Michael S. P. Kelley

Department of Astronomy
University of Maryland
College Park, MD 20742-2421

Phone: 301-405-3796
Email: msk@astro.umd.edu
URL: http://www.astro.umd.edu/~msk/

Areas of Specialization

Comets	Dust (dynamics, composition), activity, outbursts.
Asteroids	Thermal properties.
Spectroscopy	Infrared.
Archiving	Planetary Data System Small-Bodies Node Science Staff.

Current Position

since 2022	*Principal Research Scientist* University of Maryland

Prior Positions

2014–2022	*Associate Research Scientist* University of Maryland
2012–2014	*Assistant Research Scientist* University of Maryland
2009–2012	*Post-Doctoral Researcher* University of Maryland
2006–2009	*Post-Doctoral Researcher* University of Central Florida
2002–2006	*Graduate Research Assistant* University of Minnesota
2003–2004	*Visiting Graduate Student Fellow* Spitzer Science Center, California Institute of Technology
2000–2002	*Graduate Teaching Assistant* University of Minnesota
2000	*Research Assistant* Brookhaven National Laboratory
1997-2000	*Research Assistant* Ames Laboratory, Iowa State University

Education

2006 Ph.D. in Astrophysics, University of Minnesota

2000 B.S. in Physics, Iowa State University

Technical Skills

Spectroscopy, imaging, polarimetry. Experienced with observing and analyzing cometary and asteroidal data from ground- and space-based observatories, including *James Webb Space Telescope*, Zwicky Transient Facility, *Gemini*, *Hubble Space Telescope*, *Deep Impact*, *Spitzer Space Telescope*, *Kepler*, *TESS*, and SOFIA.

Astronomical and open-source software, databases (spatial indexing). Co-founder of sbpy (cometary and asteroidal Python tools). User of and advocate for Python and GitHub with astronomical projects. See my code repositories at https://github.com/mkelley?tab=repositories.

Honors and Awards

2024 Spectroscopic identification of water emission from a main-belt comet *(Kelley et al. 2023) highlighted in a review of papers published in 2023*
International Astronomical Union, Commission F4 (Asteroids, Comets & Transneptunian Objects)
https://www.iau.org/science/scientific_bodies/commissions/F4/info/news/

2023 *NASA Silver Group Achievement Award (Planetary Data System)*
NASA Headquarters

2022 *Distinguished Research Scientist Prize*
Department of Astronomy, University of Maryland

2017 *NASA Silver Achievement Medal (OSIRIS-REx Asteroid Astronomy Science Team)*
NASA Headquarters

2015 *NASA Group Achievement Award (Comet Siding Spring Observing Team)*
NASA Headquarters

2015 *NASA Group Achievement Award (Comet Modeling, Prediction, and Assessment Team)*
NASA Headquarters

2014 *NASA Group Achievement Award (PDS4 Development Team)*
NASA Headquarters

2014 *Two letters of recognition for service to NASA's Comet Siding Spring Observing Campaign*
James Green (Director), Planetary Science Division, NASA

2014 *Minor planet (9530) Kelleymichael*
International Astronomical Union

2013 *Letter of recognition for service to NASA's Comet ISON Observing Campaign*
James Green (Director), Planetary Science Division, NASA

2013 *Early Career Research Scientist Prize for Excellence*
Department of Astronomy, University of Maryland

2011 *NASA Group Achievement Award (EPOXI Science Team)*
NASA Headquarters

2005 *Doctoral Dissertation Fellowship*
The Graduate School, University of Minnesota

2003 *Visiting Graduate Student Fellowship*
Spitzer Science Center, California Institute of Technology

Grants

*As principal investigator. **As co-investigator.

