Dr. Kyle F. Kaplan

SOFIA Science Center
NASA Ames Research Center
Mail Stop N232-12
P.O. Box 1
Moffett Field, CA 94036

kkaplan@usra.edu
https://sites.google.com/view/kylekaplansastronomy
(650) 604-5881
001-650-604-5881

Interests:

— High resolution infrared and optical spectroscopy, the interstellar medium, photodissociation regions, planetary nebulae, feedback from high mass star formation, spectroscopy of H_2 and OH molecules, elemental abundances in nebulae, H II regions, dust

Education:

— **Ph.D. in Astronomy** - University of Texas at Austin - 2017

Dissertation: *Probing the conditions within Photo-dissociation Regions with high resolution near-infrared spectroscopy of UV-excited molecular hydrogen*

Co-advisors: Harriet Dinerstein and Dan Jaffe

— **B.S. in Astrophysics** - University of California, Santa Cruz - 2010

Employment:

— Instrument Scientist - SOFIA Science Center - USRA - Topic: *Supporting the planning and observing of community projects with the GREAT instrument* - Advisor: Randolf Klein - 2019 to present

— Postdoctoral Research Associate - University of Arizona - Topic: *Development and implementation of the data reduction software for the precision radial velocity HPF and NEID spectrometers* - Advisor: Chad Bender - 2017 to 2019

— Graduate Research and Teaching Assistantships - University of Texas at Austin - 2011 to 2017

— Junior Researcher - University of California, Santa Cruz Institute of Particle Physics (SCIPP) - Topic: *UCSC Blazar Monitoring program, optical photometry and spectroscopy of blazars* - Advisor: David Williams - 2010 to 2011

— Undergrad Summer Researcher - University of California, Santa Cruz - Topic: *Metal strong Damped Lyman-α systems* - Advisor: Jason X. Prochaska - 2008 to 2010

— REU - San Diego State University - Topic: *Light-curves of the eclipsing binary star system UV Psc.* - Advisor: Ronald Angione - Summer 2007

First Author Publications:

— **Kaplan, K. F.**, Dinerstein, H. L., Kim, H., Jaffe, J. T. *A Near-infrared Survey of UV-excited Molecular Hydrogen in Photodissociation Regions*, 2021, ApJ, 919, 27

— **Kaplan, K. F.**, Bender, C. F., Terien, R. C., Ninan, J., Roy, A. *The Algorithms Behind the HPF and NEID Pipeline* 2019, in ASP Conf. Ser. 523, Astronomical Data Analysis Software and Systems XXVII, ed. P. J. Teuben et al. (San Francisco, CA: ASP), 567

— **Kaplan, K. F.**, Dinerstein, H. L., Oh, H., Mace, G. N., et al. *Excitation of Molecular Hydrogen in the Orion Bar Photodissociation Region From a Deep Near-Infrared IGRINS Spectrum* 2017, ApJ, 838, 152

— **Kaplan, K. F.**, Jogee, S., Kewley, L., Blanc, G. A., et al. *The VIRUS-P Exploration of Nearby Galaxies (VENGA): spatially resolved gas-phase metallicity distributions in barred and unbarred spirals* 2016, MNRAS, 462, 1642

— **Kaplan, K. F.**, Prochaska J. X. Herbert-Fort, S. Ellison, S., Dessauges-Zavadsky, M. *H I Column Densities, Metallicities, and Dust Extinction of Metal-Strong Damped Lyα Systems* 2010, PASP, 122, 619

Co-Authored Publications:

— López-Valdivia, R., Sokal K., Mace, G. N., et al. *The IGRINS YSO Survey I. Stellar parameters of pre-main sequence stars in Taurus-Auriga* 2021, Accepted for publication in ApJ

— Sneden, C., Afşar, M., Bozkurt, Z., et al. *Chemical Compositions of Red Giant Stars from Habitable Zone Planet Finder Spectroscopy* 2021, AJ, 161, 128

