

# Carlo Graziani

## Curriculum Vitae

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### Education

Ph.D. in Physics  
University of Chicago, 1993

B.Sc. in Applied Physics  
Columbia University, 1985

### Professional Experience

Scientist in CASE November 2018-Present  
Department of Astronomy & Astrophysics, University of Chicago

Computational Scientist November 2017-Present  
Mathematics and Computer Science Division, Argonne National Laboratory

Research Associate Professor March 2017-October 2017  
Department of Astronomy & Astrophysics, University of Chicago

Senior Research Associate March 2002-March 2017  
Department of Astronomy & Astrophysics, University of Chicago

Senior Research Associate June 2007-April 2014  
Flash Center for Computational Science, University of Chicago

Science Team Member September 1994-March 2008  
*High-Energy Transient Explorer (HETE)*

Research Scientist March 1999-February 2002  
Department of Astronomy & Astrophysics, University of Chicago

Research Associate February 1996-February 1999  
Enrico Fermi Institute, University of Chicago

NRC/NASA Research Associate NASA Goddard Space Flight Center	October 1993-January 1996
Postdoctoral Research Associate University of Chicago	June-September 1993
Graduate Research Assistant University of Chicago	September 1986-June 1993
Graduate Research Assistant Los Alamos National Laboratory	June-August 1989, December 1989
Intern Argonne National Laboratory	June-August 1984
Intern UCLA Tokamak Lab	June-August 1983

## Honors and Awards

*Impact Argonne Award* for internal review excellence, 2021

National Research Council/NASA Research Associate, 1993-1995

NASA Graduate Student Researchers Program Fellow, 1990-1993

Gregor Wentzel Prize for excellence in graduate student teaching, University of Chicago, 1986

## Professional Societies

Society for Industrial and Applied Mathematics  
American Physical Society – Division of Plasma Physics

## Journal Articles Submitted or In Preparation

- [1] B. Blaiszik, C. Graziani, J. L. Olds, and I. Foster. *The Delta Variant Had Negligible Impact on COVID-19 Vaccine Effectiveness in the USA*. 2021. DOI: [10.1101/2021.09.18.21263783](https://doi.org/10.1101/2021.09.18.21263783).
- [2] A. Dasgupta, C. Graziani, and Z. W. Di. *Gaussian Process for Tomography*. 2021. eprint: <https://arxiv.org/pdf/2103.15864>.

- [3] C. Graziani and M. Ngom. *Targeted Adaptive Design*. 2021.
- [4] N. Rittler, C. Graziani, J. Wang, and K. Rao. *A Deep Learning Approach to Probabilistic Forecasting of Weather*. Local copy of draft available at [https://web.cels.anl.gov/~cgraziani/wind\\_forecasting.pdf](https://web.cels.anl.gov/~cgraziani/wind_forecasting.pdf). 2021.

## Refereed Journal Articles

- [5] A. F. A. Bott, P. Tzeferacos, L. Chen, C. A. J. Palmer, A. Rigby, A. R. Bell, R. Bingham, A. Birkel, C. Graziani, D. H. Froula, J. Katz, M. Koenig, M. W. Kunz, C. Li, J. Meinecke, et al. “Time-Resolved Turbulent Dynamo In A Laser Plasma”. In: *Proceedings of the National Academy of Sciences* 118.11 (2021). ISSN: 0027-8424. DOI: [10.1073/pnas.2015729118](https://doi.org/10.1073/pnas.2015729118).
- [6] C. Graziani, R. Rosner, J. M. Adams, and R. L. Machete. “Probabilistic Recalibration Of Forecasts”. In: *International Journal of Forecasting* 37.1 (2021), pp. 1–27. ISSN: 0169-2070. DOI: [10.1016/j.ijforecast.2019.04.019](https://doi.org/10.1016/j.ijforecast.2019.04.019).
- [7] S. Reeves, D. Lee, A. Reyes, C. Graziani, and P. Tzeferacos. “An Application of Gaussian Process Modeling for High-order Accurate Adaptive Mesh Refinement Prolongation”. In: *Communications in Applied Mathematics and Computer Science (Accepted)* (2021). eprint: <https://arxiv.org/abs/2003.08508>.
- [8] L. Chen, A. Bott, P. Tzeferacos, A. Rigby, A. Bell, R. Bingham, C. Graziani, J. Katz, M. Koenig, C. Li, et al. “Transport of High-energy Charged Particles through Spatially Intermittent Turbulent Magnetic Fields”. In: *The Astrophysical Journal* 892.2 (2020), p. 114. DOI: [10.3847/1538-4357/ab7a19](https://doi.org/10.3847/1538-4357/ab7a19).
- [9] A. Reyes, D. Lee, C. Graziani, and P. Tzeferacos. “A Variable High-Order Shock-Capturing Finite Difference Method With GP-WENO”. In: *Journal of Computational Physics* 381 (2019), pp. 189–217. ISSN: 0021-9991. DOI: [10.1016/j.jcp.2018.12.028](https://doi.org/10.1016/j.jcp.2018.12.028).
- [10] A. Reyes, D. Lee, C. Graziani, and P. Tzeferacos. “A New Class Of High-Order Methods For Fluid Dynamics Simulations Using Gaussian Process Modeling: One-Dimensional Case”. In: *Journal of Scientific Computing* 76.1 (2018), pp. 443–480. DOI: [10.1007/s10915-017-0625-2](https://doi.org/10.1007/s10915-017-0625-2).
- [11] P. Tzeferacos, A. Rigby, A. Bott, A. Bell, R. Bingham, A. Casner, F. Cattaneo, E. Churazov, J. Emig, F. Fiuza, et al. “Laboratory Evidence Of Dynamo Amplification Of Magnetic Fields In A Turbulent Plasma”. In: *Nature Communications* 9.1 (2018), p. 591. DOI: [10.1038/s41467-018-02953-2](https://doi.org/10.1038/s41467-018-02953-2).
- [12] A. F. A. Bott, C. Graziani, P. Tzeferacos, T. G. White, D. Q. Lamb, G. Gregori, and A. A. Schekochihin. “Proton Imaging Of Stochastic Magnetic Fields”. In: *Journal of Plasma Physics* 83.6 (2017), p. 905830614. DOI: [10.1017/S0022377817000939](https://doi.org/10.1017/S0022377817000939).
- [13] C. Graziani, P. Tzeferacos, D. Q. Lamb, and C. Li. “Inferring Morphology And Strength Of Magnetic Fields From Proton Radiographs”. In: *Review of Scientific Instruments* 88.12 (2017), p. 123507. DOI: [10.1063/1.5013029](https://doi.org/10.1063/1.5013029).