2022–2025 **Deep Imaging with TESS: Studying Distant Comets, Dust Trails and Other Faint Phenomena* ($TBD,000)
NASA Solar System Workings

2022–2025 *,***James Webb Space Telescope Data Analysis Grants* ($166,000)
Space Telescope Science Institute

2020–2023 **Insights into Cometary Nucleus Heterogeneity and Evolution via Orbital Trends* ($485,000)
NASA Solar System Workings

2020–2023 **Deciphering Cometary Outbursts* ($418,000)
NASA Solar System Observations

2020–2022 ***A TESS Survey of Temporal Cometary Phenomena* ($—,000)
NASA TESS Guest Investigator Cycle 3

2020–2023 ***A Survey of Comets Using TESS* ($—,000)
NASA Solar System Workings

2020–2022 ***Observational Characterization of Recurrently Active Main-Belt Comet Candidates* ($—,000)
NASA Solar System Observations

2018–2022 **,***A Python Package for Small-Body Planetary Astronomy* ($599,000)
NASA Planetary Data Archiving, Restoration, and Tools Program

2013–2021 ***Hubble Space Telescope Data Analysis Grants* ($147,000)
Space Telescope Science Institute

2015–2021 ***The Small Bodies Node of NASA's Planetary Data System* ($22,475,000)
NASA PDS Discipline Nodes

2017–2019 ***Characterizing the properties of near-Sun objects: the least understood class of PHOs* ($660,000)
NASA Solar System Observations

2016–2019 ***Comprehensive Analyses of Comet Siding Spring, Before, During and After Its Mars Encounter* ($500,000)
NASA Solar System Workings Program

2016–2019 ***Emerging Comets from Protoplanetary Processes* ($379,000)
NASA Emerging Worlds Program

2007–2018 *,***Spitzer Space Telescope Data Analysis Grants* ($346,000)
Caltech / NASA JPL

2015–2017 ** *The Physical Properties of Water Ice in Comets* ($346,000)
NASA Solar System Observations Program

2013–2015 * *Crystalline Silicates in Comets and Dynamical Mixing of the Disk* ($338,000)
NASA Planetary Astronomy Program

2013–2015 * *Icy Giants in Comet Comae* ($192,000)
NASA Planetary Mission Data Analysis Program

2012–2015 ** *Analysis of the Coma of Comet Hartley 2 and Its Interaction With the Nucleus* ($575,000)
NASA Planetary Mission Data Analysis Program

2012–2015 ** *Acquisition of an integrated telescope system for astrophysical surveys and transient discovery* ($0,000)
NSF Major Research Instrumentation

2013–2014 ** *The Dust Environment of Comet Siding Spring at Mars* ($50,000)
Caltech / NASA JPL

2009–2012 ** *Mining Comet Comae for Crystalline Silicates* ($61,000)
NASA Planetary Atmospheres Program

2009–2012 * *Astromineralogy of Comets: Probing Early Solar Nebula Processes* ($281,000)
NASA Planetary Astronomy Program

2009–2010 ** *Assessing Lunar Crater Observation and Sensing Satellite (LCROSS) Ejecta* ($5,000)
Universities Space Research Association

Professional Service

Sorted by end date.

2015– Cometary Science Newsletter, Editor
http://www.cometarysciencenews.org/

2004– Referee for several journals, including *Science*, *Planetary Science Journal*, *Icarus*, *Astronomical Journal*, *Astrophysical Journal*, *Astrophysical Journal Letters*, *Monthly Notices of the Royal Astronomical Society*, *Astronomy and Astrophysics*, *Planetary & Space Science*, *Nature*

2010–2024 NASA research and analysis grant review panel member (x6)

2022 Referee for the Comets III book (Univ. of Arizona Press)

2019–2022 Equity, Diversity, and Inclusion Committee Member
Department of Astronomy, University of Maryland

2011–2022 NASA research and analysis grant external reviewer (x8)

2020–2021 Scientific Organizing Committee for *Comets III*, University of Arizona Press

2018 Scientific Organizing Committee for *Physics of Comets After the Rosetta Mission: Unresolved Problems*, Slovakia

2009–2023 NASA Planetary Data System review panel member (x9)

2016 National Science Foundation grant review panel

2015 *Spitzer Space Telescope* time allocation committee member

2012–2015 Seminar Organizer
Planetary Astronomy Seminar (PALS), University of Maryland

2014 *James Web Space Telescope* Comet Science Working Sub-group

2014 Coordination Team Member
NASA Coordinated Investigations of Comets (CIOC)
http://www.cometcampaign.org/

2014 *Hubble Space Telescope* Director's Discretionary Time reviewer.

