

Masato SHIRASAKI

Personal

Citizenship: Japanese

Birth: August 14, 1987

Address: Division of Science, National Astronomical Observatory of Japan,
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Research Interest

- ▷ Probing dark matter and dark energy with multi-wavelength astronomical surveys
- ▷ Simulating our observable universe with supercomputers
- ▷ Designing and building new statistical tools to study large-scale structures in the Universe

Education

- ▷ 2015 March **Ph.D. in Physics, University of Tokyo**

Thesis: *Probing Cosmic Dark Matter and Dark Energy with Weak Gravitational Lensing*

Supervisor: Prof. Naoki YOSHIDA

- ▷ 2012 March **M.S. in Physics, University of Tokyo**

Thesis: *Numerical simulations of weak gravitational lensing and their cosmological application*

Supervisor: Prof. Naoki YOSHIDA

- ▷ 2010 March **B.S. in Physics, Nagoya University**

Research Experience

- ▷ 2019-present **Jet Propulsion Laboratory**

Overseas Research Fellowships of the Japan Society for the Promotion of Science (expected to start from Nov. 2019)

Research subject: *Probing The Physics of Cosmic Acceleration with Big Data in Galaxy Surveys*

- ▷ 2017-present **National Astronomical Observatory of Japan**

National Astronomical Observatory of Japan Fellowship (NAOJ fellow)

- ▷ 2015-2017 **National Astronomical Observatory of Japan**

Postdoctoral Fellowships of the Japan Society for the Promotion of Science

Research subject: *Probing Dark Energy and Dark Matter with Higher-order Statistics of Weak Gravitational Lensing*

▷ 2012-2015 **University of Tokyo**

Research Fellowships of the Japan Society for the Promotion of Science for Young Scientists

Research subject: *Constraining cosmological models with weak gravitational lensing*

Prizes and Awards

▷ 2017 Inoue Research Award for Young Scientists

▷ 2015 Outstanding Ph.D. Thesis Award in Department of Physics, University of Tokyo

Papers

As of Oct 2019, 49 citable papers with 941 citations and h-index of 16 [from NASA ADS].

Publications in Refereed Journals (accepted or in press)

1. M. Shirasaki, "Pseudo Evolution of Galaxy-Cluster Masses and Its Impact on Mass Density Profile", *Astrophys. J.* 883 (2019) 1
2. R. Murata, M. Oguri, T. Nishimichi, M. Takada, R. Mandelbaum, S. More, M. Shirasaki and others, "The mass-richness relation of optically-selected clusters from weak gravitational lensing and abundance with Subaru HSC first-year data", accepted for publication in *Publications of the Astronomical Society of Japan*, <https://doi.org/10.1093/pasj/psz092>
3. T. Nishimichi, M. Takada, R. Takahashi, K. Osato, M. Shirasaki and others, "Dark Quest. I. Fast and Accurate Emulation of Halo Clustering Statistics and Its Application to Galaxy Clustering", *Astrophys. J.* 884 (2019) 1
4. M. Shirasaki, N. Yoshida, and S. Ikeda, "Denoising Weak Lensing Mass Maps with Deep Learning", *Phys. Rev. D* 100 (2019) 043527
5. M. Shirasaki, T. Hamana, M. Takada, R. Takahashi, and H. Miyatake, "Mock galaxy shape catalogs in the Subaru Hyper Suprime-Cam Survey", *Mon. Not. Roy. Astron. Soc.* 486 (2019) 52-69
6. D. Hashimoto, A. Nishizawa, M. Shirasaki, O. Macias, S. Horiuchi, H. Tashiro, and M. Oguri, "Measurement of redshift-dependent cross-correlation of HSC clusters and Fermi γ -rays", *Mon. Not. Roy. Astron. Soc.* 484 (2019) 5256-5266
7. M. Shirasaki, "Impact of radio sources and cosmic infrared background on thermal Sunyaev-Zel'dovich - gravitational lensing cross-correlation", *Mon. Not. Roy. Astron. Soc.* 483 (2019) 342-351
8. R. Takahashi, T. Nishimichi, M. Takada, M. Shirasaki and K. Shiroyama, "Covariances for cosmic shear and galaxy-galaxy lensing in the response approach", *Mon. Not. Roy. Astron. Soc.* 482 (2019) 4253-4277
9. M. Shirasaki and M. Takada, "Stacked lensing estimators and their covariance matrices: excess surface mass density versus lensing shear", *Mon. Not. Roy. Astron. Soc.* 478 (2018) 4277-4292

