Ke Zhang

Assistant Professor, University of Wisconsin-Madison

ke.zhang@wisc.edu

2535 Sterling Hall, 475 N. Charter Street, Madison WI 53706 USA Tel: 1(608)262-3071

RESEARCH INTERESTS

Planet formation, Protoplanetary disks, Astrochemistry, (sub)mm Interferometry, Infrared spectroscopy

EDUCATION

CALIFORNIA INSTITUTE OF TECHNOLOGY Pasadena, CA USA

Ph.D. Astrophysics Advisor: Geoffrey A. Blake 10/2009 – 06/2015

Thesis: Volatiles in Protoplanetary Disks

BEIJING NORMAL UNIVERSITY Beijing, CHINA

M.S. Astrophysics 09/2005 – 07/2008

B.S. Astronomy 09/2001 – 07/2005

PROFESSIONAL APPOINTMENT

ASSISTANT PROFESSOR Madison, WI USA

Department of Astronomy, University of Wisconsin-Madison 08/2020-Present

HUBBLE FELLOW Ann Arbor, MI USA

Department of Astronomy, University of Michigan 08/2017-07/2020

POSTDOCTORAL RESEARCHER Ann Arbor, MI USA

Department of Astronomy, University of Michigan 07/2015-08/2017

AWARDS AND HONERS

- Hubble Fellowship (~330k), Sagan Fellowship (declined) 01/2017
- The ALMA Ambassadors Postdoctoral Program (10k) 01/2017
- The Chinese government award for outstanding self finance students Abroad (6k) 03/2015
- Sub-millimeter Array fellowship (declined) 01/2015
- AAS International travel grant 03/2015
- Travel grant, the Graduate student office of Caltech 09/2014
- Meyerson travel grant, Department of Astronomy, Caltech 08/2014
- Academic fellowship, Beijing Normal University 09/2006
- Excellent Students Awards, Beijing Municipality Government 06/2005
- Chongying scholarship, Beijing Normal University 2002-2004

OBSERVING EXPERIENCE AND TRAINING

Keck II 10m Telescope, Mauna Kea: 20 nights (NIRSPEC)

Gemini North, Mauna Kea: 2 nights (Michelle)

CARMA, Big Pine: 31 days, array operations and commissioning

CSO, Mauna Kea: 2 nights (FFTS1)

JWST Proposal Planning Workshop (Pasadena, CA) 12/2017

NRAO NAASC Training for organizing ALMA workshop (Charlottesville, VA) 02/2017

NRAO NAASC Data Reduction Party (Charlottesville, VA)	01/2017
NRAO/ALMA Community Day at IPAC (Pasadena, CA)	10/2013
NRAO NAASC visit for ALMA Cycle 0 data reduction (Charlottesville, VA)	11/2012
Caltech CASA Radio Analysis Workshop (Pasadena, CA)	01/2012
CARMA Summer School (Bigpine, CA)	07/2011
Herschel Data Processing Workshop (Pasadena, CA)	02/2011

TECHNICAL SKILLS

(sub)mm synthesis imaging: interferometric observation and data reduction for both continuum and spectral line ((ALMA, NOEMA)

Infrared observation: spectral line (Keck/NIRSPEC, Spitzer/IRS, Herschel/PACS) and spectro-astrometric observations and high dynamic range data reduction

Radiative transfer modeling: modeling of the thermal dust and spectral line emission from circumstellar disks, for both rotational and rovibrational tracers.

Chemical evolution simulation: modeling kinetic evolutions of molecules and ions in astronomical environments

Software: Python, IDL, Fortran, Latex, CASA, RADMC3D, RADLite, RAC2D, GILDAS

PUBLICATIONS

h-index 16, >1300 citations

ADS Google Scholar

FRIST-AUTHOR

1. *Excess C/H in Protoplanetary Disk Gas from Icy Pebble Drift Across the CO Snowline*
   Zhang, Ke; Bosman, Arthur D.; Bergin, Edwin A. 2020, ApJL, 891, 16 [link]

2. *Rapid Evolution of Volatile CO from the Protostellar Disk Stage to the Protoplanetary Disk Stage*
   Zhang, Ke; Schwarz, Kamber R.; Bergin, Edwin A. 2020, ApJL, 891, 17 [link]

3. *Systematic Variation of CO gas abundance with radius in gas-rich protoplanetary disks*
   Zhang, Ke; Schwarz, Kamber R; Bergin, Edwin A.; Sebastiaan Krijt; et al., 2019, ApJ, 883, 1 [link]

4. *Unveiling the mass inventory of the giant-planet formation zone in a solar nebula analog*
   Zhang, Ke; Bergin, Edwin A.; Blake, Geoffrey A.; Cleeves, L. Ilsedore; Schwarz, Kamber R
   2017, *Nature Astronomy*, 1, 6 [link]

