Michael Zingale / Publications and Talks

Refereed Publications

61. *Dynamics of Laterally Propagating Flames in X-ray Bursts. II. Realistic Burning & Rotation,*

    A. Harpole, N. M. Ford, K. Eiden, M. Zingale, A. D. Willcox, Y. Cavecchi, & M. P. Katz, 2021, ApJ, 912, 36

60. *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

59. *Preparing Nuclear Astrophysics for the Exascale,*

    M. Katz, A. Almgren, M. Barrios Sazo, K. Eiden, K. Gott, A. Harpole, J. Sexton, D. Willcox, W. Zhang, & M. Zingale, 2020, accepted to SC20

58. *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, ApJ, 894, 6

57. *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, 14th Int. Conf. on Numerical Modeling of Space Plasma Flows: ASTRONUM-2019 1-5 July 2019, Paris, France

56. *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, 14th Int. Conf. on Numerical Modeling of Space Plasma Flows: ASTRONUM-2019 1-5 July 2019, Paris, France

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

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54. *Improved Coupling of Hydrodynamics and Nuclear Reactions via Spectral Deferred Corrections,*

    M. Zingale, M. P. Katz, J. B. Bell, M. L. Minion, A. J. Nonaka, & W. Zhang, 2019, ApJ, 886, 105

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52. *AMReX: a framework for block-structured adaptive mesh refinement,*

    W. Zhang, A. Almgren, V. Beckner, J. Bell, J. Blaschke, C. Chan, M. Day, B. Friesen, K. Gott, D. Graves, M. P. Katz, A. Myers, T. Nguyen, A. Nonaka, M. Rosso, S. Williams, & M. Zingale, 2019, Journal of Open Source Software, 4, 37, 1370

51. *Numerical Stability of Detonations in White Dwarf Simulations,*

    M. P. Katz & M. Zingale, 2019, ApJ, 874, 169

50. *pyro: a framework for hydrodynamics explorations and prototyping,*

    A. Harpole, M. Zingale, I. Hawke, & T. Chegini, 2019, Journal of Open Source Software, 4, 34, 1265

49. *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

48. *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

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45. *Observatory science with eXTP,*

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44. *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, 1, 012024

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    P. Karpov, M. Barrios Sazo, M. Zingale, W. Zhang, & A. C. Calder, 2017, Journal of Computational Science Education, 8, 25–29

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39. *Double White Dwarf Mergers on Adaptive Meshes I. Methodology and Code Verification,* M. P. Katz, M. Zingale, A. C. Calder, F. D. Swesty, A. S. Almgren, W. Zhang,

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35. *Multidimensional Modeling of Type I X-ray Bursts. II. Two-Dimensional Convection in a Mixed H/He Accretor,*

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Open Books

2. *Teaching and Learning with Jupyter*,

   L. A. Barba, L. J. Barker, D. S. Blank, J. Brown, A. B. Downey, T. George, L. J. Heagy, K. T. Mandli, J. K. Moore, D. Lippert, K. E. Niemeyer, R. R. Watkins, R. H. West, E. Wickes, C. Willing, & M. Zingale

   `https://jupyter4edu.github.io/jupyter-edu-book/`

1. *Introduction to Computational Astrophysical Hydrodynamics*,

   M. Zingale

   `https://github.com/Open-Astrophysics-Bookshelf/numerical_exercises`

White Papers

6. *MMA SAG: Thermonuclear Supernovae,*

   M. Zingale, C. Fryer, A. Hungerford, S. Safi-Harb, R. Trappitsch, R. Fisher, A. Calder, & K. Shen, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 259; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 259 (2019)

5. *Nuclear Physics Exascale Requirements Review: An Office of Science review sponsored jointly by Advanced Scientific Computing Research and Nuclear Physics,*