- [14] P. Tzeferacos, A. Rigby, A. Bott, A. R. Bell, R. Bingham, A. Casner, F. Cattaneo, E. M. Churazov, J. Emig, N. Flocke, F. Fiuza, C. B. Forest, J. Foster, C. Graziani, J. Katz, et al. “Numerical Modeling Of Laser-Driven Experiments Aiming To Demonstrate Magnetic Field Amplification Via Turbulent Dynamo”. In: *Physics of Plasmas* 24.4 (2017), p. 041404. DOI: [10.1063/1.4978628](https://doi.org/10.1063/1.4978628).
- [15] C. Graziani, P. Tzeferacos, D. Lee, D. Q. Lamb, K. Weide, M. Fatenejad, and J. Miller. “The Biermann Catastrophe In Numerical Magnetohydrodynamics”. In: *The Astrophysical Journal* 802.1 (2015), p. 43. DOI: [10.1088/0004-637x/802/1/43](https://doi.org/10.1088/0004-637x/802/1/43).
- [16] A. Lien, T. Sakamoto, N. Gehrels, D. M. Palmer, S. D. Barthelmy, C. Graziani, and J. K. Cannizzo. “Erratum: ‘Probing the Cosmic Gamma-Ray Burst Rate with Trigger Simulations of the Swift Burst Alert Telescope’ (2014, ApJ, 783, 24)”. In: *The Astrophysical Journal* 806.1 (2015), p. 276. DOI: [10.1088/0004-637x/806/2/276](https://doi.org/10.1088/0004-637x/806/2/276).
- [17] P. Tzeferacos, M. Fatenejad, N. Flocke, C. Graziani, G. Gregori, D. Lamb, D. Lee, J. Meinecke, A. Scopatz, and K. Weide. “FLASH MHD Simulations Of Experiments That Study Shock-Generated Magnetic Fields”. In: *High Energy Density Physics* 17.1 (2015), pp. 24–31. DOI: [10.1016/j.hedp.2014.11.003](https://doi.org/10.1016/j.hedp.2014.11.003).
- [18] E. Chatzopoulos, C. Graziani, and S. M. Couch. “Characterizing The Convective Velocity Fields In Massive Stars”. In: *The Astrophysical Journal* 795.1 (2014), p. 92. DOI: [10.1088/0004-637x/795/1/92](https://doi.org/10.1088/0004-637x/795/1/92).
- [19] A. Lien, T. Sakamoto, N. Gehrels, D. M. Palmer, S. D. Barthelmy, C. Graziani, and J. K. Cannizzo. “Probing The Cosmic Gamma-Ray Burst Rate With Trigger Simulations Of The Swift Burst Alert Telescope”. In: *The Astrophysical Journal* 783.1 (2014), p. 24. DOI: [10.1088/0004-637x/783/1/24](https://doi.org/10.1088/0004-637x/783/1/24).
- [20] M. Long, G. C. Jordan IV, D. R. Van Rossum, B. Diemer, C. Graziani, R. Kessler, B. Meyer, P. Rich, and D. Q. Lamb. “Three-Dimensional Simulations Of Pure Deflagration Models For Thermonuclear Supernovae”. In: *The Astrophysical Journal* 789.2 (2014), p. 103. DOI: [10.1088/0004-637x/789/2/103](https://doi.org/10.1088/0004-637x/789/2/103).
- [21] S. M. Couch, C. Graziani, and N. Flocke. “An Improved Multipole Approximation For Self-Gravity And Its Importance For Core-Collapse Supernova Simulations”. In: *The Astrophysical Journal* 778.2 (2013), p. 181. DOI: [10.1088/0004-637x/778/2/181](https://doi.org/10.1088/0004-637x/778/2/181).
- [22] B. Diemer, R. Kessler, C. Graziani, G. C. Jordan IV, D. Q. Lamb, M. Long, and D. R. Van Rossum. “Comparing The Light Curves Of Simulated Type Ia Supernovae With Observations Using Data-Driven Models”. In: *The Astrophysical Journal* 773.2 (2013), p. 119. DOI: [10.1088/0004-637x/773/2/119](https://doi.org/10.1088/0004-637x/773/2/119).
- [23] A. Dubey, A. C. Calder, C. Daley, R. T. Fisher, C. Graziani, G. C. Jordan, D. Q. Lamb, L. B. Reid, D. M. Townsley, and K. Weide. “Pragmatic Optimizations For Better Scientific Utilization Of Large Supercomputers”. In: *The International Journal of High Performance Computing Applications* 27.3 (2013), pp. 360–373. DOI: [10.1177/1094342012464404](https://doi.org/10.1177/1094342012464404).

