Sohyoun L. Yun Cárcamo, Ph.D.

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My webpage · NASA ADS Publications (28 refereed papers, >400 citations, H-index: 11) · LinkedIn

UAT keywords: Gamma-ray astronomy (628); Neutrino astronomy (1100); Galactic cosmic rays (567)

EDUCATION

University of Maryland, Ph.D. in Physics — August 2021 – April 2025

- *Observation of Ultra-High-Energy Gamma Rays and Search for Dark Matter Signatures in the Galactic Center with the HAWC Observatory* (link)
- **Advisor:** Jordan Goodman (goodman@umd.edu)

Universidad de Chile, B.S. in Physics (GPA: 4.0) — March 2017 – Dec. 2020

RESEARCH INTERESTS

Experimental particle astrophysics, multimessenger astronomy, cosmic-ray acceleration, Galactic PeVatrons, gamma-ray and neutrino astronomy, high-energy astrophysics, indirect detection of dark matter

RESEARCH APPOINTMENTS

Postdoctoral Researcher (HAWC†, IceCube‡, P-ONE§) — July 2025 – present
Drexel University, Philadelphia, PA
PI: Naoko Kurahashi Neilson (nn344@drexel.edu)

Graduate Research Assistant (HAWC†) — 2021–2025
University of Maryland, College Park, MD
PI: Jordan Goodman (goodman@umd.edu)

Undergraduate Research Assistant (Chilean Complexity Cluster) — 2018–2020
Universidad de Chile, Ñuñoa, Chile
PI: J. Alejandro Valdivia (alejo@uchile.cl), José Rogan (jrogan@uchile.cl)

†HAWC (High-Altitude Water Cherenkov) Gamma-ray Observatory in Mexico
‡IceCube Neutrino Observatory at the South Pole; recognized by the 2026 Nobel Prize in Physics
§P-ONE (Pacific-Ocean Neutrino Experiment) planned for the coast of Canada

(Publication list at the end)

INVITED RESEARCH VISITS

Invited Research Visitor (IceCube‡) — August 2026
Sungkyunkwan University, Suwon, South Korea
PI: Chang Dong Rho (cdr397@skku.edu)

Invited Research Visitor (P-ONE§) — July 2025
Michigan State University, East Lansing, MI
PI: Mehr Un Nisa (nisamehr@msu.edu)

Invited Research Visitor (HAWC†) — October 2024
Michigan State University, East Lansing, MI
PI: Mehr Un Nisa (nisamehr@msu.edu)

AWARDS AND HONORS

American Physical Society Division of Astrophysics Travel Award — 2026

2nd Prize Poster, "UHE Observations of the Galactic Center with HAWC" — 2024
CDY Future of Gamma-Ray Astronomy Summer School, MPIK

Highest GPA in Physics cohort 2020
Universidad de Chile, Chile

INVITED TALKS

Conferences
- International Conference on High Energy, Particles and Nuclear Physics in the LHC Era, Valparaíso, Chile **(IceCube overview)** Upcoming 01/2027
- American Physical Society Global Physics Summit, Denver, CO USA **(HAWC overview talk)** 04/2026

Seminars
- Physics Seminar, Universidad de Chile, Chile **(upcoming talk)** Upcoming 12/2026
- Physics Seminar, Sungkyunkwan University, South Korea 08/2026
- Particle Seminar, Drexel University, USA 06/2025
- High Energy Seminar, Center for Astrophysics, Harvard & Smithsonian (YouTube) 02/2025
- High Energy Physics Seminar, University of Maryland 09/2024

CONTRIBUTED PRESENTATIONS

Conferences
- Gamma Connection, Santiago, Chile **(upcoming talk)** Upcoming 12/2026
- TeV Particle Astrophysics (TeVPA), Tendo, Japan **(talk)** 08/2026
- Fermi Symposium, College Park, MD USA **(talk)** 09/2024
- ICRC in Nagoya, Japan **(talk)** 07/2023
- APS in Minneapolis, MN USA **(talk)** 04/2023
- APS in New York, NY USA **(poster)** 04/2022

