Donald E. Willcox / Publications and Talks

Refereed Publications:

26. *ERF: Energy Research and Forecasting Model*

    A. Lattanzi, A. Almgren, E. Quon, M. Natarajan, B. Kosovic, J. Mirocha, B. Perry, D. Wiersema, D. Willcox, X. Yuan, W. Zhang

    2024, Submitted to the Journal of Advances in Modeling Earth Systems, arXiv:2412.04395

25. *Code Generation for AMReX with Applications to Numerical Relativity*

    A. J. Peterson, D. Willcox, and P. Moesta

    2023, Classical and Quantum Gravity, 40, 245013

24. *Dimming the Lights: 2D Simulations of Deflagrations of Hybrid C/O/Ne White Dwarfs using FLASH*

    C. Feldman, N. Gutierrez, E. Eisenberg, D. E. Willcox, D. M. Townsley, and A. C. Calder

    2023, Astrophysical Journal, 959, 112

23. *ERF: Energy Research and Forecasting*

    A. Almgren, A. Lattanzi, R. Haque, P. Jha, B. Kosovic, J. Mirocha, B. Perry, E. Quon, M. Sanders, D. Wiersema, D. Willcox, X. Yuan, W. Zhang

    2023, Journal of Open Source Software, 8, 87

22. *Particle-in-Cell Simulations of Relativistic Magnetic Reconnection with Advanced Maxwell Solver Algorithms*

    H. Klion, R. Jambunathan, M. E. Rowan, E. Yang, D. Willcox, J. L. Vay, R. Lehe, A. Myers, A. Huebl, W. Zhang

    2023, Astrophysical Journal, 952, 8

21. *pynucastro: A Python Library for Nuclear Astrophysics*

    A. Smith Clark, E. T. Johnson, Z. Chen, K. Eiden, D. E. Willcox, B. Boyd, L. Cao, C. J. DeGrendele, M. Zingale,

    2023, Astrophysical Journal, 947, 65

20. *Neural Networks for Nuclear Reactions in MAESTROeX*

    D. Fan, D. E. Willcox, C. DeGrendele, M. Zingale, A. Nonaka,

    2022, Astrophysical Journal, 940, 134

19. *Dark Matter from Axion Strings with Adaptive Mesh Refinement*

    M. Buschmann, J. W. Foster, A. Hook, A. Peterson, D. E. Willcox, W. Zhang, & B. R. Safdi

    2022, Nature Communications, 13, 1

18. *Neutrino Fast Flavor Instability in Three Dimensions*

    S. Richers, D. E. Willcox, & N. M. Ford

    2021, Physical Review D, 104, 103023

17. *Practical Effects of Integrating Temperature with Strang Split Reactions*

    M. Zingale, M. P. Katz, D. E. Willcox, & A. Harpole

    2021, Research Notes of the AAS, 5, 71

16. *Dynamics of Laterally Propagating Flames in X-Ray Bursts. II. Realistic Burning & Rotation*

    A. Harpole, N. M. Ford, K. Eiden, M. Zingale, D. E. Willcox, Y. Cavecchi, & M. P. Katz

    2021, Astrophysical Journal, 912, 36

15. *Particle-in-cell Simulation of the Neutrino Fast Flavor Instability*

    S. Richers, D. E. Willcox, N. M. Ford, & A. Myers

    2021, Physical Review D, 103, 083013

14. *Preparing Nuclear Astrophysics for Exascale*

    M. Katz, A. Almgren, M. Barrios Sazo, K. Eiden, K. Gott, A. Harpole, J. Sexton, D. Willcox, W. Zhang, & M. Zingale

    Published in Supercomputing 20.

13. *CASTRO: A Massively Parallel Compressible Astrophysics Simulation Code*

    A. Almgren, M. Barrios Sazo, J. Bell, A. Harpole, M. Katz, J. Sexton, D. Willcox, W. Zhang, M. Zingale

    2020, Journal of Open Source Software, 5, 54, 2513

12. *Dynamics of Laterally Propagating Flames in X-Ray Bursts. I. Burning Front Structure*

    K. Eiden, M. Zingale, A. Harpole, D. Willcox, Y. Cavecchi, & M. P. Katz

    2020, Astrophysical Journal, 894, 1

11. *MAESTROeX: A Massively Parallel Low Mach Number Astrophysical Solver*

    D. Fan, A. Nonaka, A. Almgren, D. Willcox, A. Harpole, & M. Zingale

    2019, Journal of Open Source Software, 4, 43, 1757

10. *SN Ia Explosions from Hybrid Carbon-Oxygen-Neon White Dwarf Progenitors That Have Mixed During Cooling*