- [24] M. Fatenejad, B. Fryxell, J. Wohlbier, E. Myra, D. Lamb, C. Fryer, and C. Graziani. “Collaborative Comparison Of Simulation Codes For High-Energy-Density Physics Applications”. In: *High Energy Density Physics* 9.1 (2013), pp. 63–66. DOI: [10.1016/j.hedp.2012.10.004](https://doi.org/10.1016/j.hedp.2012.10.004).
- [25] Y. Kim, G. Jordan IV, C. Graziani, B. Meyer, D. Lamb, and J. Truran. “The Effect of the Pre-detonation Stellar Internal Velocity Profile on the Nucleosynthetic Yields in Type Ia Supernova”. In: *The Astrophysical Journal* 771.1 (2013), p. 55. DOI: [10.1088/0004-637x/771/1/55](https://doi.org/10.1088/0004-637x/771/1/55).
- [26] Z. J. Medin, J. G. Wohlbier, C. L. Fryer, R. M. Rauenzahn, M. Fatenejad, D. Lamb, C. Graziani, B. Fryxell, and E. Myra. “Collaborative Comparison of High-Energy-Density Physics Codes”. In: *Simulation* 900.1 (2013), p. 6.
- [27] R. T. Wollaeger, D. R. van Rossum, C. Graziani, S. M. Couch, G. C. Jordan IV, D. Q. Lamb, and G. A. Moses. “Radiation Transport For Explosive Outflows: A Multigroup Hybrid Monte Carlo Method”. In: *The Astrophysical Journal Supplement Series* 209.2 (2013), p. 36. DOI: [10.1088/0067-0049/209/2/36](https://doi.org/10.1088/0067-0049/209/2/36).
- [28] A. Dubey, C. Daley, J. ZuHone, P. Ricker, K. Weide, and C. Graziani. “Imposing a Lagrangian particle framework on an Eulerian hydrodynamics infrastructure in FLASH”. In: *The Astrophysical Journal Supplement Series* 201.2 (2012), p. 27. DOI: [10.1088/0067-0049/201/2/27](https://doi.org/10.1088/0067-0049/201/2/27).
- [29] G. Jordan IV, C. Graziani, R. Fisher, D. Townsley, C. Meakin, K. Weide, L. Reid, J. Norris, R. Hudson, and D. Lamb. “The Detonation Mechanism of the Pulsationally Assisted Gravitationally Confined Detonation Model of Type Ia Supernovae”. In: *The Astrophysical Journal* 759.1 (2012), p. 53. DOI: [10.1088/0004-637x/759/1/53](https://doi.org/10.1088/0004-637x/759/1/53).
- [30] C. Graziani. “GRBs As Standard Candles: There Is No “Circularity Problem” (And There Never Was)”. In: *New Astronomy* 16.2 (2011), pp. 57–64. DOI: [10.1016/j.newast.2010.08.001](https://doi.org/10.1016/j.newast.2010.08.001).
- [31] D. Lee, G. Xia, C. Daley, A. Dubey, S. Gopal, C. Graziani, D. Lamb, and K. Weide. “Progress In Development Of HEDP Capabilities In Flash’s Unsplit Staggered Mesh MHD Solver”. In: *Astrophysics and Space Science* 336.1 (2011), pp. 157–162. DOI: [10.1007/s10509-011-0654-5](https://doi.org/10.1007/s10509-011-0654-5).
- [32] M. Arimoto, N. Kawai, K. Asano, K. Hurley, M. Suzuki, Y. E. Nakagawa, T. Shimokawabe, N. V. Pazmino, R. Sato, M. Matsuoka, et al. “Spectral-Lag Relations In GRB Pulses Detected With HETE-2”. In: *Publications of the Astronomical Society of Japan* 62.2 (2010), pp. 487–499.
- [33] G. Jordan IV, R. Fisher, D. Townsley, A. Calder, C. Graziani, S. Asida, D. Lamb, and J. Truran. “Three-Dimensional Simulations Of The Deflagration Phase Of The Gravitationally Confined Detonation Model Of Type Ia Supernovae”. In: *The Astrophysical Journal* 681.2 (2008), p. 1448. DOI: [10.1086/588269](https://doi.org/10.1086/588269).

- [34] Y. Shirasaki, A. Yoshida, N. Kawai, T. Tamagawa, T. Sakamoto, M. Suzuki, Y. Nakagawa, A. Kobayashi, S. Sugita, I. Takahashi, et al. “Multiple-Component Analysis of the Time-Resolved Spectra of GRB041006: A Clue to the Nature of the Underlying Soft Component of GRBs”. In: *Publications of the Astronomical Society of Japan* 60.4 (2008), pp. 919–931.
- [35] M. Arimoto, N. Kawai, M. Suzuki, R. Sato, N. V. Pazmino, T. Shimokawabe, T. Ishimura, J. Kotoku, A. Yoshida, T. Tamagawa, et al. “HETE-2 Observations Of The X-Ray Flash XRF 040916”. In: *Publications of the Astronomical Society of Japan* 59.3 (2007), pp. 695–702.
- [36] G. Stratta, S. Basa, N. Butler, J. Atteia, B. Gendre, A. Pélangéon, F. Malacrino, Y. Mellier, D. Kann, S. Klose, et al. “X-Ray Flashes Or Soft Gamma-Ray Bursts?-The Case Of The Likely Distant XRF 040912”. In: *Astronomy & Astrophysics* 461.2 (2007), pp. 485–492.
- [37] M. Suzuki, N. Kawai, T. Tamagawa, A. Yoshida, Y. E. Nakagawa, K. Tanaka, Y. Shirasaki, M. Matsuoka, G. R. Ricker, R. Vanderspek, et al. “Discovery Of A New X-Ray Burst/Millisecond Accreting Pulsar, HETE J1900. 1-2455”. In: *Publications of the Astronomical Society of Japan* 59.1 (2007), pp. 263–268.
- [38] Y. E. Nakagawa, A. Yoshida, S. Sugita, K. Tanaka, N. Ishikawa, T. Tamagawa, M. Suzuki, Y. Shirasaki, N. Kawai, M. Matsuoka, et al. “An Optically Dark GRB Observed By HETE-2: GRB 051022”. In: *Publications of the Astronomical Society of Japan* 58.4 (2006), pp. L35–L39.
- [39] J.-L. Atteia, N. Kawai, R. Vanderspek, G. Pizzichini, G. Ricker, C. Barraud, M. Boer, J. Braga, N. Butler, T. Cline, et al. “HETE-2 Observation Of Two Gamma-Ray Bursts At  $z > 3$ ”. In: *The Astrophysical Journal* 626.1 (2005), p. 292.
- [40] N. Butler, T. Sakamoto, M. Suzuki, N. Kawai, D. Lamb, C. Graziani, T. Donaghy, A. Dullighan, R. Vanderspek, G. Crew, et al. “High-Energy Observations Of XRF 030723: Evidence For An Off-Axis Gamma-Ray Burst?” In: *The Astrophysical Journal* 621.2 (2005), p. 884.
- [41] D. Lamb, T. Donaghy, and C. Graziani. “A Unified Jet Model Of X-Ray Flashes, X-Ray-Rich Gamma-Ray Bursts, And Gamma-Ray Bursts. I. Power-Law-Shaped Universal And Top-Hat-Shaped Variable Opening Angle Jet Models”. In: *The Astrophysical Journal* 620.1 (2005), p. 355.
- [42] F. Martel, M. Matsuoka, J.-F. Olive, N. Kawai, M. Galassi, J. Jernigan, G. Crew, J. Doty, M. Boer, T. Donaghy, et al. “Discovery Of The Short Gamma-Ray Burst GRB 050709”. In: *Nature: International Weekly Journal of Science* 437.7060 (2005), pp. 855–858.
- [43] T. Sakamoto, D. Lamb, N. Kawai, A. Yoshida, C. Graziani, E. Fenimore, T. Donaghy, M. Matsuoka, M. Suzuki, G. Ricker, et al. “Global Characteristics Of X-Ray Flashes And X-Ray-Rich Gamma-Ray Bursts Observed By HETE-2”. In: *The Astrophysical Journal* 629.1 (2005), p. 311.

