

Carlos Alberto López Cobá

Extragalactic Astronomy | Galaxy Kinematics and 3D Spectroscopic Analysis

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Professional Profile

Extragalactic astronomer whose research focuses on the kinematics and dynamics of galaxies, non-circular gas motions, galactic outflows, and the warm and cold interstellar medium. Develops software for kinematic modeling of spectroscopic observations, including three-dimensional spectral-line data. Research experience includes integral-field spectroscopy, large galaxy surveys, and analysis of optical and millimeter observations. Research contributions include first-author and collaborative peer-reviewed publications, public software, teaching, student mentoring, and scientific service.

Research Areas

Galaxy kinematics and dynamics; non-axisymmetric motions; dynamical evolution of galaxies; star-formation- and AGN-driven outflows; chemical evolution; warm and cold interstellar medium; integral-field spectroscopy; three-dimensional spectroscopy; ALMA; large galaxy surveys.

Academic Appointments

Postdoctoral Research Associate

August 2025–present

Homer L. Dodge Department of Physics and Astronomy, University of Oklahoma

Supervisor: Dr. Michael Hayden.

Distinguished Postdoctoral Fellow

April 2021–August 2025

Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taiwan

Supervisor: Dr. Lihwai Lin.

Research Assistant

October 2016–January 2017

Instituto de Astronomía, Universidad Nacional Autónoma de México (UNAM), Mexico

Research assistant position supported by Mexico's National Council of Science and Technology (CONACYT); worked with Dr. Irene Cruz González.

Education

Ph.D. in Astrophysics, Universidad Nacional Autónoma de México (UNAM)

February 2021

January 2017–February 2021. Thesis: *Systematic study of outflows in the Local Universe*. Advisor: Dr. Sebastián Francisco Sánchez Sánchez. [Thesis record](#).

M.Sc. in Astrophysics, Universidad Nacional Autónoma de México (UNAM)

June 2016

August 2014–June 2016. Thesis: *Star forming driven galactic winds in UGC 10043*. Advisor: Dr. Sebastián Francisco Sánchez Sánchez.

B.Sc. in Physics, Universidad Autónoma Metropolitana, Mexico

April 2013

September 2008–April 2013.

Research Contributions and Technical Experience

- Develops software for kinematic modeling of gaseous disks and non-circular motions in galaxies, including analysis of three-dimensional spectral-line cubes and two-dimensional velocity maps.
- Public software: [XS3D](#) and [XookSuut](#).
- Experience with CALIFA, SDSS-IV MaNGA, ALMaQUEST, EDGE-CALIFA, AMUSING/AMUSING++, KILOGAS, GECKOS, PHANGS-MUSE, and PHANGS-ALMA.
- Large-scale data analysis includes approximately 2 TB for 31 GECKOS galaxies; approximately 500 GB for PHANGS-MUSE; kinematic studies of 10,000 MaNGA galaxies; and approximately 200 galaxies across ALMaQUEST, EDGE-CALIFA, and PHANGS-ALMA.
- Programming and analysis: Python; Linux/Ubuntu; cluster-based analysis of large astronomical datasets.

Teaching Experience

- **Life in the Universe (ASTR 1523)**, instructor of record, University of Oklahoma, Spring 2026; enrollment of 84 students.
- Developed course materials and learning activities; used Gradescope to support grading and TopHat to monitor student engagement.

- Formal institutional student evaluations: 57 of 84 enrolled students responded (68% response rate); approximately 76% rated instructional quality as Good or Excellent.
- **Extragalactic Astronomy**, teaching assistant, UNAM, 2018, 2019, and 2020; approximately 20 students each semester.

Student Supervision and Mentoring

- Assists in supervising one Ph.D. student at the University of Oklahoma.
- Co-supervises an ongoing master's thesis with Dr. Jorge K. Barrera-Ballesteros at Instituto de Astronomía, UNAM: "Characterization of the XS code in simulated barred galaxies."
- Advised and co-advised three undergraduate and master's-level summer students through the ASIAA Summer Student Program in 2023. Their projects concerned barred-galaxy kinematics and star formation using MaNGA data.

Fellowships, Honors, and Awards

- Distinguished Postdoctoral Fellowship, ASIAA, April 2021–August 2025 (USD 8,000 per year for four years).
- Paris Pismis Award (2016), awarded for graduate-student achievement at IA-UNAM.
- Grant of the Mexican Society of Physics (2019).
- National undergraduate scholarships, National Council of Science and Technology (CONACyT), Mexico (2014).

