GRAYSON C. PETTER

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Observational astrophysicist studying accreting supermassive black holes and the connections to their host environments and galaxies. Interested in revealing black hole feedback through statistical studies of active galactic nuclei found in wide-area surveys. Currently focused on studying how different classes of AGN populate the large-scale structure of the universe, or how they occupy their host dark matter halos.

EDUCATION

Ph.D. Candidate Sept 2019 – May 2024
Thesis: *The Large-scale Environments of Active Galactic Nuclei*
Department of Physics & Astronomy, Advisor: Professor Ryan Hickox
Dartmouth College

B.S. Physics, B.S. Astronomy Aug 2015 – May 2019
Department of Physics, Advisor: Professor Gregory Rudnick
University of Kansas

PUBLICATIONS

First Author:

1. (Mature Manuscript) "Environments of Luminous Low-frequency Radio Galaxies Since Cosmic Noon: Jet-mode feedback dominant at $z < 1$", **Grayson C. Petter**, Ryan C. Hickox, Leah K. Morabito, David M. Alexander, 2024, *The Astrophysical Journal*, Manuscript copy
2. "Host Dark Matter Halos of WISE-selected Obscured and Unobscured Quasars: Evidence for Evolution", **Grayson C. Petter**, Ryan C. Hickox, David M. Alexander, Adam D. Myers, James E. Geach, Kelly E. Whalen, and Carolina P. Andonie, 2023, *The Astrophysical Journal*, doi:10.3847/1538-4357/acb7ef
3. "Host Dark Matter Halos of SDSS Red and Blue Quasars: No Significant Difference in Large-scale Environment", **Grayson C. Petter**, Ryan C. Hickox, David M. Alexander, James E. Geach, Adam D. Myers, David J. Rosario, Victoria A. Fawcett, Lizelke Klindt, and Kelly E. Whalen, 2022, *The Astrophysical Journal*, doi:10.3847/1538-4357/ac4d31
4. "Deviations from the Infrared-radio Correlation in Massive, Ultracompact Starburst Galaxies", **Grayson C. Petter**, Amanda A. Kepley, Ryan C. Hickox, Gregory H. Rudnick, Christy A. Tremonti, Aleksandar M. Diamond-Stanic, James E. Geach, Alison L. Coil, Paul H. Sell, John Moustakas, David S. N. Rupke, Serena Perrotta, Kelly E. Whalen and Julie D. Davis, 2020, *The Astrophysical Journal*, doi:10.3847/1538-4357/abb19d

Co-author:

- "X-ray and multi-wavelength analysis of candidate AGNs in dwarf galaxies in the Boötes field", Purohit, Rujuta et al., 2023, *The Astrophysical Journal*, submitted
- "Obscuration beyond the nucleus: infrared quasars can be buried in extreme compact starbursts", Andonie, Carolina et al., 2023, *Monthly Notices of the Royal Astronomical Society*, doi:10.1093/mnrasl/slad144

- "Extending the Dynamic Range of Galaxy Outflow Scaling Relations: Massive Compact Galaxies with Extreme Outflows", Julie D. Davis et al., 2023, *The Astrophysical Journal*, doi:10.3847/1538-4357/accbbf
- "The Ionization and Dynamics of the Makani Galactic Wind", David S.N. Rupke et al., 2023, *The Astrophysical Journal*, doi:10.3847/1538-4357/acbfae
- "A panchromatic view of infrared quasars: excess star formation and radio emission in the most heavily obscured systems", Carolina P. Andonie et al., 2022, *Monthly Notices of the Royal Astronomical Society*, doi:10.1093/mnras/stac2800
- "The Space Density of Intermediate Redshift, Extremely Compact, Massive Starburst Galaxies", Kelly E. Whalen et al., 2022, *The Astronomical Journal*, doi:10.3847/1538-3881/ac958f
- "TESS Hunt for Young and Maturing Exoplanets (THYME). VII. Membership, Rotation, and Lithium in the Young Cluster Group-X and a New Young Exoplanet", Elisabeth R. Newton et al., 2022, *The Astrophysical Journal*, doi:10.3847/1538-3881/ac8154
- "Physical Properties of Massive Compact Starburst Galaxies with Extreme Outflows", Serena Perrotta et al., 2021, *The Astrophysical Journal*, doi:10.3847/1538-3881/ac8154
- "Compact Starburst Galaxies with Fast Outflows: Central Escape Velocities and Stellar Mass Surface Densities from Multiband Hubble Space Telescope Imaging", Aleksandar M. Diamond-Stanic et al., 2021, *The Astrophysical Journal*, doi:10.3847/1538-4357/abe935
- "The GOGREEN and GCLASS surveys: first data release", Michael L. Balogh et al., 2021, *Monthly Notices of the Royal Astronomical Society*, doi:10.1093/mnras/staa3008