- [44] R. Sato, T. Sakamoto, J. Kataoka, A. Yoshida, M. Suzuki, J. Kotoku, Y. Urata, Y. Yamamoto, M. Arimoto, T. Tamagawa, et al. “HETE-2 Localization And Observations Of The Gamma-Ray Burst GRB 020813”. In: *Publications of the Astronomical Society of Japan* 57.6 (2005), pp. 1031–1039.
- [45] J. Villasenor, D. Lamb, G. Ricker, J.-L. Atteia, N. Kawai, N. Butler, Y. Nakagawa, J. Jernigan, M. Boer, G. Crew, et al. “Discovery Of The Short  $\gamma$ -Ray Burst GRB 050709”. In: *Nature* 437.7060 (2005), pp. 855–858.
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- [47] R. Vanderspek, T. Sakamoto, C. Barraud, T. Tamagawa, C. Graziani, M. Suzuki, Y. Shirasaki, G. Prigozhin, J. Villasenor, J. Jernigan, et al. “HETE Observations Of The Gamma-Ray Burst GRB 030329: Evidence For An Underlying Soft X-Ray Component”. In: *The Astrophysical Journal* 617.2 (2004), p. 1251.
- [48] C. Barraud, J.-F. Olive, J. Lestrade, J.-L. Atteia, K. Hurley, G. Ricker, D. Lamb, N. Kawai, M. Boer, J.-P. Dezalay, et al. “Spectral Analysis Of 35 GRBs/XRFs Observed With HETE-2/FREGATE”. In: *Astronomy & Astrophysics* 400.3 (2003), pp. 1021–1030.
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- [50] Y. Shirasaki, N. Kawai, A. Yoshida, M. Matsuoka, T. Tamagawa, K. Torii, T. Sakamoto, M. Suzuki, Y. Urata, R. Sato, et al. “Design And Performance Of The Wide-Field X-Ray Monitor On Board The High-Energy Transient Explorer 2”. In: *Publications of the Astronomical Society of Japan* 55.5 (2003), pp. 1033–1049.
- [51] P. Price, S. R. Kulkarni, E. Berger, S. Djorgovski, D. A. Frail, A. Mahabal, D. Fox, F. Harrison, J. Bloom, S. Yost, et al. “GRB 010921: Discovery Of The First High Energy Transient Explorer Afterglow”. In: *The Astrophysical Journal Letters* 571.2 (2002), p. L121.
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- [59] C. Graziani. “Strong-Field Cyclotron Scattering. I-Scattering Amplitudes And Natural Line Width”. In: *The Astrophysical Journal* 412.1 (1993), pp. 351–362.
- [60] D. Q. Lamb, C. Graziani, and I. A. Smith. “Evidence For Two Distinct Morphological Classes Of Gamma-Ray Bursts From Their Short Time Scale Variability”. In: *The Astrophysical Journal Letters* 413 (Aug. 1993), pp. L11–L14.

## Book Chapters

- [61] D. Lamb, T. Donaghy, and C. Graziani. “Gamma-Ray Bursts As A Laboratory For The Study Of Type Ic Supernovae”. In: *Cosmic Explosions in Three Dimensions: Asymmetries in Supernovae and Gamma-Ray Bursts*. Ed. by P. Höflich, P. Kumar, and J. Wheeler. Cambridge Contemporary Astrophysics. Cambridge University Press, 2004, p. 327. URL: <https://books.google.com/books?id=SKvvvY4zfJgC>.

## Refereed Conference Proceeding Articles

- [62] C. Graziani, P. Tzeferacos, D. Lee, D. Lamb, K. Weide, M. Fatenejad, and J. Miller. “The Biermann Catastrophe Of Numerical MHD”. In: *Journal of Physics: Conference Series*. Vol. 719. 1. IOP Publishing, 2016, p. 012018.
- [63] C. Graziani. “Commentary: Simulation-Aided Inference in Cosmology”. In: *Statistical Challenges in Modern Astronomy V*. Vol. 201. 2. Springer, 2012, pp. 59–64. DOI: [10.1007/978-1-4614-3520-4\\_5](https://doi.org/10.1007/978-1-4614-3520-4_5).



