Dr. John A. ZuHone: Curriculum Vitae

Personal

Citizenship	United States of America
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Education

Ph. D. in Astronomy and Astrophysics, University of Chicago	2009
Advisor: Prof. Donald Q. Lamb, Dept. of Astronomy and Astrophysics	
Thesis: "Simulations of Binary Galaxy Cluster Mergers: Modeling Real Clusters and Exploring Parameter Spaces"	
M. S. in Astronomy and Astrophysics, University of Chicago	2004
B. S. in Physics, University of Illinois at Urbana-Champaign	2002

Honors, Awards, and Named Fellowships

NASA Postdoctoral Program	2011-2014
Department of Energy Computational Science Graduate Fellowship	2004-2008
McCormick Fellowship, University of Chicago	2002-2003
Graduated With Highest Honors in Physics, University of Illinois	2002

Research Interests

Astrophysics

Cosmology; large-scale structure formation; galaxy clusters; galaxy cluster mergers; intracluster medium; dark matter; X-ray and radio observations of galaxy clusters

Computational Science

Developing numerical algorithms for computational physics; developing visualization and analysis techniques for large datasets; development of scientific software for Python

Research Positions Held

Astrophysics Science Division, NASA/Goddard Space Flight Center
     Research Associate   2011-

High-Energy Astrophysics Division, Smithsonian Astrophysical Observatory
     Research Associate   2009-2011

National Center for Computational Sciences, Oak Ridge National Laboratory
     Summer Graduate Research Assistant   2006

Department of Astronomy and Astrophysics, University of Chicago
     Graduate Research Assistant   2004-2009

Department of Astronomy and Astrophysics, University of Chicago
     Summer Undergraduate Research Assistant   2001

Department of Physics, University of Illinois at Urbana-Champaign
     Summer Undergraduate Research Assistant   2000

Teaching Experience

Trinity International University, Instructor
     Physics 350, "Topics in Physical Science: Astronomy"   2007
        (undergraduate)

University of Chicago, Graduate Teaching Assistant
     PHSC 12000, "The Origin of the Universe and How We Know"   2003
        (undergraduate)
     PHSC 11900, "Stellar Astronomy and Astrophysics"   2003
        (undergraduate)

University of Illinois at Urbana-Champaign, Undergraduate Teaching Assistant
     PHYS 102, "College Physics: E&M & Modern"   2002
        (undergraduate)
     PHYS 111, "University Physics: Mechanics"   2002
        (undergraduate)
     PHYS 101, "College Physics: Mech & Heat"   2001
        (undergraduate)
     PHYS 111, "University Physics: Mechanics"   2001
        (undergraduate)

Grants as Co-Investigator

National Aeronautics and Space Administration
>ROSES-12: "Investigating Microphysics of Intracluster Medium   2012
>with Advanced Hydrodynamic Simulations and X-Ray
>Observations", PI: Maxim Markevitch, 12-ATP12-0159

Computing Allocations as Principal Investigator or Co-Investigator

National Aeronautics and Space Administration
>"Studying the Detailed Physics of the Intracluster Medium in   2011-
>Mergers of Clusters of Galaxies"
>(SMD-11-2304, SMD-12-3164, SMD-13-4120)
>PIs: Timothy Kallman, Maxim Markevitch
>NAS Pleiades SGI ICE system (8,355,847 core-hours)

National Science Foundation
>"The Formation and Evolution of X-ray Clusters, Galaxies,   2013-
>and the First Stars" (TG-MCA06N030)
>PI: Greg Bryan
>NICS Cray XT5 (1,184,274 service units)
>TACC Dell PowerEdge C8220 (3,365,832 service units)

>"Studying the Detailed Physics of the Intracluster Medium in   2010-2011
>Clusters of Galaxies with the FLASH Code" (TG-AST100017)
>PI: John ZuHone
>NICS Cray XT5 (1,100,000 service units)

>"Exploring the Nature of Cold Fronts in Merging Clusters of   2009-2010
>Galaxies with the FLASH Code" (TG-AST090037)
>PI: Maxim Markevitch
>TACC Sun Constellation Cluster (1,000,000 service units)

Contributions to Scientific Software

FLASH (http://flash.uchicago.edu)   2005-
>Assisted in porting the particle, cosmology, and multigrid gravity
>modules from FLASH2 to FLASH3; tested and improved basic
>functionality of particle and magnetohydrodynamics modules

yt (http://yt-project.org)   2010-
> Assisted in development of FLASH and Athena code interfaces;
> improved capabilities for working with in-memory datasets;
> developed analysis modules for particle trajectories, mock S-Z and
> X-ray observations; improved FITS image writing capabilities

pywwt (http://www.jzuhone.com/pywwt)   2014-
> Developed a Python interface to the Microsoft World Wide Telescope
> (WWT) Windows client. Used for controlling WWT from Python and
> importing arbitrary event data into WWT.