10. M. Shirasaki, O. Macias, S. Horiuchi, N. Yoshida, C-H. Lee, and A. Nishizawa, “Correlation of extragalactic γ rays with cosmic matter density distributions from weak gravitational lensing”, *Phys. Rev. D* 97 (2018) 123015
11. M. Shirasaki, E. T. Lau and D. Nagai, “Modelling Baryonic Effects on Galaxy Cluster Mass Profiles”, *Mon. Not. Roy. Astron. Soc.*, 477 (2018) 2804-2814
12. R. Murata, T. Nishimichi, M. Takada, H. M. Shirasaki, S. More et al., “Constraints on the mass-richness relation from the abundance and weak lensing of SDSS clusters”, *Astrophys. J.* 854 (2018) 120
13. B. Li and M. Shirasaki, “Galaxy-galaxy weak gravitational lensing in $f(R)$ gravity”, *Mon. Not. Roy. Astron. Soc.*, 474 (2018) 3599-3614
14. K. Osato, S. Flender, D. Nagai, M. Shirasaki and N. Yoshida, “Investigating Cluster Astrophysics and Cosmology with Cross-Correlation of the Thermal Sunyaev-Zel’dovich Effect and Weak Lensing”, *Mon. Not. Roy. Astron. Soc.*, 475 (2018) 532-542
15. M. Shirasaki and N. Yoshida, “Probing the shape and internal structure of dark matter halos with the halo-shear-shear three-point correlation function”, *Mon. Not. Roy. Astron. Soc.*, 475 (2018) 1665-1679
16. R. Takahashi, T. Hamana, M. Shirasaki, T. Namikawa, T. Nishimichi, K. Osato et al., “Full-sky Gravitational Lensing Simulation for Large-area Galaxy Surveys and Cosmic Microwave Background Experiments”, *Astrophys. J.* 850 (2017) 24
17. M. Shirasaki, K. Kashiyama and N. Yoshida, “Large-scale clustering as a probe of the origin and the host environment of fast radio bursts”, *Phys. Rev. D* 95 (2017) 083012
18. M. Shirasaki, T. Nishimichi, B. Li and Y. Higuchi, “The imprint of $f(R)$ gravity on weak gravitational lensing - II. Information content in cosmic shear statistics”, *Mon. Not. Roy. Astron. Soc.* 466 (2017) 2402-2417
19. M. Shirasaki, “Statistical connection of peak counts to power spectrum and moments in weak lensing field”, *Mon. Not. Roy. Astron. Soc.* 465 (2017) 1974-1983
20. M. Shirasaki, M. Takada, H. Miyatake, R. Takahashi, T. Hamana, T. Nishimichi et al., “Robust covariance estimation of galaxy–galaxy weak lensing: validation and limitation of jackknife covariance”, *Mon. Not. Roy. Astron. Soc.* 470 (2017) 3476-3496
21. M. Shirasaki, O. Macias, S. Horiuchi, S. Shirai and N. Yoshida, “Cosmological constraints on dark matter annihilation and decay: Cross-correlation analysis of the extragalactic γ -ray background and cosmic shear”, *Phys. Rev. D* 94 (2016) 063522
22. M. Shirasaki, D. Nagai, and E.T. Lau, “Covariance in the thermal SZ-weak lensing mass scaling relation of galaxy clusters”, *Mon. Not. Roy. Astron. Soc.* 460 (2016) 3913-3924
23. Y. Higuchi, and M. Shirasaki, “The imprint of $f(R)$ gravity on weak gravitational lensing - I. Connection between observables and large-scale structure”, *Mon. Not. Roy. Astron. Soc.* 459 (2016) 2762-2776
24. K. Osato, T. Sekiguchi, M. Shirasaki, A. Kamada, and N. Yoshida, “Cosmological constraint on the light gravitino mass from CMB lensing and cosmic shear”, *Journal of Cosmology and Astroparticle Physics* 06 (2016) 004