2013 Panel Member for the Asteroid 2009 BD *Spitzer* Observation Readiness Review
NASA JPL's Asteroid Redirect Robotic Mission (ARRM)

2013 Coordination Team Member
NASA Comet ISON Observing Campaign (CIOC) Coordination Team
http://www.isoncampaign.org/

2007–2009 Time Allocation Committee Member
NASA Infrared Telescope Facility (IRTF)

2008 Scientific and Local Organizing Committee Member
39th AAS Division for Planetary Sciences Meeting, Orlando, FL

Professional Memberships and Science Collaborations

Sorted by end date.

2021– `astropy/astroquery` archive maintainer
Module responsibilities: `jplhorizons` (JPL Horizons ephemeris generator), `jplsbdb` (JPL Small Body Database), and `mpc` (Minor Planet Center ephemeris generator and orbit database).

2020– Comet Interceptor: Science Team Associate (Ground-based Observer Team)
ESA F-Class Mission
Principal Investigator: Geraint Jones

2019– Comet Astrobiology Exploration Sample Return (CAESAR), Co-Investigator
NASA New Frontiers 5 mission concept
Principal Investigator: Alex Hayes

2017– LSST Solar System Science Collaboration Member
Active Objects Working Group Lead: 2018–2021
Co-chairs: Meg Schwamb, David Trilling

2017– Zwicky Transient Facility Solar System Working Group Member
Co-Lead: 2020–2023

2017– JWST Team Solar System
Lead: Heidi Hammel

2001– American Astronomical Society, Division for Planetary Sciences

1999– American Astronomical Society

2022–2023 International Space Science Institute: The Life Cycle of Comets Team
Lead: Rosita Kokotanekova

2017–2019 Comet Astrobiology Exploration Sample Return (CAESAR), Co-Investigator
NASA New Frontiers 4 mission concept
Principal Investigator: Steve Squires

2017–2018 International Space Science Institute: Main Belt Comets Team
Lead: Colin Snodgrass

2009–2013 NASA Deep Impact eXtended Investigation (DIXI) Mission Science Team
Principal Investigator: Mike A'Hearn

Teaching and Mentoring Experience

2024 Undergraduate Research Mentor for Debika Biswas
University of Maryland

2019–2023 Graduate Thesis Committee for Carrie Holt
University of Maryland

2023 Undergraduate Research Mentor for Cole Smith (accepted to UMD PhD program)
University of Maryland

2021–2022 Undergraduate Research Mentor for Ky Huynh (awarded high honors, hired at Space Telescope Science Institute)
University of Maryland

2014–2018 Graduate Thesis Committee for Margaret McAdam
University of Maryland

2013 Undergraduate Research Mentor for Rebecca Willis
University of Maryland

2011 Undergraduate Research Mentor for Ryal Galpion
University of Maryland

2010–2015 Graduate Thesis Committee Member for Kelsey Hargrove
University of Central Florida

2008 Undergraduate Research Mentor for Kelsey Hargrove
University of Central Florida

2003 Teaching Assistant: *Methods of Astrophysics*
University of Minnesota

2000–2002 Teaching Assistant (Head T.A. in 2001-2002): *Introduction to Astronomy*
University of Minnesota

Public Outreach

I have given many public talks and informal sky observing sessions for people of all ages, from elementary school kids to adults, Girl Scouts/Boy Scouts to state senators.

I was a coordinator for University of Minnesota's Universe in the Park, a summer outreach program that gives the public access to the excitement of modern astrophysics through an informative talk and Q&A session, followed by sky observing.

