# Mary Knapp

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**Professional Experience**

**MIT Haystack Observatory** Westford, MA
Research Scientist, 2018-present

**Massachusetts Institute of Technology** Cambridge, MA
Postdoctoral Associate, 2017-2018

**Education**

**Massachusetts Institute of Technology** Cambridge, MA
PhD, Planetary Science, Degree date: February 2018
Relevant Courses: Radio Astronomy (Harvard CfA), Atmospheric Radiation, Essentials of Geophysics, Plasma Physics I, Plasma Astrophysics (Harvard CfA), Plasma Waves, Astroinformatics, Planets and Life
*Thesis Title: "Toward Detection and Characterization of Exoplanetary Magnetic Fields via Low Frequency Radio Observation." Advisor: Sara Seager.*

**Massachusetts Institute of Technology** Cambridge, MA
Bachelor of Science in Aerospace Engineering, June 2011
**GPA: 4.4/5.0**

**Notre Dame High School** Elmira, NY
Graduated 1st in a class of 97, June 2007

**Honors/ Awards**

IEEE Aerospace Conference Best Student Paper Award (March 2016)
Mission Idea Contest 2, 1st place (Nagoya, Japan, October 2012)
Society of Physics Students Research Symposium (poster), 1st place (MIT, 2011)
MIT 150 Exploration Ideas Competition, 1st place (MIT, 2011)
AXELSPACE Mission Idea Competition, 2nd place (Tokyo, Japan, 2011)
NSF Graduate Research Fellowship Program Awardee (2011)

## Selected Publications

(** indicates peer reviewed, * indicates student under direct mentorship)

**Kononov, E., **Knapp, M**. (2025). All-Sky Imaging with Vector Sensor Interferometry. *RASTI. In review.*

**Shkolnik E., David R. Ardila, Logan Jensen, April D. Jewell, Tahina Ramiaramanantsoa, Judd Bowman, Daniel Jacobs, Paul Scowen, Christophe Basset,Johnathan Gamaunt, Dawn Gregory,

Maria C. Ladwig, Matthew Kolopanis, Shouleh Nikzad, Nathaniel Struebel, Joe Llama, **Mary Knapp**, Sarah Peacock, Titu Samson, Mark Swain (2025) Building SPARCS, an Ultraviolet Science CubeSat for Exoplanet Habitability Studies, Technology Advancements, and Mission Training. *In Review.*

**Kononov, E.*, **Knapp, M.**, Morris, A., Lind, F., Robey, F., & Cahoy, K. (2024). Sensitivity of an Electromagnetic Vector Sensor. *IEEE Aerospace Conference Proceedings*. https://doi.org/10.1109/AERO58975.2024.10521241 *Winner of Track 3 Best Paper Award.*

**Knapp, M.**, Paritsky, L,. Kononov, E., Kao, M. Great Observatory for Long Wavelengths (GO-LoW) NIAC Phase I Final Report (2024) https://arxiv.org/abs/2404.08432

Lind, F., **Knapp, M.**, Erickson, P., McWhirter, R., Schaefer, R., Gedenk, T., Robey, F., Thompson, E., Silver, M., Fenn, A., Majewski, J., Morris, A., Boland, W., Schiavone, F., Masterson, R., Belsten, N., & Otero, A. (2022, August). Aurora: A Software Radio for Electromagnetic Vector Sensors in Space. *36th Annual Small Satellite Conference*.

**Chang, A.*, **Knapp, M.**, LaBelle, J., Swoboda, J., Volz, R., & Erickson, P. J.. Removing Radio Frequency Interference from Auroral Kilometric Radiation with Stacked Autoencoders. 48th International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2023). arXiv preprint arXiv:2210.12931. (2022)

**Krishnamurthy, A., **Knapp, M.**, Günther, M. N., Daylan, T., Demory, B.-O., Seager, S., Bailey, V. P., Smith, M. W., Pong, C. M., Hughes, K., Donner, A., Di Pasquale, P., Campuzano, B., Smith, C., Luu, J., Babuscia, A., Bocchino, R. L., Loveland, J., Colley, C., Gedenk, T., Kulkarni, T., White, M., Krajewski, J., & Fesq, L. Transit Search for Exoplanets around Alpha Centauri A and B with ASTERIA. *The Astronomical Journal (AJ)*, 161(6), 275. https://doi.org/10.3847/1538-3881/abf2c0 (2021).