25. M. Shirasaki, T. Hamana, and N. Yoshida, "Probing cosmology with weak lensing selected clusters - II. Dark energy and $f(R)$ gravity models", Publications of the Astronomical Society of Japan 68 (2016) 414
26. M. Shirasaki, S. Horiuchi, and N. Yoshida, "Cross-correlation of the extragalactic gamma-ray background with luminous red galaxies", Phys. Rev. D 92 (2015) 123540
27. M. Shirasaki, T. Hamana, and N. Yoshida, "Probing cosmology with weak lensing selected clusters - I. Halo approach and all-sky simulations", Mon. Not. Roy. Astron. Soc. 453 (2015) 3043-3067
28. K. Osato, M. Shirasaki, and N. Yoshida, "Impact of Baryonic Processes on Weak-lensing Cosmology: Power Spectrum, Nonlocal Statistics, and Parameter Bias", Astrophys. J. 806 (2015) 186
29. M. Shirasaki, "Weak Gravitational Lensing as a Probe of Physical Properties of Substructures in Dark Matter Halos", Astrophys. J. 799 (2015) 188
30. M. Shirasaki, S. Horiuchi, and N. Yoshida, "Cross-Correlation of Cosmic Shear and Extragalactic Gamma-ray Background: Constraints on the Dark Matter Annihilation Cross-Section", Phys. Rev. D 90 (2014) 063502
31. Y. Higuchi, M. Oguri, and M. Shirasaki, "Statistical properties of filaments in weak gravitational lensing", Mon. Not. Roy. Astron. Soc. 441 (2014) 745-756
32. M. Shirasaki and N. Yoshida, "Statistical and Systematic Errors in the Measurement of Weak-Lensing Minkowski Functionals: Application to the Canada-France-Hawaii Lensing Survey", Astrophys. J. 786 (2014) 43
33. A. Kamada, M. Shirasaki, and N. Yoshida, "Weighing the Light Gravitino Mass with Weak Lensing Surveys", JHEP 1406 (2014) 162
34. M. Shirasaki, N. Yoshida, and T. Hamana, "Effect of Masked Regions on Weak-lensing Statistics", Astrophys. J. 774 (2013) 111
35. T. Hamana, M. Oguri, M. Shirasaki, and M. Sato, "Scatter and bias in weak lensing selected clusters", Mon. Not. Roy. Astron. Soc. 425 (2012) 2287-2298
36. M. Shirasaki, N. Yoshida, T. Hamana, and T. Nishimichi, "Probing Primordial Non-Gaussianity with Weak Lensing Minkowski Functionals", Astrophys. J. 760 (2012) 45

Publications in Refereed Journals (submitted)

1. K. Osato, M. Shirasaki, H. Miyatake, D. Nagai, N. Yoshida, M. Oguri, R. Takahashi, "Cross-correlation of the thermal Sunyaev-Zel'dovich effect and weak gravitational lensing: Planck and Subaru Hyper Suprime-Cam first-year data", <https://arxiv.org/abs/1910.07526>
2. M. Shirasaki, Erwin T. Lau, Daisuke Nagai, "Probing Cosmology and Cluster Astrophysics with Multi-Wavelength Surveys I. Correlation Statistics" submitted, <https://arxiv.org/abs/1909.02179>