   J. Carlson, M. J. Savage, R. Gerber, K. Antypas, D. Bard, R. Coffey, E. Dart, S. Dosanjh, J. Hack, I. Monga, M. E. Papka, K. Riley, L. Rotman, T. Straatsma, J. Wells, H. Avakian, Y. Ayyad, S. A. Bass, D. Bazin, A. Boehnlein, G. Bollen, L. J. Broussard, A. Calder, S. Couch, A. Couture, M. Cromaz, W. Detmold, J. Detwiler, H. Duan, R. Edwards, J. Engel, C. Fryer, G. M. Fuller, S. Gandolfi, G. Gavalian, D. Georgobiani, R. Gupta, V. Gyurjyan, M. Hausmann, G. Heyes, W. R. Hix, G. Jansen, R. Jones, B. Joo, O. Kaczmarek, D. Kasen, M. Kostin, T. Kurth, J. Lauret, D. Lawrence, H.-W. Lin, M. Lin, P. Mantica, P. Maris, B. Messer, W. Mittig, S. Mosby, S. Mukherjee, H. A. Nam, W. Nazarewicz, E. Ng, T. O'Donnell, K. Orginos, F. Pellemoine, P. Petreczky, S. C. Pieper, C. H. Pinkenburg, B. Plaster, R. J. Porter, M. Portillo, S. Pratt, M. L. Purschke, J. Qiang, S. Quaglioni, D. Richards, Y. Roblin, B. Schenke, R. Schiavilla, S. Schlichting, N. Schunck, P. Steinbrecher, M. Strickland, S. Syritsyn, B. Terzic, R. Varner, J. Vary, S. Wild, F. Winter, R. Zegers, H. Zhang, V. Ziegler, & M. Zingale 2017, US Department of Energy, Washington, DC (United States). Advanced Scientific Computing Research and Nuclear Physics

4. *The Importance of Computation in Astronomy Education,*

   M. Zingale, F. X. Timmes, R. Fisher, & B. W. O'Shea, 2016, white paper submitted to the AAS Education Taskforce call
   (`https://aas.org/posts/opportunity/2016/04/aas-task-force-education-begins-its-work`)

3. *White Paper on Nuclear Astrophysics,*

   A. Arcones, D. Bardayan, T. Beers, L. Berstein, J. Blackmon, M. Bronson, A. Brown, E. Brown, C. Brune, A. Champagne, A. Chieffi, A. Couture, P. Danielewicz, R. Diehl, M. El-Eid, J. Escher, B. Fields, C. Frohlich, F. Herwig, W. R. Hix, C. Iliadis, W. Lynch, G. McLaughlin, B. Meyer, A. Mezzacappa, F. Nunes, B. O'Shea, M. Prakash, B. Pritychenko, S. Reddy, E. Rehm, G. Rogachev, R. Rutledge, H. Schatz, M. Smith, I. Stairs, A. Steiner, T. Strohmayer, F. Timmes,

D. Townsley, M. Wiescher, R. Zegers, & M. Zingale, 2016, Community white paper based on 2012 JINA Town Meeting in Detroit, MI, and 2014 APS Town Meeting in College Station, TX

2. *Modeling Astrophysical Explosions with Sustained Exascale Computing*,

   M. Zingale, A. C. Calder, C. M. Malone, & F. X. Timmes, 2015, Response to RFI NOT-GM-15-122: *Science Drivers Requiring Capable Exascale High Performance Computing*

1. *The LOFT perspective on neutron star thermonuclear bursts*,

   J. J. M. in 't Zand, D. Altamirano, D. R. Ballantyne, S. Bhattacharyya, E. F. Brown, Y. Cavecchi, D. Chakrabarty, J. Chenevez, A. Cumming, N. Degenaar, M. Falanga, D. K. Galloway, A. Heger, J. José, L. Keek, M. Méndez, S. Mahmoodifar, M. Linares, C. M. Malone, M. C. Miller, F. B. S. Paerels, J. Poutanen, A. Różańska, H. Schatz, M. Serino, V. F. Suleimanov, T. E. Strohmayer, F.-K. Thielemann, A. L. Watts, N. N. Weinberg, S. E. Woosley, W. Yu, S. Zhang, & M. Zingale, 2015, White Paper in Support of the Mission Concept of the Large Observatory For x-ray Timing

Invited Lectures / Seminars / Colloquia

05/20/2022	FastMath seminar, *Algorithmic Improvements for Coupling Hydrodynamics and Reactions in Astrophysical Flows*
05/04/2022	Invited speaker in the AMReX Breakout Session of the 2022 ECP Annual Meeting, *Castro Developments for Exascale Platforms*
11/17/2021	Invited panelist for KITP Transport in Stars workshop on convection (KITP, Santa Barbara, CA)
10/19/2021	Astronomy Society of Ireland Colloquium, *The Challenges of Modeling Astrophysical Reactive Flows*
10/18/2021	Michigan State University, Department of Computational Mathematics, Science and Engineering Colloqium, *The Challenges of Modeling Astrophysical Reactive Flows*
03/02/2021	Invited talk in the *Computational Methods in Explosive Nuclear Astrophysics* session at the SIAM Computational Science and Engineering 2021 meeting, *Modeling Astrophysical Reacting Flows*
01/30/2020	Princeton University, Department of Astrophysical Sciences Thunch talk, *Modeling Stellar Explosions*
01/09/2020	Invited presentation at Texas Advanced Computing Center *Workshop on Future Directions in Extreme Scale Computing for Scientific Grand Challenges* on *Challenges in Modeling Astrophysical Thermonuclear Explosions*
11/06/2019	Stony Brook University, Department of Physics and Astronmomy Colloquium, *Modeling Thermonuclear X-ray Bursts*
07/05/2019	Invited talk at AstroNum 2019–14th International Conference on Numerical Modeling of Space Plasma Flows, Paris, France, *Improved Coupling of Hydrodynamics and Nuclear Burning in Astrophysical Flows using SDC*
02/26/2019	Invited talk in the *Spectral Deferred Correction Methods for Temporal Integration* session at the SIAM Computational Science and Engineering 2019 meeting, *Improved Coupling of Hydrodynamics and Nuclear Burning in Astrophysical Flows using SDC*