- [64] D. Lamb, G. Jordan, B. Diemer, C. Graziani, R. Hudson, R. Kessler, M. Long, J. Norris, D. van Rossum, R. Fisher, et al. “The Central Role of Turbulence in Thermonuclear-Powered Supernovae”. In: *41st AIAA Fluid Dynamics Conference and Exhibit*. Vol. 336. 1. IOP Publishing. Springer, 2011, p. 3240.
- [65] A. Dubey, R. Fisher, C. Graziani, G. Jordan IV, D. Lamb, L. Reid, P. Rich, D. Sheeler, D. Townsley, and K. Weide. “Challenges Of Extreme Computing Using The FLASH Code”. In: *Numerical Modeling of Space Plasma Flows*. Vol. 385. 1. AIP. Springer, 2008, p. 145.
- [66] G. Jordan IV, R. Fisher, D. Townsley, A. Calder, C. Graziani, S. Asida, D. Lamb, and J. Truran. “Preliminary Results of Three-Dimensional Simulations of the Deflagration Phase of the Gravitationally Confined Detonation Model of Type Ia Supernovae”. In: *Numerical Modeling of Space Plasma Flows*. Vol. 385. 4. AIP. Springer, 2008, p. 97.
- [67] M. Matsuoka, N. Kawai, A. Yoshida, T. Tamagawa, K. Torii, Y. Shirasaki, G. Ricker, J. Doty, R. Vanderspek, G. Crew, et al. “The Gamma-Ray Burst Alert System And The Results Of HETE-2”. In: *Baltic Astronomy* 13.1 (2004), pp. 201–206.

## Technical Reports

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## Gamma-Ray Burst Coordinate Network (GCN) Circulars

I am a co-author of 184 Gamma-Ray Burst Coordinate Network (GCN) Circulars (see <https://gcn.gsfc.nasa.gov/>). These circulars are used for rapid distribution of results concerning GRBs that may affect imminent observations. They were an important publication route for first-look results concerning in-progress GRBs detected by the HETE-2 mission. I have omitted listing these circulars here for the sake of brevity. A full listing may be obtained using the following link, which is a *TinyURL* abbreviation of the URL describing the required search at the *NASA/ADS* service: <https://tinyurl.com/adsgcn>.

## Invited Conference Talks

- [360] *Inferring Morphology and Strength of Magnetic Fields From Proton Radiographs*. Omega Laser Facility Users Group Meeting. Rochester, NY, Apr. 2016.
- [361] *The Biermann Catastrophe in Numerical MHD*. Astronom Conference. Avignon, France, June 2015.
- [362] *Comments On Dave Higdon's "Simulation-Aided Inference In Cosmology"*. Statistical Challenges in Modern Astronomy V. State College, PA, June 2011.
- [363] *Type Ia Supernovae: Models Meet Data*. ICIS Workshop on Verification, Validation, and Uncertainty Quantification. Park City, UT, Aug. 2011.
- [364] *Type Ia Supernovae: Models Meet Data*. Chicagoland Computational Cosmology Workshop. Argonne National Laboratory, Lemont, IL, Dec. 2011.
- [365] *FLASH HEDP Co-Design Center: Application, Codes, and Exascale Requirements*. IESP Meeting. Maui, HI, Oct. 2010.
- [366] *HETE-WXM: Fenimorean GRB Localization On A Shoestring*. Symposium in Honor of Ed Fenimore. Los Alamos, NM, Sept. 2009.
- [367] *Predictive Science Methodologies*. Flash Center Supernova Workshop. Chicago, IL, Oct. 2007.
- [368] *Predictive Science Methodologies for Type Ia SN - Dark Energy Problem*. Flash Center Supernova Workshop. Chicago, IL, Sept. 2006.

## Seminars and Colloquia

- [369] *The Delta Variant had Negligible Impact on COVID-19 Vaccine Effectiveness in the USA*. University of Chicago Department of Public Health Sciences Seminar. Chicago, IL, Oct. 2021.
- [370] *A Behavioral Multispread Epidemic Model*. LANS Seminar. Argonne National Laboratory, Aug. 2020.

- [371] *Recalibration of Probabilistic Forecasts*. University of Chicago Center for Spatial Data Science, Environmental Data Science Lunch Seminar. Chicago, IL, Jan. 2020.
- [372] *Deep Learning of Distributions*. University of Iowa Department of Mathematics Colloquium. Iowa City, IA, Oct. 2019.
- [373] *Bayesian Parameter Estimation for Non-Linear Dynamical Systems*. LANS Seminar. Argonne National Laboratory, June 2019.
- [374] *Better Forecasting Through Information Theory*. EVS Seminar. Argonne National Laboratory, Feb. 2018.
- [375] *Re-Calibration of Probabilistic Forecasts*. LANS Seminar. Argonne National Laboratory, Jan. 2018.
- [376] *Laser Plasma Selfies With Proton Beams*. University of Chicago Astronomy Department Tuesday Chalk Talk. Chicago, IL, May 2017.
- [377] *The Biermann Catastrophe in Numerical MHD*. University of Chicago Computation in Science Seminar. Chicago, IL, Feb. 2016.
- [378] *The Biermann Catastrophe of Numerical MHD*. University of Chicago Astronomy Department Tuesday Chalk Talk. Chicago, IL, Dec. 2015.
- [379] *Type Ia Supernovae: Models Meet Data*. Seminar, University of Chicago Working Group on Statistical Challenges in Operational Forecasting. Chicago, IL, May 2014.
- [380] *A Random Walk Through The Mathematics of High-Performance Computing*. University of Chicago Computation Institute Seminar. Chicago, IL, Apr. 2014.
- [381] *Stellar Velocity Modes*. Flash Center Astronomy Group Seminar. Chicago, IL, Oct. 2013.
- [382] *Fuzzy Functions: An Introduction To Gaussian Process Modeling Lecture 1*. Flash Center for Computational Science Lecture. Chicago, IL, Feb. 2009.
- [383] *Fuzzy Functions: An Introduction To Gaussian Process Modeling Lecture 2*. Flash Center for Computational Science Lecture. Chicago, IL, Feb. 2009.
- [384] *Fuzzy Functions: An Introduction To Gaussian Process Modeling Lecture 3*. Flash Center for Computational Science Lecture. Chicago, IL, Feb. 2009.
- [385] *Blowing Up Stars For Fun And Profit*. Colloquium, University of Louisville Department of Physics and Astronomy. Louisville, KY, Sept. 2007.
- [386] *Gaussian Process Modeling of Multi-Color Type Ia Light Curves*. SNack Lunchtime Talk, University of Chicago Department of Astronomy. Chicago, IL, May 2007.
- [387] *Evidence From HETE-2 For GRB Evolution With Redshift*. Colloquium, Northwestern University Department of Physics and Astronomy. Evanston, IL, Feb. 2004.