Collaboration Meetings
- IceCube Collaboration Meeting, Bochum, Germany **(plenary talk)** 05/2026
- IceCube Collaboration Meeting, University of Utah, UT USA **(talk)** 10/2025
- HAWC Collaboration Meeting, Temple University, Philadelphia, PA USA **(talk)** 10/2024
- HAWC Collaboration Meeting, Mexico City, Mexico **(talk)** 04/2024
- HAWC Collaboration Meeting, Puerto Vallarta, Mexico **(talk)** 11/2023
- HAWC Collaboration Meeting, Puebla, Mexico **(talk)** 05/2023
- HAWC Collaboration Meeting, Madison, WI USA **(talk)** 10/2022

TEACHING

Workshop Instructor — Sungkyunkwan University
IceCube Software 08/2026

Course Instructor — Postgraduate Diploma, Fundamentals of Physics, Universidad de Chile
Optics 07–08/2026

Guest Lecturer — B.S. Physics, Physics Department, Drexel University
PHYS 170 Electricity and Motion — Prof. C. Love 04/2026

Guest Lecturer — B.S. Physics, Physics Department, Drexel University
PHYS T380 Special Topics in Physics — Prof. C. Love 08/2025

Teaching Assistant — Postgraduate Diploma, Fundamentals of Physics, Universidad de Chile
Electromagnetism — Prof. J. Rogan 2021
Advanced Programming (Numerical Methods in Python) — Prof. S. Blunier 2021
Mathematical Methods for Physics III — Prof. B. Toledo 2020
Introduction to Physics (Classical Mechanics) — Prof. J. A. Valdivia 2018

Undergraduate Teaching Assistant — Physics Department, Universidad de Chile
Electromagnetism — Prof. J. Rogan 2019 & 2020
Programming and Numerical Methods (Python) — Prof. J. Rogan 2020

MENTORSHIP

Graduate Research Mentor — HAWC Collaboration

- Nilanjana Ghosh & Mahsa Najafi (Ph.D., Michigan Technological University) 2024–present

Mentoring on their research projects, navigating the collaboration and its internal review procedures, preparing for and presenting at conferences, and career development.

Graduate Research Mentor — IceCube and HAWC Collaborations, Sungkyunkwan University

- Taeyun Kim & Minji Shin (Ph.D.): Training them on IceCube software and co-developing the pipeline for a joint analysis of the cosmic-ray spectrum with HAWC. 2026–present

Graduate Research Mentor — IceCube Collaboration, Drexel University

- Riya Shah (Ph.D.): Supervised the preparation of her thesis manuscript and helped her prepare for her defense. 2025–present
- JJ Pimentel (M.S.): Training him on IceCube data and supervising his M.S. thesis project.

Undergraduate Research Mentor — IceCube Collaboration, Drexel University

- Willem Kirsch: Training him on IceCube software and supervising his senior research project. 2026–present
- Particle Astrophysics Undergraduate Group: Co-host weekly meetings where students choose topics in particle astrophysics or scientific careers, and I prepare and deliver informal lectures on them. I also manage the group's online forum, where I answer research questions and give feedback.

OUTREACH

Colegio San Andrés, Ancud, Chile Upcoming 12/2026

- High-school level: Career path and working with the Nobel Prize
- Elementary school level: Astronomy with IceCube

Departamento de Física, Universidad de Chile, Santiago, Chile 10/2026
Designed a public Instagram post (link) and recorded a video (YouTube; in Spanish) for the department explaining the 2026 Nobel Prize in Physics, the IceCube Neutrino Observatory, and the discovery of astrophysical neutrinos

Start Talking Science, Philadelphia, PA, USA 08/2026
Reviewed student and early-career researcher poster abstracts and provided recommendations on scientific communication and presentation

Science in Community — Denver Museum of Nature & Science, Denver, CO 03/2026
American Physical Society participant in structured dialogue on science, trust, and the relationship between science and society, organized by APS Public Engagement in partnership with the Institute for Science & Policy.

25th Kaczmarczik Lecture and Science Fair, Philadelphia, PA 03/2026
I exhibited physics experiments in a science fair for nearly 700 high schoolers.