PRESENTATIONS

Talks:

- "Radio Galaxy Clustering; Jet-mode Feedback Dominant in Groups"; Boston-area Black Hole Accretion Meeting, Oct 20 2023, Boston, Massachusetts.
- "Physical Models for the Clustering of Obscured and Unobscured Quasars"; What drives the growth of black holes?, Sept 26-29 2022, Reykjavik, Iceland.
- "Host Dark Matter Halos of Obscured and Unobscured Quasars"; Panchromatic view of the life-cycle of AGN, Sept 14-16 2022, Madrid, Spain.
- "Host Halos/Galaxies of Obscured and Unobscured Quasars"; New England Regional Quasar and AGN Meeting, May 26 2022, Storrs, Connecticut.

Posters:

- "Unveiling Star Formation and its Demise in Ultra-compact Post-merger Galaxies using Jansky VLA Continuum Measurements"; American Astronomical Society Meeting 233, Jan 6-10 2019, Seattle, Washington.

OBSERVING EXPERIENCE

Principal Investigator:

•SALT 2022-2 RSS Spectroscopy: Characterizing Heavily Obscured Quasars Missed by X-ray Surveys.
•SALT 2023-1 RSS Spectroscopy: Characterizing Heavily Obscured Quasars Missed by X-ray Surveys.

Co-investigator

•VLA 2018A: Probing Dust-Obscured Star Formation in Massive Ultra-compact Galaxies.

MENTORING/TEACHING EXPERIENCE

•Co-advisor to Ms. Rujuta Purohit, an undergraduate studying with Prof. Ryan Hickox at Dartmouth College who has submitted her first lead-author paper and is preparing her second.

•Graduate teaching assistant for an undergraduate foreign study program in observational astronomy in Cape Town, South Africa, culminating in a research project involving hands-on observations with a 1-meter telescope at the South African Astronomical Observatory.

•Graduate teaching assistant at Dartmouth College for eight terms of introductory physics and astronomy courses.

•Undergraduate teaching assistant at the University of Kansas for six semesters of introductory physics courses.

AWARDS

•Selamawit Tsehaye Teaching Award, 2023, Dartmouth College

PAST RESEARCH APPOINTMENTS

•NSF REU at the National Radio Astronomy Observatory, Advisor: Dr. Amanda Kepley

SOFTWARE PACKAGES

•HaloModelPy - An efficient and flexible Python package to model galaxy auto/cross-correlation functions, and cross-power spectra with lensing signals in a halo model framework.

•Corrfunc Helper - A wrapper for the Corrfunc package to simplify computation of correlation functions. Pass galaxy and random catalogs and compute angular/spatial, auto/cross correlations, and perform bootstrap resampling all in one line.

COMPUTING SKILLS

- Python - functional and object-oriented, writing vectorized numpy code for speed
- High-performance computing / parallelization
- Markov chain Monte Carlo methods (emcee), nested samplers (dynesty)
- SQL/ADQL
- Operations on HEALPix maps, multi-order coverage maps, MANGLE maps, and MASTER power spectrum estimation

- Usage of Code for Anisotropies in the Cosmic Microwave Background (CAMB), Fourier methods (FFTLog), Core Cosmology Library (CCL), astropy
- Modeling galaxy spectral energy distributions with CIGALE
- Maintaining projects on GitHub

REFERENCES

Professor Ryan Hickox
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