physical Society - Division of Fluid Dynamics, Seattle, WA (November 2019).
31) **Denis Aslangil**, Zachary K. Farley, Arindam Banerjee, Andrew G. W. Lawrie, G28.00003, *"On the effects of variable deceleration periods on Rayleigh-Taylor instability with multiple acceleration reversals"*, American Physical Society - Division of Fluid Dynamics, Atlanta, GA (November 2018).
32) **Denis Aslangil**, Daniel Livescu, Arindam Banerjee, M29.00008, *"Density-ratio effects on buoyancy-driven variable-density turbulent mixing."*, American Physical Society - Division of Fluid Dynamics, Denver, CO (November 2017).
33) **Denis Aslangil**, Daniel Livescu, Arindam Banerjee, M34.00006, *"Non-Boussinesq effects on buoyancy-driven variable-density turbulence"*, American Physical Society - Division of Fluid Dynamics Portland, OR (November 2016).
34) **Denis Aslangil**, Daniel Livescu, Arindam Banerjee, D40.00003, *"Reynolds and Atwood Numbers Effects on Homogeneous Rayleigh Taylor Instability"*, American Physical Society - Division of Fluid Dynamics, Boston, MA (November 2015).

35) **Denis Aslangil**, Andrew Lawrie, Arindam Banerjee, A22.00006, *"Rayleigh Taylor Instability with Acceleration Reversals"* American Physical Society - Division of Fluid Dynamics, San Francisco, CA (November 2014).
36) **Denis Aslangil**, Andrew Lawrie, Arindam Banerjee *"Effect of initial conditions on late-time evolution to turbulence of Rayleigh Taylor instability under variable acceleration histories"*, Int. Centre for Theoretical Physics-Turbulent Mixing and Beyond Workshop, Trieste, Italy (August 2014).
37) **Denis Aslangil**, Andrew Lawrie, Arindam Banerjee, L30.00006, *"Initial condition effects on turbulent Rayleigh Taylor instability under variable acceleration history."*, American Physical Society - Division of Fluid Dynamics, Pittsburgh, PA (November 2013).

Advising:

PhD Students:

- Ahmet Furkan Kula (AEM) Developing high-fidelity high-order solver for bio-inspired fluid-dynamics
- Paul Mekhedjian (part-time) (AEM) Optimizing of high-fidelity turbulence and plasma solvers on GPUs

MS Students:

- Brian Goldstein (AEM) Variable-density jet flows
- Tyler Prine (ME & AEM) Two-dimensional compressible Rayleigh-Taylor instability

Undergraduate students:

- Darren Ferrier (AEM) Designing autonomous morphing blades (computational)
- Eric Barr (AEM) Multi-material plasma flow
- Ian Harlow (ME) Designing autonomous morphing blades (experimental)
- Nick Pak (ME) Rayleigh-Taylor instability under variable acceleration histories

Undergraduate Alumni:

- Benjamin Robertson (BS in AEM 2022) Analyzing homogeneous isotropic turbulence,

Teaching:

AEM 622: Turbulent Flows (Spring 2023 -scheduled-)

AEM 420: Computational Fluid Dynamics, (Fall 2022 SOI: 4.8/5.0, Fall 2023)

AEM 311: Fluid Mechanics (thought to Aerospace, Mechanical, and Civil and Environmental Engineering sophomore students), Spring 2022 SOI: 4.5/5.0

Awards and Honors:

- Outstanding Student Opinion of Instruction, given to the Department of Aerospace Engineering and Mechanics faculty member who has an average Student Opinion of Instruction score of 4.50/5.00 or greater (Fall 2021).
- Selected for participating in the Argonne Training Program on Extreme-Scale Computing, ATPESC 2020 in Chicago IL, which is a part of the Exascale Computing Project, and a collaborative effort of the DOE Office of Science and the National Nuclear Security Administration.
- Awarded the first prize in the best theoretical approach category at the 2019 ASME IMECE U.S. National Science Foundation student poster competition (Awarded among 178 poster presentations).

- Awarded Non-Academic Research Internships for Graduate Students Supplemental Funding, 2018 by U.S. National Science Foundation.
- University Scholarship of Lehigh University, the Department of Mechanical Engineering and Mechanics, 2012-2013 (Awarded to the top student of the incoming graduate class of over 50 graduate students).
- Graduated with double major in Mechanical Engineering and Industrial Engineering concurrently in four years, 2012.
- Secured an overall rank of 3 out of 300 in Mechanical Engineering Department, Istanbul Technical University, 2012.
- Secured High Honor List in Mechanical Engineering Department, Istanbul Technical University, from 2008 to 2012.
- Secured the 3rd place in Istanbul Chess Championship, 2003 and 2007.

Service:

Conference organization and chairing:

- Local Organization Committee, International Workshop on Physics of Compressible Turbulent Mixing 2024, Bristol UK.
- Session chair, American Physical Society - Division of Fluid Dynamics, Indianapolis, IN, November 2022.
- Reviewer, American Institute of Aeronautics and Astronautics, AVIATION Forum, June 2021.
- Session chair, American Institute of Aeronautics and Astronautics, SciTech Forum, January 2021.
- Topic co-organizer, Fluids Engineering Division Summer Meeting 2020, Orlando, FL, July 2020.

Outreach activities:

- Invited talk at the Northridge Middle School, Tuscaloosa AL, 2022.
- Scientific judge at Los Alamos National Laboratory Student Symposium, 2020.
- Invited lecturer on Fluid Dynamics at the Summer Physics Camp for Young Women at Los Alamos National Laboratory 2020.
- Scientific judge at Santa Fe Mathematics Days (high School students), 2018, 2019.
- Invited lecturer at Santa Fe Mathematics Days (high School students), 2018.

Journals reviewed:

- Physical Review Fluids
- Physical Review Letters
- Physical Review E
- Physics of fluids
- Renewable Energy
- Physica D: Nonlinear Phenomena
- ASME J. of Fluids Engineering
- International J. of Multi-phase Flow

Professional Affiliations

- American Society of Mechanical Engineering (ASME)
- American Physical Society (APS)
- American Chemical Society (ACS)
- American Institute of Aeronautics and Astronautics (AIAA)
- American Geophysical Union (AGU)
- Australasian Fluid Mechanics Society (AFMS)