Press releases and news items

2023 *NASA's Webb Finds Water, and a New Mystery, in Rare Main Belt Comet*

2019 *NASA's Web to Unlock the Mysteries of Comets and the Early Solar System*
Space Telescope Science Institute news release on the *James Webb Space Telescope's* first cometary observations

2018 *University of Maryland to Have Key Role in Possible NASA Comet Mission*
University of Maryland news release for on our participation in the Comet Astrobiology Exploration Sample Return (CAESAR) mission

2018 *Spinning Comet Slows Down During Close Approach to Earth*
University of Maryland news release on *Swift* and Discovery Channel Telescope observations of comet 41P/Tuttle-Giacobini-Kresák

2013 *Hubble Brings Faraway Comet Into View*
University of Maryland news release on *HST* observations of comet C/2012 S1 (ISON)

2013 *NASA's Swift Sizes Up Comet ISON*
NASA Goddard news release on *Swift* satellite observations of Comet C/2012 S1 (ISON)

2011 *NASA's Swift and Hubble Probe Asteroid Collision Debris*
NASA Goddard news release on observations of the outburst of asteroid (596) Scheila

2005 *Riding a Trail of Debris*
Spitzer Science Center news release on *Spitzer Space Telescope* observations of comet 2P/Encke

Notable interviews

2023 *Peculiar comet confirms existence of water ice in the asteroid belt*
Physics Today

2023 *A bright green comet is making a rare trip across the Earth's sky*
National Public Radio: Morning Edition

2023 *What the Green Comet Tells Us About the Past—and the Future*
The New Yorker

Invited Talks

2023 *JWST Reveals Water Ice in the Asteroid Belt*
Department of Astronomy Colloquium
University of Maryland, College Park

2023 *JWST Observations of Two Short-Period Comets*
Active Small Bodies in the Solar System, Star'a Lesn'a, Slovakia

2023 *Distant Cometary Activity*
Asteroids, Comets, Meteors 2023, Flagstaff AZ

2020 *sbpy Overview*
LSST Solar System Science Collaboration Readiness Sprint 2020

2018 *Cometary Mass-loss and Surface Evolution*
Colloquium
Southwest Research Institute, Boulder

2018 *Season-Driven Surface Evolution in Comets*
Physics of Comets After the Rosetta mission: Unresolved problems
Stará Lesná, Slovakia

2017 *Cometary Orbital Trends in Activity*
Solar System Exploration Science Seminar
Goddard Spaceflight Center

2016 *Comet Dust and the Interstellar Medium Connection*
Astronomy & Space Physics Seminar
University of Delaware

2016 *Comet Dust and the Interstellar Medium Connection*
Astrophysics Research Centre Seminar
Queen's University Belfast

2015 *Thermal Properties and Models of Comet Dust*
Thermal Models for Planetary Science (TherMOPS) II

2014 *Comet Dust and Astrophysical Connections*
SOFIA Community Tele-Talk

2014 *Comet Dust and Comet ISON, Too.*
Cosmic Dust VII, Osaka, Japan

2014 *Close Encounters with the Largest Particles in Comets*
SOFIA Colloquium
SOFIA Science Center, NASA Ames Research Center

2013 *What Do We Know About Comet ISON?*
8th NASA Small Bodies Assessment Group Meeting

2012 *The Latest from the EPOXI Mission to Comet Hartley 2*
Minnesota Institute for Astrophysics Colloquium
University of Minnesota

2011 *The Latest from the EPOXI Mission to Comet Hartley 2*
Astronomy Group Seminar
Department of Terrestrial Magnetism, Carnegie Institution of Washington

2011 *Observations of Comet Dust and Gas Diversity*
Planetary Science and Astrobiology Seminar
NASA Goddard Space Flight Center

2011 *Using Asteroid Collisions to Search for Buried Ice*
Workshop on Water in Asteroids and Meteorites
Observatoire de Paris, France

2011 *Comet Dust Taxonomy*
Workshop on Comet Taxonomy, Annapolis MD

2007 *The Size Distribution and Surface Properties of Comets*
Department of Astronomy Colloquium
University of Minnesota

2006 *NASA's* Spitzer Space Telescope *Probes the Properties of Comet Dust*

Department of Physics Colloquium
University of Central Florida

First-Authored Publications

Refereed and non-refereed.