Voices of IceCube, virtual 01/2026
Participated in an interview highlighting research and life as an early-career scientist (written article and YouTube)

Start Talking Science, Philadelphia, PA, USA 09/2025
Provided feedback in a science communication workshop for students and early-career researchers

Feria Científica Colegio San Andrés, virtual 10/2024
Created a video message for students promoting interest in science at the Colegio San Andrés science fair (Facebook)

MEDIA COVERAGE

Online news: Universidad de Chile 11/2026
Headline translation: *From the University of Chile to the 2026 Nobel Prize in Physics team: Sohyoun Yun Cárcamo*

and her search for answers in the universe

Newspaper: Las Últimas Noticias 10/2026

Headline translation: *The scientist who grew up in Chiloé and now works alongside the 2026 Nobel laureate in Physics*

Los Alamos National Laboratory news 10/2024

Highest-energy ever gamma rays observed from Milky Way center

Phys.org 10/2024

Record gamma rays detected at Milky Way's core

CERN Courier 09/2024

A Pevatron at the Galactic Centre

University of Maryland, Department of Physics 09/2024

High Altitude Water Cherenkov Observatory Sheds Light on Origin of Galactic Cosmic Rays

SERVICE & LEADERSHIP

External peer reviewer 2026

- Nature Astronomy, Physical Review D

IceCube Collaboration 2025–present

- Served as internal analysis, paper and code reviewer, as well as weekly shifter (online monitoring of IceCube)

HAWC Collaboration 2021–present

- **Galactic Sources Working Group Coordinator** (nominated and elected; October 2026–present): lead the working group, chairing meetings and coordinating scientific discussions, reviewing analysis technical notes, and overseeing analysis quality and readiness prior to manuscript preparation.
- Galactic Sources Working Group Deputy Coordinator (July–October 2026).
- Internal paper reviewer and expert monthly shifter, ensuring stable data taking, managing subsystem procedures, and coordinating with on-site technical staff.

ADDITIONAL TRAINING

International School of Cosmic Rays Astrophysics, Ettore Majorana Centre, Erice 07/2024

CDY Future of Gamma-Ray Astronomy Summer School, MPIK, Heidelberg 06/2024

TECHNICAL SKILLS AND LANGUAGES

- **Programming:** Python, C++, Bash
- **Computing:** HTCondor DAGMan (large-scale cluster workflows), git
- **Languages:** Spanish (native), English (academic/professional), Korea (basic)

SELECT PUBLICATIONS

HAWC and IceCube collaborations list authors alphabetically. **The publications below are papers for which I served as corresponding author and lead analyst.**
The remainder of my collaboration publications are listed at the end. Full authorship reflects contributions to the detector, software, and validation.

1. **Resolving the Galactic Center Region's Gamma-Ray Emission and Searching for Its Neutrino Counterpart with HAWC and IceCube**. R. Alfaro et al. (including S. Yun-Cárcamo) for the HAWC and IceCube Collaborations. Accepted in ApJ Letters, November 6th 2026. DOI: 10.48550/arXiv.2609.22577

2. **Search for signatures of dark matter annihilation in the Galactic Center with HAWC**. R. Alfaro et al. (including S. Yun-Cárcamo). Phys. Rev. Lett. 136, 191001, May 2026. DOI: 10.1103/k7wc-d5kn

3. **Observation of the Galactic Center PeVatron Beyond 100 TeV with HAWC**. A. Albert et al. (including S. Yun-Cárcamo). Astrophysical Journal Letters, 973(1):L34, September 2024, DOI: 10.3847/2041-8213/ad772e

4. **Performance of the HAWC Observatory and TeV Gamma-Ray Measurements of the Crab Nebula with Improved Extensive Air Shower Reconstruction Algorithms**. A. Albert et al. (including S. Yun-Cárcamo). The Astrophysical Journal, 972(2):144, September 2024, DOI: 10.3847/1538-4357/ad5f2d

5. **Stability and robustness of asymptotic autocatalytic systems**. ***S. Yun-Cárcamo***, Sebastián Carrasco, José Rogan, Paulina Correa-Burrows & Juan Alejandro Valdivia. Scientific Reports volume 10, Article number: 15498 (2020), DOI: 10.1038/s41598-020-72580-9

