

SUNAO SUGIYAMA

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CONTACT INFORMATION

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RESEARCH INTERESTS

Theoretical and Observational cosmology
large-scale structure of the Universe, gravitational weak/micro lensing, primordial black hole

MAJOR INVOLVEMENT IN LARGE PROJECTS

Subaru HSC weak lensing working group, member (2021-present)

EDUCATION

University of Tokyo, Tokyo, Japan April 2020 – March 2023
Ph.D. course in Physics, July, 2018
Dissertation: *“Joint cosmology analyses using gravitational weak lensing data from Subaru Hyper Suprime-Cam”*
Supervisor: Prof. Masahiro Takada

University of Tokyo, Tokyo, Japan April 2018 – March 2020
M.S. in Physics, July, 2018
Dissertation: *“Validation of cosmological analysis based on perturbation theory for wide-field galaxy survey”*
Supervisor: Prof. Masahiro Takada

University of Tokyo, Tokyo, Japan April 2014 – March 2018
B.A. in Physics, March, 2018

AWARDS AND FELLOWSHIP

The School of Science Encouragement Award (Doctoral program), University of Tokyo, the School of Science, Mar. 2023

Research Fellowships for Young Scientists (Doctoral Course Students, DC2), Japan Society for the Promotion of Science, Apr. 2021 – present

International Graduate Program for Excellence in Earth-Space Science (IGPEES), World-leading Innovative Graduate Study Program (WINGS), Sep. 2018 – present

GRANTS

Grant-in-Aid for JSPS Research Fellows (DC2)

OBSERVATIONS

PI, Definitive search for PBH dark matter in the multiverse cosmology with HSC ([Subaru website](#))

PROFESSIONAL SOCIETY

The Astronomical Society of Japan (ASJ), 2018 – present

The Physical Society of Japan (JPS), 2022 – present

PUBLICATIONS

For up-to-date list of my papers, please see [ADS](#).

* = Author list alphabeticized

Major author

1. H. Miyatake, **Sugiyama, Sunao**, M. Takada, et al. Cosmological inference from an emulator based halo model. II. Joint analysis of galaxy-galaxy weak lensing and galaxy clustering from HSC-Y1 and SDSS. *Phys. Rev. D*, 106(8):083520, [October 2022:083520](#). doi: 10.1103/PhysRevD.106.083520
2. H. Miyatake, Y. Kobayashi, M. Takada, et al. Cosmological inference from an emulator based halo model. I. Validation tests with HSC and SDSS mock catalogs. *Phys. Rev. D*, 106(8):083519, [October 2022:083519](#). doi: 10.1103/PhysRevD.106.083519
3. **Sugiyama, Sunao**. Fast Fourier Transformation Based Evaluation of Microlensing Magnification with Extended Source. *ApJ*, 937(2):63, [October 2022:63](#). doi: 10.3847/1538-4357/ac8df1
4. **Sugiyama, Sunao**, M. Takada, H. Miyatake, et al. HSC Year 1 cosmology results with the minimal bias method: HSC \times BOSS galaxy-galaxy weak lensing and BOSS galaxy clustering. *Phys. Rev. D*, 105(12):123537, [June 2022:123537](#). doi: 10.1103/PhysRevD.105.123537
5. **Sugiyama, Sunao**, M. Takada, and A. Kusenko. Possible evidence of QCD axion stars in HSC and OGLE microlensing events. *arXiv e-prints*, arXiv:2108.03063, [August 2021:arXiv:2108.03063](#)
6. **Sugiyama, Sunao**, V. Takhistov, E. Vitagliano, et al. Testing stochastic gravitational wave signals from primordial black holes with optical telescopes. *Physics Letters B*, 814:136097, [March 2021:136097](#). doi: 10.1016/j.physletb.2021.136097
7. *A. Kusenko, M. Sasaki, **Sugiyama, Sunao**, et al. Exploring Primordial Black Holes from the Multiverse with Optical Telescopes. *Phys. Rev. Lett.*, 125(18):181304, [October 2020:181304](#). doi: 10.1103/PhysRevLett.125.181304
8. **Sugiyama, Sunao**, M. Takada, Y. Kobayashi, et al. Validating a minimal galaxy bias method for cosmological parameter inference using HSC-SDSS mock catalogs. *Phys. Rev. D*, 102(8):083520, [October 2020:083520](#). doi: 10.1103/PhysRevD.102.083520
9. **Sugiyama, Sunao**, T. Kurita, and M. Takada. On the wave optics effect on primordial black hole constraints from optical microlensing search. *MNRAS*, 493(3):3632–3641, [April 2020:3632–3641](#). doi: 10.1093/mnras/staa407
10. H. Niikura, M. Takada, N. Yasuda, et al. Microlensing constraints on primordial black holes with Subaru/HSC Andromeda observations. *Nature Astronomy*, 3:524–534, [April 2019:524–534](#). doi: 10.1038/s41550-019-0723-1