21. **Kelley**, **Michael S. P.**, Henry H. Hsieh, Dennis Bodewits, Mohammad Saki, Geronimo L. Villanueva, et al. (2023). *Spectroscopic identification of water emission from a main-belt comet*. Nature 619.7971, 720–723.

20. **Kelley**, **Michael S. P.**, Rosita Kokotanekova, Carrie E. Holt, Silvia Protopapa, Dennis Bodewits, et al. (2022). *A Look at Outbursts of Comet C/2014 UN$_{271}$ (Bernardinelli-Bernstein) near 20 au*. Astrophys. J., Lett. 933.2, L44.

19. **Kelley**, **Michael S. P.**, David E. Harker, Charles E. Woodward, and Diane H. Wooden (2021). *Spitzer Space Telescope Spectroscopy of Comets, urn:nasa:pds:spitzer:spitzer-spec-comet::1.0*. URL: https://pdssbn.astro.umd.edu/holdings/pds4-spitzer:spitzer-spec-comet-v1.0/SUPPORT/dataset.shtml.

18. **Kelley**, **Michael S. P.**, Tony L. Farnham, Jian-Yang Li, Dennis Bodewits, Colin Snodgrass, et al. (2021). *Six Outbursts of Comet 46P/Wirtanen*. Planet. Sci. J. 2.4, 131.

17. **Kelley**, **Michael S. P.**, Henry H. Hsieh, Colin Orion Chandler, Siegfried Eggl, Timothy R. Holt, et al. (2021). "Community Challenges in the Era of Petabyte-Scale Sky Surveys." *Bull. Am. Astron. Soc.* Vol. 53, 495, 495.

16. **Kelley**, **Michael S. P.**, Dennis Bodewits, Quanzhi Ye, Tony L. Farnham, Eric C. Bellm, et al. (2019). *Comet 240P/NEAT Is Stirring*. Astrophys. J., Lett. 886.1, L16.

15. **Kelley**, **Michael S. P.**, Dennis Bodewits, Quanzhi Ye, Tomás Ahumada, John Cromer, et al. (2019). *Outbursts at Comets 46P/Wirtanen, 64P/Swift-Gehrels, and 78P/Gehrels 2 in 2018*. Res. Not. AAS 3.9, 126.

14. **Kelley**, **Michael S. P.**, Dennis Bodewits, Quanzhi Ye, Russ R. Laher, Frank J. Masci, et al. (2019). "ZChecker: Finding Cometary Outbursts with the Zwicky Transient Facility." *ADASS XXVIII*. Ed. by P. J. Teuben, M. W. Pound, B. A. Thomas, and E. M. Warner. Vol. 523. ASP Conf. Ser. 471. URL: http://www.aspbooks.org/a/volumes/article_details/?paper_id=39288.

13. **Kelley**, **M. S. P.**, C. E. Woodward, R. D. Gehrz, W. T. Reach, and D. E. Harker (2017). *Mid-infrared spectra of comet nuclei*. Icarus 284, 344–358.

12. **Kelley**, **M. S. P.**, C. E. Woodward, D. Bodewits, T. L. Farnham, M. S. Gudipati, et al. (2016). *Cometary Science with the James Webb Space Telescope*. Publ. Astron. Soc. Pac. 128.1, 018009.

11. **Kelley**, **M. S. P.**, D. J. Lindler, D. Bodewits, M. F. A'Hearn, C. M. Lisse, et al. (2015). *Erratum to "A distribution of large particles in the coma of Comet 103P/Hartley 2" [Icarus 222 (2013) 634-652]*. Icarus 262, 187–189.

10. **Kelley**, **M. S. P.**, T. L. Farnham, D. Bodewits, P. Tricarico, and D. Farnocchia (2014). *A Study of Dust and Gas at Mars from Comet C/2013 A1 (Siding Spring)*. Astrophys. J., Lett. 792, L16.

9. **Kelley**, **M. S.**, Y. R. Fernández, J. Licandro, C. M. Lisse, W. T. Reach, et al. (2013). *The persistent activity of Jupiter-family comets at 3-7 AU*. Icarus 225, 475–494.

