Alejandra Melo Melo

Contact information

Postdoc fellow at the Max Planck Institute for Astrophysics and the Technical University of Munich

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ORCID ID: 0000-0002-6449-3970

Professional Status PhD in Astrophysics

Nacionality Chilean

Spanish Mothertongue

English Expert

Research interest strong gravitational lensing, lens finding, machine learning, black hole masses, galaxy evolution, observational reduction, microlensing analysis

Education and Career

Current Position

Postdoc fellow at the Max Planck Institute for Astrophysics

06/2022 - Present

Education

Universidad de Valparaíso, Valparaíso, Chile.

PhD in Astrophysics, 03/2017 - 04/2022

Title: "Probing the source structure in lensed AGNs"

Advisor: Dr. Verónica Motta

Universidad de Concepción, Concepcíon, Chile.

Professional degree : Astrónoma, 08/2016

Bachelor's degree in Astronomy : Licenciado en Ciencias Mención Astronomía, 12/2014

Bachelor in Astronomy, 2010-2014

Employment history

PhD fellowship / PUENTE, UVA20993 / Instituto de Física y Astronomía / Universida de Valparaíso / Chile / 09/2021 - 12/2021.

PhD fellowship / CONICYT (ANID) / Instituto de Física y Astronomía / Universida de Valparaíso / Chile / 03/2017 - 01/2022

Collaboration membership

2022 - present Highly Optimised Lensing Investigations of Supernovae, Microlensing Objects, and Kinematics of Ellipticals and Spirals (**HOLISMOKES**)

2023 - present **Euclid consortium**; Euclid Strong Lensing Science Working Group

2022 - present Vera C. Rubin Observatory (**LSST**) Strong Lensing Science Collaboration.

2022 - present German Center for Cosmological Lensing (**GCCL**)

2022 - present Time-delay Cosmography (**TDCOSMO**) kinematics analysis subgroup.

2024 - present Chilean AGN/Galaxy Extragalactic Survey (**ChANGES**) from the **4MOST** collaboration.

Telescope runs/skills

Observing proposals

2021 109.23A0.001/P108, Very Large Telescope, XSHOOTER, 12.0 hours (PI).

2021 108.22BQ.001/P108, Very Large Telescope, XSHOOTER, 15.0 hours (PI).

2020 106.21DC.001/P106, Very Large Telescope, XSHOOTER, 16.0 hours (PI).

2019 0103.B-0566(A)/P103, Very Large Telescope, XSHOOTER, 10.5 hours (PI).

2023 Core run: 7E7H39JG 3, Las Campanas Observatory / Magellan Telescope / 3 nights (Col).

2021 106.216P.002/P107, VLT Survey Telescope (VST) / OMEGACAM / 291.5.0 hours (Col).

2020 106.216P.001/P106, VLT Survey Telescope (VST) / OMEGACAM / 315.0 hours (Col).

2019 1103.A-0801/P103, VLT Survey Telescope (VST) / OMEGACAM / 182.0 hours (Col).

2018 0102.A-0335(A)/P101, Very Large Telescope, XSHOOTER, 12.0 hours (Col).

Observing nights

2023 Clay/Magellan telescope at Las Campanas Observatory, SDSS3 instrument, one night. This run was part of PhDc Felipe Ávila to measure black hole masses and study microlensing analysis.

2021 2.2m ESO/MPG 2.2m telescope at La Silla Observatory, WFI, FEROS and GROND instruments, 11 nights. This run was part of the COSmological MOnitoring of GRAvItational Lenses (COSMOGRAIL) program for the observation of gravitational lenses.

2019 The Southern Astrophysical Research (SOAR) Telescope, SOAR Optical Imager (SOI), 3 nights. This run was part of the STRong-lensing Insights into Dark Energy Survey (STRIDES) in the search and confirmation of gravitational lenses.

2018 2.2m ESO/MPG 2.2m telescope at La Silla Observatory, WFI, FEROS and GROND instruments, 9 nights. This run was part of the COSMOGRAIL program.

2018 The ESO New Technology Telescope (NTT) at La Silla Observatory, SofI instrument, 3 nights. This run was part of the ESO/NEON Observing School at La Silla to obtain black holes masses of quasars.

2018 2.2m ESO/MPG 2.2m telescope at La Silla Observatory, WFI, FEROS and GROND instruments, 3 nights. This run was part of the COSMOGRAIL program.