## Contributed Conference Talks

- [388] *Deep Probabilistic Forecasting*. Workshop: Scientific Machine Learning and Uncertainty Quantification. University of Southern California, June 2018.

- [389] *Distributional Deep Learning*. Workshop: Advanced Statistical Methods Meet Machine Learning. Argonne National Laboratory, Sept. 2018.
- [390] *The Biermann Catastrophe in Numerical MHD*. APS Division of Plasma Physics Meeting. New Orleans, LA, Nov. 2014.
- [391] *Gaussian Process Supernova Spectra*. Flash Center Supernova Workshop. Chicago, IL, Oct. 2007.
- [392] *Gamma-Ray Burst Jet Profiles And Their Signatures*. Gamma-Ray Bursts In The Swift Era: Sixteenth Maryland Astrophysics Conference. Washington, DC, Nov. 2005.
- [393] *Likelihood Analysis of GRB Evolution With Redshift*. Gamma-Ray Burst In The Afterglow Era, 4th Workshop. Rome, Italy, Oct. 2004.
- [394] *Evidence From HETE-2 For GRB Evolution With Redshift*. Gamma-Ray Bursts: 30 Years Of Discovery: Gamma-Ray Burst Symposium. Santa Fe, NM, Sept. 2003.
- [395] *Astrometric Calibration and Estimate of the Systematic Error in WXM Localizations Obtained by the Chicago Bayesian Method*. Gamma-Ray Burst And Afterglow Astronomy 2001: A Workshop Celebrating the First Year of the HETE Mission. Woods Hole, MA, Nov. 2001.
- [396] *Are the Four Gamma-Ray Bursts of 1996 October 27-29 Due to Repetition of a Single Source?* Fourth Huntsville Gamma Ray Burst Symposium. Huntsville, AL, Sept. 1997.
- [397] *Analysis of the Systematic Errors in the Positions of BATSE Catalog Bursts*. Gamma Ray Bursts, Third Huntsville Symposium. Huntsville, AL, Oct. 1995.
- [398] *Likelihood Methods and Classical Burster Repetition*. High Velocity Neutron Stars and Gamma Ray Bursts. La Jolla, CA, Mar. 1995.
- [399] *Evidence for Two Distinct Morphological Classes of Gamma-Ray Bursts*. Gamma Ray Bursts, Second Workshop. Huntsville, AL, Oct. 1993.
- [400] *Establishing the Existence of Harmonically-Spaced Lines in Gamma-Ray Burst Spectra using Bayesian Inference*. Compton Gamma-Ray Observatory Symposium. St. Louis, MO, Oct. 1992.
- [401] *Line Strength Variations in Gamma-Ray Burst GB870303: Possible evidence of Neutron Star Rotation*. Conference on Gamma Ray Bursts. Huntsville, AL, Oct. 1991.
- [402] *Cyclotron Line Strength Variations in Gamma-Ray Burst GB870303: Possible Evidence of Neutron Star Rotation*. Los Alamos Workshop on Gamma-Ray Bursts. Taos, NM, Aug. 1990.

## Other Presentations

- [403] *Bayesianism, Uncertainty, Information, AI, and Predictability (And Earth System Modeling)*. CELS Climate-MLAI Teach-in. Argonne National Laboratory, Dec. 2020.

- [404] *A Bit Of Gamma-Ray Bursts*. Guest lecture to teachers participating in NASA All-Stars Multiwavelength Astronomy Curriculum Development program operated by the Chicago Public Schools/University of Chicago Internet Project (CUIP). Chicago, IL, Aug. 2012.
- [405] *A Bit Of Gamma-Ray Bursts*. Guest lecture to teachers participating in NASA All-Stars Multiwavelength Astronomy Curriculum Development program operated by the Chicago Public Schools/University of Chicago Internet Project (CUIP). Chicago, IL, July 2010.
- [406] *Gamma-Ray Bursts As Standard Candles*. Guest Lecture for Graduate Course on Special Topics at the University of Chicago Astronomy Department. Chicago, IL, Feb. 2010.
- [407] *Gamma-Ray Bursts: Introduction and Overview*. Guest Lecture for Graduate Course on Special Topics at the University of Chicago Astronomy Department. Chicago, IL, Feb. 2010.
- [408] *GRB Energy-Spectrum Correlations For Fun And Profit*. Guest Lecture for Graduate Course on Gamma-Ray Bursts at the University of Chicago Astronomy Department. Chicago, IL, May 2006.
- [409] *GRB Missions, Instrumentation, and Data*. Guest Lecture for Graduate Course on Gamma-Ray Bursts at the University of Chicago Astronomy Department. Chicago, IL, Mar. 2006.
- [410] *Gamma-Ray Bursts: The Cracking of a Cold Case*. Adler Planetarium Public Lecture. May 2005.
- [411] *A Bit of Gamma-Ray Bursts*. Adler Planetarium Public Lecture. Sept. 2004.