8. **Kelley**, **M. S.**, D. J. Lindler, D. Bodewits, M. F. A'Hearn, C. M. Lisse, et al. (2013). *A distribution of large particles in the coma of Comet 103P/Hartley 2*. Icarus 222, 634–652.

7. **Kelley**, **M. S.** and D. H. Wooden (2009). *The composition of dust in Jupiter-family comets inferred from infrared spectroscopy*. Planet. Space Sci. 57, 1133–1145.

6. **Kelley**, **M. S.**, D. H. Wooden, C. Tubiana, H. Boehnhardt, C. E. Woodward, et al. (2009). *Spitzer Observations of Comet 67P/Churyumov-Gerasimenko at 5.5-4.3 AU from the Sun*. Astron. J. 137, 4633–4642.

5. **Kelley**, **M. S.**, W. T. Reach, and C. E. Woodward (2009). "A Search for Deep Impact's Large Particle Ejecta." *Deep Impact as a World Observatory Event: Synergies in Space, Time, and Wavelength*. Ed. by H. U. Käufl & C. Sterken, 125.

4. **Kelley**, **M. S.**, W. T. Reach, and D. J. Lien (2008). *The dust trail of Comet 67P/Churyumov-Gerasimenko*. Icarus 193, 572–587.

3. **Kelley**, **M. S.**, C. E. Woodward, D. E. Harker, D. H. Wooden, R. D. Gehrz, et al. (2006). *A Spitzer Study of Comets 2P/Encke, 67P/Churyumov-Gerasimenko, and C/2001 HT50 (LINEAR-NEAT)*. Astrophys. J. 651, 1256–1271.

2. **Kelley**, **M. S.**, C. E. Woodward, and T. J. Jones (2005). "Polarimetry of Comets in the Near-IR." *Astronomical Polarimetry: Current Status and Future Directions*. Ed. by A. Adamson, C. Aspin, C. Davis, & T. Fujiyoshi. Vol. 343. Astronomical Society of the Pacific Conference Series, 192. URL: http://aspbooks.org/custom/publications/paper/343-0192.html.

1. **Kelley**, **M. S.**, C. E. Woodward, T. J. Jones, W. T. Reach, and J. Johnson (2004). *Near-Infrared Polarimetry and Photometry of Recent Comets*. Astron. J. 127, 2398–2405.

All Refereed Publications

126. Hsieh, Henry H., John W. Noonan, **Michael S. P. Kelley**, Dennis Bodewits, Jana Pittichova, et al. (n.d.). *The Volatile Composition and Activity Evolution of Main-Belt Comet 358P/PANSTARRS*. Planet. Sci. J. (). in press, arXiv:2411.07435.

125. Holt, Carrie E., Matthew M. Knight, **Michael S. P. Kelley**, Tim Lister, Quanzhi Ye, et al. (2024). *Brightness Behavior of Distant Oort Cloud Comets*. Planet. Sci. J. 5.12, 273.

124. Dobson, Matthew M., Megan E. Schwamb, Alan Fitzsimmons, **Michael S. P. Kelley**, Carrie E. Holt, et al. (2024). *Analyzing the Onset of Cometary Activity by the Jupiter-family Comet 2023 RN$_3$*. Astron. J. 168.6, 286.

123. Ferellec, Lea, Cyrielle Opitom, Abbie Donaldson, Johan P. U. Fynbo, Rosita Kokotanekova, et al. (2024). *Coma composition and profiles of comet 12P/Pons-Brooks using long-slit spectroscopy*. Mon. Not. R. Astron. Soc. 534.3, 1816–1826.

122. Faggi, Sara, Geronimo L. Villanueva, Adam McKay, Olga Harrington Pinto, **Michael S. P. Kelley**, et al. (2024). *Heterogeneous outgassing regions identified on active centaur 29P/Schwassmann-Wachmann 1*. Nature Astronomy.

121. Dobson, Matthew M., Megan E. Schwamb, Alan Fitzsimmons, Charles Schambeau, Aren Beck, et al. (2024). *The Discovery and Evolution of a Possible New Epoch of Cometary Activity by the Centaur (2060) Chiron*. Astron. J. 5.7, 165.