5. *On the Commonality of 10-30 AU Sized Axisymmetric Dust Structures in Protoplanetary Disks*
   Zhang, Ke; Bergin, Edwin A.; Blake, Geoffrey A.; Cleeves, L. Ilsedore; Hogerheijde, Michiel; Salinas, Vachail; Schwarz, Kamber R., 2016, ApJL, 818,16 [link]

6. *Evidence of fast pebble growth near condensation fronts in the HL Tau protoplanetary disk*
   Zhang, Ke; Blake, Geoffrey A.; Bergin, Edwin A, 2015, *ApJL*, 806,7 [link]

7. *Dimming and CO absorption toward AA Tau protoplanetary disk: infalling flow caused by disk instability?*
Zhang, Ke; Crockett, Nathan; Salyk, Colette; Pontoppidan, Klaus; Turner, Neal J.; Carpenter, John M.; Blake, Geoffrey A., 2015, *ApJ*, 805, 55 [link]

8. *Comparison of the Dust and Gas Radial Structure in the Transition Disk [PZ99] J1604*
Zhang, Ke; Isella, Andrea; Carpenter, John M.; Blake, Geoffrey A., 2014, *ApJ*, 791,42 [link]

9. *Evidence for a Snow Line beyond the Transitional Radius in the TW Hya Protoplanetary Disk*
Zhang, Ke; Pontoppidan, Klaus M.; Salyk, Colette; et al., 2013, *ApJ*, 766, 82 [link]

10. *On Magnesium Sulfide as the Carrier of the 30 μm Emission Feature in Evolved Stars*
Zhang, Ke; Jiang, B. W.; Li, Aigen, 2009, *ApJ*, 702, 680 [link]

11. *On the carriers of the 21 μm emission feature in post-asymptotic giant branch stars*
Zhang, Ke; Jiang, B. W.; Li, Aigen, 2009, *MNRAS*, 396,1247 [link]

12. *The 21 micron feature in the circumstellar envelopes around highly evolved stars*
Zhang, Ke; Jiang, B. W.; Li, Aigen, 2006, *PABei*, 24, 43 (in Chinese) [link]

CO-AUTHORED

1. *CO Depletion in Protoplanetary Disks: A Unified Picture Combining Physical Sequestration and Chemical Processing*
Krijt, Sebastiaan; Bosman, Arthur D.; **Zhang, Ke**; et al., 2020, *ApJ*, 899,134 [link]

2. *Hints of a Population of Solar System Analog Planets from ALMA*
Long, Deryl E.; **Zhang, Ke**; Teague, Richard; Bergin, Edwin A.; 2020, ApJ, 895, 46 [link]

3. *Unlocking CO Depletion in Protoplanetary Disks. II. Primordial C/H Predictions inside the CO Snowline* [link]
Schwarz, Kamber R.; Bergin, Edwin A.; Cleeves, L. Ilsedore; **Zhang, Ke**; et al., 2019, *ApJ*, 877, 131

4. *Probing the Gas Content of Late-stage Protoplanetary Disks with N2H+* [link]
Anderson, Dana E.; Blake, Geoffrey A.; Bergin, Edwin A.; **Zhang, Ke**; et al., *2019, ApJ,* 881, 127

5. *A High-resolution Mid-infrared Survey of Water Emission from Protoplanetary Disks*
Salyk, Colette; Lacy, John; Richter, Matt; **Zhang, Ke**; et al., 2019, *ApJ*, 874, 24 [link]

6. *A Cavity of Large Grains in the Disk Around the Group II Herbig Ae/Be Star HD 142666*
Rubinstein, Adam E.; Macias, Enrique; Espaillat, Catherine C.; **Zhang, Ke**; Calvet, Nuria; Robinson, Connor, 2018, *ApJ*, 860, 7 [link]

7. *Unlocking CO Depletion in Protoplanetary Disks. I. The Warm Molecular Layer*
Schwarz, Kamber R.; Bergin, Edwin A.; Cleeves, L. Ilsedore; **Zhang, Ke**; Öberg, Karin I.; Blake, Geoffrey A.; Anderson, Dana, 2018, *ApJ*, 856, 85 [link]

8. *On Graphene in the Interstellar Medium*
Chen, X. H.; Li, Aigen; **Zhang, Ke**, 2017, *ApJ*, 850,104 [link]

9. *Discovery and physical characterization of a large scattered disk object at 92 au*
Gerdes, D. W.; Sako, M.; Hamilton, S.; **Zhang, Ke**; et al. 2017, ApJ, 839,15 [link]