ADDITIONAL PUBLICATIONS WITH RELEVANT CONTRIBUTION

*→The following publications benefited from improvements to the **HAWC** detector performance supported by my contributions, including validation of new air shower reconstruction algorithms, development of performance evaluation tools, and verification of data-simulation agreement, enhancing the sensitivity and robustness of these analyses.*

6. **Investigating IceCube Neutrino Alerts with the HAWC Gamma-Ray Observatory** R. Alfaro et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2026). The Astrophysical Journal DOI: 10.3847/1538-4357/aea154

7. **Combined dark matter search towards dwarf spheroidal galaxies with *Fermi*-LAT, HAWC, H.E.S.S., MAGIC, and VERITAS**. S. Abdollahi et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2026). Journal of Cosmology and Astroparticle Physics 03(2026)035. DOI: 10.1088/1475-7516/2026/03/035

8. **The first 10 years of the HAWC Gamma-Ray Observatory: science results**. A. Albert et al (including S. Yun-Cárcamo) for the HAWC Collaboration Rev.Mex.Astron.Astrofis. 61 (2025) 3, 261-299. DOI: 10.22201/ia.01851101p.2025.61.03.13

9. **Study of the IC 443 Region with the HAWC Observatory**. R. Alfaro et al (including S. Yun-Cárcamo) for the HAWC Collaboration ApJ 992 22 (2025). DOI: 10.3847/1538-4357/adf7aa

10. **HAWC, VERITAS, Fermi-LAT, and XMM-Newton Follow-up Observations of the Unidentified Ultra-high-energy Gamma-Ray Source LHAASO J2108+5157**. C. B. Adams et al (including S. Yun-Cárcamo) for the HAWC Collaboration ApJ 991 192 (2025). DOI: 10.3847/1538-4357/adf439

11. **Study of Long-term Spectral Evolution and X-Ray and γ-Ray Correlation of Blazars Seen by HAWC**. R. Alfaro et al (including S. Yun-Cárcamo) for the HAWC Collaboration ApJ 980 88 (2025). DOI: 10.3847/1538-4357/ad9d3d

12. **Orbital Modulation of Gamma Rays up to 100 TeV from LS 5039**. R. Alfaro et al (including S. Yun-Cárcamo) for the HAWC Collaboration ApJL 987 L42 (2025). DOI: 10.3847/2041-8213/ade760

13. **Ultra-High-Energy Gamma-Ray Bubble around Microquasar V4641 Sgr**. HAWC Collaboration (including S. Yun-Cárcamo) (2024). Nature, 634, 557–560. DOI: 10.1038/s41586-024-07995-9

14. **Testing the Molecular Cloud Paradigm for Ultra-High-Energy Gamma Ray Emission from the Direction of SNR G106.3+2.7** R. Alfaro et al. (including S. Yun-Cárcamo) (2024). Astronomy & Astrophysics, 691, A89. DOI: 10.1051/0004-6361/202451514

15. **Analysis of the Emission and Morphology of the Pulsar Wind Nebula Candidate HAWC J2031+415**. R. Alfaro et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2024). 2024 ApJ 975 198 DOI: 10.3847/1538-4357/ad782a

16. **Search for Joint Multimessenger Signals from Potential Galactic Cosmic-Ray Accelerators with HAWC and IceCube**. HAWC and IceCube Collaborations (including S. Yun-Cárcamo) (2024). Astrophysical Journal, 976, 8. DOI: 10.3847/1538-4357/ad812f

17. **Spectral Study of Very-High-Energy Gamma Rays from SS 433 with HAWC**. HAWC Collaboration (including S. Yun-Cárcamo) (2024). Astrophysical Journal, 976, 30. DOI: 10.3847/1538-4357/ad7e1b

18. **TeV Analysis of a Source-Rich Region with the HAWC Observatory: Is HESS J1809-193 a Potential Hadronic PeVatron?** A. Albert et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2024). Astrophysical Journal, 972, 21. DOI: 10.3847/1538-4357/ad59a6