120. Cheng, Yu-Chi, Bryce T. Bolin, **Michael S. P. Kelley**, D. Bodewits, Quanzhi Ye, et al. (2024). *Postperihelion Cometary Activity on the Outer Main-belt Asteroid 2005 XR$_{132}$*. Planet. Sci. J. 5.3, 78.

119. Jones, Geraint H., Colin Snodgrass, Cecilia Tubiana, Michael Küppers, Hideyo Kawakita, et al. (2024). *The Comet Interceptor Mission*. Space Sci. Rev. 220.1, 9.

118. Pinto, O. Harrington, **M. S. P. Kelley**, G. L. Villanueva, M. Womack, S. Faggi, et al. (2023). *First Detection of CO_2 Emission in a Centaur: JWST NIRSpec Observations of 39P/Oterma*. Planet. Sci. J. 4.11, 208.

117. Harker, David E., Diane H. Wooden, **Michael S. P. Kelley**, and Charles E. Woodward (2023). *Dust Properties of Comets Observed by Spitzer*. Planet. Sci. J. 4.12, 242.

116. Hui, Man-To, **Michael S. P. Kelley**, Denise Hung, Tim Lister, Joseph Chatelain, et al. (2023). *Splitting of Long-period Comet C/2018 F4 (PANSTARRS)*. Astron. J. 166.2, 47.

115. **Kelley**, **Michael S. P.**, Henry H. Hsieh, Dennis Bodewits, Mohammad Saki, Geronimo L. Villanueva, et al. (2023). *Spectroscopic identification of water emission from a main-belt comet*. Nature 619.7971, 720–723.

114. Schwamb, Megan E., R. Lynne Jones, Peter Yoachim, Kathryn Volk, Rosemary C. Dorsey, et al. (2023). *Tuning the Legacy Survey of Space and Time (LSST) Observing Strategy for Solar System Science*. Astrophys. J., Suppl. Ser. 266.2, 22.

113. Ye, Quanzhi, **Michael S. P. Kelley**, James M. Bauer, Tony L. Farnham, Dennis Bodewits, et al. (2023). *Comet P/2021 HS (PANSTARRS) and the Challenge of Detecting Low-activity Comets*. Planet. Sci. J. 4.3, 47.

112. Hsieh, Henry H., Marco Micheli, **Michael S. P. Kelley**, Matthew M. Knight, Nicholas A. Moskovitz, et al. (2023). *Observational Characterization of Main-belt Comet and Candidate Main-belt Comet Nuclei*. Planet. Sci. J. 4.3, 43.

111. Agarwal, Jessica, Yoonyoung Kim, **Michael S. P. Kelley**, and Raphael Marschall (2024). "Dust Emission and Dynamics." *Comets III*. Ed. by K. J. Meech, D. Bockeleé-Morvan, M. Combi, S. N. Raymond, and M. Zolensky. in press.

110. Kolokolova, Ludmilla, **Michael S. P. Kelley**, Hiroshi Kimura, and Thiem Hoang (2024). "Interaction of Electromagnetic Radiation With Cometary Dust." *Comets III*. Ed. by K. J. Meech, D. Bockeleé-Morvan, M. Combi, S. N. Raymond, and M. Zolensky. in press.

109. Marschall, Raphael, Vladimir Zakharov, Cecilia Tubiana, **Michael S. P. Kelley**, Carlos Corral van Damme, et al. (2022). *Determining the dust environment of an unknown comet for a spacecraft flyby: The case of ESA's Comet Interceptor mission*. Astron. Astrophys. 666, A151.

108. Battams, Karl, Angel J. Gutarra-Leon, Brendan M. Gallagher, Matthew M. Knight, Guillermo Stenborg, et al. (2022). *Continued PSP/WISPR Observations of a Phaethon-related Dust Trail*. Astrophys. J. 936.1, 81.

107. Astropy Collaboration, Adrian M. Price-Whelan, Pey Lian Lim, Nicholas Earl, Nathaniel Starkman, et al. (2022). *The Astropy Project: Sustaining and Growing a Community-oriented Open-source Project and the Latest Major Release (v5.0) of the Core Package*. Astrophys. J. 935.2, 167.

