Cristóbal Sifón

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Research Interests

My research focuses on galaxy cluster physics including observable–mass scaling relations for cosmological analyses, brightest cluster galaxies, the mass content of cluster galaxies, and merging clusters. I am also interested in intrinsic galaxy alignments, both as contaminants for cosmic shear and as a physical mechanism in their own right. I use various tools and techniques to study these phenomena, including weak gravitational lensing, spectroscopy, the exploitation of optical surveys in general, and most recently analyses involving hydrodynamical simulations.

Collaborations: Atacama Cosmology Telescope (ACT) — Canadian Cluster Comparison Project (CCCP) — Galaxy Cluster Mass Reconstruction Project — Hyper-Suprime Cam survey (HSC) — Kilo-Degree Survey (KiDS) — Large Synoptic Survey Telescope Dark Energy Science Collaboration (LSST-DESC) — Multi-Epoch Nearby Cluster Survey (MENeaCS) — Simons Observatory.

Employment and Education

[2016 – Present] Postdoctoral Research Associate, Princeton University, USA
[2012 – 2016] Ph.D. Astrophysics, Universiteit Leiden, The Netherlands
[2010 – 2012] M.Sc. Astrophysics, P. Universidad Católica de Chile, Chile
[2005 – 2010] B.Sc. Astronomy, P. Universidad Católica de Chile, Chile

Internships

[2011] Science Intern, Gemini South Observatory (6 months)
[2011] Internship, Rutgers University (2 months)
[2009] Science Intern, Gemini South Observatory (6 months, *B.Sc. thesis*)

Teaching & Mentoring

Student Research Mentoring

[2018 – Present] Malik Walker, Princeton University: Undegraduate Summer Research Program and Junior Project.
[2017 – Present] Naomi Robertson, Oxford University (UK): co-advising PhD thesis project.
[2013 – 2014] Joshua Albert, Universiteit Leiden: co-advised MSc thesis project.

Teaching Assistant

[Leiden] Stellar dynamics; organizer of MSc thesis defense presentations
[U. Católica] Extragalactic astrophysics; Experimental astrophysics; Laboratory of thermodynamics and kinetic theory

Successful Observing Proposals (as PI)

I have been the PI of 6 different successful observing proposals in 5 different telescopes:
[Magellan/FourStar] (2019A) 0.5 nights for near-infrared imaging of galaxy clusters
[Very Large Array] (2019A) 4.5 h to study AGN feedback in galaxy clusters
[Giant Metrewave Radio Telescope] (2017B,2013B) 44 h to study diffuse radio emission in clusters
[Gemini South/GMOS] (2017B) 24 h for optical imaging and spectroscopy of high-redshift galaxy clusters
[VLT Survey Telescope/OmegaCAM] (2015A) 6 h for optical imaging of galaxy clusters

Observing Experience: I have spent roughly 180 hours observing with optical (Gemini South/GMOS) and near-infrared (La Silla-2.2m) instruments performing both imaging and spectroscopy of galaxy clusters.

Community Activity

I have served as a referee for Astronomy & Astrophysics, The Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, and Nature Astronomy.

Informal courses

[2016] *Making Better Figures*, Universiteit Leiden (http://bit.ly/2NTznxW)

Press articles authored

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

Outreach

[2018 – Present] Assisting with *Public Astronomical Observations in Spanish*, Princeton University.
[2013 – 2014] Assisted with *Public Observations at the Old Observatory*, Leiden Observatory.
[2012] Co-taught an *Astronomy Course for Seniors*, U. Católica.
[2011] Participated in *Starry Nights*, observation nights for elementary and middle school students in social risk organized by ESO-Santiago.
[2010] Invited talk on board the "FFG14 Almirante Latorre" Chilean Navy ship, Valparaiso, Chile.
[2010] *The Universe*, a series of talks for elementary school students in social risk organized by U. Católica.

Technical skills

I am an experienced `python` programmer, and I also have some experience with IRAF/PyRAF. I have written `pygmos`, a Python/PyRAF pipeline to reduce Gemini-GMOS spectra which is available here. I also developed an early analysis pipeline for the FLAMINGOS-II infrared imager and spectrograph installed in the Gemini-South telescope. I am one of three 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). Other codes I have written are posted at my `github` page.

Other Work Experience

[2007 – 2008] Ski instructor at Homewood Mountain Ski Resort in Lake Tahoe, CA. 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.

References

- Prof. Henk Hoekstra (*PhD advisor*)
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Publication list

I have co-authored 59 scientific articles intended for peer-reviewed publication, including 7 first-author papers. They have been cited more than 2,000 times and have an h-index of 24, with more than 220 citations on my first-author papers. My publications include three companion reviews on galaxy alignments written for a special issue of Space Science Reviews (B. Joachimi et al. 2015, A. Kiessling et al. 2015, D. Kirk et al. 2015). The full list of publications is summarized below, and can be accessed at this url. I also wrote an invited 'News & Views' article for the 4 July 2017 edition of Nature Astronomy, accessible here.

This document is maintained live on `github`.

