

Katherine R. de Kleer

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EDUCATION	Ph.D. Astrophysics , University of California, Berkeley <i>Thesis</i> : “Dynamic Processes in the Solar System: Near-Infrared Spectroscopy of Io and Uranus” <i>Advisor</i> : Prof. Imke de Pater M.A. Astrophysics , University of California, Berkeley B.Sc. Mathematics , Massachusetts Institute of Technology B.Sc. Physics with Astronomy Minor , Massachusetts Institute of Technology <i>Thesis</i> : “Photometry and Transit-Timing Analysis for Eleven Transiting Exoplanets” <i>Advisor</i> : Prof. Joshua Winn	May 2017 (expected) June 2013 June 2009 June 2009
RESEARCH INTERESTS	Broad interests in planetary astronomy, including the interiors, surfaces, and atmospheres of planets and satellites. Recent work has focused on the composition of ice giant atmospheres and on Io’s tidally-powered volcanism, based on ground-based infrared and millimeter telescope observations. Additional interests include planetary ring systems, geophysics of satellites and extrasolar planets, and astrobiology.	
RESEARCH POSITIONS	NSF Graduate Research Fellow , UC Berkeley Graduate Student Researcher , UC Berkeley Visiting Research Student , Montana State University, Bozeman, Montana Visiting Research Student , Max Planck Institute (MPE), Garching, Germany Visiting Research Student , Tel Aviv University, Tel Aviv, Israel Undergraduate Research Assistant (UROP Program) , MIT NSF REU Research Student , NASA Ames/SETI Institute Undergraduate Research Assistant (UROP Program) , MIT NSF REU Research Student , MIT Haystack Observatory	2013-2016 2010; 2012-2013; 2016 Fall 2015; Summer 2016 Summer 2012 Summer & Fall 2009 2008-2009 Summer 2007 Spring 2007 Summer 2006
PI TELESCOPE PROGRAMS	The Atacama Large Millimeter Array (ALMA) 1. K. de Kleer , I. de Pater, M. Gurwell, A. Moullet, B. Butler, R. Moreno, Cycle 4 (2016-17): 2016.1.00691.S (7.2 hours) Gemini Observatory 6. K. de Kleer & I. de Pater, Fall 2016: GN-2016B-Q-5, NIRI+ALTAIR (20 hours; cadence program). 5. K. de Kleer & I. de Pater, Spr 2016: GN-2016A-Q-34, NIRI+ALTAIR (20 hours; cadence program). 4. K. de Kleer & I. de Pater, Spr 2016: GN-2016A-Q-33, NIRI+ALTAIR (3 hours). 3. K. de Kleer & I. de Pater, Fall 2015: GN-2015B-FT-12, NIRI+ALTAIR (3.5 hours). 2. K. de Kleer , I. de Pater, A. Davies, Spr 2014: GN-2014A-Q-34, NIRI+ALTAIR (20 hours; cadence program). 1. K. de Kleer , I. de Pater, A. Davies, Fall 2013: GN-2013B-DD-3, NIRI+ALTAIR (3 hours; cadence program). NASA Infrared Telescope Facility (IRTF) 2. K. de Kleer , I. de Pater, A. Davies, M. Ádámkovics, J. Rathbun, J. Spencer, Spr 2014: 2014A032, NSFCam/CSHELL (6.7 hours over 20 nights) 1. K. de Kleer , I. de Pater, A. Davies, M. Ádámkovics, Fall 2013: 2013B030, SpeX (6.7 hours over 4 nights). Combined Array for Research in Millimeter Astronomy (CARMA) 4. K. de Kleer , I. de Pater, S. Luszcz-Cook, Fall 2013. A/B/C-arrays, 220 GHz (8 hours ToO). 3. K. de Kleer , I. de Pater, S. Luszcz-Cook, Fall 2013. B-array, 220 GHz (15 hours). 2. K. de Kleer , I. de Pater, S. Luszcz-Cook, Spr 2013. B-array, 220 GHz (15 hours Director’s Discretionary Time). 1. K. de Kleer , I. de Pater, S. Luszcz-Cook, Spr 2013. C-array, 220 GHz (28 hours). Lick Observatory 2. K. de Kleer , I. de Pater, J. Tollefson, M. Wong, S. Luszcz-Cook, E. Gates, D. Gavel, Fall 2016. 2016B.S002, ShARCs/ShaneAO (cadence program). 1. K. de Kleer & I. de Pater, Fall 2015: 2015B.S015, ShARCs/ShaneAO (4 hours over 4 nights).	