**Seager, S., **Knapp, M.**, Demory, B.-O., Krishnamurthy, A., Huang, C. X., Agusti, M. B., Shporer, A., Weisserman, D., Becker, J., Vanderburg, A., Smith, M., Pong, C. M., Bailey, V. P., Donner, A., Pasquale, P. Di, Campuzano, B., Smith, C., Luu, J., Babuscia, A., Bocchino, R. L., Loveland, J., Colley, C., Gedenk, T., Kulkarni, T., Hughes, K., White, M., Krajewski, J., Fesq, L., Ricker, G., Vanderspek, R., Latham, D. W., Jenkins, J. M., Winn, J. N., Caldwell, D. A., Collins, K. A., Dragomir, D., Fausnaugh, M., Glidden, A., Schlieder, J. E., Twicken, J. D., & Wohler, B. HD 219134 Revisited: Planet d Transit Upper Limit and Planet f Transit Nondetection with ASTERIA and TESS. *The Astronomical Journal (AJ)*, 161(3), 117. https://doi.org/10.3847/1538-3881/abcd3d (2021)

Langford, A.*, **Knapp, M.**, Swoboda, J., Volz, R., Erickson, P., & Lind, F. (2021). The AERO-VISTA Interactive Spectrogram Display: An Original Software Solution for Scientific Operations of Twin 6U CubeSats. *Small Satellite Conference*. https://digitalcommons.usu.edu/smallsat/2021/all2021/164

**De Gasperin, F., Lazio, T. J. W., & **Knapp, M**. (2020). Astronomy Radio observations of HD 80606 near planetary periastron II. LOFAR low band antenna observations at 30-78 MHz. *Astrophysics A&A*, *644*, 157. https://doi.org/10.1051/0004-6361/202038746

****Knapp, M**., Seager, S., Demory, B.-O., Smith, M. W., Pong, C. M., Donner, A. J., Di Pasquale, P., Campuzano, B. et al. Demonstrating high-precision photometry with a CubeSat: ASTERIA observations of 55 Cancri e. *AJ* (2020)

Fesq, L., Beauchamp, P., Donner, A., Bocchino, R., Kennedy, B., Mirza, F., Mohan, S., Sternberg, D., Smith, M.W., Troesch, M, **Knapp, M.**, Extended Mission Technology Demonstrations Using the ASTERIA Spacecraft. *IEEE Aerospace Conference*, Big Sky, MT, March 2019, IEEEAC paper # 978-1-5386-6854-2/19.

Donner, A. J.-N., Di Pasquale, P., Smith, M. W., Pong, C. M., Campuzano, B., and **Knapp, M**. ASTERIA Operations Demonstrates the Value of Combining the Mission Assurance and Fault Protection Roles on CubeSats, 69th International Astronautical Congress, IAF, Bremen, Germany, October 2018.

Erickson, P. J., Crew, G., Hecht, M., **Knapp, M.**, Lind, F. D., Volz, R. AERO: Auroral Emissions Radio Observer. In *Proceedings of the AIAA/USU Conference on Small Satellites.* 2018.

Smith, M. W., Donner, A., **Knapp, M**., Pong, C. M., Smith, C., Luu, J. et al. On-Orbit Results and Lessons Learned from the ASTERIA Space Telescope Mission. In *Proceedings of the AIAA/USU Conference on Small Satellites*. 2018.

****Knapp, M**., Gary, D.E., Hecht, M.H, Lonsdale, C., Lind, F.D., Robey, F.C., Fuhrman, L., Chen, B., Fenn, A.J., and the HeRO team. HeRO: A Space-Based Low Frequency Interferometric Observatory for Heliophysics Enabled by Novel Vector Sensor Technology. Proc. 8th International Workshop on Planetary, Solar, and Heliospheric Radio Emissions (PRE VIII). 2017.