First-Author Papers

7. **C. Sifón**, R. Herbonnet, H. Hoekstra, R. F. J. van der Burg, M. Viola, **"The Galaxy-Subhalo Connection in Low-Redshift Galaxy Clusters from Weak Gravitational Lensing"**, 2018, MNRAS, 478, 1244 [arXiv]

6. **C. Sifón**, R. F. J. van der Burg, H. Hoekstra, A. Muzzin, R. Herbonnet, **"A First Constraint on the Average Mass of Ultra Diffuse Galaxies from Weak Gravitational Lensing"**, 2018, MNRAS, 473, 3747 [arXiv]

5. **C. Sifón** et al. (25 co-authors), **"The Atacama Cosmology Telescope: Dynamical Masses for 44 SZ-Selected Galaxy Clusters over 755 Square Degrees"**, 2016, MNRAS, 461, 248 [arXiv]

4. **C. Sifón** et al. (26 co-authors), **"The Masses of Satellites in GAMA Galaxy Groups from 100 Square Degrees of KiDS Weak Lensing Data"**, 2015, MNRAS, 454, 3938 [arXiv]

3. **C. Sifón**, H. Hoekstra, M. Cacciato, M. Viola, F. Köhlinger, R. F. J. van der Burg, D. J. Sand, M. L. Graham, **"Constraints on the Alignments of Galaxies in Galaxy Clusters from ∼14,000 Spectroscopic Members"**, 2015, A&A, 575, A48 [arXiv]

2. **C. Sifón**, F. Menanteau, J. P. Hughes, M. Carrasco, L. F. Barrientos, **"Strong Lensing Analysis of PLCK G004.5−19.5, a Planck-Discovered Cluster Hosting a Radio Relic at $z = 0.52$"**, 2014, A&A, 562, A43 [arXiv]

1. **C. Sifón** et al. (36 co-authors), **"The Atacama Cosmology Telescope: Dynamical Masses and Scaling Relations for a Sample of Massive Sunyaev-Zel'dovich Effect Selected Galaxy Clusters"**, 2013, ApJ, 772, 25 [arXiv]

Major Contributor Papers

11. M. Hilton, M. Hasselfield, **C. Sifón**, et al. (43 co-authors), **"The Atacama Cosmology Telescope: The Two-Season ACTPol Sunyaev-Zel'dovich Effect Selected Cluster Catalog"**, 2018, ApJS, 235, 20 [arXiv]

10. J. G. Albert, **C. Sifón**, A. Stroe, F. Mernier, H. T. Intema, H. J. A. Röttgering, G. Brunetti, **"Complex Diffuse Emission in the $z = 0.52$ Cluster PLCK G004.5−19.5"**, 2017, A&A, 607, A4 [arXiv]

9. R. F. J. van der Burg, H. Hoekstra, A. Muzzin, **C. Sifón**, et al. (17 co-authors), **"The Abundance of Ultra-Diffuse Galaxies from Groups to Clusters: UDGs are Relatively More Common in More Massive Haloes"**, 2017, A&A, 607, A79 [arXiv]

8. E. van Uitert, M. Cacciato, H. Hoekstra, M. Brouwer, **C. Sifón**, et al. (29 co-authors), **"The Stellar-to-Halo Mass Relation of GAMA Galaxies from 100 Square Degrees of KiDS Weak Lensing Data"**, 2016, MNRAS, 459, 3251 [arXiv]

7. D. Kirk, M. L. Brown, H. Hoekstra, B. Joachimi, T. D. Kitching, R. Mandelbaum, **C. Sifón**, M. Cacciato, A. Choi, A. Kiessling, A. Leonard, A. Rassat, B. Malte Schäfer, **"Galaxy Alignments: Observations and Impact on Cosmology"**, 2015, Space Sci. Rev., 193, 139 [arXiv]

6. A. Kiessling, M. Cacciato, B. Joachimi, D. Kirk, T. D. Kitching, A. Leonard, R. Mandelbaum, B. Malte Schäfer, **C. Sifón**, M. L. Brown, A. Rassat, **"Galaxy Alignments: Theory, Modelling & Simulations"**, 2015, Space Sci. Rev., 193, 67 [arXiv]

5. B. Joachimi, M. Cacciato, T. D. Kitching, A. Leonard, R. Mandelbaum, B. Malte Schäfer, **C. Sifón**, H. Hoekstra, A. Kiessling, D. Kirk, A. Rassat, **"Galaxy Alignments: an Overview"**, 2015, Space Sci. Rev., 193, 1 [arXiv]

4. R. F. J. van der Burg, H. Hoekstra, A. Muzzin, **C. Sifón**, M. L. Balogh, S. McGee, **"Evidence for the Inside-Out Growth of the Stellar Mass Distribution in Galaxy Clusters since $z \sim 1$"**, 2015, A&A, 577, 19 [arXiv]

3. M. Hilton, M. Hasselfield, **C. Sifón**, et al. (26 co-authors), **"The Atacama Cosmology Telescope: The Stellar Content of Galaxy Clusters Selected Using the Sunyaev-Zel'dovich Effect"**, 2013, MNRAS, 435, 3469 [arXiv]

2. F. Menanteau, **C. Sifón**, et al. (26 co-authors), **"The Atacama Cosmology Telescope: Physical Properties of Sunyaev-Zel'dovich Effect Clusters on the Celestial Equator"**, 2013, ApJ, 765, 67 [arXiv]

1. F. Menanteau, J. P. Hughes, **C. Sifón**, et al. (27 co-authors), **"The Atacama Cosmology Telescope: ACT-CL J0102–4915 "El Gordo," a Massive Merging Cluster at Redshift 0.87"**, 2012, ApJ, 748, 7 [arXiv]