106. **Kelley**, **Michael S. P.**, Rosita Kokotanekova, Carrie E. Holt, Silvia Protopapa, Dennis Bodewits, et al. (2022). *A Look at Outbursts of Comet C/2014 UN$_{271}$ (Bernardinelli-Bernstein) near 20 au*. Astrophys. J., Lett. 933.2, L44.

105. Lister, Tim, **Michael S. P. Kelley**, Carrie E. Holt, Henry H. Hsieh, Michele T. Bannister, et al. (2022). *The LCO Outbursting Objects Key Project: Overview and Year 1 Status*. Planet. Sci. J. 3.7, 173.

104. Lowry, Vanessa C., Kerri L. Donaldson Hanna, Gen Ito, **Michael S. P. Kelley**, Humberto Campins, et al. (2022). *T-matrix and Hapke Modeling of the Thermal Infrared Spectra of Trojan Asteroids and (944) Hidalgo: Implications for Their Regolith Particle Size and Porosity*. Planet. Sci. J. 3.7, 181.

103. Holt, Carrie E., Matthew M. Knight, **Michael S. P. Kelley**, Quanzhi Ye, Henry H. Hsieh, et al. (2022). *Surface Properties of Near-Sun Asteroids*. Planet. Sci. J. 3.8, 187.

102. Chang, Chan-Kao, Ting-Shuo Yeh, HanJie Tan, Wing-Huen Ip, **Michael S. P. Kelley**, et al. (2022). *The Large Superfast Rotators Discovered by the Zwicky Transient Facility*. Astrophys. J., Lett. 932.1, L5.

101. Farnham, Tony L., **Michael S. P. Kelley**, and James M. Bauer (2021). *Early Activity in Comet C/2014 UN271 Bernardinelli-Bernstein as Observed by TESS*. Planet. Sci. J. 2.6, 236.

100. Hsieh, Henry H., Colin O. Chandler, Larry Denneau, Alan Fitzsimmons, Nicolas Erasmus, et al. (2021). *Physical Characterization of Main-belt Comet (248370) 2005 QN$_{173}$*. Astrophys. J., Lett. 922.1, L9.

99. Ye, Quanzhi, Matthew M. Knight, **Michael S. P. Kelley**, Nicholas A. Moskovitz, Annika Gustafsson, et al. (2021). *A Deep Search for Emission from "Rock Comet" (3200) Phaethon at 1 au*. Planet. Sci. J. 2.1, 23.

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Published Code

Main projects as a lead developer:

2019 calviacat — Calibrate star photometry by comparison to a catalog.
https://github.com/mkelley/calviacat

2019 catch — Comet and asteroid search tool for the Planetary Data System Small-Bodies Node
https://github.com/Small-Bodies-Node/catch
https://catch.astro.umd.edu/

2018 sbsearch — Comet and asteroid search library for astronomical surveys.
https://github.com/Small-Bodies-Node/sbsearch

2017 zchecker — Find comets and asteroids in Zwicky Transient Facility data.
https://github.com/mkelley/zchecker

2017 dct-redux — Discovery Channel Telescope LMI reduction scripts.
https://github.com/mkelley/mskpy

2017 comadyn — Cometary dust dynamics
https://github.com/mkelley/comadyn

2017 sbpy – An Astropy affiliated package for small-body planetary astronomy.
https://github.com/NASA-Planetary-Science/sbpy

2016 elevation — Observation planning web app
https://github.com/mkelley/elevation
Online at https://mkelley.github.io/elevation

2015 pds4-python-examples
https://github.com/Small-Bodies-Node/pds4-python-examples

2013 mskpy — Personal library of astronomical tools and code shortcuts
https://github.com/mkelley/mskpy

As a contributor:

2018 astroquery — Added ephemeris retrieval from the Minor Planet Center
https://github.com/astropy/astroquery

2016 jwst_gtvt — *JWST* general target visibility tool: Added moving target support
https://github.com/spacetelescope/jwst_gtvt

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