10/12/2018 Flatiron Institute Center for Computational Astrophysics Colloquium, *Algorithmic Demands for Modeling X-ray Bursts and Type Ia Supernovae*

08/23/2018 Talk at the TEAMS Collaboration meeting, *StarKiller Microphysics*

06/26/2018 Invited talk at AstroNum 2018—13th International Conference on Numerical Modeling of Space Plasma Flows, Panama City, Florida, *Modeling X-ray Bursts with the AMReX Astrophysics Suite*

08/10/2017 Seminar at LLNL High Energy Density Science Center, LLNL, *Modeling Stellar Explosions with the AMReX Astrophysics Suite*

07/27/2017 Seminar at Computational Science Initiative, BNL, *The AMReX Astrophysics Suite: Simulating the Stars at the Exascale*

06/30/2017 Invited talk at AstroNum 2017—12th International Conference on Numerical Modeling of Space Plasma Flows, St. Malo, France, *Computational Challenges of Modeling X-ray Bursts and Type Ia Supernovae*

06/02/2017 Invited participant / overview talk at Stellar Hydro Days, Univesity of Victoria, *Modeling Stellar Convection and Explosions with Maestro, Castro, and the BoxLib/AMReX Astrophysics Suite*

04/05/2017 Astronomy Seminar at Michigan State University, *Computational Challenges of Modeling X-ray Bursts and Type Ia Supernovae*

02/23/2017 Seminar at Stony Brook Institute for Advanced Computational Science, *Computational Challenges of Modeling X-ray Bursts and Type Ia Supernovae*

06/15/2016 Case study talk at DOE Nuclear Physics / ASCR Exascale Requirements Review, Gaithersburg, MD, *Thermonuclear Transients*

04/29/2016 Seminar at Oak Ridge National Laboratory, *Modeling Stellar Explosions with Maestro, Castro, and the BoxLib Astrophysics Suite*

03/17/2016 Talk at the *18th Workshop on Nuclear Astrophysics*, Ringberg Castle, Tegernsee, Germany, *Models of convection in X-ray bursts and pre-SNe Ia white dwarfs*

02/26/2016 Seminar at the U. S. Naval Research Laboratory, *Computational Challenges of Modeling X-ray Bursts and Type Ia Supernovae*

08/02/2015 Invited talk at the *International Colloquium on the Dynamics of Explosions and Reactive Systems (ICDERS)*, Leeds, UK, *Understanding Ignition in Type Ia Supernovae*

06/22/2015 Invited talk at the *OLCF User's Meeting*, ORNL, Oak Ridge, TN, *Computation Challenges of Modeling Astrophysical Explosions*

06/03/2015 Invited talk at the *Fifty One Ergs* meeting, NCSU, *Modeling the Early Phases of Type Ia Supernovae*

05/24/2015 "Setting the Stage" talk on *Stellar Hydrodynamics* at the JINA *GNASH: The anomalous metal-poor stars and convective-reactive nuclear astrophysics* workshop, Victoria, BC, Canada, `http://jina-cee.phys.uvic.ca/gnash-workshop/talks-and-contributions/monday/setting-the-stage`

04/08/2015 Seminar at U Mass Darthmouth, *Algorithmic Developments for Modeling Stellar Explosions*

01/15/2015 CCS-2 Seminar at Los Alamos National Laboratory, *The Challenges of Modeling Type Ia Supernovae and X-ray Bursts*

09/15/2014 Invited talk at the *Type Ia Supernovae: progenitors, explosions, and cosmology* conference, Chicago, IL, *Modeling the Early Phases of SNe Ia*, `https://kicp-workshops.uchicago.edu/sn2014/presentations.php`