## Sponsor Reports

NSF Award AST-0909132, “Petascale Computing of Thermonuclear Supernova Explosions”:  
 Assisted with writing annual reports, 2010-2013  
 Assisted with writing final report, 2014

## Proposal Review Panels

NSF Astrophysics Program, March 2011, reviews submitted remotely

NASA *Swift* Guest Investigator Program Cycle 3, October 2006, San Francisco, Ca

NASA Astrophysics Theory Program, October 1998, Washington, DC

## Leadership/Service

### Technical White Papers

#### AI For Earth System Predictability (AI4ESP, 2021)

- White Paper: Probabilistic Machine Learning and Data Assimilation. V. Rao (ANL), S. Madireddy (ANL), C. Graziani (ANL), P. Xue (Michigan Tech), R. Maulik (ANL)
- White Paper: Data-Driven Exploration of Climate Attractor Manifolds For Long-Term Predictability. C. Graziani (ANL), R. Jacob (ANL), S. Madireddy (ANL), R. Maulik (ANL), S. Habib (ANL), R. Matamala (ANL), J. Franke (University of Chicago), and I. Foster (ANL)

#### AI For Science (AI4Science, 2021)

- White Paper: Predictive Turbulence Models (C. Graziani, R. Balakrishnan, A. Dubey, S. Madireddy, and R. Maulik)
- White Paper: Origin of the Elements, with A. Dubey, B. Messner (ORNL), and S. Couch (MSU)
- White Paper: Mastering Solution Chemistry (L. Soderholm, M. Servis, N. Srikanth, S. Wild, R. Bollapragada, C. Graziani)

### Referee Reports

I am the author of many referee reports for multiple peer-reviewed journals, including *Astrophysical Journal*, *Astronomy & Astrophysics*, *Monthly Notices of the Royal Astronomical Society*, *Physics of Fluids*, *Frontiers in Molecular Biosciences*, *Journal of Plasma Physics*, *Shock Waves*, *PLOS ONE*, and others.

### Leadership

Associate Director, Flash Center for Computational Science	February-November 2013
Astronomy Group Leader, Flash Center for Computational Science	2012-2014
V&V/UQ Group Leader, Flash Exascale Codesign Center	June 2010-January 2011
HETE Wide-Field X-Ray Monitor (WXM) imaging software lead	1994-2007

## Teaching

### *High-Energy Astrophysics*

Dates: April-June 2016

University of Chicago Graduate course, co-taught with Angela Olinto and Vikram Dwarkadas

### *Introductory Statistics*

Dates: June-July 2015

University of Chicago undergraduate core course

## Student/Researcher Supervision

Supervisor, Marieme Ngom, ANL/MCS Postdoctoral researcher, June 2020-present

Mentor, Youngjun Lee, ANL/ASD Postdoctoral researcher, October 2021-present

Supervisor, Enakshi Saha, University of Chicago Statistics PhD student/ANL Givens Summer intern, May–August 2021

Supervisor, Nick Rittler, University of Chicago Statistics Masters student/ANL summer internship, May–August 2020, ANL pre-doctoral student, January-August 2021

Mentor, Alex Grannan, ANL/MCS Postdoctoral researcher, October 2018-December 2019

Supervisor, Andrew Pensoneault, University of Iowa Mathematics PhD student/ANL Givens summer intern, June-August 2019

## Conferences Co-Organized

*IMSI Workshop on Verification, Validation, and Uncertainty Quantification Across Scientific Disciplines*, May 10-14 2021, University of Chicago (Virtual). <https://www.imsi.institute/activities/verification-validation-and-uncertainty-quantification-a-cross-disciplines/>.

*ICIS Workshop on Verification, Validation, and Uncertainty Quantification*, August 6-13 2011, Park City, UT

*Symposium in Honor of Don Lamb*, October 28 2005, University of Chicago, Chicago, IL

*75th Anniversary Astronomical Debate: The Distance Scale to Gamma Ray Bursts*  
22 April 1995, Baird Auditorium, Natural History Museum, The Smithsonian Institution,



Washington, DC.

## Software

### FLASH Code

I collaborated within the Flash Center on the development of FLASH code units, including the corrected Biermann Battery term, on the improved multipole gravity solver, on particle distribution routines, and on electron entropy advection support in EOS and hydro units, as well as on developing some physics unit tests.

I also developed proton radiography imaging code that is recommended as an analysis tool alongside of FLASH. The code — PRaLine — is released through *github*, at <https://github.com/flash-center/PRaLine>.

### TAD

Together with Marieme Ngom, a postdoctoral researcher at MCS, I am developing the Targeted Adaptive Design (TAD) code, a scalable, PyTorch/GPyTorch-based code for adaptive data-driven manufacture design. The code, which is open-source, is currently in early development—it is the basis for a research article in preparation [3]. It is available at [https://github.com/mngom2/Targeted\\_Adaptive\\_Design](https://github.com/mngom2/Targeted_Adaptive_Design).

### Bayesian Vaccine Efficacy

I developed a python code for computing Bayesian estimates of vaccine efficacy, which was the basis for the research reported in [106]. The code is publicly available in a *github* repository at <https://github.com/CarloGraziani/BayesVaccineEfficacy>. I also used the same code to produce comparisons of COVID-19 vaccine performance at the *COVID-19 Vaccine Efficacy Page* at <https://wordpress.cels.anl.gov/covid-vaccine-efficacy/>. As of 11 October 2021, that website has received approximately 28,000 visits from 17,000 distinct visitors, from IP addresses originating all over the world.

## Computing Resource Awards

Co-Investigator

INCITE 2013 award: “Next-Generation Petascale Simulations of Type Ia Supernovae” (PI Don Lamb).

105,000,000 core-hours, 75M on *Mira* and 30M on *Intrepid* at ANL

Co-wrote quarterly reports

Co-Investigator

INCITE 2013 award: “Transformative Simulation of Shock-Generated Magnetic Fields” (PI

M Fatenejad).

40,000,000 core-hours, 20M on *Mira* and 20M on *Intrepid* at ANL

Co-Investigator

INCITE 2012 award: “Toward Exascale Computing of Type Ia and Ib,c Supernovae: V&V of Current Models” (PI Don Lamb).

40,000,000 core-hours on *Intrepid* at ANL

Co-wrote quarterly reports

Co-Investigator

INCITE 2011 award: “Study of Buoyancy-Driven Turbulent Nuclear Burning and Validation of Type Ia Supernova Models” (PI Don Lamb).