SELECTED CO-I TELESCOPE PROGRAMS	Keck Observatory P.I.: I. de Pater (10+ programs, 2010-2016) Instruments: NIRC2, NIRSPEC, OSIRIS Program Categories: Classical & ToO	
	Large Binocular Telescope (LBT) P.I.'s: A. Conrad, D. Defrère (multiple programs, 2014-2016) Instruments: LBT Interferometer (LBTI): LMIRcam, NOMIC; ALES	
	Very Large Array (VLA) P.I.: I. de Pater (2015A) Configurations: Bands Ka, Ku, X, C, S; A-Array	
TEACHING, OUTREACH & LEADERSHIP	Lead Instructor , Introductory Lab Physics, Patten University at San Quentin State Prison, San Quentin, CA. Position includes: syllabus creation and instruction for a college-level laboratory physics course taught to inmates at San Quentin prison; management of two instructors and two tutors; creation of lab experiments subject to prison regulations.	Fall 2016
	Outreach Collaborator , Guerilla Science. Collaborator on numerous large-scale science outreach events at schools, music festivals, and co-working spaces across California and New York.	2012-present
	Graduate Teaching Assistant , UC Berkeley A121 Radio Astronomy Laboratory	Spring 2015
	C162 The Solar System	Fall 2012
	A122 Infrared and Optical Astronomy Laboratory	Fall 2010
	Instructor & Curriculum Designer , Five Stars Mentoring Program, Girls Inc., Oakland, CA. Hands-on astronomy course for underprivileged middle and high school girls.	Fall 2013
	Lead Field Staff (full-time) , Pacific Quest, Na'alehu, HI. Field instructor for at-risk young adults in wilderness therapy setting. Position included: management of two staff and 15 young adults; coordination with therapists to carry out individualized therapy plans for students; directing students in running an organic farm.	2011
	Instructor (full-time) , Astrocamp, Guided Discoveries, Idyllwild, CA. Physics and astronomy outdoor education camp for middle school students.	Spring 2010
	Undergraduate Teaching Assistant , MIT 12.409 Hands-On Astronomy	2008-2009
	Co-creator and Co-teacher , "Hands-on Astronomy", MIT High School Studies Program. Extracurricular weekly class for local high school students.	2008
RESEARCH ADVISING	Public Talks & Star Parties , various locations	2005-present
	Clayton Cantrall, Undergraduate Student, UC Berkeley <i>Co-advised with Imke de Pater</i>	2015-present
	Sara Gutierrez, Undergraduate Student, UC Berkeley <i>Co-advised with Imke de Pater</i>	2014-present
	Thomas Fitzpatrick, Undergraduate Student, UC Berkeley <i>Co-advised with Imke de Pater</i>	2014-present
PUBLICITY	Press Release , UC Berkeley/Keck/Gemini/AAS DPS, "Long-term, hi-res tracking of Eruptions on Jupiter's moon Io"	Oct 2016
	Press Conference , AAS DPS Meeting, "Long-term, hi-res tracking of Io's eruptions"	Oct 2016
	GeminiFocus Featured Article , "Gemini captures extreme eruption on Io"	Oct 2014
	Image Release , Gemini Observatory "Extreme volcanism: Image captures one of the brightest volcanoes ever seen in the Solar System"	Aug 2014
	Press Release , UC Berkeley "A hellacious two weeks on Jupiter's moon Io"	Aug 2014
SELECTED AWARDS & HONORS	The Robert J. Trumpler Graduate Student Excellence Award , UC Berkeley	2016
	NSF Graduate Research Program Fellowship	2013
	NASA Earth and Space Science Fellowship (declined)	2013
	Outstanding Graduate Student Instructor , UC Berkeley	2013

PROFESSIONAL ACTIVITIES & SERVICE	Keck Expert , Solar System Panel, Keck-JWST Meeting	Sep 2016
	Discipline Leader , Satellites Working Group, International Outer Planet Watch	2016-present
	Steering Committee Member , International Outer Planet Watch	2016-present
	Mentor , Graduate-Undergraduate Mentoring Program, UC Berkeley	2016-present
	External Grant Reviewer , NASA	2016-present
	Mentor , Society for Women in the Physical Sciences, UC Berkeley	2016-present
	Public Liaison , Astronomy Department, UC Berkeley	2015-present
	Referee for <i>Icarus</i>	2015-present
	Graduate Assembly Delegate , Astronomy Department, UC Berkeley	2013-2015
	Residential Advisor , Dept of Residential Life, MIT	2008