Contributing author

11. Y. Park, T. Sunayama, M. Takada, et al. Cluster cosmology with anisotropic boosts: validation of a novel forward modelling analysis and application on SDSS redMaPPer clusters. *MNRAS*, 518(4):5171–5189, [February 2023:5171–5189](#). doi: 10.1093/mnras/stac3410
12. T. Zhang, X. Li, R. Dalal, et al. A General Framework for Removing Point Spread Function Additive Systematics in Cosmological Weak Lensing Analysis. *arXiv e-prints*, arXiv:2212.03257, [December 2022:arXiv:2212.03257](#)

SELECTED TALKS

Listing 17 selected talks among 25 talks.

1. Cosmology analysis with Subaru HSC Y3 data and SDSS data: cosmological parameter inference in Λ CDM model, [2023 Spring Annual Meeting of ASJ](#), 2023, Mar., *Oral*
2. Cosmology analysis with Subaru HSC Y3 data and SDSS data: a joint analysis of cosmic shear + galaxy-galaxy lensing + galaxy clustering, [2022 Autumn Annual Meeting of ASJ](#), 2022, Sep., *Oral*
3. Revealing the nature of dark matter with gravitational lensing: weak and microlensing, [Colloquium at Osaka theoretical astrophysics group](#), 2022, Jul., *Oral* (Invited Talk)
4. HSC cosmology: Joint analysis of galaxy-galaxy lensing and clustering from Subaru HSC and SDSS data, [77th Annual Meeting of JPS](#), 2022, Mar., *Oral*
5. Exploring Primordial black hole with microlensing observation of Andromeda galaxy, [Subaru Users Meeting 2021](#), 2022, Jan., *Oral*
6. Joint analysis of galaxy-galaxy lensing and clustering at large scales from Subaru HSC and SDSS data, [34th astro-theory Symposium](#), 2021, Dec., *Oral*
7. Joint analysis of galaxy-galaxy lensing and clustering at large scales from Subaru HSC and SDSS data, [2021 Autumn Annual Meeting of ASJ](#), 2021, Sep., *Oral*
8. Exploring Dark Matter Candidates with Microlensing, [KEK theory seminar](#), 2021, Apr., *Oral*
9. Constraining PBH with HSC microlensing, IPMU phenomenology lunch journal club, 2020, Dec., *Oral*
10. Testing stochastic gravitational wave signals by PBH microlensing, [4th KEK-PH + KEK-Cosmo Joint Lectures and Workshop on "Gravitational Wave"](#), 2020, Nov., *Oral* (Invited Talk)
11. Observational constraint on PBH scenarios with HSC microlensing, [9th workshop on observational cosmology](#), 2020, Nov., *Oral*
12. Developing a method of cosmological parameter inference from galaxy survey data by Subaru/HSC, [Summer school for young researchers in astronomy/astrophysics](#), 2020, Aug., *Oral*
13. Validating a minimal galaxy bias method for cosmological parameter inference using HSC-SDSS mock catalog, Seminar at Daniel Eisenstein group@CfA, 2020, Aug., *Oral*
14. Validation of PT-based method for cosmology analysis with wide field galaxy survey data, Seminar at astro group of Hiroasaki University, 2020, Feb., *Oral*
15. Validation of PT-based method for cosmology analysis of wide field galaxy survey data, [2019 Autumn Annual Meeting of ASJ](#), 2019, Sep., *Oral*
16. On the wave effect of PBH microlensing in the observation of the M31 stars, [2019 Spring Annual Meeting of ASJ](#), 2019, Mar., *Oral*
17. Wave effect on PBH micro-lensing and constraint, [7th workshop on observational cosmology](#), 2018, Dec., *Oral*

PEER REVIEWS

Reviewer of International Journal of Modern Physics D

PRESS RELEASES

Primordial black holes and the search for dark matter from the multiverse ([IPMU website](#))

PROGRAMMING SKILLS

Computing Language	C, C++, Python, HSC pipeline (for image analysis)
Code developed	fft-extended-source
Software Maintenance	dark emulator as a part of Dark Quest Project

SEMINARS AND WORKSHOPS ORGANIZED

IPMU weekly lunch seminar (co-organizer), 2019 – 2021

HSC weaklensing mini workshop, Aug. 2022