

# Minghao Guo

## PERSONAL INFORMATION

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Name:	Minghao Guo	Address:	Peking University, 5 Yi He Yuan Road, Haidian District, Beijing, P.R. China
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## EDUCATION

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<b>Peking University</b>	Beijing, CN
Undergraduate of Science, Physics, Minor in Mathematics	Sept 2016 – Present
• GPA: 3.65/4.0; GRE Physics 990/990	

## RESEARCH INTERESTS

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- 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

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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

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<b>Director, Prof. Luis C. Ho</b> <a href="mailto:lho.pku@gmail.com">lho.pku@gmail.com</a>	Kavli Institute for Astronomy and Astrophysics, Peking University
<b>Prof. Victor P. Debattista</b> <a href="mailto:vpdebattista@gmail.com">vpdebattista@gmail.com</a>	University of Central Lancashire
<b>Prof. Kohei Inayoshi</b> <a href="mailto:inayoshi0328@gmail.com">inayoshi0328@gmail.com</a>	Kavli Institute for Astronomy and Astrophysics, Peking University
<b>Prof. Lijing Shao</b> <a href="mailto:lshao@pku.edu.cn">lshao@pku.edu.cn</a>	Kavli Institute for Astronomy and Astrophysics, Peking University

## RESEARCH EXPERIENCE

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<b>Numerical study of scalar-tensor gravity and application to pulsars</b>	Feb 2020 – Present
<b>Advisor:</b> <a href="#">Lijing Shao</a>	Peking University, CN
<ul style="list-style-type: none"><li>• 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.</li><li>• Constructed reduced-order surrogate model for the derived quantities.</li><li>• Integrated the model into a python package <a href="#">pySTGROMX</a> that speeds up calculations at two order-of-magnitude yet still keeps accuracy, compared with the previous method.</li><li>• Applied pySTGROMX to constrain the parameters of the DEF theory with well-timed binary pulsars</li><li>• Currently working on a first-author paper manuscript in prep for Physical Review D.</li></ul>	

## 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 model for 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

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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

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<b>PKU Undergraduate Astronomy Symposium</b> (Oral presentation) <i>Hunting for Wandering Massive Black Holes</i>	Sept 2020
<b>2019 Annual Meeting of Chinese Astronomical Society</b> (Oral presentation) <i>A New Channel of Bulge Formation via the Destruction of Short Bars</i>	Sept 2019
<b>IAU Symposium 353: Galactic Dynamics in the Era of Large Surveys</b> (Poster presentation) <i>A New Channel of Bulge Formation via the Destruction of Short Bars</i>	June 2019

## ACTIVITIES

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- 2020 Theoretical Physics and Particle Physics Summer School of Peking University 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

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**Programming:** Proficient in Python, C/C++, L<sup>A</sup>T<sub>E</sub>X, and Mathematica. Basic knowledge of Matlab, Fortran.  
**Software and 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)