WORKSHOPS & SUMMER SCHOOLS	NExSS Arizona Winter School , Oracle, AZ. <i>Upstairs Downstairs: Consequences of Internal Planet Evolution for the Habitability and Detectability of Life on Extrasolar Planets</i>	Feb 2016
	NExSS Upstairs Downstairs Workshop , ASU. <i>Upstairs Downstairs: Consequences of Internal Planet Evolution for the Habitability and Detectability of Life on Extrasolar Planets</i>	Feb 2016
	NASA Nordic Astrobiology Summer School , Iceland. <i>Water, Ice, and the Origin of Ice in the Universe</i> . Lectures and research project sampling microbial life in glacial and volcanic environments.	Jul 2015
	ESO Planets 2015 Workshop , Santiago, Chile. <i>Ground and space observatories: A joint venture in planetary science</i>	Mar 2015
	NRAO 14th Synthesis Imaging Workshop , Socorro, NM	May 2014
	48th ESLAB Symposium , Noordwijk, The Netherlands. <i>New Insights into Volcanism across the Solar System</i>	Jun 2014
	International Summer School in Astrobiology , Santander, Spain. <i>Habitable Environments in the Universe</i>	Jun 2014
	Combined Array for Research in Millimeter Astronomy (CARMA) Summer School , Big Pine, CA	Aug 2013
	MIT Astronomy Field Camp , US Naval Observatory, Flagstaff, AZ. Month-long research project “ <i>Optical Expansion of Planetary Nebulae</i> ” advised by Dr. Stephen Levine.	Jan 2008
	MIT Discovering Earth, Atmospheric, and Planetary Sciences Program , Yellowstone, Wyoming. Field camp focused on geology and field-work sampling extremophiles.	Aug 2005

REFEREED PUBLICATIONS

17. Hueso, R., Kivits, W., Simon, A., Rojas, J., Gorczynski, P., Ammons, M., Law, N., Riddle, R., Sánchez-Lavega, A., Tollefson, J., **de Kleer, K.**, and 24 co-authors. Neptune long-lived atmospheric features in 2013-2015 from small (28 cm) and large (10 m) telescopes. *Icarus*, *in review*.
16. **de Kleer, K.**, Skrutskie, M., Leisenring, J., Davies, A.G., Conrad, A., de Pater, I., Resnick, A., Bailey, V., Defrère, D., Hinz, P., Skemer, A., Spalding, E., Vaz, A., Veillet, C., Woodward, C.E. Occultation of Io by Europa reveals a complex resurfacing process at Loki Patera. *Nature*, *in review*.
15. **de Kleer, K.** and de Pater, I. Io’s Loki Patera: Modeling of Three Brightening Events in 2013-2016. *Icarus*, *in review*.
14. M. Shepard, J. Richardson, P. Taylor, L. Rodrigues-Ford, A. Conrad, I. de Pater, M. Ádámkóvics, **K. de Kleer**, and 14 co-authors. Radar observations and shape model of asteroid 16 Psyche. *Icarus*, 281, 388 (2016).
13. **de Kleer, K.** and de Pater, I. Spatial distribution of Io’s volcanic activity from near-IR adaptive optics observations on 100 nights in 2013-2015. *Icarus*, 280, 405 (2016).
12. **de Kleer, K.** and de Pater, I. Time variability of Io’s volcanic activity from near-IR adaptive optics observations on 100 nights in 2013-2015. *Icarus*, 280, 378 (2016).
11. de Pater, I., Laver, C., Davies, A.G., **de Kleer, K.**, Williams, D.A., Howell, R.R., Rathbun, J.A., Spencer, J.R. Io: Eruptions at Pillan, and the time evolution of Pele and Pillan from 1996 to 2016. *Icarus* 264, 198 (2016).
10. Luszcz-Cook, S., **de Kleer, K.**, de Pater, I., Ádámkóvics, M., Hammel, H.B. Retrieving Neptune’s aerosol properties from Keck OSIRIS Observations. I. Dark Regions. *Icarus*, 276, 52 (2016).
9. Conrad, A., **de Kleer, K.**, Leisenring, J., La Camera, A., and 16 co-authors. Spatially-resolved M-band emission from Io’s Loki Patera – Fizeau imaging at the 22.8 meter LBT. *AJ*, 149, 175 (2015).