10. *Hydrocarbon emission rings in protoplanetary disks induced by dust evolution*
Bergin, Edwin A.; Du, Fujun; Cleeves, L. Ilsedore; Blake, Geoffrey A.; Schwarz, Kamber; Visser, Ruud; **Zhang, Ke**, 2016, *ApJ*, 831, 101 [link]

11. *The Radial Distribution of H2 and CO in TW Hya as Revealed by Resolved ALMA Observations of CO Isotopologues*
Schwarz, Kamber R.; Bergin, Edwin A.; Cleeves, L. Ilsedore; Blake, Geoffrey A.; **Zhang, Ke**; Öberg, Karin I.; van Dishoeck, Ewine F.; Qi, Chunhua, 2016, *ApJ*, 823, 91 [link]

12. *Measurements of Water Surface Snow Lines in Classical Protoplanetary Disks*
Blevins, Sandra M.; Pontoppidan, Klaus M.; Banzatti, Andrea; **Zhang, Ke**; Najita, Joan R.; Carr, John S.; Salyk, Colette; Blake, Geoffrey A., 2016, *ApJ*, 818, 22 [link]

13. *Detection of Water Vapor in the Terrestrial Planet Forming Region of a Transition*
Salyk, Colette; Lacy, John H.; Richter, Matthew J.; **Zhang, Ke**; Blake, Geoffrey A.; Pontoppidan, Klaus M., 2015, *ApJL*, 810, 24 [link]

14. *ALMA Observations of the T Tauri Binary System AS 205: Evidence for Molecular Winds and/or Binary Interactions*
Salyk, Colette; Pontoppidan, Klaus; Corder, Stuartt; Muñoz, Diego; **Zhang, Ke**; Blake, Geoffrey A., 2014, ApJ, 792, 68 [link]

15. *Crystalline Silicates in Evolved Stars. I. Spitzer/Infrared Spectrograph Spectroscopy of IRAS 16456-3542, 18354-0638, and 23239+5754*
Jiang, B. W.; **Zhang, Ke**; Li, Aigen; Lisse, C. M., 2013, ApJ, 765, 72 [link]

16. *An old disk still capable of forming a planetary system* [link]
Bergin, Edwin A.; Cleeves, L. Ilsedore; Gorti, Uma; **Zhang, Ke**; et al. 2013, Nature, 493, 644

17. *On Silicon Carbide Grains as the Carrier of the 21 μm Emission Feature in Post-Asymptotic Giant Branch Star*
Jiang, B. W.; **Zhang, Ke**; Li, Aigen, 2005, ApJL, 630, 77 [link]

WHITE PAPERS

1. *The Unique Potential of ALMA to Probe the Gas Reservoir of Planet Formation* [link]
Cleeves, L. Ilsedore; Loomis, Ryan; Teague, Richard; **Zhang, Ke,** et al.; 2019, Astro2020 White Paper

2. *Tracing the Water Snowline in Protoplanetary disks with the ngVLA* [link]
Zhang, Ke; Bergin, Edwin A., Jonathan P. Williams, Paola Pinilla, Sean M. Andrews, 2018, ngVLA science book

3. *The need for a far-IR cold space telescope to understand the chemistry of planet formation* [link]
Pontoppidan, Klaus M.; Bergin, Edwin A.; Melnick, Gary; Bradford, Matt; Staguhn, Johannes G.; Leisawitz, David T.; Meixner, Margaret; Fortney, Jonathan J.; Salyk, Colette; Blake, Geoffrey A.; **Zhang, Ke**; et al. White paper submitted to The National Academies of Science, Engineering, and Medicine Exoplanet Science Strategy Committee

TALKS & POSTERS

07/2020	•	Astrochemical Frontiers, IAU online conference	Contributed talk
11/2019	•	University of Arizona	Seminar
10/2019	•	Ohio State University	Colloquium
08/2019	•	Canadian Institute for Theoretical Astrophysics, Toronto, Canada	Seminar
06/2019	•	Community Science workshop of Origins Space Telescope	Invited talk
03/2019	•	Hubble Symposium	Contributed talk
08/2019	•	Canadian Institute for Theoretical Astrophysics, Toronto, Canada	Seminar
02/2019	•	University of Wisconsin-Madison	Colloquium
02/2019	•	University of Rochester	Colloquium
12/2018	•	Exoplanet research conference in the Great Lake area	Contributed talk
07/2018	•	Astrochemistry: Past, Present, and Future, CA	Contributed talk
03/2018	•	Hubble Symposium	Contributed talk
03/2018	•	University of Wisconsin-Madison	Colloquium
01/2018	•	University of Illinois at Urbana-Champaign	Colloquium
07/2017	•	Protoplanetary disk formation and evolution, Netherlands	Invited talk
03/2017	•	IAU Astrochemistry VII, Chile	Contributed talk
02/2017	•	NRAO TUNA lunch talk	Lunch talk
11/2016	•	Comets: A new vision after Rosetta/Philae, France	Invited talk
04/2016	•	Young Solar Systems, Barcelona, Spain	Contributed talk
09/2015	•	University of Michigan	Colloquium
10/2014	•	CfA radio and geoastronomy division lunch talk	Lunch talk
01/2014	•	AAS, Washington, D.C	Contributed talk
12/2013	•	Yuk lunch seminar talk, CA	Invited talk
11/2012	•	NRAO TUNA lunch talk, Charlottesville, VA	Lunch talk