— Nina, J. P., Stefansson, G., Mahadevan, S., et al. *Evidence for He I 10830 Å Absorption during the Transit of a Warm Neptune around the M-dwarf GJ 3470 with the Habitable-zone Planet Finder* 2020, ApJ, 894, 97

— Lee, H. Pak, S., Mace, G. N., **Kaplan, K. F.**, et al *IGRINS Slit-viewing Camera Software* 2020, PASP, 132, 5001

— Carrillo, A., Jogee, S., Drory, N., **Kaplan, K. F.**, et al. *The VIRUS-P Exploration of Nearby Galaxies (VENGA): the stellar populations and assembly of NGC 2903's bulge, bar, and outer disc* 2020, MNRAS, 493, 4094

— Ryde, N. Jönsson, H., Mace, G., et al. *Fluorine in the Solar Neighborhood: The Need for Several Cosmic Sources* 2020, ApJ, 893, 37

— Roy, A., Halverson, S., Mahadevan, S., et al. *Solar Contamination in Extreme-precision Radial-velocity Measurements: Deleterious Effects and Prospects for Mitigation* 202, AJ, 159, 161

— Stefansson, G., Cañas, C., Wisniewski, J., et al. *A Sub-Neptune-sized Planet Transiting the M2.5 Dwarf G 9-40: Validation with the Habitable-zone Planet Finder*, 2020, AJ, 159, 100

— Ninan, J. P., Mahadevan, S., Stefansson, G., et al. *Impact of crosshatch patterns in H2RGs on high-precision radial velocity measurements: exploration of measurement and mitigation paths with the Habitable-Zone Planet Finder* 2019, JATIS, 5, 041511

— Metcalf, A. J, Anderson, T., Bender, C. F., et al. *Stellar spectroscopy in the near-infrared with a laser frequency comb* 2019, Optica, 6, 233

— Robertson, P., Anderrson, T. Stefansson, G., et al. *Ultrastable environment control for the NEID spectrometer: design and performance demonstration* 2019, JATIS., 5, 015003

— Park, S.; Lee, J., Kang, W., Lee, S., et al. *IGRINS Spectral Library* 2018, ApJS, 238, 29

— Ninan, J. P., Bender, C. F., Mahadevan, S., et al. *The Habitable-Zone Planet Finder: improved flux image generation algorithms for H2RG up-the-ramp data*, 2018, Proc. SPIE, 10709

— Mace, G., Sokal, K., Lee, J., et al. *IGRINS at the Discovery Channel Telescope and Gemini South*, 2018, Proc. SPIE, 10702

— Madonna, S., Bautista, M., Dinerstein, H. L., Sterling, N. C., et al. *Neutron-capture Elements in Planetary Nebulae: First Detections of Near-infrared [Te III] and [Br V] Emission Lines* 2018, ApJ, 861, 8

— Oh, H., Pyo, T., Koo, B., Yuk, I., et al. *High-resolution Near-IR Spectral Mapping with H_2 and [Fe II] Lines of Multiple Outflows around LkHα 234* 2018, ApJ, 858, 23

— Carleo, I., Benatti, S., Lanza, A. F., Gratton, R., et al. *Multi-band high resolution spectroscopy rules out the hot Jupiter BD+20 1790b. First data from the GIARPS Commissioning* 2018, A&A, 613, 50

— Lyo, A., Kim, J., Lee, J., Kim, K., et al. *Inner Warm Disk of ESO H? 279a Revealed by NA I and CO Overtone Emission Lines* 2017, ApJ, 844, 4

— Robinson, E. L., Cynthia, S., Jaffe, D. T., **Kaplan, K. F.**, et al. *The Spectrum of SS 433 in the H and K Bands* 2017, ApJ, 841, 79