2017 The Southern Astrophysical Research (SOAR) Telescope, SOAR Optical Imager (SOI), 6 nights. This run was part of STRIDES.

2016 The Swope Telescope, Las Campanas Observatory, CCD camera, E2V 4kx4k, 2 nights.

2016 2.2m ESO/MPG 2.2m telescope at La Silla Observatory, GROND instrument, 3 nights.

2016 Henrietta Swope telescope at Las Campanas Observatory, Direct CCD camera, 4 nights.

2015 Smarts 0.9-m telescope in cerro Tololo, 2048x2046 Tek2K CCD detector, 2 nights.

Skills

Computing

Python: Most used for programming, R software, SExtractor, Github, SQL, Topcat, IRAF, Excel, LINUX, MAC OS, LATEX

Lensmodel: Package used to model a gravitational lens and obtain the lens parameters to get the magnification of each image.

Low Resolution Template (LRT): Package for creating an Spectral Energy Distribution (SED) for AGNs.

Experience with machine learning and deep learning in lens search.

Data reduction

X-shooter pipeline/Esoreflex workflow and R software (Python) for reduction

Molecfit software

IRAF (Image Reduction and Analysis Facility)

SINFONI pipeline/Esoreflex workflow

MOPEX (MOsaicker and Point source EXtractor)

THELI GUI

Fellowships and grants

2017-2021 BECA DE DOCTORADO NACIONAL CONICYT (ANID) (Folio: 21171499) at Universidad de Valparaíso, CLP $57.000.000

A scholarship that covers the cost of a PhD at the university you apply to while pursuing one.

2019 Gastos operacionales (Folio: 24190202), CONICYT (ANID), CLP $2.400.000

Award that supports doctoral studies.

Talks and Seminars

2025 Strong Lensing in the next decade, Center for Astrophysics, Harvard & Smithsonian, USA. Talk contribution.

2025 SWG Strong Lensing meeting, Barcelona, Spain. Talk contribution.

2024 Rubin Strong Lensing 2024, Oxford, UK. Talk contribution.

2024 Euclid Strong Lensing Science Working Group meeting, Bologna, Italy. Online talk contribution.

2023 **LARIM 2023: XVII Reunión Regional Latinoamericana De La UAI, Montevideo, Uruguay. Invited speaker: "Strong-lens search through deep learning with both ground- and space-based imaging data"**

2023 Astrophysic seminar at Universidad de Valparaíso, Valparasíso, Chile. Talk contribution.

2023 MIAPbP 2023, Garching Bei Munchen, Germany, The Extragalactic Distance Scale and Cosmic Expansion in the Era of Large Surveys and the James Webb Telescope. Contributed talk.

2023 Strong Gravitational Lensing in the era of big data, Otranto Castle, Italy, Poster presentation: "Strong-lens search through deep learning with both ground- and space-based imaging data"

2022 LENSING ODYSSEY 2022, Kouremenos, Crete, Oral presentation: "Black hole mass estimation of 14 gravitational lensed quasars."

2020 Seminar at Universidad de Valparaíso, Oral presentation: "Supermassive black hole mass estimation of gravitational lensed quasars."

2019 LARIM 2019: XVI Latim American Regional IAU Meeting, Antofagasta, Chile, Oral presentation: "Supermassive Black Hole mass estimations using gravitational lensed quasars."

2019 PANORAMAS 2019, Valparaíso, Chile, Oral presentation: "Supermassive Black Hole mass estimations for 13 gravitational lensed quasars."

2018 PANORAMAS 2018, Valparaíso, Chile, Oral presentation: "Probing the source structure in lensed AGNs."

2016 XII Annual Meeting Sociedad Chilena de Astronomiía (SOCHIAS), Puerto Varas, Chile, Oral presentation: "Infrared properties of hard X-ray emitters detected in the NuSTAR Serendipitous Survey."

2016 LARIM 2016: XV Latim American Regional IAU Meeting, Cartagena de Indias, Colombia, Poster presentation: "Physical Properties of hard X-ray NuSTAR in the NuSTAR Serendipitous Sourvey."

2015 SOCHIAS, Poster presentation: "Near IR Properties of NuSTAR hard X-ray Emitters Observed by Spitzer."

2015 Unveiling the AGN - Galaxy Evolution Connection, Puerto Varas, Chile, Poster presentation: "Near IR Properties of NuSTAR hard X-ray Emitters Observed by Spitzer."