Academic Service

- Referee for peer-reviewed journals, including *The Astrophysical Journal*.
- Doctoral advisory committee evaluator for "Estudio sistemático de la retroalimentación en los AGNs Seyfert," Instituto de Astronomía, UNAM (December 2021).
- Local Organizing Committee, "The Interplay between Local and Global Processes in Galaxies," Cozumel, Mexico (March 2016).

Observing and Proposal Experience

- Principal investigator for five observing nights at Observatorio Astronómico Nacional San Pedro Mártir, Mexico (December 2018), observing galaxies hosting galactic-scale outflows with a Fabry–Pérot interferometer at high spectral resolution.
- Principal investigator on a CFHT/SITELLE proposal (rank C, second semester of 2021) to measure gas inflows and mass inflow rates associated with spiral arms and stellar bars. The program was not executed.

Conference Participation

- KLOGAS Workshop, Cardiff, United Kingdom (May 2025).
- East Asian ALMA Science and Data Analysis Workshop, Seoul, South Korea (July 2024).
- East Asian Young Astronomers Meeting, Chiang Mai, Thailand (January 2024).
- Taiwan Astronomy Workshop, Taipei, Taiwan (January 2024).
- Probing the Universe at Higher Resolution: A Celebration of the Science and Leadership of Paul T. P. Ho, Taipei, Taiwan (November 2023).
- Galactic Bars: Driving and Decoding Galaxy Evolution, Granada, Spain (July 2023).
- ASIAA Mini-workshop: (Dense) Molecular Gas in Nearby Galaxies, Taipei, Taiwan (April 2023).
- Wide-Field Spectroscopy vs. Galaxy Formation Theory, Tucson, Arizona, USA (March 2023).
- 9th Galaxy Evolution Workshop, Kyoto, Japan (February 2023).
- Annual Meeting of the Physical Society of Taiwan, Tainan, Taiwan (January 2023).
- Annual Meeting of the Astronomical Society of the Republic of China (ASROC), Minxiong, Taiwan (September 2022).
- IAU Symposium 373: Resolving the Rise and Fall of Star Formation in Galaxies, Busan, Republic of Korea (August 2022).
- SDSS-IV/V Collaboration: The Month of MaNGA, virtual conference (October 2020).
- SDSS-IV/V Collaboration Meeting, virtual conference (June 2020).
- IAU Symposium 359: Galaxy Evolution and Feedback Across Different Environments (GALFEED), Bento Gonçalves, Brazil (March 2020).
- Canada-America-Mexico Graduate Student Physics Conference, Sudbury, Canada (July 2019).
- The Extragalactic Database for Galaxy Evolution (EDGE) Team Meeting, Mexico City, Mexico (July 2019).

- European Week of Astronomy and Space Science (EWASS), Lyon, France (June 2019).
- MaNGA Collaboration Meeting, Oxford, United Kingdom (March 2019).
- XXVII National Conference in Astronomy, Puebla, Mexico (October 2018).
- The Laws of Star Formation: From the Cosmic Dawn to the Present Universe, Cambridge, United Kingdom (July 2018).
- XI Estallidos Workshop, Madrid, Spain (June 2018).
- Guillermo Haro Programme for Advanced Astrophysics: Synergy between the GTC and GTM/LMT, Puebla, Mexico (September 2018).
- MaNGA SDSS-IV Meeting and Workshop, Campeche, Mexico (December 2017).
- XXVI National Conference in Astronomy, Monterrey, Mexico (October 2017).
- The Cosmic Feast of the Elements: A Conference to Celebrate the Work of Grazyna Stasinska, Puebla, Mexico (October 2017).
- Multi-scale Star Formation, Morelia, Mexico (April 2017).
- Multi-spin Galaxies 2016, Nizhny Arkhyz, Russia (October 2016).
- The Interplay between Local and Global Processes in Galaxies, Cozumel, Mexico (March 2016).
- Guillermo Haro Program: Advanced School on IFS, Puebla, Mexico (September 2014).
- Massive Young Star Clusters Near and Far from the Milky Way to Re-ionization, Morelia, Mexico (December 2013).