— Le, H. A. N., Pak, S., **Kaplan, K. F.**, Mace, G. N., et al. *Fluorescent H_2 Emission Lines from the Reflection Nebula NGC 7023 observed with IGRINS* 2016, ApJ, 841, 13

— Oh, H., Pyo, T., **Kaplan, K. F.**, Yuk, I., et al. *Three-dimensional Shock Structure of Orion KL Outflow with IGRINS* 2016, ApJ, 833, 275

— Herczeg, G. J., Dong, S., Shappee, B. J. Chen, P., et al. *The Eruption of the Candidate Young Star ASASSN-15QI* 2016, ApJ, 831, 133

— Sterling, N. C., Dinerstein, H. L., **Kaplan, K. F.**, Bautista, M. A. *Discovery of Rubidium, Cadmium, and Germanium Emission Lines in the Near-infrared Spectra of Planetary Nebulae* 2016, ApJL, 819, L9

— Afşar, M., Sneden, C., Frebel, A., Kim, H., et al. *The Chemical Compositions of Very Metal-poor Stars HD 122563 and HD 140283: A View from the Infrared* 2016, ApJ, 819, 103

— Mann, A. W., Gaidos, E., Mace, G. N., Johnson, M. C., et al. *Zodiacal Exoplanets in Time (ZEIT). I. A Neptune-sized Planet Orbiting an M4.5 Dwarf in the Hyades Star Cluster* 2016, ApJ, 818, 46

— Oh, H., Pyo, T., Yuk, I., Park, B., et al. *IGRINS Near-IR High-resolution Spectroscopy of Multiple Jets around LkHα 234* 2016, ApJ, 817, 148

— Le, H. A. N., Pak, S., Jaffe, D. T., **Kaplan, K.**, et al. *Exposure time calculator for Immersion Grating Infrared Spectrograph: IGRINS* 2015, AdSpR, 55, 2509

— Park, C., Jaffe, D. T., Yuk, I., Chun, M., et al. *Design and early performance of IGRINS (Immersion Grating Infrared Spectrometer)* 2014, Proc. SPIE, 9147

— Blanc, G., Wenzirl, T., Song, M., Heiderman, A., et al. *The VIRUS-P Exploration of Nearby Galaxies (VENGA): Survey Design, Data Processing, and Spectral Analysis Methods* 2013, AJ, 145, 138

— Aliu, E., Archambault, S., Arlen, T., Aune, T., et al. *VERITAS Observations of Six Bright, Hard-spectrum Fermi-LAT Blazars* 2012, ApJ, 759, 102

— Fumagalli, M., Dessauges-Zavadsky, M., Furniss, A., Prochaska, J. X., et al. *A search of CO emission lines in blazars: the low molecular gas content of BL Lac objects compared to quasars* 2012, MNRAS, 424, 227

— Aliu, E., Aune, T., Beilicke, M., Benbow, W., Böttcher, M., et al. *Multiwavelength Observations of the Previously Unidentified Blazar RX J0648.7+1516* 2011, ApJ, 742, 127

— Fittingoff, A., Prochaska, J. X., Kalirai, J. S., Strader, et al. *A survey of ultraviolet-bright sources behind the halo of M31* 2009, MNRAS, 399, 728

— Hamann, F., **Kaplan, K. F.**, Rodríguez Hidalgo, P., Prochaska, J. X., & Herbert-Fort, S. *Emergence of a quasar outflow* 2008, MNRAS, 391, L39

Fellowships, Grants, and Awards:

— Financial aid to attend the ADASS XXVII conference - November 2018

— Office of Graduate Studies Professional Development Award - For travel to present my dissertation talk at the 229th Winter 2017 AAS meeting - December 2016

— McDonald Observatory Board of Visitors David Alan Benfield Memorial Fellowship - Recognizes outstanding research by a senior UT Astronomy graduate student - February 2016

— SOFIA travel grant to attend conference "30 Years of PhotoDissociation Regions" - July 2015