    C. N. Augustine, D. E. Willcox, J. Brooks, D. M. Townsley, & A. C. Calder

    2019, Astrophysical Journal, 887, 188

9. *The Castro AMR Simulation Code: Current and Future Developments*

    M. Zingale, A. S. Almgren, M. Barrios Sazo, J. B. Bell, K. Eiden, A. Harpole, M. P. Katz, A. J. Nonaka, D. E. Willcox, & W. Zhang

    2019, Journal of Physics: Conference Series, 1623, 012021

8. *Modelling low Mach number stellar hydrodynamics with MAESTROeX*

   A. Harpole, D. Fan, M. P. Katz, A. J. Nonaka, D. E. Willcox, & M. Zingale

   2019, Journal of Physics: Conference Series, 1623, 012015

7. *Toward Resolved Simulations of Burning Fronts in Thermonuclear X-ray Bursts*

   M. Zingale, K. Eiden, Y. Cavecchi, A. Harpole, J. B. Bell, M. Chang, I. Hawke, M. P. Katz, C. M. Malone, A. J. Nonaka, D. E. Willcox, & W. Zhang

   2019, Journal of Physics: Conference Series, 1225, 012005

6. *Thermonuclear (Type Ia) Supernovae and Progenitor Evolution*

   A. C. Calder, D. E. Willcox, C. J. DeGrendele, D. Shangase, M. Zingale, & D. M. Townsley

   2019, Journal of Physics: Conference Series, 1225, 012002

5. *Quantification of Incertitude in Black Box Simulation Codes*

   A. C. Calder, M. M. Hoffman, D. E. Willcox, M. P. Katz, F. D. Swesty, & S. Ferson

   2018, Journal of Physics: Conference Series, 1031, 012016

4. *pynucastro: an interface to nuclear reaction rates and code generator for reaction network equations*

   D. E. Willcox & M. Zingale

   2018, Journal of Open Source Software, 3(23), 588

3. *Meeting the Challenges of Modeling Astrophysical Thermonuclear Explosions: Castro, Maestro, and the AMReX Astrophysics Suite*

   M. Zingale, A. S. Almgren, M. G. Barrios Sazo, V. E. Beckner, J. B. Bell, B. Friesen, A. M. Jacobs, M. P. Katz, C. M. Malone, A. J. Nonaka, D. E. Willcox, & W. Zhang

   2018, Journal of Physics: Conference Series, 1031, 012024

2. *Cosmic Chandlery with Thermonuclear Supernovae*

   A. C. Calder, B. K. Krueger, A. P. Jackson, D. E. Willcox, B. J. Miles, & D. M. Townsley

   2017, Journal of Physics: Conference Series, 837, 012005

1. *Type Ia Supernova Explosions From Hybrid Carbon-Oxygen-Neon White Dwarf Progenitors*

   D. E. Willcox, D. M. Townsley, A. C. Calder, P. Denissenkov, & F. Herwig

   2016, Astrophysical Journal, 832, 13

Meeting Talks / Invited Talks / Seminars:

07/15/2021 Seminar for the CS Summer Student Seminar Series, Computing Sciences, Lawrence Berkeley National Laboratory, *Supercomputing For Nuclear Astrophysics*

04/19/2021 Invited Speaker in APS April Meeting 2021 Session T05, *Neutrino Flavor Transformations with Emu: A New Particle-in-Cell Code for Quantum Kinetics*

03/02/2021 Speaker in SIAM CSE 2021 Minisymposium MS137, *Towards Surrogate Models for Nuclear Reactions in Astrophysics*

07/09/2020 Seminar for the CS Summer Student Seminar Series, Computing Sciences, Lawrence Berkeley National Laboratory, *Simulating Supernovae with Supercomputers*

01/31/2020 Talk at the 1st Annual CS Area Postdoc Symposium, Computing Sciences, Lawrence Berkeley National Laboratory, *Towards ExaScale Supernovae Simulations*

11/15/2017 Seminar for the Student Seminar Series, Institute for Advanced Computational Sciences, Stony Brook University, *Stellar Explosion Mechanics: Properties and Physical Processes in White Dwarf Interiors*

10/05/2017 Talk at the Interdisciplinary Theoretical and Computational Physical Science meeting, Tokyo Institute of Technology, Japan, *The Dynamics and Origins of Thermonuclear (Type Ia) Supernovae*

09/29/2017 Talk at NY Area Computational Hydro Workshop, Flatiron Institute/CCA, *A Brief Tour of the AMReX Astrophysics Suite of Codes*

06/28/2017 Seminar for the Research Café Series, Center for Inclusive Education, Stony Brook University, *White Dwarfs as Type Ia Supernovae Progenitors*

06/16/2017 Invited talk at Current Challenges in the Physics of White Dwarf Stars, Santa Fe, NM, *Simulations of Various White Dwarf Progenitor Models for Type Ia Supernovae*