Seminars and Colloquia

- “Revisiting Kinematic Modeling of Gaseous Disks in the Era of 3D Spectroscopy,” University of Oklahoma (December 2025).
- “3D Modeling of Gaseous Disks,” ASIAA Postdoc Flash Talk, Taipei, Taiwan (November 2024).
- “3D Kinematic Modeling of Gaseous Disks,” ASIAA, Taipei, Taiwan (October 2024).
- “Exploring the Imprints of Nonaxisymmetric Motions in Disk Galaxies: The Case of NGC 1087,” Universidad Complutense de Madrid, online (February 2024).
- “Bar-like Flows in Galaxies: An Integral-Field-Spectroscopic Study of Non-circular Motions in Barred Galaxies,” National Central University, Taiwan (June 2023).
- “Effects of Non-circular Motions in Galaxies,” Instituto de Astronomía, UNAM, Mexico (April 2023).
- “Spatially Resolved Non-circular Motions in Galaxies: Exploring Bar-like Flows with IFS Data,” ASIAA, Taiwan (December 2021).
- Local MaNGA/SDSS-V Symposium, Instituto de Astronomía, UNAM (January 2020).
- Extragalactic Astronomy and Cosmology Department seminar, UNAM (February 2019).
- Extragalactic Astronomy and Cosmology Department seminar, UNAM (May 2018).
- Extragalactic Astronomy and Cosmology Department seminar, UNAM (August 2017).
- Local Meeting of Astronomy Students, Mérida, Mexico (August 2017).
- Extragalactic Astronomy and Cosmology Department seminar, UNAM (June 2016).
- Seminar at the Institute of Physics, UNAM (January 2016).
- Extragalactic Astronomy and Cosmology Department seminar, UNAM (June 2015).
- Extragalactic Astronomy and Cosmology Department seminar, UNAM (February 2015).

Other Contributions

Mentioned in the acknowledgments of the following publications:

- Cortijo-Ferrero, C. et al. (2017), *Astronomy & Astrophysics*, 606, A95. doi:10.1051/0004-6361/201730669; arXiv: 1706.01896.
- Sánchez, S. F. et al. (2020), *Annual Review of Astronomy and Astrophysics*, 58. doi:10.1146/annurev-astro-012120-013326; arXiv: 1911.06925.

Computer Skills

- **Programming:** Python; software development for kinematic modeling of galaxies.
- **Operating systems:** Linux and Ubuntu.
- **Scientific computing:** cluster-based processing and analysis of large astronomical datasets.
- **Public software repositories:** XookSuut and XS3D.

Manuscripts in Preparation

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1. López-Cobá, C. and Michael Hayden, “The Link Between Non-Axisymmetric Motions and Outflows in Edge-On Galaxies from the GECKOS Survey” (2026; planned submission to *The Astrophysical Journal*).
 2. López-Cobá, C. and Lihwai Lin, “What Causes the Velocity Dispersion on Cold Disks: ALMAQUEST, EDGE-CALIFA, PHANGS-ALMA” (2026; planned submission to *The Astrophysical Journal*).
 3. López-Cobá, C. and the KILOGAS team, “Investigating the Tully–Fisher Relation in Warm and Cold Molecular Gas Phases with KILOGAS” (2026; planned submission to *The Astrophysical Journal*).

Publication Record

The supplied NASA ADS publication list reports 31 refereed articles: 9 first-author papers and 22 co-authored papers. The same snapshot reports 2,812 citations, 133.7 normalized citations, an average of 90.7 citations, an h-index of 16, an m-index of 1.3, and a tori-index of 1.5. These metrics change over time; see the linked NASA ADS library for the current record.

Publications

The following bibliography lists the publications recorded in the supplied publication list.