Research Experience:

— Data reduction and optimal extraction of high resolution optical and near-IR stellar spectra for precision radial velocity measurements to search for terrestrial mass exoplanets

— High resolution near-IR spectroscopy of H_2 in PDRs, exploring H_2 excitation physics, IGRINS instrument and observing support

— Addressing the abundance discrepancy problem in PNe with optical IFU and infrared Herschel observations of recombination and collisionally excited lines

— Measuring gas-phase metallicity gradients in nearby spiral galaxies with IFU data from the VENGA survey

— Optical photometry, light-curves, and spectroscopy of Blazars to support the VERITAS gamma ray telescope collaboration

— Absorption spectroscopy to measure abundances and dust content of metal strong damped Lyman-α systems

— Photometry and light-curves of eclipsing binary stars

Computer Experience (GitHub account - https://github.com/kfkaplan):

— Python, DS9, GILDAS, and IDL

— Reduction and analysis of data from high resolution spectrographs

— Wrote code for processing, telluric correcting, flux calibrating, and analyzing 1D and 2D spectra, extracting emission line fluxes, and creating and analyzing data-cubes

— IFU data, imaging, and photometry

— Using the plasma simulation code Cloudy to fit observed emission line data

Observing Support:

— As an instrument scientist for the GREAT spectrometer on SOFIA, supported community science for six flight series, including two foreign deployments

— Participated in the commissioning of the HPF precision radial velocity near-IR spectrograph on the Hobby-Eberly Telescope at McDonald Observatory

— Participated in the commissioning the IGRINS Near-IR spectrometer on the 2.7 m Harlan J. Smith Telescope at McDonald Observatory

— Observed for two IGRINS mini-queue runs in August 2015 and January 2016 where I was in charge of planning and observing the targets in the queue from night to night.

— Wrote code for creating real time finder charts in DS9

Observing Experience:

— **26 nights**, SOFIA, GREAT - 2019 to present

— **13 nights**, McDonald Observatory, 10 m Hobby-Eberly Telescope, HPF precision RV near-IR spectrometer - 2017 to 2018

— **8 nights**, Lowell Observatory, 4.3 m Discovery Channel Telescope, IGRINS near-IR spectrometer - 2017

— **132 nights**, McDonald Observatory, 2.7 m Harlan J. Smith Telescope, IGRINS near-IR spectrometer, $\sim$ 40% of time for my own projects and $\sim$ 60% on other people's projects - 2014 to 2017

— **8 nights**, McDonald Observatory, 2.7 m Harlan J. Smith Telescope, Mitchell Spectrograph (VIRUS-P) IFU - 2013 to 2014

— Worked with images taken nightly with the robotic SuperLOTIS robotic telescope at Kitt Peak Observatory - 2010 to 2011

— $\sim$**10 nights**, Lick Observatory, 3 m Shane Telescope, KAST spectrometer - 2008 to 2011

Professional Presentations:

— Exhibitor Theater Presentation - AAS Meeting #240 - Pasadena, CA, USA, - *SOFIA Legacy data: The ISM at high spectral resolution with GREAT* - June 13, 2022

— Contributed talk - "Extreme Precision in Radial Velocity IV" conference - Grindelwald, Switzerland - *Telluric emission and absorption correction in the HPF and NEID pipeline* - March 18, 2019

— Poster - AAS Meeting #233 - Seattle, WA, USA - #245.14 *Monitoring and forward modeling OH sky emission lines in high resolution spectra*

— Poster - ADASS XXVIII - College Park, MD, USA - P12-7 *The algorithms behind the HPF and NEID pipeline*

— Poster - AAS Meeting #230 - Austin, TX, USA - #215.03 *A Comparative Study of H_2 Excitation and Physical Conditions in Interstellar and Circumstellar Photo-dissociation Regions* - 2017