**C. Lonsdale, Benkevitch, L., Cairns, I., Crowley, M., Erickson, P., **Knapp, M**., Kozarev, K., Lind, F., McCauley, P., Morgank, J., Oberoi, D. Solar Imaging Using Low Frequency Arrays. Proc. 8th International Workshop on Planetary, Solar, and Heliospheric Radio Emissions (PRE VIII). 2017.

Volz, R., **Knapp, M**., Lind, F. D., and Robey, F. C. Covariance Estimation in Terms of Stokes Parameters with Application to Vector Sensor Imaging. In 50th Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, 2016.

**Knapp, M**., Volz, R., Lind, F.D., Robey, F.C., Fenn, A.J., Johnson, K., Silver, M., Morris, A., and Klein, S. HF vector sensor for radio astronomy: Ground testing results. In AIAA Space and Astronautics Forum and Exposition, SPACE 2016, 2016.

Robey, F.C., **Knapp, M**., Fenn, A.J., Silver, M., Johnson, K., Lind, F.D., Volz, R., Seager, S., and Neylon-Azad, F. High Frequency (HF) Radio Astronomy from a Small Satellite. In 30th Annual AIAA/USU Conference on Small Satellites,
2016.

****Knapp, M**., Robey, F. C., Volz, R., Lind, F. D., Fenn, A., Morris, A., Silver, M., Klein, S., Seager, S. Vector Antenna and Maximum Likelihood Imaging for Radio Astronomy. Proc. IEEE Aerospace Conference, March 2016. *Winner of Best Student Paper award.*

Winterhalter, D., **Knapp, M**. A Systematic Search of the Nearest Stars for Exoplanetary Radio Emission: Preliminary Results from LOFAR. AGU Fall Meeting, 2015. (poster)

**Knapp, M**., Seager, S. ASTERIA: A CubeSat for Exoplanet Transit and Stellar Photometry. AAS Extreme Solar Systems meeting, 2015. (poster)

**Knapp, M**., Winterhalter, D., Lazio, J., Majid, W., Kuiper, T., Farrell, W., Spitler, L. Search for Radio Emission from HD80606b: A Highly Eccentric Exoplanet. AGU Fall Meeting 2014. (poster)

Winterhalter, D., Majid, W., **Knapp, M**. Search for Magnetospheric Radio Emissions from Exoplanets. EGU May, 2014.

**Knapp, M**. SOLARA/SARA: First Steps Toward a Space-Based Radio Interferometry Constellation. Proc. 65$^{th}$ IAC 2014.

**Knapp, M**., Van de Loo, M., Krishnamurthy, A., Hicks, F. TSat: Demonstrating Attitude Control and Orbit Maneuvers with Electrospray Microthrusters. Proc. 65$^{th}$ IAC 2014.

Greenbaum, A., **Knapp, M**. Schaalman, G., Henderson, T., Seager, S. Low-mass High-performance Deployable Optical Baffle for CubeSats. Proc. IEEE Aerospace Conference, March 2013.

**Babuscia, A., Corbin, B., Jensen-Clem, R., **Knapp, M**., Van de Loo, M., Seager, S. CommCube 1 and 2: A CubeSat series of missions to enhance communication capabilities for CubeSat. Proc. IEEE Aerospace Conference, March 2013.

****Knapp, M**., Babuscia, A., Jensen-Clem, R., Martel, F., Seager, S. "SOLARA/SARA: Solar Observing Low-frequency Array for Radio Astronomy/Separated Antennas Reconfigurable Array." *Innovative Ideas for Micro/Nano-Satellite Missions*. Eds. R. Sandau, R. Kawashima, S. Nakasuka, J. Sellers. IAA Book Series, 2013. *First place in Mission Idea Contest 2 (MIC2, Nagoya, Japan 2012).*

**Knapp, M**., Smith, M., Pong, C., Seager, S., Nash, J,. ExoplanetSat: High Precision Photometry for Exoplanet Transit Detection in a 3U CubeSat. Proceedings of the 63$^{rd}$ IAC. (2012).