First-author publications

1. López-Cobá, C., Lin, L., Cruz González, I., Sánchez, S. F., Pan, H.-A., Barrera-Ballesteros, J. K., & Hsieh, B.-C. (2025). “Physical Properties of Gas Departing from Circular Rotation at 50 pc Scales Using the PHANGS-MUSE Galaxies.” *The Astronomical Journal*, 170, 236. DOI. arXiv: 2508.18517.
2. López-Cobá, C., Lin, L., & Sánchez, S. F. (2024). “XookSuut: A Bayesian Tool for Modeling Circular and Non-Circular Flows on 2D Velocity Maps.” *Revista Mexicana de Astronomía y Astrofísica*, 60, 19–39. DOI.
3. López-Cobá, C., Lin, L., & Sánchez, S. F. (2024). “Unveiling a Hidden Bar-like Structure in NGC 1087: Kinematic and Photometric Evidence Using MUSE/VLT, ALMA, and JWST.” *The Astrophysical Journal*, 962, 65. DOI. arXiv: 2312.04098.
4. López-Cobá, C., Lin, L., Neumann, J., & Bershadsky, M. A. (2024). “On the Role of Non-circular Motions in MaNGA Galaxies. I. Global Properties.” *The Astrophysical Journal*, 975, 182. DOI. arXiv: 2410.21147.
5. López-Cobá, C., Sánchez, S. F., Lin, L., Anderson, J. P., Lin, K.-Y., Cruz-González, I., Galbany, L., & Barrera-Ballesteros, J. K. (2022). “Exploring Stellar and Ionized Gas Noncircular Motions in Barred Galaxies with MUSE.” *The Astrophysical Journal*, 939, 40. DOI. arXiv: 2207.07906.
6. López-Cobá, C., Sánchez, S. F., Anderson, J. P., Cruz-González, I., Galbany, L., Ruiz-Lara, T., Barrera-Ballesteros, J. K., Prieto, J. L., & Kuncarayakti, H. (2020). “The AMUSING++ Nearby Galaxy Compilation. I. Full Sample Characterization and Galactic-scale Outflow Selection.” *The Astronomical Journal*, 159, 167. DOI. arXiv: 2002.09328.
7. López-Cobá, C., Sánchez, S. F., Bland-Hawthorn, J., Moiseev, A. V., Cruz-González, I., García-Benito, R., Barrera-Ballesteros, J. K., & Galbany, L. (2019). “Systematic study of outflows in the Local Universe using CALIFA: I. Sample selection and main properties.” *Monthly Notices of the Royal Astronomical Society*, 482, 4032–4056. DOI. arXiv: 1811.01253.
8. López-Cobá, C. et al. (2017). “Serendipitous Discovery of an Optical Emission-line Jet in NGC 232.” *The Astrophysical Journal Letters*, 850, L17. DOI. arXiv: 1711.02785.
9. López-Cobá, C. et al. (2017). “Star formation driven galactic winds in UGC 10043.” *Monthly Notices of the Royal Astronomical Society*, 467, 4951–4964. DOI. arXiv: 1701.01695.

Co-authored publications

1. Jian, H.-Y., Lin, L., Bottrell, C., Hsieh, B.-C., López-Cobá, C., Ho, Z.-H., Feng, S., & Shen, S. (2025). “Comparing Inside-out and Outside-in Quenching Modes in MaNGA Observation and MaNGIA Simulation.” *The Astrophysical Journal*, 995, 187. DOI.
2. Hogarth, L. M., Saintonge, A., Davis, T. A., Ellison, S. L., Lin, L., López-Cobá, C., Pan, H.-A., & Thorp, M. D. (2024). “The ALMaQUEST Survey XIV: Do Radial Molecular Gas Flows Affect the Star-forming Ability of Barred Galaxies?” *Monthly Notices of the Royal Astronomical Society*, 528, 6768–6785. DOI. arXiv: 2312.14702.
3. Kim, T., Gadotti, D. A., Lee, Y. H., López-Cobá, C., Kim, W.-T., Kim, M., & Park, M. (2024). “Do Strong Bars Exhibit Strong Noncircular Motions?” *The Astrophysical Journal*, 976, 220. DOI. arXiv: 2410.20583.
4. Lin, L. et al. (2024). “The ALMaQUEST Survey. XII. Dense Molecular Gas as Traced by HCN and HCO⁺ in Green Valley Galaxies.” *The Astrophysical Journal*, 963, 115. DOI. arXiv: 2401.05976.
5. Villar Martín, M., López-Cobá, C., Cazzoli, S., Pérez Montero, E., & Cabrera Lavers, A. (2024). “AGN Feedback Can

