Minghao Guo

Personal Information

Name:	Minghao Guo	Address:	Peking University, 5 Yi He Yuan Road, Haidian District, Beijing, P.R. China
Phone:	+86 13001998064		
Email:	gmh@pku.edu.cn	ORCID:	orcid.org/0000-0002-3680-5420
Homepage:	mh-guo.github.io	GitHub:	github.com/mh-guo

Education

Peking University — Beijing, CN

Bachelor of Science, Physics, Minor in Mathematics — Sept 2016 – Present

- GPA: 3.65/4.0; GRE Physics 990/990

Research Interests

- Galaxy dynamics and evolution, galaxy structure
- Black hole, high energy astrophysics, accretion disks, SMBHs.
- Modified gravity, neutron stars, pulsars, gravitational waves, dark matter.
- Numerical simulations, Numerical methods, New numerical techniques.

Publications

1. Minghao Guo, Kohei Inayoshi, Tomonari Michiyama, and Luis C. Ho, Hunting for Wandering Massive Black Holes, ApJ **901**, 39 (2020), arXiv:2006.08203 [astro-ph.HE] .
2. Minghao Guo, Min Du, Luis C. Ho, Victor P. Debattista, and Dongyao Zhao, A New Channel of Bulge Formation via the Destruction of Short Bars, ApJ **888**, 65 (2020), arXiv:1911.07002 [astro-ph.GA] .
3. Minghao Guo, Lijing Shao, and Junjie Zhao, Extended reduced-order surrogate models for scalar-tensor gravity in the strong field and applications to binary pulsars, in preparation (2020).

References

Director, Prof. Luis C. Ho — Kavli Institute for Astronomy and Astrophysics, Peking University
lho.pku@gmail.com

Prof. Victor P. Debattista — University of Central Lancashire
vpdebattista@gmail.com

Prof. Kohei Inayoshi — Kavli Institute for Astronomy and Astrophysics, Peking University
inayoshi0328@gmail.com

Prof. Lijing Shao — Kavli Institute for Astronomy and Astrophysics, Peking University
lshao@pku.edu.cn

Research Experience

Numerical study of scalar-tensor gravity and application to pulsars — Feb 2020 – Present

Advisor: Lijing Shao — Peking University, CN

- Designed and developed a method for computing derived quantities in scalar-tensor gravity of Damour and Esposito-Farèse (DEF) with pontaneous scalarization phenomena developed for neutron stars.
- Constructed reduced-order surrogate model for the derived quantities.
- Integrated the model into a python package pySTGROMX that speeds up calculations at two order-of-magnitude yet still keeps accuracy, compared with the previous method.
- Applied pySTGROMX to constrain the parameters of the DEF theory with well-timed binary pulsars
- Currently working on a first-author paper manuscript in prep for Physical Review D.

Hunting for wandering massive black holes Feb 2019 – Present

Advisor: Kohei Inayoshi, Luis C. Ho Peking University, CN

- Performed three-dimensional simulations for gas accretion onto a wandering black hole at the outskirts of galaxies (e.g., massive ellipticals, Milky Way, dwarf galaxies).
- Constructed radiative inefficient accretion-flow models for accretion near the horizon of a black hole.
- Applied the simulation results to the emission model and calculated the spectral energy distribution for the accretion flow onto a wandering black hole.
- Studied the detectability of wandering (super-massive) black holes in different types of galaxies, predicting that ALMA will enable us to hunt for a population of wandering BHs.
- Published a paper in the Astrophysical Journal as the first-author.

Quasar lifetime model June 2020 – Sept 2020

Advisor: Kohei Inayoshi Peking University, CN

- Constructed a model for lifetime of quasars.
- Built a theoretical correlation between the mass, luminosity and lifetime of quasars.
- Compared the model with the observed quasar lifetimes from measurements of proximity zone size.

Co-evolution between black holes and their host galaxies Mar 2018 - Jan 2020

Advisor: Luis C. Ho,Victor P. Debattista Peking University, CN

- Made N-body simulations to investigate the dissolution of bars and the growth of bulges, under the dynamical influence of central black holes
- Built morphological decomposition for the structures of the galaxy models using IRAF and GALFIT.
- Investigated the growth of a central black hole, the dissolution of the nuclear bar, and the gradual formation of an inner bulge through morphological decomposition as well as the dynamics of galaxies.
- Demonstrated that the initially boxy/peanut-shaped bulge is transformed into a more massive, compact structure that bears many similarities to a classical bulge, in terms of its morphology, kinematics, and location on standard scaling relations (Kormendy relation, mass-size relation, and correlations between black hole mass and bulge stellar mass and velocity dispersion).
- Led to a first-author paper published in Astrophysical Journal.

Honors and Awards

Lin-bridge First Prize for Undergraduate Research (endowed by Prof. Douglas Lin)	Sept 2020
Yuanpei College First Award for Undergraduate Research	June 2020
National Undergraduate Research & Training Program	May 2019
Peking University Scholarship for Outstanding Freshmen	Sept 2016

Conference Experience

PKU Undergraduate Astronomy Symposium Sept 2020

(Oral presentation) *Hunting for Wandering Massive Black Holes*

2019 Annual Meeting of Chinese Astronomical Society Sept 2019

(Oral presentation) *A New Channel of Bulge Formation via the Destruction of Short Bars*

IAU Symposium 353: Galactic Dynamics in the Era of Large Surveys June 2019

(Poster presentation) *A New Channel of Bulge Formation via the Destruction of Short Bars*

Activities

- 2020 Theoretical Physics and Particle Physics Summer School of Peking Unversity Aug 2020
- São Paulo School of Advanced Science on First Light:
  Stars, Galaxies and Black Holes in the Epoch of Reionization Aug 2019

Technical Skills

Programming: Proficient in Python, C/C++, LaTeX, and Mathematica. Basic knowledge of Matlab, Fortran.
Software ans Packages: emcee, Git, MPI, OMP, cuda, SymPy, yt, VisIt, ParaView, PLUTO, IRAF, GALFIT
Experience: Massive parallel computing on supercomputer, analyzing dataset and visualization.
Language: Mandarin (Native), English (Fluent, GRE General 320+3, TOEFL iBT 102)