06/14/2017 Invited astrophysics seminar at Los Alamos National Laboratory, NM, *Status of Recent Work for Type Ia Supernovae Progenitors: Hybrid C-O-Ne White Dwarfs, the Convective Urca Process, and Accelerated Reaction Networks*

02/05/2017 Talk at JINA-CEE Frontiers in Nuclear Astrophysics: Junior Researchers Workshop, Michigan State University, *Elucidating the Convective Urca Process in Pre-Supernova White Dwarfs Using Three-Dimensional Simulations*

Conference Posters:

13. *SedonaEx: A Monte Carlo Radiation Transfer Code for Astrophysical Events,*

    D. E. Willcox, A. S. Almgren, D. Kasen, A. Myers, & W. Zhang

    SIAM CSE 2019 Meeting, Spokane, WA (Best Poster Prize)

12. *Visualizing Nuclear Reaction Rates and Constructing Networks with pynucastro*

    D. E. Willcox, A. Jacobs, X. Li, & M. Zingale

    2019, American Astronomical Society Meeting 233, 457.05

11. *Computational Astrophysics and Cosmology*

    D. Fan, J. Sexton, & D. Willcox

    2019, Computational Research Division Capability Review, Lawrence Berkeley National Laboratory

10. *pynucastro: Code Generation and Visualization for Nuclear Reaction Networks,*

    D. E. Willcox, A. Jacobs, X. Li, & M. Zingale

    Bay Area Scientific Computing Day 2018, Sandia National Laboratories, Livermore, CA, December 7, 2018.

9. *Three Dimensional Simulations of the Convective Urca Process in White Dwarf Progenitors of Type Ia Supernovae,*

    D. E. Willcox, D. M. Townsley, M. Zingale, & A. C. Calder

    2017, Current Challenges in the Physics of White Dwarf Stars, Santa Fe, NM, June 12-16, 2017.

8. *Elucidating the Convective Urca Process in Pre-Supernova White Dwarfs Using Three-Dimensional Simulations,*

    D. E. Willcox, D. M. Townsley, M. Zingale, & A. C. Calder

    2017, JINA-CEE Frontiers in Nuclear Astrophysics Meeting, February 7-9, 2017.

7. *Three-Dimensional Simulations of the Convective Urca Process in Pre-Supernova White Dwarfs,*

    D. E. Willcox, D. M. Townsley, M. Zingale, & A. C. Calder

    2017, American Astronomical Society Meeting 229, 244.05

6. *On the Quantification of Incertitude in Astrophysical Simulation Codes,*

    M. M. Hoffman, M. P. Katz, D. E. Willcox, S. Ferson, F. D. Swesty, & A. C. Calder

    2017, American Astronomical Society Meeting 229, 154.27

5. *Thermonuclear Supernova Explosions From Hybrid White Dwarf Progenitors,*

    D. E. Willcox, D. M. Townsley, A. C. Calder, P. Denissenkov, & F. Herwig

    2016, American Astronomical Society Meeting 227, 237.17

4. *A Comparison of Type Ia Supernovae with C-O and Hybrid C-O-Ne White Dwarf Progenitors,*

    D. E. Willcox, D. M. Townsley, A. C. Calder, P. Denissenkov, & F. Herwig

    2015, F.O.E. Fifty-One Erg International Workshop, North Carolina State University, NC.

3. *A Study of Steady-State Detonation Structures for Hybrid C, O, Ne White Dwarf Models,*

    D. E. Willcox, D. M. Townsley, & A. C. Calder

    2014, International Conference: "Type Ia Supernovae: Progenitors, Explosions, and Cosmology," University of Chicago, IL.

2. *Imaging Molecular Structure With High Harmonics,*

    D. E. Willcox, M. A. Reber, Y. Chen, K. Halder, & T. Allison

    2013, Chemistry Research Day, Stony Brook University, NY.

1. *Cavity-Enhanced Transient Absorption Spectroscopy,*

    M. A. Reber, Y. Chen, D. E. Willcox, & T. Allison

    2013, Chemistry Research Day, Stony Brook University, NY.

Non-Refereed Conference Proceedings:

3. *Implementation of Digital Radio Mondiale receiver - Part II,*
   D. E. Willcox, J. Kim, & J. Wineman
   2011, IEEE 43rd Southeastern Symposium on System Theory, Auburn, AL, March 2011.

2. *Implementation of Digital Radio Mondiale Receiver - Part I,*
   D. E. Willcox, J. Kim, C. Loewen, & J. Wineman
   2010, IEEE 42nd Southeastern Symposium on System Theory, Tyler, TX, March 2010.

1. *Diversity Receiver for Digital Radio Mondiale - a multi-year design project,*
   P. Leiffer, J. Kim, R. W. Graff, & D. E. Willcox
   2010, ASEE 2010 Annual Conference & Exposition, Louisville, KY, June 2010.