

Arturo O. Martinez

Astronomer · Research Scientist

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Research Interests

My current research interests lies in image reconstruction techniques and stellar astronomy in topics such as calculating stellar parameters, and image reconstruction through optical interferometry and speckle imaging. My recent work involved imaging rapid rotators, imaging spotted stars, and 3-D stellar modeling. I am currently working on projects which involve speckle imaging using deconvolution techniques and maintaining software for narrow-field speckle targets. Other current research interests include image restoration, combining astronomy with modern technology (using virtual reality), and learning new optimization techniques as well as machine learning for any future data scientific work.

Education

Georgia State University

Doctor of Philosophy – Astronomy

Atlanta, GA, USA

Aug. 2016 – Aug. 2021

- Dissertation title: “*Exploring Interferometric Realms: Modeling and Imaging of Stars, and Optical Test Bench Simulations*”.
- Second Century Initiative University Doctoral Fellow

Georgia State University

Master of Science – Physics (with concentration in Astronomy)

Atlanta, GA, USA

Aug. 2016 – May 2018

- Second Century Initiative University Doctoral Fellow

San Diego State University

Bachelor of Science – Astronomy (with Math Minor)

San Diego, CA, USA

Sep. 2011 – May 2015

- Cal-Bridge Scholar

Employment/Research Experience

Bay Area Environmental Research Institute

NASA Research Scientist

Moffett Field, CA, USA

Jul. 2021 – present

- Tasked with revamping and incorporating newer image analysis software for astronomy.
- Transcribe and maintain software, from Matlab to Julia, which retrieves the original object in speckle images by deconvolving the object from the atmospheric turbulence.
- Co-led projects solving the inverse problem by filtered/cleaned unstructured astronomical data and created reconstructed images using newer deconvolution techniques of high priority astronomical objects, and made suggestions to astronomical observing strategies for better image quality.
- Spearheaded project investigating amount of optical aberrations in research imaging instruments showing how optical quality within an instrument can change from throughout any given night.
- Collaborate with scientists from various institutions (e.g., Caltech, NASA Ames, Georgia State University, Georgia Tech Research Institute) and showcase research at astronomy science conferences.

Georgia State University

Atlanta, GA, USA

Graduate Research Assistant (Advisors: Profs. Fabien Baron & Stuart Jefferies)

Jan. 2017 – Jun. 2021

- As a graduate research assistant, was tasked with testing primitive 3-D imaging Julia code for optical interferometry and building atmospheric turbulence simulator in an optics laboratory.
- Collaborated in writing proposals to obtain telescope time at a world-class interferometer (CHARA Array) to obtain new stellar astronomy data and filtered/cleaned unstructured data in order to test 3-D imaging code.
- Updated untested 3-D imaging code using interferometric data with new 3-D models aimed at showing stellar surface features, and created images by solving an inverse interferometric imaging problem and using optimization algorithms.
- Built an atmospheric turbulence simulator and created destructive interference. Analyzed preliminary limits of beam propagation through horizontal atmospheric turbulence.
- Presented and published 3-D surface images to a professional astronomy scientific journal and conference showcasing world's 3rd detailed 3-D surface image of a heavily spotted star, and calculated more accurate physical parameterization compared to previous 2-D imaging works.
- Presented optics laboratory results for a wide audience at science conferences showcasing preliminary results free-space beam propagation for an interferometer through different levels of atmospheric turbulence.

Steward Observatory, University of Arizona

Tucson, AZ, USA

Visiting Research Scientist (Advisor: Prof. Ian Crossfield)

Jun. 2015 – Dec. 2016

- Initially worked as a summer research intern which expanded into a 1.5-year project in order to find the physical properties of several low-mass stars of interest.
- Obtained spectroscopic data, removed noise from data (or filtered/cleaned unstructured data), and created Python software for analysis.
- Calculated physical properties of 34 low-mass stellar systems and their respective planetary physical parameters.
- Presented results at various professional astronomy science conferences to many different audiences (in Jan. 2016).
- Collaborated with various scientists and published results to a professional astronomy scientific journal (in early 2017).
- Found a 0.15 median stellar radius correction toward more accurate stellar parameterization, important for future calibration and research studies.

Department of Astronomy, San Diego State University

San Diego, CA, USA

Junior Research Scientist (Advisor: Prof. Eric Sandquist)

Jan. 2014 – Jul. 2016

- Tasked as junior research scientist to solve for the physical properties of binary star systems to accurately age date a stellar cluster.
- Obtained photometric data, removed noise from data (data cleaning), and used Fortran software for image analysis.
- Calculated the previously unknown rotation period of a key binary system, which assisted in finding age of the stellar cluster.