— Dissertation talk - Winter AAS Meeting #229 - Grapevine, TX, USA - January 6, 2017 *Probing the conditions within Photo-dissociation Regions with high resolution near-infrared spectroscopy of UV-excited molecular hydrogen*

— Poster - Cloudy: Emission Lines in Astrophysics, From Gaseous Nebulae to Quasars - Mexico City, Mexico - *New observational probes and constraints on the physical conditions and excitation mechanisms of molecular hydrogen in PDRs* - 2016

— Poster - AAS Meeting #228 - San Diego, CA, USA - #219.06 *Resolving shocked and UV excited components of H2 emission in planetary nebulae with high-resolution near-infrared spectroscopy* - 2016

— Invited talk - "High Resolution Spectroscopy with IGRINS" conference - Seoul, South Korea - *Probing the physics of excited molecular hydrogen gas with IGRINS* - November 13, 2015

— Contributed talk - "High Resolution Spectroscopy with IGRINS" conference - Seoul, South Korea - *2-D Analysis of Extended Objects with IGRINS: Constructing and Extracting Information from Position-Velocity Diagrams and Data Cubes* - November 12, 2015

— Contributed talk - "30 Years of PhotoDissociation Regions" conference - Asilomar, CA, USA - *H_2 excitation and mapping in the Orion Bar with IGRINS* - June 30, 2015

— Poster - AAS Meeting #215 - Washington DC, USA - #460.03 *H I Column Densities, Metallicities, and Dust Extinction of Metal-Strong Damped Lyman Alpha Systems* - 2010

— Poster - AAS Meeting #211 - Austin, TX, USA - #03.29 *Photometric Analysis of UV Piscium. Light curves and analyses of the RS CVn eclipsing system* - 2008

Graduate Research Assistantships:

— Topic: Near-IR spectroscopy of H_2 in PDRs, IGRINS instrument and observing support - Advisors: Harriet Dinerstein and Dan Jaffe - Fall 2014 to Spring 2017

— Topic: The abundance discrepancy problem in PNe - Advisor: Harriet Dinerstein - Fall 2013 to Spring 2014

— Topic: Measuring gas-phase elemental abundance gradients in nearby spiral galaxies in the VENGA survey - Advisor: Shardha Jogee - Summer 2012 to Summer 2013

Graduate Teaching Assistantships:

— Class: Extraterrestrial Life - Professor: Neal Evans - Led discussion section and graded assignments for this writing intensive signature course for non-science majors - Spring 2015

— Class: Introduction to Astronomy Lab - Primary instructor for this stand-alone lab course - Independently developed several new labs for the course - Spring 2012 to Spring 2013

— Class: Introduction to Astronomy - Professor: Derek Wills - Led review discussions and proctored and graded tests - Fall 2011

Public Outreach:

— Volunteer - Lick Observatory Evening with the Stars, Mt. Hamilton CA - June 24, 2022

— Volunteer - Partial solar eclipse at the University of Arizona, Tuscon AZ - August 21, 2017

— Volunteer - 2017 Girl Day STEM Festival at UT Austin, Austin TX - February 25, 2017

— Poster presentation, McDonald Observatory Board of Visitors meeting, *High Resolution Near-Infrared Spectroscopy of the Orion Bar with IGRINS*, Austin TX - August 2016

— Volunteer - 2016 Girl Day STEM Festival at UT Austin, Austin TX - February 27, 2016

— Invited graduate student talk, McDonald Observatory Board of Visitors meeting, *Observing the Evaporating Tears of a Dying Star with IGRINS*, Fort Davis TX - July 2014

— Volunteer, NASA JWST at SXSW exhibit, Austin TX - March 8-10, 2013

— Public star party host (Fridays and Saturdays) and operator for the 9 inch Painter Hall Telescope at UT Austin - Spring 2012 to Spring 2013

— Volunteer, Astronomy booth at the Texas Science and Engineering Festival, Austin TX - December 2011