19. **Precise Measurements of TeV Halos around Geminga and Monogem Pulsars with HAWC**. A. Albert et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2024). Astrophysical Journal, 974, 246. DOI: 10.3847/1538-4357/ad738e

20. **Exploring the Coronal Magnetic Field with Galactic Cosmic Rays: The Sun Shadow Observed by HAWC**. R. Alfaro et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2024). Astrophysical Journal, 966, 67. DOI: 10.3847/1538-4357/ad3208

21. **Search for Decaying Dark Matter in the Virgo Cluster of Galaxies with HAWC**. A. Albert et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2024). Physical Review D, 109, 043034. DOI: 10.1103/PhysRevD.109.043034

22. **Discovery of Gamma Rays from the Quiescent Sun with HAWC**. A. Albert et al. (including S. Yun-Cárcamo) for the HAWC Collaboration (2023). Physical Review Letters, 131, 051201. DOI: 10.1103/PhysRevLett.131.051201

→*The following **IceCube** Collaboration publications list me as a full author through service contributions to the experiment, including internal review of manuscripts, code, and analysis discussions.*

23. **WavePID: low-energy flavor identification using single-PMT time series in IceCube**. R. Abbasi et al (including S. Yun-Cárcamo) for the IceCube Collaboration. Journal of Instrumentation, Volume 21, Issue 09, id.P09023, 20 pp. DOI: 10.1088/1748-0221/21/09/P09023

24. **Characterization of the Three-Flavor Composition of Cosmic Neutrinos with IceCube**. R. Abbasi et al (including S. Yun-Cárcamo) for the IceCube Collaboration. Physical Review Letters, Volume 137, Issue 8, id.081002, 9 pp. DOI: 10.1103/vntd-m133

25. **Constraining the Prompt Atmospheric Neutrino Flux combining IceCube's Cascade and Track samples**. R. Abbasi et al (including S. Yun-Cárcamo) for the IceCube Collaboration. The European Physical Journal C, Volume 86, Issue 7, id.814. DOI: 10.1140/epjc/s10052-026-15632-0

26. **Search for GeV-scale dark matter from the Galactic Center with IceCube-DeepCore**. Abbasi, R., et al. (including S. Yun-Cárcamo) for the IceCube Collaboration Physical Review D 113.12 (2026): 122004 DOI: 10.1103/rvq4-br6l

27. **Deep Search for Joint Sources of Gravitational Waves and High-energy Neutrinos with IceCube during the Third Observing Run of LIGO and Virgo**. R. Abbasi et al (including S. Yun-Cárcamo) for the IceCube Collaboration 2026 ApJ 1003 41 DOI: 10.3847/1538-4357/ae4e1b

28. **Evidence for Neutrino Emission from X-Ray Bright Seyfert Galaxies in the Southern Hemisphere Using Enhanced Starting Track Events with IceCube**. R. Abbasi et al (including S. Yun-Cárcamo) for the IceCube Collaboration 2026 ApJL 1000 L37 DOI: 10.3847/2041-8213/ae4aac

29. **Constraints on the Correlation of IceCube Neutrinos with a Tracer of Nearby Large-scale Structure**. R. Abbasi et al (including S. Yun-Cárcamo) for the IceCube Collaboration 2026 ApJ 1000 124 DOI: 10.3847/1538-4357/ae43df

→*The following **P-ONE** Collaboration publications list me as a full author through service contributions to the experiment, including internal review of manuscripts, code, and analysis discussions.*

30. **Optical calibration systems of the Pacific Ocean Neutrino Experiment**. M. Agostini et al (including S. Yun-Cárcamo) for the P-ONE Collaboration. Journal of Instrumentation, Volume 21, Issue 07, id.P07029, 28 pp. DOI: 10.1088/1748-0221/21/07/P07029

Conference Proceedings

31. **Observation of the Crab Nebula and Galactic Center with the Improved HAWC Reconstruction Algorithm**. S. Yun-Cárcamo for the HAWC Collaboration (2023). Proceedings of Science (ICRC2023), 697. DOI: 10.22323/1.444.0697
Contributions: Data Analyst and author.