Technical Skills

Programming Languages: Julia, Python

Software/Tools: Git, Optimization tools (e.g., NLOpt, OptimPack), NumPy, Pandas, Matplotlib, Linux

Document Preparation: L^AT_EX, LibreOffice (Writer, Impress, Calc), Microsoft Office (Word, Powerpoint, Excel)

Spoken Languages: English (native), Spanish (conversant)

Professional: Adaptability, Verbal Communication, Teamwork/Collaboration, Independent, Problem Solving, Critical Thinking, Research and Analysis, Data Visualization, Modeling, Statistical Analysis

Honors & Awards

American Astronomical Society FAMOUS Grant, Jan. 2020

Second Century Initiative University Doctoral Fellow, Aug. 2016 – Jul. 2020

Cal-Bridge Scholar, Oct. 2014 – Jul. 2016

Atlanta, GA, USA

San Diego, CA, USA

Presentations

Science by Diverse Scientists: A Cal-Bridge Physics & Astronomy Seminar Series

Online

Invited Talk

December 1, 2020

- Presented PhD research: “Exploring Current and Future Interferometric Imaging”

American Astronomical Society Meeting

Honolulu, HI, USA

iPoster Presentation

January 2020

- Presented PhD research: “Interferometric 3D imaging of lambda Andromedae”

CHARA Meeting

Flagstaff, AZ, USA

Research Talk

March 19, 2019

- Presented PhD research: “Updates to Stellar Surface Imaging & Modeling”

NSF Presentation at CHARA Array

Mt. Wilson, CA, USA

Research Talk

July 18, 2018

- Presented PhD research related to CHARA: “Imaging Stars with MIRC-X”

American Astronomical Society Meeting

Kissimmee, FL, USA

Poster Presentation

January 2016

- Presented CAMPARE summer research: “Stellar and Planetary Parameters for K2’s Late-type Dwarf Systems from C1 to C5”

K2SciCon Meeting

Santa Barbara, CA, USA

Poster Presentation

November 2015

- Presented CAMPARE summer research: “Stellar and Planetary Parameters for K2’s Late-type Dwarf Systems from C1 to C5”

Lunar and Planetary Laboratory Conference

Tucson, AZ, USA

Research Talk

August 20, 2015

- Presented CAMPARE summer research: “Stellar and Planetary Parameters for K2’s Late-type Dwarf Systems from C1 to C5”

Teaching Experience

Georgia State University

Atlanta, GA, USA

Lecturer - Introductory Astronomy Course

Jan. 2020 – May 2020

- Taught 15-week introductory level astronomy course to a class of 50+ students covering stars, galaxies, and cosmology.
- Gave lectures initially in a classroom setting but migrated towards and adapted to online setting during COVID-19 lockdowns.
- Provided exams to gauge student understand of material and provided office hours/email availability to answer student’s questions.

Georgia State University

Atlanta, GA, USA

Teaching Assistant - Lab Instructor

Aug. 2016 – Dec. 2019

- Taught laboratory portion of 15-week undergraduate courses in astronomy to a class of ~20 students to provide understanding of lectures.
- Gave brief lectures at the beginning of each class to explain topic and monitored laboratory work for each student.
- Assisted students with completing laboratory work and graded laboratory work to ensure student retention of lecture material.

Service

NASA Proposal Reviewer

Undisclosed (due to NDA)

NASA Science Mission Directorate Review Panel

Undisclosed (due to NDA)

- Served as a panelist to provide objective reviews for several NASA proposals according to NASA proposal guidelines.
- Ranked proposals to allow NASA fund projects that would greatly benefit society & work on cutting-edge science projects.

Early Career Working Group Co-Lead

Remote

NASA Science Mission Directorate Bridge Program

Aug. 2022 – Oct. 2023

- Co-directed a group of early career individuals for NASA to provide insights for best practices of academic success for future STEM students.
- In coordination with many other groups, published a NASA report highlighting recommendations to extend to assistance to the underserved STEM community based on community feedback ([“Report from the Bridge Program Workshop Organizing Committee”](#)).
- Published a white paper based on recommendations of early-career professionals in different STEM fields ([“Early Career Perspectives for the NASA SMD Bridge Program”](#)).