04/30/2014 Invited presentation at *Large Scale Computing and Storage Requirements for Nuclear Physics (NP): Target 2017* meeting, *Convection in X-ray Bursts*

02/28/2014 Astronomy Seminar at the Center for Cosmology and Particle Physics, New York University, *Modeling Convective Burning in Type Ia Supernovae and X-ray Bursts*

09/27/2013 Nuclear Theory Seminar at Brookhaven National Lab, *Modeling Convective Burning in Type Ia Supernovae and X-ray Bursts*

07/09/2013 Seminar at the Flash Center, University of Chicago, *Modeling Convective Burning in Type Ia Supernovae and X-ray Bursts*

10/10/2012 Astro Computation working group at *2012 Nuclear Astrophysics Town Meeting*, *Thermonuclear Driven Events*

04/04/2012 Nuclear Astrophysics Seminar at Ohio University entitled *The Challenges of Modeling Explosive Phenomena*

07/28/2010 Invited talk at the Lorentz Center Workshop on *X-ray Bursts and Burst Oscillations* entitled *The Algorithmic Challenges of Multidimensional Models of X-ray Bursts*, `http://www.lorentzcenter.nl/lc/web/2010/408/info.php3?wsid=408`

05/13/2010 Joint NRAO / UVa Dept. of Astronomy Colloquium (Charlottesville, VA) entitled *Modeling Convection and Ignition in Type Ia Supernovae*

03/31/2010 Center for the Study of Cosmic Evolution Seminar, Dept. of Physics and Astronomy, Michigan State University (E. Lansing, MI), entitled: *Modeling Convection and Ignition in Type Ia Supernovae*

05/12/2009 Astronomy Seminar at the American Museum of Natural History (New York, NY), entitled: *Modeling Convection and Ignition in Type Ia Supernovae*

09/30/2008 Astronomy Seminar at the Institute for Advanced Studies (Princeton, NJ), entitled: *New Methods for Modeling Type Ia Supernovae*

07/15/2008 Invited Poster at the *SciDAC 2008* conference (Seattle, WA), entitled: *Astrophysical Applications of the Maestro Code* (with co-authors: A. S. Almgren, J. B. Bell, C. M. Malone, & A. J. Nonaka)

04/06/2007 Astronomy Seminar at Rutgers University (New Brunswick, NJ), entitled: *The Challenges of Modeling Type Ia Supernova*

10/31/2006 Astronomy Colloquia at McGill University (Montreal, CA), entitled: *Understanding Type Ia Supernovae*

06/27/2006 Invited talk at the *SciDAC 2006* conference (Denver, CO), entitled: *The Challenges of Modeling Type Ia Supernovae*

10/03/2005 T-13 Seminar, Los Alamos National Laboratory, entitled: *Simulations of Thermonuclear Flames in Type Ia Supernovae*

06/26/2005	Invited poster at the *SciDAC 2005* conference (San Francisco, CA), *The Physics of Thermonuclear Flames in Type Ia Supernovae*
03/01/2005	Astronomy Seminar at SUNY Stony Brook, *Flame Instabilities in Type Ia Supernovae*
02/23/2005	N Division Seminar, Lawrence Livermore National Laboratory, *Flame Instabilities in Type Ia Supernovae*
12/17/2003	Astrophysics Seminar, Institute for Advanced Study, Princeton, NJ, *Flame Instabilities in Type Ia Supernovae*

Popular Press Features

How Stars Explode, Forbes.com, Oct. 1, 2009
(http://www.forbes.com/2009/09/30/supernovae-universe-science-technology-breakthroughs-stars.html)

Unveiled: The First Full 3-D Model of a Star Going Supernova, Popular Science Online, Sept. 24, 2009
(http://www.popsci.com/military-aviation-amp-space/article/2009-09/first-3-d-models-white-dwarf-supernova)

Flash Upon a Neutron Star, American Scientist, Sept.–Oct. 2000, vol. 88, no. 5, p. 400.

Popular Press Mentions

Stars Go Kaboom, Spilling Cosmic Secrets, Science News, 2009, Vol. 176, #4 (Aug. 15, 2009)
(see also http://www.sciencenews.org/view/feature/id/46029/title/Stars_go_kaboom,_spilling_cosmic_secrets)

Supernova explosion simulated in exquisite detail, New Scientist Online, July 2006
(http://www.newscientist.com/article/dn9604-supernova-explosion-simulated-in-exquisite-detail.html)

Life-or-Death Question: How Supernovas Happen? NY Times, Nov. 9, 2004.

Physics Today cover, Feb. 2002.