3. D. Hashimoto, O. Macias, A. J. Nishizawa, K. Hayashi, M. Takada, M. Shirasaki, S. Ando, “Constraining dark matter annihilation with HSC Low Surface Brightness Galaxies”, submitted, <https://arxiv.org/abs/1906.06701>
4. T. Hamana, M. Shirasaki, S. Miyazaki, et al. “Cosmological constraints from cosmic shear two-point correlation functions with HSC survey first-year data”, submitted, <https://arxiv.org/abs/1906.06041>
5. H. Kondo, H. Miyatake, M. Shirasaki, N. Sugiyama, A. J. Nishizawa, “Weak Lensing Measurement of Filamentary Structure with the SDSS BOSS and Subaru Hyper Suprime-Cam Data”, submitted, <https://arxiv.org/abs/1905.08991>

Large Collaboration Papers

1. J. Rhodes and others (incl. M. Shirasaki), “Cosmological Synergies Enabled by Joint Analysis of Multi-probe data from WFIRST, Euclid, and LSST”, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 201; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 201 (2019)
2. T. Eifler and others (incl. M. Shirasaki), “Partnering space and ground observatories - Synergies in cosmology from LSST and WFIRST”, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 418; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 418 (2019)
3. O. Dore and others (incl. M. Shirasaki), “WFIRST: The Essential Cosmology Space Observatory for the Coming Decade”, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 341; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 341 (2019)
4. C. Hikage and others (incl. M. Shirasaki), “Cosmology from cosmic shear power spectra with Subaru Hyper Suprime-Cam first-year data”, Publications of the Astronomical Society of Japan, 71 (2019) 43
5. H. Miyatake and others (incl. M. Shirasaki), “Weak-Lensing Mass Calibration of ACTPol Sunyaev-Zel’dovich Clusters with the Hyper Suprime-Cam Survey”, Astrophys. J. 875 (2019) 1
6. S. Miyazaki, M. Oguri, T. Hamana, M. Shirasaki and others “A large sample of shear-selected clusters from the Hyper Suprime-Cam Subaru Strategic Program S16A Wide field mass maps”, Publications of the Astronomical Society of Japan, 70 (2018) S27
7. R. Mandelbaum and others (incl. M. Shirasaki), “The first-year shear catalog of the Subaru Hyper Suprime-Cam SSP Survey”, Publications of the Astronomical Society of Japan, 70 (2018) S25
8. H. Aihara and others (incl. M. Shirasaki), “The Hyper Suprime-Cam SSP Survey: Overview and Survey Design”, Publications of the Astronomical Society of Japan, 70 (2018) S4

Books

1. M. Shirasaki, “Probing Cosmic Dark Matter and Dark Energy with Weak Gravitational Lensing Statistics”, Springer Theses. ISBN 978-981-287-795-6. Springer Science+Business Media Singapore, 2016

Presentations

Seminars

1. M. Shirasaki, *De-noising image of cosmic large-scale structure with deep learning*, ipi monthly seminar, Institute for Physics of Intelligence, University of Tokyo, June 6, 2019
2. M. Shirasaki, *Gravitational lensing effect of large-scale structures and its correlations to multi-wavelength extragalactic background*, ASIAA Colloquium, Institute of Astronomy and Astrophysics, Academia Sinica, January 30, 2019
3. M. Shirasaki, *On Covariance Estimation in Weak Gravitational Lensing Survey*, Astrophysics Luncheon Seminar, Jet Propulsion Laboratory, United states, July 24 2017
4. M. Shirasaki, *Simulations for the HSC shear catalogue*, HSC discussion meeting, Princeton University, United states, June 8 2017
5. M. Shirasaki, *Probing Cosmology with Peak Count in Weak Lensing Mass Map*, KASI seminar, Korea Astronomy and Space Science Institute, Korea, March 16 2017
6. M. Shirasaki, *Constraining Dark Matter Annihilation with Large-scale Structures*, CTPU seminar, Institute for Basic Science, Center for Theoretical Physics of the Universe, Korea, March 15 2017