Accepted Observing Proposals as PI

2020B	The CHARA Array , Contemporaneous Imaging of Rapid Rotators with CHARA/MIRC-X and NPOI/VISION	<i>8 full nights</i>
2020A	The CHARA Array , Contemporaneous Imaging of Rapid Rotators with CHARA/MIRC-X and NPOI/VISION	<i>2 full, 13 half nights</i>
2019B	The CHARA Array , Contemporaneous Imaging of Rapid Rotators with CHARA/MIRC-X and NPOI/VISION	<i>2 full, 4 half nights</i>
2019A	The CHARA Array , Imaging Rapid Rotators with CHARA/MIRC-X	<i>9 full, 3 half nights</i>
2018B	The CHARA Array , Imaging Rapid Rotators with CHARA/MIRC-X	<i>5 full nights</i>
2018A	The CHARA Array , Monitoring Spotty Stars with MIRC-X	<i>3 full, 6 half nights</i>
2018A	The CHARA Array , Imaging Rapid Rotators with CHARA/MIRC-X	<i>7 full nights</i>
2017B	The CHARA Array , Imaging Rapid Rotators with CHARA/MIRC-X	<i>2 full, 2 half nights</i>

Roles/Committees

Computing Committee

Atlanta, GA, USA

GSU Physics & Astronomy

Jan. 01, 2020 – Jun. 30, 2021

Publicity and Outreach Committee

Atlanta, GA, USA

GSU Physics & Astronomy

Jan. 01, 2020 – Jun. 30, 2021

Web/Media Manager

Atlanta, GA, USA

GSU Physics Graduate Student Association

Jul. 01, 2019 – Jun. 30, 2020

Department Webmaster

Atlanta, GA, USA

GSU Physics & Astronomy

Jul. 01, 2018 – Jun. 30, 2021

Publications

First Author

[Exploring Interferometric Realms: Modeling and Imaging of Stars, and Optical Test Bench Simulations](#)

Martinez, A. O.

Georgia State University ScholarWorks, Ph.D. Dissertation pp. 1–125, Aug. 2021.

[Dynamical Surface Imaging of \$\lambda\$ Andromedae](#)

Martinez, A. O., Baron, F. R., Monnier, J. D., Roettenbacher, R. M., Parks, J. R.,

ApJ, 916 p. 60, July 2021.

[Looking into the future of interferometry using free-space beam propagation](#)

Martinez, A. O., Abbott, C. G., Jefferies, S. M., ten Brummelaar, T. A., Baron, F. R.,

Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series vol. 11446 114461B, Dec. 2020.

[Stellar and Planetary Parameters for K2's Late-type Dwarf Systems from C1 to C5](#)

Martinez, A. O., Crossfield, I. J. M., Schlieder, J. E., Dressing, C. D., Obermeier, C., Livingston, J., Ciceri, S., Peacock, S.,

Beichman, C. A., Lépine, S., Aller, K. M., Chance, Q. A., Petigura, E. A., Howard, A. W., Werner, M. W.,

ApJ, 837 p. 72, Mar. 2017.

Contributing Author

[High-contrast, High-angular-resolution Optical Speckle Imaging: Uncovering Hidden Stellar Companions](#)

Howell, S. B., **Martinez, A. O.**, Hope, D. A., Ciardi, D. R., Jefferies, S. M., Baron, F. R., Lund, M. B.,

AJ, 167 p. 258, June 2024.

[Early Career Perspectives For the NASA SMD Bridge Program](#)

Cann, J. M., **Martinez, A. O.**, Barnes, A., Doan, S., Ilesanmi, F., Lazzarini, M., Monsue, T., Pinedo, C., Cabrera Salazar, N., Steele, A.,

arXiv e-prints arXiv:2310.15287, Oct. 2023.

[Long Term Evolution of Surface Features on the Red Supergiant AZ Cyg](#)

Norris, R. P., Baron, F. R., Monnier, J. D., Paladini, C., Anderson, M. D., **Martinez, A. O.**, Schaefer, G. H., Che, X., Chiavassa, A., Connelley, M. S., Farrington, C. D., Gies, D. R., Kiss, L. L., Lester, J. B., Montargès, M., Neilson, H. R., Majoinen, O., Pedretti, E., Ridgway, S. T., Roettenbacher, R. M., Scott, N. J., Sturmann, J., Sturmann, L., Thureau, N., Vargas, N., ten Brummelaar, T. A.,

ApJ, 919 p. 124, Oct. 2021.

