Don 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, arXiv:2412.04395

    doi.org/10.48550/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

    doi.org/10.1088/1361-6382/ad0b37

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, A. C. Calder

    2023, Astrophysical Journal, 959, 112

    doi.org/10.3847/1538-4357/acf658

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

    doi.org/10.21105/joss.05202

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

    doi.org/10.3847/1538-4357/acd75b

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

    doi.org/10.3847/1538-4357/acbaff

20. *Neural Networks for Nuclear Reactions in MAESTROeX*

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

    2022, Astrophysical Journal, 940, 134

    doi.org/10.3847/1538-4357/ac9a4b

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

    doi.org/10.1038/s41467-022-28669-y

18. *Neutrino Fast Flavor Instability in Three Dimensions*

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

    2021, Physical Review D, 104, 103023

    doi.org/10.1103/PhysRevD.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

    doi.org/10.3847/2515-5172/abf3cb

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

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

    2021, Astrophysical Journal, 912, 36

    doi.org/10.3847/1538-4357/abee87

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

    doi.org/10.1103/PhysRevD.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

    2020, Supercomputing 20 (SC20)

    doi.org/10.1109/SC41405.2020.00095

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

    doi.org/10.21105/joss.02513

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, 6
    doi.org/10.3847/1538-4357/ab80bc

11. *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
    2020, Journal of Physics: Conference Series, 1623, 012021
    doi.org/10.1088/1742-6596/1623/1/012021

10. *Modelling low Mach number stellar hydrodynamics with MAESTROeX*
    A. Harpole, D. Fan, M. P. Katz, A. J. Nonaka, D. E. Willcox, M. Zingale
    2020, Journal of Physics: Conference Series, 1623, 012015
    doi.org/10.1088/1742-6596/1623/1/012015

9. *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
    doi.org/10.21105/joss.01757

8. *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
    doi.org/10.3847/1538-4357/ab511a

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
    doi.org/10.1088/1742-6596/1225/1/012005

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
    doi.org/10.1088/1742-6596/1225/1/012002

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
    doi.org/10.1088/1742-6596/1031/1/012016

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

   doi.org/10.21105/joss.00588

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

   doi.org/10.1088/1742-6596/1031/1/012024

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

   doi.org/10.1088/1742-6596/837/1/012005

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

   doi.org/10.3847/0004-637X/832/1/13

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.