****Knapp, M.**, Sugel, I., Seager, S., Smith, M. W., Pong, C. M., Aldama, D., Garcia, J., Howland, S., Jensen-Clem, R., Jethwani, A., McCarter, J., Reddy, J., Stavely, R., Wang, A., Ferraro, M., Li, L., Miller, D. "ExoplanetSat Constellation." *Novel Ideas for Nanosatellite Constellation Mission.* Eds. R. Sandau, S. Nakasuka, R. Kawashima, J. Sellers. IAA Book Series, 2012. *Second Place in Axelspace Mission Idea Contest 1 (MIC1, Tokyo, Japan 2011).*

Jensen-Clem, R., Seager, S., Smith, M. W., Pong, C., **Knapp, M.**, Miller, D. ExoplanetSat: The Search for Earth-Sized Planets. AAS meeting #218, Vol 43, 2011. (poster)

**Knapp, M.**, Jensen-Clem, R., Seager, S., Miller, D., Smith, M. W. ExoplanetSat Constellation. AAS meeting #218, Vol. 43, 2011. (poster)

Smith, M. W., Seager, S., Pong, C. M., Villaseñor, J. S., Ricker, G. R., Miller, D. W., **Knapp, M.**, Farmer, G. T., Jensen-Clem, R. ExoplanetSat: detecting transiting exoplanets using a low-cost CubeSat platform. Proc. SPIE, Vol. 7731, 2010.

## PhD Committees

Nicholas Belsten. Thesis title: Embedded Computing for Wavefront Control on Future Space Telescopes. 2025.

Thomas ("Joey") Murphy. Thesis title: OPTASAT: An Open-Source, Flexible Software Framework for Small Satellite Operations. 2025. https://dspace.mit.edu/handle/1721.1/158868

Ekaterina Kononov. Thesis title: Synthesis Imaging with Vector Sensor Arrays. 2024. https://dspace.mit.edu/handle/1721.1/155414?show=full

## Research Proposals (selected)

NASA H-ARD 2025. "Relationships between active sun phenomena, from radio to X-rays". C. Lonsdale, **M. Knapp**, L. Paritsky.

NASA NIAC Phase II 2024. "Great Observatory for Long Wavelengths (GO-LoW). **M. Knapp** (Fellow), L. Paritsky, M. Kao, E. Kononov, A. Lue, J. Wang, J. Turner.

NASA H-FOS 2022. "Space Weather Impact on Planetary Emissions (SWIPE)". **M. Knapp** (PI), L. Paritsky, E. Palmerio.

NASA NIAC Phase I 2022. "Great Observatory for Long Wavelengths (GO-LoW). **M. Knapp** (Fellow), L. Paritsky, M. Kao, E. Kononov.

NASA Astrophysics Science SmallSat Studies (AS3) 2019. "A Constellation of Small Satellites to Search for a Transiting Earth-Size Planet in an Earth-like Orbit about a Bright Sun-Like Star" S. Seager (PI), **M. Knapp** (Co-I), M. Badenas, M. Smith, A. Krishnamurthy, V. Bailey, A. Chontos, D. Huber.

NASA H-TIDES 2018. “VISTA : Vector Interferometry Space Technology using AERO” F. Lind (PI), **M. Knapp** (Co-I), P. Erickson, M. Hecht, G. Crew, R. Volz, F. Robey, A. Fenn, K. Cahoy, B. Malphrus.

NASA H-TIDES 2017. “The Auroral Emission Radio Observer (AERO)” P. Erickson (PI), **M. Knapp** (Co-I), F. Lind, M. Hecht, G. Crew, R. Volz, F. Robey, A. Fenn, D. Burianek, K. Cahoy, B. Malphrus, J. LaBelle, A. Weatherwax, J. Vierinen.

## Observation Proposals

LOFAR, Cycle 11 (LC11_018). “Testing Radio Flux Predictions for Young Exoplanet V830 Tau b with LOFAR LBA.” **M. Knapp (PI)**, A. Vidotto, D. Winterhalter. September 2018. 16 hours.