2014 XIX Simposio Chileno de Física 2014, Concepción, Chile, Poster Presentation: "Utilización de Tecnologías de la Información en la Enseñanza de la Astronomía."

Summer schools and trainings

02/2018 - 03/2018 ESO/NEON Observing School at La Silla, Santiago and La Silla Observatory

Scientific visit

Visit collaborator from ESO (PhD Julian Mejía-Restrepo) at ESO headquarters in Santiago, Chile, 2018 . He tought me to use his program to obtain black hole mass of AGNs.

Visit collaborator from Universidad Diego Portales (Astronomy Professor Roberto Assef) at Universidad de Valparaíso, Chile, 2019. Collaboration together for MMIRS and LUCIFER data.

Mentoring

2024/present Allan Schweinfurth (Undergraduate student at Technical University of Munich)

2024/present Duy Anh Hoang (Undergraduate student at Technical University of Munich)

2022/2023 Felipe Ávila Vera (PhDc at Universidad de Valparaíso)

Scientific community work

02-July-2019 Went to Cachiyuyo, Chile, to be part of the monitoring of the telescope group of Universidad de Valparaíso for the eclipse 2019

2019–Present **Telescope instructor in Toki-Kura**, Casablanca, Chile.
Observations open to the community.

2019 Reñaca, Chile: Talk for the community about eclipses.

2014–2017 **Telescope instructor**, Universidad de Concepción, Chile.
Observations open to the community.

2013–2016 **Part of Equipo de Divulgación Astronómica (E.D.A.)**, Universidad de Concepción, Chile.
Workshops and talks for all audiences within the sout of Chile.

In Conferences Local organizing committee for the 2024 TDCOSMO annual meeting in Garching bei München, Germany.

Teaching experience

2022/Present FOPRA Experiment 85: Colour-Magnitude Diagrams of Star Clusters: Determining Their Relative Ages, Technical University of Munich.

2023 Images reduction using Python, Universidad de Valparaíso.

2021 Night observation at the 2.2m telescope at La Silla at Universidad de Valparaíso.

2016/First semester Módulos Complementarios, Universidad de Concepción.

2015/Second semester Programación Astronómica, Universidad de Concepción.

2015/Second semester Ciencia y Tecnología, Universidad de Concepción.

2015/First semester Física II: Fundamentos de Mecánica, Universidad de Concepción.

2015/First semester Módulos Complementarios, Universidad de Concepción.

2014/First semester Proyecto de Física II, Universidad de Concepción.

2014/First semester Módulos Complementarios, Universidad de Concepción.

2013/Second semester Proyecto de Física II, Universidad de Concepción.

References

Prof. Dr. Sherry Suyu Associate Professor at the Technical University of Munich, and Max Planck Fellow at the Max Planck Institute for Astrophysics, Garching Bei Munich, Germany.
Mail address: suyu@mpa-garching.mpg.de

Dr. Verónica Motta full professor at Instituto de Física y Astronomía, Facultad de Ciencias, Universidad de Valparaíso, Valparaíso, Chile.
Mail address: veronica.motta@uv.cl

Dr. Roberto Assef Núcleo de Astronomía, Universidad Diego Portales, Santiago de Chile, Chile.
Mail address: roberto.assef@mail.udp.cl

List of Publications

2024 **Melo, A.**; Canameras, R.; Suyu, S.; et al.: "HOLISMOKES XV. Search for strong gravitational lenses combining ground-based and space-based imaging"

2024, eprint arXiv:2411.18694

2023 **Melo, A.**; Motta, V.; Mejía-Restrepo, J.; Assef, R. J.; Godoy, N.; Mediavilla, E.; Falco, E.; Kochanek, C. S.; Ávila-Vera, F.; Jerez, R.: "Black Hole masses for 14 gravitational lensed quasars"

2023, A&A 680, A51.

2021 **Melo, A.**; V. Motta, N. Godoy, J. Mejia-Restrepo, R. J. Assef, E. Mediavilla5, E. Falco, F. Ávila-Vera, and R. Jerez: "First black hole mass estimation for the quadruple lensed system WGD2038-4008"

2021, A&A, 656, A108.

