Cristóbal Sifón

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Research Interests

I focus on the interplay between luminous and dark matter using galaxy clusters as probes. Specific questions I address include observable–mass scaling relations for cosmological analyses and the transformation of galaxies in and around galaxy clusters. I use various tools and techniques, most prominently weak gravitational lensing and the Sunyaev-Zel'dovich effect, taking advantage of large-scale surveys, targeted optical and near-infrared observations, and hydrodynamical simulations.

Collaborations: 4MOST Chilean Cluster Galaxy Evolution Survey (CHANCES, *proposal Co-I*) — 4MOST Hemisphere Survey (4HS, *proposal Co-I*) — Atacama Cosmology Telescope (ACT) — Canadian Cluster Comparison Project (CCCP) — Cerro Chajnantor Atacama Telescope (CCAT) — CMB-S4 — Galaxy Cluster Mass Reconstruction Project — Kilo-Degree Survey (KiDS) — Legacy Survey of Space and Time Dark Energy Science Collaboration (LSST-DESC) — Multi-Epoch Nearby Cluster Survey (MENeaCS) — Simons Observatory.

Employment

[2022 – Present] Profesor Auxiliar, Pontificia Universidad Católica de Valparaíso (PUCV), Chile
[2019 – 2022] Profesor Asociado, PUCV
[2016 – 2019] Postdoctoral Research Associate, Princeton University, USA

Education

[2012 – 2016] Ph.D. Astrophysics, Universiteit Leiden, The Netherlands
[2010 – 2012] M.Sc. Astrophysics, P. Universidad Católica de Chile (PUC), Chile
[2005 – 2010] B.Sc. Astronomy, PUC

Teaching & Mentoring

Graduate Research Mentoring

[2023 – Present] Javier Urrutia, PUCV: MSc thesis advisor.
[2020 – 2022] Camila Aros, PUCV: MSc thesis advisor.
[2017 – 2019] Naomi Robertson, Oxford University (UK): co-advised PhD thesis project (Advisor: Joanna Dunkley).
[2013 – 2014] Joshua Albert, Universiteit Leiden: co-advised MSc thesis project (Advisor: Huub Röttgering).

Undergraduate Research Mentoring

[PUCV] 3 Senior theses and 4 Summer projects.
[Princeton] Summer project and Junior project.
[Others] Four-month research project through the Central American-Caribbean Bridge in Astrophysics (URL).

Courses Taught (all at PUCV)

Graduate: Data Analysis, Techniques of Observational Astrophysics, Observational Cosmology
Undergraduate: Introductory Astronomy, Astronomical Instrumentation, Galactic Astronomy, Programming, Cosmology
Non-Physics Major: Basic Astronomy

Grants

[2024] "Núcleos Amplios para Investigación Asociativa en Inteligencia Artificial y Astrofísica (NAIA^2)" (ANID-FONDEQUIP midsize equipment grant, **Co-I**, US$400,000)
[2020] "Developing Chilean infrastructure for early imaging and analysis of extragalactic sources in cosmic microwave background surveys" (ALMA-ANID Fund to hire a post-doctoral researcher, **Co-PI**, 2 years, US$77,000)
[2019] "Physics and Cosmological Implications of Galaxy Clusters with Optical and CMB Surveys" (FONDECYT Iniciación research grant, **PI**, 4 years, US$125,000)

Observing Proposals and Experience

I have been the PI of 17 successful observing proposals totaling hundreds of observing hours in optical (VLT/MUSE, Gemini-South/GMOS, VST/OmegaCAM, Blanco/DECam), near-infrared (Magellan/Fourstar, Blanco/NEWFIRM), submm (APEX/CONCERTO), and radio (GMRT, VLA) telescopes. I have spent roughly 180 hours observing with optical (Gemini South/GMOS, Blanco/DECam) and near-infrared (Blanco/NEWFIRM, Magellan/Fourstar, NTT/SofI) instruments performing both imaging and spectroscopy of galaxy clusters.

Community Activity

Journal referee: Astronomy & Astrophysics, The Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Nature Astronomy.
Telescope Allocation Committees: Canadian Astronomical Society, *Chandra* X-ray Observatory
Grant Allocation Committees: Swiss National Science Foundation, Chilean National Agency for Research and Development (ANID)

Press Articles Authored

[July 2017] *Galaxy clusters: Falling into line* (Nature Astronomy *News & Views*)
[July 2013] *Featured Science: Dynamical masses of galaxy clusters discovered with the Sunyaev-Zel'dovich effect* (Gemini Focus)

Outreach (past 5 years)

[Nov. 2023] Guest in "Diálogos Cósmicos" podcast (in Spanish, available here).
[Aug. 2023] Guest in "Conversemos de Astronomía" podcast (in Spanish, available here).
[Nov. 2022] Guest in "Rockstars" podcast by Radio TXS (in Spanish, available here).
[Oct. 2022] Interview for Radio Valentín Letelier, Valparaíso, to talk about CHANCES.
[Mar. 2021] Online public talk in the conext of the Chilean *Day of Astronomy* (in Spanish, available here).
[2018 – 2019] Assisted with *Public Astronomical Observations in Spanish*, Princeton University.