LOFAR, Cycle 6 (LC6_007). “Search for Star-Planet Magnetic Interaction in a Nearby Terrestrial Exoplanetary System.” **M. Knapp (PI)**, A. Burgasser, M. Gillon, J. de Wit, D. Queloz, B-O. Demory, S. M. Lederer, L. Delrez, A. Burdanov, V. van Grootel, A. Triaud, P. Magain, C. Melis. March 2016. 73 hours.

LOFAR, Cycle 5 (LC5_009). “A Systematic Search of the 10 Nearest Stars for Planetary Magnetosphere Emissions (a continuation from Cycle 4).” D. Winterhalter (PI), J. Lazio, W. Majid, **M. Knapp**, P. Zarka, J-M Griessmeier, T. Bastian, A. Beasley. September 2015. 20 hours.

JVLA, 16A (VLA/16A-379). “Systematic Search of the 10 Nearest Stars for Evidence of Planets.” D. Winterhalter (PI), **M. Knapp**, T. Bastian, J. Lazio, W. Majid, S. Seager, N. Kassim. August 2015. 102.3 hours requested, received C-priority observations.

LOFAR, Cycle 4 (LC4_012). “A Search for Radio Emissions from Extrasolar Planets on Highly Eccentric Orbits Near Planetary Periastron.” J. Lazio (PI), **M. Knapp**, D. Winterhalter, W. Farrell. March 2015. 90 hours.

LOFAR, Cycle 4 (LC4_018). “A Systematic Search of the 10 Nearest Stars for Planetary Magnetosphere Emissions.” D. Winterhalter (PI), J. Lazio, W. Majid, **M. Knapp**, P. Zarka, J-M Griessmeier, T. Bastian, A. Beasley. March 2015. 22 hours.

## Professional Meetings (selected)

Planetary Radio Emission X, Marseille, France. June 11-13, 2025

Beyond Earth: Lunar and Space Radio Missions, ASTRON Dwingeloo, NL. May 12-15, 2025 (invited)

Radio Stars, MIT Haystack Observatory Westford, MA. April 17-19, 2024 (invited)

Breakthrough Discuss, UC Santa Cruz, CA. June 28-29, 2023 (invited)

NASA Planetary Science Technology Showcase, Galveston, TX. January 9-11, 2023

NASA LEARN Forum, Wallops, VA. October 25-26, 2022

Next Generation Space VLBI (ngSVLBI) Workshop, Dwingeloo, NL. October 17-19, 2022

American Astronomical Society (AAS) Winter meeting. Honolulu, HI. January 4-8, 2020

Extreme Solar Systems IV. Reykjavik, Iceland. August 19-23, 2019

CubeSat Developers Workshop (CDW). San Luis Obispo, CA. April 23-25, 2019

Pathways to Mission Leadership: Mission PI Diversity Workshop. DC. November 27-28, 2018.

Small Satellite Conference (SmallSat). Logan, UT. August 2018

American Geophysical Society (AGU). New Orleans, LA. December 11-15, 2017

AASTCS 5: Radio Exploration of Planetary Habitability, Palm Springs, CA. May 7-12, 2017

Science at Low Frequencies III, Caltech, Pasadena, CA. December 7-9, 2016

8th International Workshop on Planetary, Solar, and Heliospheric Radio Emissions (PRE VIII), Seggauberg, Austria. October 25-27, 2016

IEEE Aerospace Conference, Big Sky, MT. March 6-11 2016 (Best Paper Award)

Extreme Solar Systems III, Hawaii, HI. November 29 – December 4, 2015

3rd LOFAR Data School, Dwingeloo, Netherlands. November 17-21, 2014

Heliophysics Summer School: Comparative Magnetospheres, Boulder, CO. July 9-16, 2014 (competitive admission)

14th Synthesis Imaging Workshop, Socorro, NM. May 13-20, 2014

Keck Institute for Space Studies (KISS) workshop titled "Planetary Magnetic Fields: Planetary Interiors and Habitability" August 12-16, 2013 and February 18-20, 2014 (invited)

## Research Skills

General: Python, MATLAB, VO, STK, CAD (SolidWorks).

Radio astronomy: CASA, LOFAR (Generic pipeline, especially PiLL and prefactor, FACTOR, NDPPP, PyBDSF), MWA (cotter, AIRCARS)