Forrest Wolfgang Glines

Contact Information

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Summary

I am a new Metropolis Postdoctoral Fellow at Los Alamos National Laboratory studying astrophysical plasmas using large scale simulations with high performance computing. My research at Los Alamos explores the behavior of jets launched from binary black hole mergers embedded within accretion disks to determine their observational signatures. These studies are enabled by the AthenaPK exascale-ready magnetohydrodynamics code which I helped develop as a PhD student at Michigan State University.

My broader research covers simulations of galaxy clusters with self-regulating AGN feedback, simulations of magnetohydrodynamic turbulence, numerical methods for magnetized Newtonian and relativistic plasmas, and performance-portable astrophysics codes.

Experience

Metropolis Postdoctoral Fellow **September 2022-present**
MSU Department of Physics and Astronomy
Developing exascale-ready simulations of magnetized jets embedded in AGN accretion disks
Contributing to the performance portable adaptive mesh refinement framework Parthenon

Graduate Research Assistant **August 2016 - August 2022**
MSU Department of Physics and Astronomy
Developed and ran multiphysics simulations of galaxy clusters with thermal and magnetic feedback from active galactic nuclei
Developed performance-portable astrophysics codes for exascale GPU and CPU supercomputers
Investigated the development of magnetized turbulence in astrophysical plasmas

Graduate Student Researcher **December 2018 - August 2022**
Sandia National Laboratory
Developed robust relativistic hydrodynamics methods and IMEX methods for relativistic two-fluid electrodynamics

Education

Michigan State University, Astronomy **August 2022**
East Lansing, Michigan
Dual PhD in Astrophysics and Computational Mathematics, Science and Engineering

Brigham Young University, B.S. (magna cum laude) **April 2016**
Provo, Utah
Dual Major in Physics and Mathematics with emphasis in Applied and Computational Mathematics
Computer Science Minor

Teaching Assistant **Spring 2018, Fall 2018**
MSU Department of Physics and Astronomy
Taught introduction to astronomy for non-science majors for Spring 2018
Assisted with a graduate course on parallel computing

Undergraduate Student Researcher **May - August 2015, 2016**
Los Alamos National Laboratory
Developed a ray tracing radiative transfer package for a cosmology code with meshless hydrodynamics

Research Assistant **December 2013 - April 2016**
BYU Department of Physics and Astronomy
Developed a relativistic magnetohydrodynamics code for GPUs using CUDA

Project Assistant **November 2013 - April 2016**

BYU Department of Mathematics

Edited a textbook on mathematical foundations for numerical methods

Helped write lab manuals on numerical methods using Python

Awards

NCSA Blue Waters Graduate Fellowship 2019
Michigan Institute for Plasma Science and Engineering (MIPSE) Fellowship, 2018
MSU Distinguished Graduate Fellowship 2016
BYU Mathematics Don Robinson Scholar 2015
BYU Mathematics Award for Academic Excellence 2015
BYU Heritage Scholar 2010, 2013-2015

Publications

Glines, F.W., Grete, P., O'Shea, B.W. "Magnetized Decaying Turbulence in the Weakly Compressible Taylor-Green Vortex," 2021, Phys. Rev. E 103, 043203.

Prasad, D., Voit, G.M., O'Shea, B.W., Glines F.W., "Environmental Dependence of Self-regulating Black Hole Feedback in Massive Galaxies," 2020, The Astrophysical Journal, 905, 50.

Glines, F.W., O'Shea, B.W., and Voit, G.M. "Tests of AGN Feedback Kernels in Simulated Galaxy Clusters," 2020, The Astrophysical Journal 901, 117.

Grete, P., Glines, F.W., and O'Shea, B.W. "K-Athena: A Performance Portable Structured Grid Finite Volume Magnetohydrodynamics Code," 2020 IEEE Transactions on Parallel and Distributed Systems 32, 85–97.

Glines, F.W., Anderson, M., and Neilsen, D. "Scalable Relativistic High-Resolution Shock-Capturing for Heterogeneous Computing," 2015, IEEE International Conference on Cluster Computing, pp. 611–618.