80,000,000 core-hours on *Intrepid* at ANL

Co-wrote quarterly reports

Co-Investigator

INCITE 2010 award: “Study of Buoyancy-Driven Turbulent Nuclear Burning and Validation of Type Ia Supernova Models” (PI Don Lamb).

70,000,000 core-hours on *Intrepid* at ANL

Assisted with writing final report

## Proposals and Awards

### Awards

Co-Principal Investigator, NSF Award AST-1908551, “Collaborative Research: Extreme-scale Ready High-order Methods for Astrophysical and Laboratory Turbulence,” \$495,000 award from August 2019 to July 2022.

Principal Investigator, LDRD Award 2019-0030, “Probabilistic Forecasting of Extreme Weather Using Deep Learning,” \$600,000 award from October 2018 to September 2020.

Principal Investigator, LDRD Award 2019-0006, “Deep Learning for Posterior Density Emulation and Sampling,” \$192,000 award from October 2018 to September 2019.

Co-Principal Investigator, NSF Award AST-0909132, “Petascale Computing of Thermonuclear Supernova Explosions,” \$2,242,341 award from July 2009 to June 2014 for scientific computing activity at Flash Center.

Co-Investigator, NASA Applied Information Systems Research (AISR) Award NNX09AK60G, “Quantified Uncertainty: Flexible Probabilistic Modeling of Dynamic Spectra and Other Astronomical Data,” \$675,000 from July 2009 to June 2012.

## Other Proposals

Principal Investigator, ASCR Base Mathematics, *Scalable Probabilistic Machine Learning for Information-Preserving Dimensional Reduction*. New Whitepaper, ANL/UC-Boulder collaboration, 3 years, \$1,663,000. Discouraged.

Principal Investigator, ASCR DE-FOA-0002493, Data-Intensive Scientific Machine Learning and Analysis, *From Simulations and Observations to Forecasts: A Probabilistic Machine Learning Approach*. Pre-application, ANL/NYU-Courant collaboration. Discouraged.

Co-Investigator, ASCR DE-FOA-0002482, Integrated Computational and Data Infrastructure (ICDI) for Scientific Discovery. GWU/UMD/ANL collaboration, PI: E. Balaras (GWU). 3 years, \$1,918,225. Declined.

Co-Investigator, DE-FOA-0002441, Scientific Discovery Through Advanced Computing: Partnerships in Basic Energy Sciences. *Rare Events: Applications, Computation, and Theory [ REACT-SciDAC ]*. Illinois/Clemson/Univ. of Minnesota/UPenn/MIT/ANL/PNNL collaboration. PI: Baron Peters (Illinois). 4 years, \$1,500,000. Declined.

Principal Investigator, LDRD PRIME EGS 2021-0245. *Probabilistic AI for Advanced Scientific Manufacturing*. MCS/AMD collaboration, 2 years, \$200,000. Declined.

Co-Investigator, LDRD PRIME EGS 2022-0018 *Targeted Adaptive Design for Advanced Scientific Manufacturing*. AMD/MCS collaboration, PI: S. Chaudhuri, 2 years, \$250,000. Declined.

Co-Investigator, NSF/PHY-Plasma Physics, *Probabilistic Forecasting of Solar Energetic Particle Impacts*. University of Chicago/ANL collaboration, PI: Damiano Caprioli (UofC). \$2,209,200 for 36 months. Declined.

Principal Investigator, C3.ai DTI call, *Using Viral RNA Test Data To Perform Epidemic Surveillance..* Collaboration between ANL, UofI/NCSA, and University of Chicago. \$403,616 for 12 months. Declined.

Principal Investigator, ASCR LAB-20-2319, Scientific Machine Learning for Modeling and Simulations, *Probabilistic Machine Learning of Subgrid Models*. ANL collaboration. \$800,000 for 24 months. Declined.

Co-Investigator, ASCR LAB 20-2321, Artificial Intelligence and Decision Support for Complex Systems, *Post Haste: Fast, Direct Posterior Emulation for Inverse Problems, Data Assimilation, and Control*. Pre-proposal, PI: Lawrence (LANL), ANL-LANL collaboration. Discouraged.

Co-Investigator, ASCR LAB 20-2321, Artificial Intelligence and Decision Support for Complex Systems, *Deep-Learning Approach for the Forecast, Prevention, and Real-Time Miti-*

*gation of Detrimental Network Cascades*. Pre-proposal, PI: Nishikawa (NWU), NWU/ANL collaboration. Discouraged.

Principal Investigator, HPC4EnergyInnovations pre-proposal in response to Project “US Steel: Real time application of spectrometer cleanliness measurements to optimize throughput of liquid steel at continuous casting machines,” ANL collaboration. No response.

Principal Investigator, LDRD PRIME/Advanced Computing 2020-0008, *Modeling Turbulence With Machine-Learned Stochastic Closures*. Pre-proposal, MCS collaboration, \$520,183 total for 2 years. Discouraged.

Co-Investigator, LDRD PRIME/Advanced Computing 2020-0025, *Coupling FLASH and MARS Codes to Mitigate Damage from High-Energy-Density Beams in the APS-U Diffraction-Limited Storage Ring*. Pre-proposal, PI J. Dooling, ASD/MCS/University of Chicago collaboration, \$282,894 total for 2 years. Discouraged.

Principal Investigator, ASCR LAB 19-2122, Scientific Machine Learning and Uncertainty Quantification *Quantification of Uncertainty From Machine-Learned Sub-Grid Models*. MCS collaboration, \$800,000 total for 2 years. Declined.

Co-Investigator, DOE/ASCR DE-FOA-0001900, MMICCS, *Expanding the Boundaries of Uncertainty-Quantified Simulation-Based Probabilistic Forecasting*. PI R. Rosner (University of Chicago), collaboration between University of Chicago, NYU/Courant, Virginia Tech, LSE, and ANL. \$7,185,740 total for 4 years. Declined.