06/2019	•	The origin of Solar systems, MA	Poster
10/2017	•	The origin of volatiles in planets, MI	Poster
06/2017	•	The origin of Solar systems, MA	Poster
08/2015	•	IAU XXIX General Assembly, Hawaii	Poster
06/2015	•	The origin of Solar systems, MA	Poster
10/2014	•	Circumstellar disk and planet formation, MI	Poster
07/2014	•	NASA Sagan workshop, CA	Poster
04/2013	•	Formation and Evolution of Planetary Systems, HI	Poster
02/2008	•	IAU 251, HongKong, CHINA	Poster

PROFESSIONAL SERVICE

- co-organizer of JWST proposal workshop at UM 03/2020
- ALMA Time Allocation Committee 2019
- NASA proposal review Panelist 2019
- External Reviewer for NASA FINESST program 2019
- Hubble Space Telescope Proposal Review Panelist 2019
- External Reviewer for NASA emerging world program, NASA Astrobiology Institute 2017
- Organizer and lecturer of NRAO/ALMA proposal workshop (1 day) at UM 03/2017
- Organizer of UM Astronomy department colloquium series 06/2017 - 04/2018
- IRAM NOEMA/30m Telescope Time Allocation Committee, Astronomy Department at University of Michigan 09/2015 - 07/2020
- Selected referee of Nature, Nature Astronomy, ApJ, ApJL, A&A, MNRAS letters, Planetary and Space Science 2014-Present

TEACHING AND ADVISING

- ASTRON 320 at UW-Madison, Physics of the Interstellar Medium, Instructor 2020 Fall
- AST401 at UM: Exoplanets, Substitute teacher 02/2019
- AST115 at UM: Introductory Astrobiology, Substitute teacher 09/2017- 11/2017
  (taught 3 lectures, large lecture-based classes, 140 undergraduate students)
- Ay220 at UM: New Discoveries in Astronomy; Guest Lecturer 02/2016, 09/2015
- Ay117 at Caltech: Statistics and Data Analysis; Graduate Student Instructor Spring 2012
- Ay125 at Caltech: High-Energy Astrophysics; Graduate Student Instructor Spring 2011
- Ay102 at Caltech: Physics of the Interstellar Medium; GSI Winter 2010
- Ay123 at Caltech: Structure and Evolution of Stars; GSI Fall 2010
- Introduction to FORTRAN Spring 2006

advising UW-Madison undergraduate, Ben Capistrant 09/2020- Present
Co-advising UM graduate, Jenny Calahan, Felipe Alarcon Pena 09/2018- Present
Co-advising UM undergraduate, Deryl Long 06/2019- 08/2020
Co-advising UM visiting undergraduate, Yuan Chen 09/2018- 01/2019
Co-advising, Post bachelor student Maria Laura Ribeiro 09/2018- 03/2019
Co-advising UM graduate, Christopher Merchantz 09/2017-06/2018
Co-advising UM undergraduate, Tia Jin 09/2017-12/2017
Co-advising Caltech Surf undergraduate, Jingyuan Li Summer 2011
Co-advising Caltech Surf undergraduate, Stacy King Summer 2010

AFFILIATIONS

Full Member of American Astronomical Society

REFERENCES

Prof. Geoffrey A. Blake
California Institute of Technology
165A South Mudd, Pasadena, CA 91125

Office phone: +1 626 395 6296
E-mail: gab@gps.caltech.edu

Prof. Edwin A. Bergin
University of Michigan
311 West Hall, Ann Arbor, MI 48109
Office phone: +1 734 615 8720
E-mail: ebergin@umich.edu

Dr. Klaus Pontoppidan
Space Telescope Science Institute
3700 San Martin Drive, Baltimore, MD 21218
Office phone: +1 410 338 4744
E-mail: pontoppi@stsci.edu

Dr. John Carpenter
Joint ALMA Observatory
Vitacura Santiago Chile
E-mail: John.Carpenter@alma.cl