[A versatile turbulence simulator for high-resolution imaging studies of astronomical targets](#)

Abbott, C. G., **Martinez, A. O.**, Jefferies, S. M., ten Brummelaar, T., Baron, F. R.,

Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series vol. 11448 114483T, Dec. 2020.

[Characterizing K2 Candidate Planetary Systems Orbiting Low-Mass Stars IV: Updated Properties for 86 Cool Dwarfs Observed During Campaigns 1-17](#)

Dressing, C. D., Hardegree-Ullman, K., Schlieder, J. E., Newton, E. R., Vanderburg, A., Feinstein, A. D., Duvvuri, G. M., Arnold, L., Bristow, M., Thackeray, B., Schwab Abrahams, E., Ciardi, D. R., Crossfield, I. J. M., Yu, L., **Martinez, A. O.**, Christiansen, J. L., Crepp, J. R., Isaacson, H.,

The Astronomical Journal, 158 p. 87, Aug. 2019.

[Spitzer Transit Follow-up of Planet Candidates from the K2 Mission](#)

Livingston, J. H., Crossfield, I. J. M., Werner, M. W., Gorjian, V., Petigura, E. A., Ciardi, D. R., Dressing, C. D., Fulton, B. J., Hirano, T., Schlieder, J. E., Sinukoff, E., Kosiarek, M., Akeson, R., Beichman, C. A., Benneke, B., Christiansen, J. L., Hansen, B. M. S., Howard, A. W., Isaacson, H., Knutson, H. A., Krick, J., **Martinez, A. O.**, Sato, B., Tamura, M.,

AJ, 157 p. 102, Mar. 2019.

[Planetary Candidates from K2 Campaign 16](#)

Yu, L., Crossfield, I. J. M., Schlieder, J. E., Kosiarek, M. R., Feinstein, A. D., Livingston, J. H., Howard, A. W., Benneke, B., Petigura, E. A., Bristow, M., Christiansen, J. L., Ciardi, D. R., Crepp, J. R., Dressing, C. D., Fulton, B. J., Gonzales, E. J., Hardegree-Ullman, K. K., Henning, T., Isaacson, H., Lépine, S., **Martinez, A. O.**, Morales, F. Y., Sinukoff, E.,

AJ, 156 p. 22, July 2018.

[197 Candidates and 104 Validated Planets in K2's First Five Fields](#)

Crossfield, I. J. M., Ciardi, D. R., Petigura, E. A., Sinukoff, E., Schlieder, J. E., Howard, A. W., Beichman, C. A., Isaacson, H., Dressing, C. D., Christiansen, J. L., Fulton, B. J., Lépine, S., Weiss, L., Hirsch, L., Livingston, J., Baranec, C., Law, N. M., Riddle, R., Ziegler, C., Howell, S. B., Horch, E., Everett, M., Teske, J., **Martínez, A. O.**, Obermeier, C., Benneke, B., Scott, N., Deacon, N., Aller, K. M., Hansen, B. M. S., Mancini, L., Ciceri, S., Brahm, R., Jordán, A., Knutson, H. A., Henning, T., Bonnefoy, M., Liu, M. C., Crepp, J. R., Lothringer, J., Hinz, P., Bailey, V., Skemer, A., Defrere, D.,
ApJS, 226 p. 7, Sept. 2016.

[Kepler Eclipsing Binary Stars. VII. The Catalog of Eclipsing Binaries Found in the Entire Kepler Data Set](#)

Kirk, B., Conroy, K., Prša, A., Abdul-Masih, M., Kochoska, A., Matijevič, G., Hambleton, K., Barclay, T., Bloemen, S., Boyajian, T., Doyle, L. R., Fulton, B. J., Hoekstra, A. J., Jek, K., Kane, S. R., Kostov, V., Latham, D., Mazeh, T., Orosz, J. A., Pepper, J., Quarles, B., Ragozzine, D., Shporer, A., Southworth, J., Stassun, K., Thompson, S. E., Welsh, W. F., Agol, E., Derekas, A., Devor, J., Fischer, D., Green, G., Gropp, J., Jacobs, T., Johnston, C., LaCourse, D. M., Saetre, K., Schwengeler, H., Toczyski, J., Werner, G., Garrett, M., Gore, J., **Martínez, A. O.**, Spitzer, I., Stevick, J., Thomadis, P. C., Vrijmoet, E. H., Yenawine, M., Batalha, N., Borucki, W.,
AJ, 151 p. 68, Mar. 2016.