- Produce Metal Enrichment on Galaxy Scales." *Astronomy & Astrophysics*, 690, A397. DOI. arXiv: 2407.02115.
6. Barrera-Ballesteros, J. K. et al. (2023). "SDSS-IV MaNGA: The Radial Distribution of Physical Properties within Galaxies in the Nearby Universe." *Revista Mexicana de Astronomía y Astrofísica*, 59, 213–258. DOI. arXiv: 2206.07058.
 7. Jian, H.-Y. et al. (2023). "Radial and Local Density Dependence of Star Formation Properties in Galaxy Clusters from the Hyper Suprime-Cam Survey." *The Astrophysical Journal*, 957, 85. DOI.
 8. Li, Z., Wisnioski, E., Mendel, J. T., Krumholz, M. R., Kewley, L. J., López-Cobá, C., Sánchez, S. F., Anderson, J. P., & Galbany, L. (2023). "Spatial metallicity distribution statistics at 100 pc scales in the AMUSING++ nearby galaxy sample." *Monthly Notices of the Royal Astronomical Society*, 518, 286–304. DOI. arXiv: 2206.08072.
 9. Abdurro'uf et al. (2022). "The Seventeenth Data Release of the Sloan Digital Sky Surveys: Complete Release of MaNGA, MaStar, and APOGEE-2 Data." *The Astrophysical Journal Supplement Series*, 259, 35. DOI. arXiv: 2112.02026.
 10. Jian, H.-Y. et al. (2022). "Star Formation Properties of Sloan Digital Sky Survey BOSS Void Galaxies in the Hyper Suprime-Cam Survey." *The Astrophysical Journal*, 926, 115. DOI. arXiv: 2201.03196.
 11. Lugo-Aranda, A. Z., Sánchez, S. F., Espinosa-Ponce, C., López-Cobá, C., Galbany, L., Barrera-Ballesteros, J. K., Sánchez-Menguiano, L., & Anderson, J. P. (2022). "PYHIIEXTRACTOR: A Tool to Detect and Extract Physical Properties of H II Regions from Integral Field Spectroscopic Data." *RAS Techniques and Instruments*, 1, 3–28. DOI. arXiv: 2204.04252.
 12. Otter, J. A. et al. (2022). "Resolved Molecular Gas Observations of MaNGA Post-starbursts Reveal a Tumultuous Past." *The Astrophysical Journal*, 941, 93. DOI. arXiv: 2210.12199.
 13. Su, Y.-C., Lin, L., Pan, H.-A., López-Cobá, C., Hsieh, B.-C., Sánchez, S. F., Thorp, M. D., Bureau, M., & Ellison, S. L. (2022). "The ALMaQUEST Survey. VIII. What Causes the Discrepancy in the Velocity between the CO and H α Rotation Curves in Galaxies?" *The Astrophysical Journal*, 934, 173. DOI. arXiv: 2206.05913.
 14. Sánchez, S. F., Walcher, C. J., López-Cobá, C., Barrera-Ballesteros, J. K., Mejía-Narváez, A., Espinosa-Ponce, C., & Camps-Fariña, A. (2021). "From Global to Spatially Resolved in Low-Redshift Galaxies." *Revista Mexicana de Astronomía y Astrofísica*, 57, 3–38. DOI. arXiv: 2009.00424.
 15. Lacerda, E. A. D., Sánchez, S. F., Cid Fernandes, R., López-Cobá, C., Espinosa-Ponce, C., & Galbany, L. (2020). "Galaxies Hosting an Active Galactic Nucleus: A View from the CALIFA Survey." *Monthly Notices of the Royal Astronomical Society*, 492, 3073–3090. DOI. arXiv: 2001.00099.
 16. Levy, R. C. et al. (2019). "The EDGE-CALIFA Survey: Evidence for Pervasive Extraplanar Diffuse Ionized Gas in Nearby Edge-on Galaxies." *The Astrophysical Journal*, 882, 84. DOI. arXiv: 1905.05196.
 17. Sánchez, S. F. et al. (2019). "The SAMI Galaxy Survey: Exploring the Gas-phase Mass-metallicity Relation." *Monthly Notices of the Royal Astronomical Society*, 484, 3042–3070. DOI. arXiv: 1812.11263.
 18. Sánchez, S. F. et al. (2017). "The Mass-metallicity Relation Revisited with CALIFA." *Monthly Notices of the Royal Astronomical Society*, 469, 2121–2140. DOI. arXiv: 1703.09769.
 19. Cano-Díaz, M. et al. (2016). "Spatially Resolved Star Formation Main Sequence of Galaxies in the CALIFA Survey." *The Astrophysical Journal Letters*, 821, L26. DOI. arXiv: 1602.02770.
 20. Sánchez, S. F. et al. (2016). "Pipe3D, a Pipeline to Analyze Integral Field Spectroscopy Data: I. New Fitting Philosophy of FIT3D." *Revista Mexicana de Astronomía y Astrofísica*, 52, 21–53. arXiv:1509.08552.
 21. Sánchez, S. F. et al. (2016). "Pipe3D, a Pipeline to Analyze Integral Field Spectroscopy Data: II. Analysis Sequence and CALIFA Dataproducts." *Revista Mexicana de Astronomía y Astrofísica*, 52, 171–220. arXiv:1602.01830.
 22. Sánchez, S., Sánchez-Menguiano, L., Marino, R., Rosales-Ortega, F., Pérez, I., de Paz, A., Pérez, E., Walcher, C., López-Cobá, C., & CALIFA Collaboration (2015). "The CALIFA Survey: Exploring the Oxygen Abundance in the Local Universe." *Galaxies*, 3, 164–183. DOI.