International Conferences & Workshops

1. M. Shirasaki *Toward a complete understanding of extragalactic gamma rays: Cross correction with large-scale structures*, CASTLE Meeting, Italy, 2018, Oral (Invited)
2. M. Shirasaki *Future Perspective of Cross Correlation of Gamma rays with Large Scale Structures*, Barolo Astroparticle Meeting, Italy, 2018, Oral (Invited)
3. M. Shirasaki, *The imprint of $f(R)$ gravity on weak gravitational lensing*, One-Day Workshop on Modified Gravity and Large-Scale Structure 2017, Japan, 2017, Oral
4. M. Shirasaki, *Covariance of galaxy-galaxy lensing: Jackknife vs. Mock*, International Conference on Particle Physics and Cosmology (COSMO 2016), United states, 2016, Oral
5. M. Shirasaki, N. Yoshida, and S. Horiuchi, *Cross-Correlation of Extragalactic Gamma-ray Background and Luminous Red Galaxies*, Workshop on Astrophysics of Dark Matter, Japan, 2015, Oral
6. M. Shirasaki, T. Hamana, and N. Yoshida, *Probing cosmology with weak lensing selected clusters*, Why does the Universe accelerate? - Exhaustive study and challenge for the future-, Japan, 2015, Oral

7. M. Shirasaki, T. Hamana, and N. Yoshida, *Probing Cosmology with Weak Lensing Selected Clusters*, Theoretical and Observational Progress on Large-scale Structure of the Universe, Germany, 2015, Poster
8. M. Shirasaki, N. Yoshida, and S. Horiuchi, *Search for Gamma-ray from Luminous Red Galaxies*, ICM physics and modeling, Germany, 2015, Oral
9. M. Shirasaki, *Mock catalogs for Hyper Suprime-Cam Survey*, Weak lensing working group meeting, United states, 2015, Oral
10. M. Shirasaki, N. Yoshida, and S. Horiuchi, *Dark Matter Annihilation Cross Section Constraints from the Cross-correlation of Cosmic Shear and Extragalactic Gamma-ray Background*, Fifth International Fermi Symposium, Japan, 2014, Oral
11. M. Shirasaki, N. Yoshida, and S. Horiuchi, *Cross-Correlation of Cosmic Shear and Extragalactic Gamma-ray Background*, International Conference on Particle Physics and Cosmology (COSMO 2014), United states, 2014, Oral
12. M. Shirasaki and N. Yoshida, *Weak Lensing Morphological Analysis in CFHTLenS*, Anisotropic Universe From Microwave to Ultrawave Length Energy, Nederland, 2013, Oral
13. M. Shirasaki, N. Yoshida, T. Hamana and T. Nishimichi, *Cosmological test with WL Minkowski Functionals*, TIFR Winter School and Symposium on Astronomical Surveys, India, 2012, Oral

Professional Activities

Memberships

Astronomical Society of Japan

Referee

The Astrophysical Journal, The Astrophysical Journal Letters, Monthly Notices of the Royal Astronomical Society, Astronomy & Astrophysics

Grants & Funding

1. “Probing The Physics of Cosmic Acceleration with Big Data in Galaxy Surveys”,
M. Shirasaki (PI), Overseas Research Fellowships of the Japan Society for the Promotion of Science, 2019-2020, 12.6 millions JPY
2. “Developing a statistical model of galaxy clusters for future astronomical surveys”,
M. Shirasaki (PI), JSPS Grant-in-Aid for Early-Career Scientists, 2019-2021, 3 millions JPY
3. “Probing the late-time cosmic acceleration with a direct comparison of numerical simulations and astronomical datasets”,
M. Shirasaki (PI), JSPS Grant-in-Aid for Scientific Research on Innovative Areas, 2018-2019, 2 millions JPY
4. “Probing dark energy and dark matter with higher-order statistics of weak gravitational lensing”,
M. Shirasaki (PI), Postdoctoral Fellowships of the Japan Society for the Promotion of Science, 2015-2017, 3.3 millions JPY

5. “Constraining cosmological models with weak gravitational lensing”,
M. Shirasaki (PI), Research Fellowships of the Japan Society for the Promotion of Science
for Young Scientists, 2012-2014, 2.7 millions JPY