8. **de Kleer, K.**, Luszcz-Cook, S., de Pater, I., Ádámkovics, M., Hammel, H. Clouds and aerosols on Uranus: Radiative transfer modeling of spatially-resolved near-infrared Keck spectra. *Icarus* 256, 120 (2015).
7. Crossfield, I., Petigura, E., Schlieder, J.E., Howard, A.W., Fulton, B.J., Aller, K.M., Ciardi, D.R., Lépine, S., Barclay, T., de Pater, I., **de Kleer, K.**, Quintana, E.V., and 15 co-authors. A nearby M star with three transiting super-Earths discovered by K2. *ApJ* 804, 10 (2015).
6. **de Kleer, K.**, de Pater I., Davies, A., Ádámkovics, M. Near-infrared monitoring of Io & detection of a violent outburst in August 2013. *Icarus* 242, 352 (2014).
5. **de Kleer, K.**, de Pater, I., Ádámkovics, M., Hammel, H. Near-Infrared Spectra of the Uranian Ring System. *Icarus* 226, 1038 (2013).
4. Hicken, M., Challis, P., Kierschner, R.P., Rest, A., Cramer, C.E., Wood-Vasey, W.M., Bakos, Gaspar, Berlind, Perry., Brown, W.R., Caldwell, N., Calkins, M., Currie, T., **de Kleer, K.**, and 26 co-authors. CfA4: Light Curves for 94 Type Ia Supernovae. *ApJ Supplement* 200, 12 (2012).
3. de Pater, I., Wong, M.H., **de Kleer, K.**, Hammel, H., Ádámkovics, M., Conrad, A. Keck adaptive optics images of Jupiter's north polar cap and Northern Red Oval, *Icarus* 213, 559 (2011).
2. Tripathi, A., Winn, J.N., Johnson, J.A., Howard, A.W., Halverson, S., Marcy, G.W., Holman, M.J., **de Kleer, K.**, Carter, J.A., Esquerdo, G.A., Everett, M.E., Cabrera, N.E. A Prograde, Low-inclination Orbit for the very hot Jupiter WASP-3b. *ApJ* 715, 421 (2010).
1. Jenniskens, P., **de Kleer, K.**, Vaubaillon, J., Trigo-Rodriguez, J.M., Madiedo, J.M., and 9 co-authors. Leonids 2006 Observations of the Tail of Trails. *Icarus* 196, 171 (2008).

UN-REFEREED PROCEEDINGS

2. Leisenring, J.M., Hinz, P.M., Skrutskie, M., Skemer, A., Woodward, C.E., Veillet, C., Arcidiacono, C., Bailey, V., Bertero, M., Boccacci, P., Conrad, A., **de Kleer, K.**, de Pater, I., and 10 co-authors. Fizeau interferometric imaging of Io volcanism with LBTI/LMIRcam. *SPIE* 9146, 91462S (2014).
1. Lonsdale, C.J., **de Kleer, K.**, Diamond, P.J., Thrall, H., Lonsdale, C.J., Smith, H.E. OH emission and absorption associated with supernovae in Arp 220. *IAU Symposium*, 242, 432 (2007).

SEMINARS & COLLOQUIA

- NASA JPL**, Planetary Science Seminar: *The Volcanism, atmosphere, and tidal heating of Io*: (May 9, 2016)
- California Institute of Technology**, Planetary Science Seminar: *The Volcanism, atmosphere, and tidal heating of Io* (May 3, 2016)
- Montana State University**, Physics Department Colloquium: *Understanding tidal heating through observations of Io's extreme volcanic activity* (Apr 22, 2016)
- Johns Hopkins University Applied Physics Lab**, Colloquium: *The Volcanism, atmosphere, and tidal heating of Io: A multi-year observing campaign* (Apr 8, 2016)
- NASA Goddard Space Flight Center**, Solar System Exploration Seminar: *Volcanic activity on Io: Recent observations and implications for tidal heating* (Apr 6, 2016)
- American Museum of Natural History**, Astrophysics Department Colloquium: *The Volcanism, atmosphere, and tidal heating of Io: A multi-year observing campaign* (Apr 5, 2016)
- MIT**, Planetary Lunch Colloquium: *The Volcanism, atmosphere, and tidal heating of Io: A multi-year observing campaign* (Mar 29, 2016)
- Harvard Center for Astrophysics**, Small-Scale Phenomena Seminar: *Volcanism and tidal heating on Io: Results from now AO observations* (Mar 28, 2016)
- Montana State University**, Earth Science Department Colloquium: *The extreme volcanism and dynamic atmosphere of Jupiter's moon Io* (Mar 3, 2016)
- UC Berkeley**, Astronomy Department Lunch Talk: *Volcanic activity on Io in 2013-2015* (Jan 28, 2016)
- Steward Observatory, The University of Arizona**, Seminar: *Near-infrared monitoring of Io and detection of three volcanic outbursts* (Mar 2015)
- UC Berkeley**, Astronomy Department Grad Student–Postdoc Seminar: *Atmospheres and volcanism in the Solar System: Near-infrared spectroscopy of Io and Uranus* (Nov 2014)
- UC Berkeley**, Center For Integrated Planetary Sciences Seminar. *Connecting Io's volcanic activity to the plasma torus: Near-infrared observations during the Sprint-A/EXCEED Mission* (Apr 2014)