2024 **Melo, A.**; Caminha, G.; Suyu, S.; et al.: "Filament features in the quadruple lensed system WGD2038-4008"

2024, in prep.

2024 **Melo, A.**; Motta, V.; et al.: "Accretion disk size estimation for four double lensed systems"

2024, in prep.

As co-author

2025 Euclid Collaboration; Holloway, P., et al.: "Euclid Quick Data Release (Q1). The Strong Lensing Discovery Engine E – Ensemble classification of strong gravitational lenses: lessons for Data Release 1"

eprint arXiv:2503.15328

2025 Euclid Collaboration; Li, T., et al.: "Euclid Quick Data Release (Q1). The Strong Lensing Discovery Engine D – Double-source-plane lens candidates"

eprint arXiv:2503.15327

2025 Euclid Collaboration; Lines, N. E. P., et al.: "Euclid Quick Data Release (Q1). The Strong Lensing Discovery Engine C – Finding lenses with machine learning"

eprint arXiv:2503.15326

2025 Euclid Collaboration; Rojas, K., et al.: "Euclid Quick Data Release (Q1) The Strong Lensing Discovery Engine B – Early strong lens candidates from visual inspection of high velocity dispersion galaxies"

eprint arXiv:2503.15325

2025 Euclid Collaboration; Walmsley, M., et al.: "Euclid Quick Data Release (Q1): The Strong Lensing Discovery Engine A – System overview and lens catalogue"

eprint arXiv:2503.15324

2025 Schuldt, S., et al.: "HOLISMOKES XVI: Lens search in HSC-PDR3 with a neural network committee and post-processing for false-positive removal"

eprint arXiv:2503.07733

2025 Nagam, B. C., et al.: "Euclid: Finding strong gravitational lenses in the Early Release Observations using convolutional neural networks"

eprint arXiv:2502.09802

2025 Andika, Irham T., et al.: "Accelerating lensed quasar discovery and modeling with physics-informed variational autoencoders"

A&A 694, A227 (2025)

2025 Schuldt, S., et al.: "HOLISMOKES XIII: Strong-lens candidates at all mass scales and their environments from the Hyper-Suprime Cam and deep learning"

A&A 693, A291 (2025)

2024 Canameras, R., et al.: "HOLISMOKES XI: Evaluation of supervised neural networks for strong-lens searches in ground-based imaging surveys"

A&A, 692, id.A72, 22 pp.

2024 Pearce-Casey, R., et al.: "Euclid: Searches for strong gravitational lenses using convolutional neural nets in Early Release Observations of the Perseus field"

eprint arXiv:2411.16808

2024 Acevedo Barroso, J., et al.: "Euclid: The Early Release Observations Lens Search Experiment"

eprint arXiv:2408.06217

2024 Bag, S., et al.: "Detecting unresolved lensed SNe Ia in LSST using blended light curves"

A&A 691, A100 (2024)

2023 Taufik Andika, Irham., et al.: "Streamlined Lensed Quasar Identification in Multiband Images via Ensemble Networks"

A&A, 678 (2023) A103

2023 Rojas, K., et al.: "The impact of human expert visual inspection on the discovery of strong gravitational lenses"

MNRAS, Volume 523, Issue 3, pp.4413-4430

2020 Millon, M., et al.: "TDCOSMO. II. Six new time delays in lensed quasars from high-cadence monitoring at the MPIA 2.2 m telescope"

2020A&A...642A.193M

2020 Lemon, C., et al.: "The STRong lensing Insights into the Dark Energy Survey (STRIDES) 2017/2018 follow-up campaign: discovery of 10 lensed quasars and 10 quasar pairs "

2020MNRAS.494.3491L

2017 Lansbury, G. B., et al.: "THE $NuSTAR$ SERENDIPITOUS SURVEY: THE 40 MONTH CATALOG AND THE PROPERTIES OF THE DISTANT HIGH ENERGY X-RAY SOURCE POPULATION "

2017ApJ...836...99L

2014 Faundez C.; Bravo A.; **Melo A.** & Astudillo H.: "Laboratorio Virtual para la Unidad Tierra y Universo como parte de la Formación Universitaria de Docentes de Ciencias"

Formación Universitaria, 2014, 7(3) 33-40.

Refereed and Accepted publications https://ui.adsabs.harvard.edu/public-libraries/CLZI3DNgToKx7m4HWM3mKQ