SUNAO SUGIYAMA

Compiled on September 17, 2023

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)

POSITIONS & EDUCATION

University of Pennsylvania, Philadelphia, the United States September 2023 – Now
Postdoctoral resercher
Mentor: Prof. Bhuvnesh Jain

Kavli IPMU, Chiba, Japan April 2023 – August 2023
Postdoctoral researcher
Mentor: Prof. Masahiro Takada

Beyond AI April 2023 – August 2023
Researcher

University of Tokyo, Tokyo, Japan April 2020 – March 2023
Ph.D. course in Physics
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
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

AWARDS AND FELLOWSHIP

Overseas Research Fellowships, Japan Society for the Promotion of Science, Sep. 2023 – Now

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 – Mar. 2023

International Graduate Program for Excellence in Earth-Space Science (IGPEES), World-leading InnovativeGraduate Study Program (WINGS), Sep. 2018 – Mar. 2023

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. Hyper Suprime-Cam Year 3 Results: Cosmology from Galaxy Clustering and Weak Lensing with HSC and SDSS using the Emulator Based Halo Model. *arXiv e-prints*, arXiv:2304.00704, April 2023:arXiv:2304.00704. doi: 10.48550/arXiv.2304.00704

2. S. More, **Sugiyama, Sunao**, H. Miyatake, et al. Hyper Suprime-Cam Year 3 Results: Measurements of Clustering of SDSS-BOSS Galaxies, Galaxy-Galaxy Lensing and Cosmic Shear. *arXiv e-prints*, arXiv:2304.00703, April 2023:arXiv:2304.00703. doi: 10.48550/arXiv.2304.00703

3. X. Li, T. Zhang, **Sugiyama, Sunao**, et al. Hyper Suprime-Cam Year 3 Results: Cosmology from Cosmic Shear Two-point Correlation Functions. *arXiv e-prints*, arXiv:2304.00702, April 2023:arXiv:2304.00702. doi: 10.48550/arXiv.2304.00702

4. R. Dalal, X. Li, A. Nicola, et al. Hyper Suprime-Cam Year 3 Results: Cosmology from Cosmic Shear Power Spectra. *arXiv e-prints*, arXiv:2304.00701, April 2023:arXiv:2304.00701. doi: 10. 48550/arXiv.2304.00701

5. **Sugiyama, Sunao**, H. Miyatake, S. More, et al. Hyper Suprime-Cam Year 3 Results: Cosmology from Galaxy Clustering and Weak Lensing with HSC and SDSS using the Minimal Bias Model. *arXiv e-prints*, arXiv:2304.00705, April 2023:arXiv:2304.00705. doi: 10.48550/arXiv.2304.00705

6. **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

7. 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

8. 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

9. **Sugiyama, Sunao**, M. Takada, H. Miyatake, et al. HSC Year 1 cosmology results with the minimal bias method: HSC ×BOSS galaxy-galaxy weak lensing and BOSS galaxy clustering. Phys. Rev. D, 105(12):123537, June 2022:123537. doi: 10.1103/PhysRevD.105.123537

10. **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

11. **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

12. *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

13. **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

14. **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

15. 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

16. 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

17. 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 20 selected talks among 28 talks.

1. **Hyper Suprime-Cam Year 3 Results: Cosmology from Weak Lensing with HSC**, Windows on the Universe, 2023, Aug., *Oral* (**Invited Talk**)

2. **HSC Year 3 Weak Lensing Cosmology Results**, HSC webinar, 2023, Apr., *Oral*

3. **HSC Y3 cosmology results**, CMB x LSS, 2023, Apr., *Oral* (**Invited Talk**)

4. **Cosmology analysis with Subaru HSC Y3 data and SDSS data: cosmological parameter inference in ΛCDM model**, 2023 Spring Annual Meeting of ASJ, 2023, Mar., *Oral*

5. **Cosmology analysis with Subaru HSC Y3 data and SDSS data: a joint analysis of cosmic shear + galaxy-galaxt lensing + galaxy clustering**, 2022 Autumn Annual Meeting of ASJ, 2022, Sep., *Oral*

6. **Revealing the nature of dark matter with gravitational lensing: weak and microlensing**, Colloqium at Osaka theoretical astrophysics group, 2022, Jul., *Oral* (**Invited Talk**)

7. **HSC cosmology: Joint analysis of galaxy-galaxy lensing and clustering from Subaru HSC and SDSS data**, 77th Annual Meeting of JPS, 2022, Mar., *Oral*

8. **Exploring Primordial black hole with microlensing observation of Andromeda galaxy**, Subaru Users Meeting 2021, 2022, Jan., *Oral*

9. **Joint analysis of galaxy-galaxy lensing and clustering at large scales from Subaru HSC and SDSS data**, 34th astro-theory Symposium, 2021, Dec., *Oral*

10. **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*

11. **Exploring Dark Matter Candidates with Microlensing**, KEK theory seminar, 2021, Apr., *Oral*

12. **Constraining PBH with HSC microlensing**, IPMU phenomenology lunch journal club, 2020, Dec., *Oral*

13. **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**)

14. **Observational constraint on PBH scenarios with HSC microlensing**, 9th workshop on observational cosmology, 2020, Nov., *Oral*

15. **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*

16. **Validating a minimal galaxy bias method for cosmological parameter inference using HSC-SDSS mock catalog**, Seminar at Daniel Eisenstein group@CfA, 2020, Aug., *Oral*

17. **Validation of PT-based method for cosmology analysis with wide field galaxy survey data**, Seminar at astro group of Hirosaki University, 2020, Feb., *Oral*

18. **Validation of PT-based method for cosmology analysis of wide field galaxy survey data**, 2019 Autumn Annual Meeting of ASJ, 2019, Sep., *Oral*

19. **On the wave effect of PBH microlensing in the observation of the M31 stars**, 2019 Spring Annual Meeting of ASJ, 2019, Mar., *Oral*

20. **Wave effect on PBH micro-lensing and constraintWave 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)

How to see the invisible: Using dark matter distribution to test our cosmological model (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