**CONFERENCE
PRESENTA-
TIONS**

(invited) de Kleer, K., Skrutskie, M., Leisenring, J., Davies, A.G., Resnick, A., Conrad, A., de Pater, I., Hinz, P., Defrère, Veillet, C. *Resolving Io's volcanoes from a mutual event observation at the Large Binocular Telescope*. AGU Fall Meeting, San Francisco, CA, Oral Presentation P54A-04 (upcoming : Dec 2016)

de Kleer, K., de Pater, I., Yoneda, M. *Io's volcanic activity in 2013-2016 and comparison with extended sodium cloud variability*. AGU Fall Meeting, San Francisco, CA, Oral Presentation P21E-04 (upcoming: Dec 2016)

de Kleer, K., de Pater, I. *The volcanism and tidal heating of Io*. Keck Science Meeting, Pasadena, CA, Oral Presentation (Sep 2016)

de Kleer, K., Skrutskie, M., Leisenring, J., de Pater, I., Davies, A.G., Conrad, A., Resnick, A.C., Hinz, P., Defrère, D., Veillet, C. *Time-evolution and thermal mapping of Io's Loki Patera at high resolution*. 48th AAS DPS/11th EPSC Joint Meeting, Pasadena, CA, Oral Presentation 517.12 (Oct 2016)

de Kleer, K., de Pater, I. *Two new brightening events at Io's Loki Patera*. AGU Fall Meeting, San Francisco, CA, Poster Presentation P31C-2074 (Dec 2015)

de Kleer, K., de Pater, I. *The spatial distribution of volcanic events on Io in 2013-2015*. 47th AAS DPS Meeting, National Harbor, MD, Oral Presentation 405.04 (Nov 2015)

de Kleer, K., de Pater, I. *Investigating variability in Io's volcanic activity and surface frosts: Results from 2013-2015*. ESO Planets Workshop, Santiago, Chile, Oral Presentation (Mar 2015)

de Kleer, K., de Pater, I., Davies, A.G., Ádámkovics, M. *Io's volcanic activity from near-infrared observations during the EXCEED mission*. AGU Fall Meeting, San Francisco, CA, Oral Presentation P13E-02 (Dec 2014)

de Kleer, K., de Pater, I., Fitzpatrick, T. *A timeline of volcanic activity on Io in 2013-14 with near-infrared surface maps*. 46th AAS DPS Meeting, Tucson, AZ, Poster Presentation 418.13 (Oct 2014)

de Kleer, K., de Pater, I., Davies, A.G., Ádámkovics, M., Ciardi, D. *Three rare volcanic outbursts on Io in August 2013*. 48th ESLAB Symposium, Noordwijk, The Netherlands, Oral Presentation (Jun 2014)

de Kleer, K., de Pater, I., Ádámkovics, M. *Infrared observations of SO emission from Io's atmosphere during eclipse*. AGU Fall Meeting, San Francisco, CA, Poster Presentation P43A-2003 (Dec 2013)

de Kleer, K., de Pater, I., Davies, A.G., Luszcz-Cook, S., Ádámkovics, M. *Monitoring Io in the near-infrared*. Io Boulder Workshop, Boulder, CO, Oral Presentation (Oct 2013)

de Kleer, K., de Pater, I., Luszcz-Cook, S., Ádámkovics, M., Hammel, H., Fry, P. *Clouds, hazes, and rings: Keck observations of Uranus*. 45th AAS DPS Meeting, Denver, CO, Poster Presentation 312.19 (Oct 2013).

de Kleer, K., de Pater, I., Hammel, H., Ádámkovics, M., Luszcz-Cook, S. *Keck observations of the Uranian atmosphere and rings*. 42nd AAS DPS Meeting, Pasadena, CA Poster Presentation 11.32 (Oct 2010).

de Kleer, K., Lonsdale, C.J., Diamond, P.J., Lonsdale, C.J., Smith, G., Thrall, H. *Time variation in OH megamaser emission and absorption toward radio supernovae in Arp 220*. 209th AAS/AAPT Joint Meeting, Seattle, WA, Poster Presentation 149.19 (Jan 2007).