Invited Colloquia and Conference Participation

"The Physics of Gas Sloshing in Galaxy Clusters." Colloquium, University of Illinois at
> Urbana-Champaign, February 2013, Urbana, IL

"Applications of Advanced Numerical Simulations and Analysis in Theoretical
> Astrophysics." Invited talk, Computational Research in Boston and Beyond,
> October 2013, Cambridge, MA

"The Physics of Gas Sloshing in Galaxy Clusters." Colloquium, Naval Research
> Laboratory, September 2013, Washington, DC

"Simulating Radio Mini-halos in Sloshing Galaxy Clusters." Invited talk,
> SnowCLUSTER 2013 Meeting, March 2013, Snowbird Lodge, UT

"Constraining the Transport Properties of the ICM with Cold Fronts." Talk,
> SnowCLUSTER 2013 Meeting, March 2013, Snowbird Lodge, UT

"The Physics of Gas Sloshing in Galaxy Clusters." Colloquium, Texas A&M
> University, February 2013, College Station, TX

"The Physics of Gas Sloshing in Galaxy Clusters." Theory Seminar, University
> of Texas at Austin, February 2013, Austin, TX

"MHD Simulations of Cold Fronts and Gas Sloshing in the Cores of Galaxy
> Clusters." Invited talk, Cold Fronts in Galaxy Clusters: Sloshing
> Through the Dolomites Meeting, January 2013, Sport & Kurhotel
> at Bad Moos, Sesto, Italy

"Turbulence and Radio Mini-halos in Galaxy Clusters." Talk, Nature's Particle
> Accelerators Meeting, October 2012, Annapolis, MD

"Gas Sloshing, Mini-halos, and Thermal Conduction" Invited talk, ICM Theory and Computation Workshop, August 2012, Ann Arbor, MI

"Probing the Microphysics of the Intracluster Medium with Cold Fronts." Talk, Galaxy Clusters as Giant Cosmic Laboratories Meeting, May 2012, Madrid, Spain

"The Physics of Gas Sloshing in Galaxy Clusters." Theory Seminar, University of Maryland at College Park, April 2012, College Park, MD

"The Physics of Gas Sloshing in Galaxy Clusters." Seminar, Columbia University, February 2012, New York, NY

"AGNs and Gas Sloshing in Galaxy Clusters: Wide-Angle Tails and Radio Mini-halos." Talk, High Energy Views of Galaxies and their Nuclei Meeting, November 2011, Tulum, Mexico

"The Physics of Gas Sloshing in Galaxy Clusters." Talk, The Structure of Groups and Clusters of Galaxies in the Chandra Era, July 2011, Boston, MA

"Testing the Connection Between Radio Mini-halos and Gas Sloshing with MHD Simulations." Talk, Non-Thermal Phenomena in Colliding Galaxy Clusters Meeting, November 2010, Nice, France

"Idealized Simulations of Merging Clusters of Galaxies and the Physics of the Intracluster Medium." Journal club talk, Brown University, October 2010, Providence, RI

"Simulations of Core Gas Sloshing in Clusters of Galaxies: Insights Into the Physics of the ICM." Invited talk, The Physics of the Intracluster Medium Meeting, August 2010, Ann Arbor, MI

"Simulations of Gas Sloshing in Galaxy Cluster Cores: Application to Radio Mini-halos." Talk, SnowCLUSTER 2010 Meeting, March 2010, Snowbird Lodge, UT

"Heating in Galaxy Cluster Cores via Gas Sloshing." Talk, 215th AAS Meeting, January 2010, Washington, DC

"Cluster Core Heating from Merging Subclusters." Talk, The Monster's Fiery Breath Meeting, June 2009, Madison, WI

"Idealized Simulations of Merging Clusters of Galaxies and the Physics of the Intracluster Medium." Colloquium, University of Massachusetts at Dartmouth, May 2009, North Dartmouth, MA

Publications

Journal articles

ZuHone, J., Brunetti, G., Giacintucci, S., & Markevitch, M. "Secondary Models for Radio Mini-Halos in Galaxy Clusters with MHD Simulations of Gas Sloshing." 2014, arXiv:1403.6743, submitted to ApJ

C. Schmid, T. Brand, H. Brunner, A. Finoguenov, **J. ZuHone**, G. Israel, G. Lamer, M. Oertel, R.K. Smith, M. Wille, J. Wilms. "The Generic X-ray Instrument Simulation Toolkit SIXTE." 2014, submitted to *Astronomy and Computing*