Technical skills

I am an experienced `Python` programmer. I am one of the lead developers and maintainers of the galaxy-galaxy lensing pipeline used by the KiDS collaboration (written in `python`, but which is not public at the moment). Much of the functionality can be found in `profiley`, an open-source software I wrote and maintain. Other codes I have written are posted at my `github` page.

Other Work Experience

[2020 – 2021] Data science & Machine Learning consultant, Minera Centinela, Chile.
[2007 – 2008] Ski instructor at Homewood Mountain Ski Resort in Lake Tahoe, CA, USA. Obtained certification as *Level I Ski Instructor* by the Professional Ski Instructors of America (PSIA).
[2006 – 2007] Ski lift operator at Sun Valley Resort, Sun Valley, ID, USA.

References **(in order of relevance)**

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Selected recent publications (All including C. Sifón)

I have co-authored 163 scientific articles intended for peer-reviewed publication, including 9 first-author papers. They have been cited more than 9,600 times, with more than 400 citations on my first-author papers. The full list of publications can be accessed at the SAO/NASA Astrophysics Data System. This document is maintained live on `github`.

15. E. Calabrese, and 171 colleagues, **"The Atacama Cosmology Telescope: DR6 Constraints on Extended Cosmological Models"**, 2025, arXiv:2503.14454 submitted to JCAP

14. T. Louis, and 167 colleagues, **"The Atacama Cosmology Telescope: DR6 Power Spectra, Likelihoods and ΛCDM Parameters"**, 2025, arXiv:2503.14452 submitted to JCAP

13. S. Naess, and 165 colleagues, **"The Atacama Cosmology Telescope: DR6 Maps"**, 2025, arXiv:2503.14451 submitted to JCAP

12. The Simons Observatory Collaboration, **"The Simons Observatory: Science Goals and Forecasts for the Enhanced Large Aperture Telescope"**, 2025, arXiv:2503.00636 submitted to JCAP

11. **C. Sifón**, and 43 colleagues, **"CHANCES, The Chilean Cluster Galaxy Evolution Survey: selection and initial characterization of clusters and superclusters"**, 2024, arXiv:2411.13655 accepted for publication in A&A

10. M. Shirasaki, **C. Sifón**, and 15 colleagues, **"Masses of Sunyaev-Zel'dovich Galaxy Clusters Detected by The Atacama Cosmology Telescope: Stacked Lensing Measurements with Subaru HSC Year 3 data"** 2024, PRD, 110, 103006, [2407.08201]

9. **C. Sifón** and J. Han, **"The history and mass content of cluster galaxies in the EAGLE simulation"**, 2024, A&A, 686, A163, [2312.12529]

8. N. C. Robertson, **C. Sifón**, and 23 colleagues, **"ACT-DR5 Sunyaev-Zel'dovich Clusters: Weak Lensing Mass Calibration with KiDS"**, 2024, A&A, 681, 87 [2304.10219]

7. W. Coulton, and 153 colleagues, **"Atacama Cosmology Telescope: High-resolution component-separated maps across one third of the sky"**, 2024, PRD, 109, 063530 [2307.01258]

6. M. S. Madhavacheril, and 158 colleagues, **"The Atacama Cosmology Telescope: DR6 Gravitational Lensing Map and Cosmological Parameters"**, 2024, ApJ, 962, 113 [2304.05203]

5. Dark Energy Survey and Kilo-Degree Survey Collaborations, and 160 colleagues, **"DES Y3 + KiDS-1000: Consistent cosmology combining cosmic shear surveys"**, 2023, The Open Journal of Astrophysics, 6, 36 [2305.17173]

4. M. Hilton, **C. Sifón**, and 133 colleagues **"The Atacama Cosmology Telescope: a Catalog of >4000 Sunyaev-Zel'dovich Galaxy Clusters"**, 2021, ApJS, 253, 3 [2009.11043]

3. M. Aguena, and 24 colleagues, **"CLMM: a LSST-DESC cluster weak lensing mass modeling library for cosmology"**, 2021, MNRAS, 508, 6092 [2107.10857]

2. M. S. Madhavacheril, **C. Sifón**, and 61 colleagues **"The Atacama Cosmology Telescope: Weighing Distant Clusters with the Most Ancient Light"**, 2020, ApJL, 903, 13 [2009.07772]

1. R. Herbonnet, **C. Sifón**, H. Hoekstra, Y. Bahé, R. F. J. van der Burg, J.-B. Melin, A. von der Linden, D. Sand, S. Kay, D. Barnes, **"CCCP and MENeaCS: (Updated) Weak-Lensing Masses for 100 Galaxy Clusters"**, 2020, MNRAS, 497, 4684 [1912.04414]