Komarov, S.V., Churazov, E.M., Schekochihin, A.A., & **ZuHone, J.A.** "Suppression of Local Heat Flux in a Turbulent Magnetized Intracluster Medium." 2014, MNRAS, 440, 2

Giacintucci, S., Markevitch, M., Brunetti, G., **ZuHone, J.**, Venturi, T., Mazzotta, P., Bourdin, H. "Mapping the Particle Acceleration in the Cool Core of the Galaxy Cluster RX J1720.1+2638." 2014, arXiv:1403.2820, submitted to ApJ

Dubey, A., Antypas, K., Calder, A. C., Daley, C., Fryxell, B., Gallagher, J. B., Lamb, D. Q., Lee, D., Olson, K., Reid, L. B., Rich, P., Ricker, P. M., Riley, K. M., Rosner, R., Siegel, A., Taylor, N. T., Weide, K., Timmes, F. X., Vladimirova, N., & **ZuHone, J.** "Evolution of FLASH, a Multiphysics Scientific Simulation Code for High Performance Computing." 2014, *International Journal of High Performance Computing Applications*, 28, 2

Lal, D. V., Kraft, R. P., Randall, S. W., Forman, W. R., Nulsen, P. E. J., Roediger, E., **ZuHone, J. A.**, Hardcastle, M. J., Jones, C., & Croston, J. H. "Gas Sloshing and Radio Galaxy Dynamics in the Core of the 3C449 Group." 2013, ApJ, 764, 83

ZuHone, J. A., Markevitch, M., Brunetti, G., & Giacintucci, S. "Turbulence and Radio Mini-halos in the Sloshing Cores of Galaxy Clusters." 2013, ApJ, 762, 78

ZuHone, J. A., Markevitch, M., Ruszkowski, M., & Lee, D. "Cold Fronts and Gas Sloshing in Galaxy Clusters with Anisotropic Thermal Conduction." 2013, ApJ, 762, 69

Dubey, A., Daley, C., **ZuHone, J.**, Ricker, P., Weide, K., & Graziani, C. "Imposing a Lagrangian Particle Framework on an Eulerian Hydrodynamics Infrastructure in FLASH." 2012, ApJS, 201, 27

Johnson, R. E., **ZuHone, J. A.**, Jones, C., Forman, W., & Markevitch, M. "Sloshing Gas in the Core of the Most Luminous Galaxy Cluster RXJ 1347.5-1145." 2012, ApJ, 751, 95

Roediger, E., & **ZuHone, J. A.** "Fast Simulations of Gas Sloshing and Cold Front Formation." 2012, MNRAS, 419, 1338

ZuHone, J. A., Markevitch, M., & Lee, D. "Sloshing of the Magnetized Cool Gas in the Cores of Galaxy Clusters." 2011, ApJ, 743, 16

ZuHone, J. A. "A Parameter Space Exploration of Galaxy Cluster Mergers I: Gas Mixing and the Generation of Cluster Entropy." 2011, ApJ, 728, 54

ZuHone, J. A., Markevitch, M., & Johnson, R. E. "Stirring Up the Pot: Can Cooling Flows In Galaxy Clusters Be Quenched By Gas Sloshing?" 2010, ApJ, 717, 908

ZuHone, J. A., Ricker, P. M., Lamb, D. Q., & Yang, H. Y. "A Line-Of-Sight Galaxy Cluster Collision: Simulated X-Ray Observations." 2009, ApJ, 699, 1004

ZuHone, J. A., Lamb, D. Q., & Ricker, P. M. "Rings of Dark Matter in Collisions Between Clusters of Galaxies." 2009, ApJ, 696, 694

Zingale, M., Dursi, L. J., **ZuHone, J.**. Calder, A. C., Fryxell, B., Plewa, T., Truran, J. W., Caceres, A., Olson, K., Ricker, P. M., Riley, K., Rosner, R., Siegel, A., Timmes, F. X., & Vladimirova, N. "Mapping Initial Hydrostatic Models in Godunov Codes." 2002, ApJS, 143, 539

Conference proceedings

ZuHone, J., Markevitch, M., & Brunetti, G. "Testing the Connection Between Radio Mini-halos and Core Gas Sloshing with MHD Simulations" 2011, in Non-thermal Phenomena in Colliding Galaxy Clusters, G. Ferrari, M. Brüggen, G. Brunetti, and T. Venturi, eds. (Pisa, Italy: Journal of the Italian Astronomical Society), 632

ZuHone, J., & Markevitch, M. "Cluster Core Heating from Merging Subclusters" 2009, in The Monster's Fiery Breath: Feedback in Galaxies, Groups, and Clusters, S. Heinz and E. Wilcots, eds. (Melville, NY: AIP Press), 383