Xing Lu

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Research Interests

- Star formation in the Central Molecular Zone of the Galaxy.
- Gas accretion in high-mass star forming filamentary clouds.

Education

Sep. 2010–Jun. 2016	Ph.D. in Astronomy, School of Astronomy & Space Science, Nanjing University.
Advisors	Drs. Qizhou Zhang and Qiusheng Gu
Thesis	Interferometric Observations of Dense Cores in High-mass Star Forming Regions
Sep. 2006–Jun. 2010	B.S. in Physics, Kuang Yaming Honor School, Nanjing University.

Professional Experience

–	Referee of The Astrophysical Journal and Research in Astronomy and Astrophysics.
–	Proposal reviewer of ALMA (the Supplemental Call) & JCMT.
Mar. 2018–Present	Co-founder and organizer of the Star Formation Weekly Meeting at NAOJ.
Jun. 2019	Technical secretary for the ALMA Cycle 7 proposal review meeting. Helped the panel chair coordinating the discussion, and answered technical questions on ALMA from reviewers.
Nov. 2017	Astronomer on Duty at the ALMA Operations Support Facility, Chile. Operated ALMA, scheduled projects, and conducted various tests during two shifts (two weeks).
Jun. 2017	Technical secretary for the ALMA Cycle 5 proposal review meeting.
Aug. 2016–Present	ALMA project research fellow at NAOJ, with duties related to ALMA operations, including data quality assurance, user support (Phase 2 Generation, helpdesk), and support of workshops.
Mar. 2012–Aug. 2015	The Submillimeter Array (SMA) pre-doctoral fellow at Harvard-Smithsonian Center for Astrophysics (advisor: Dr. Qizhou Zhang).
May 2011–Present	Administrator and contributor of *Astroleaks*, an on-line platform for professional discussion and experience-sharing. Contributed 12 articles covering topics including solar physics and data visualization.

Mar. 2010–Jun. 2010	Undergraduate research intern at Nanjing University (advisor: Prof. Yang Chen), data reduction and analysis of CO (1–0) observations taken with the KOSMA telescope towards the supernova remnant W41.
Sep. 2009–Feb. 2010	Associate editor of *College Natural Science*, a nation-wide student-managed undergraduate science journal.

Teaching/Mentoring and Outreach

Jul. 2019–Aug. 2019	Host of visiting student Xing Pan (undergraduate student from Nanjing University) at NAOJ. Taught basics of the CASA software and worked on ALMA data of molecular clouds in the Galactic Center.
Mar. 2019–May 2019	Host of visiting student Mengyuan Xiao (first-year PhD student from Nanjing University) at NAOJ. Analyzed ALMA data of a high-redshift proto-galaxy-cluster and preparing a publication.
Feb. 2019	Tutor for the SOKENDAI-UST Asia Winter School "Star and Planet Formation: Key Questions and Challenges". Worked with six schoolers (undergraduates and master students) to develop topics on high-mass star formation.
Aug. 2018	Volunteer of the Nobeyama Radio Observatory Public Open Day.
Oct. 2016/2017/2018	Volunteer of the National Astronomical Observatory of Japan Public Open Day.
Aug. 2017–Oct. 2017	Host of visiting student Mengyuan Xiao (first-year PhD student from Nanjing University) at NAOJ. Taught basics of interferometry and worked together to calibrate and image ALMA data of a high-redshift proto-galaxy-cluster.
Jun. 2013–Aug. 2015	Mentors of summer interns at Harvard-Smithsonian Center for Astrophysics. Worked with 4 interns from colleges and high schools to develop short-term research projects from interferometric imaging to Python programming.
Sep. 2011–Jan. 2012	Teaching assistant for undergraduate course *Observational Astronomy* at Nanjing University (lecturer: Dr. Junzhi Wang).

Professional Skills

- Mastered in Python and IDL.
- Text editing with LaTeX, web design with HTML/CSS/JavaScript.

Successful PI Observation Proposals

ALMA (45 hours completed & ~77 hours allocated)

2019	"Tracing the Flow into Dense Cores in High-Mass Star Forming Filaments" (resubmission; 32 hours on ACA allocated).
2018	"Evidence of accretion disks during the formation of high-mass stars in the Central Molecular Zone" (Grade A; 10 hours allocated).

2018 | “Are they low-mass protostars? A census of hundreds of compact sources in the Central Molecular Zone” (Grade A; 21 hours allocated).

2018 | “Gas accretion into dense cores from early to late evolutionary phases of massive filamentary clouds” (re-submission; 21 hours allocated but partially completed).

2017 | “Where and when do low-mass stars form in high-mass protoclusters?” (8.5 hours).

2017 | “Gas accretion into dense cores from early to late evolutionary phases of massive filamentary clouds” (36 hours).

2017 | “Confirming Deeply Embedded Protostellar Population in the Central Molecular Zone”(re-submission; 6 hours).

VLA (3 hours completed & 30 hours allocated as filler)

2018 | “Is Active Star Formation Emerging in the Central Molecular Zone?” (30 hours allocated).

2016 | “Progressive Star Formation of the Orbit in the Central Molecular Zone” (3 hours).

SMA (20 tracks completed & 4 tracks allocated; 1 track is about 6–10 hours)

2018 | “Gas Accretion toward Dense Cores in High-mass Star Forming Filaments” (4 tracks allocated).

2016 | “Understanding Formation of Low-mass Stars in Clusters with Observations of Hubs” (3 tracks).

2015 | “High-mass Star Formation in Dense Cores Embedded in Filaments” (2 tracks).

2015 | “Deeply Embedded Protostars in the Central Molecular Zone” (1 track).

2014 | “Massive Star Formation in Progress in Filamentary Clouds” (3 tracks).

2014 | “Star Formation in Progress in Filamentary Clouds” (filler; 2 tracks).

2013 | “Star Formation in the Central Molecular Zone” (filler; 1 track).

2013 | “Sgr B2: A Star-forming Cloud in the Central Molecular Zone” (2 tracks).

2013 | “Gas Kinematics in Filamentary Infrared Dark Clouds” (1 track).

2013 | “High-mass Clouds in the Central Molecular Zone” (3 tracks).

2012 | “Gas Kinematics and Condensations in Filamentary Infrared Dark Clouds” (filler; 1 track).

2012 | “Gas Kinematics and Condensations in Filamentary Infrared Dark Clouds” (1 track).

JCMT (24 hours completed & 32 hours allocated)

2018 | “Are supercritical filaments supported by magnetic fields?” (32 hours allocated).

2017 | “A Rigorous Survey of Gas Accretion in High-mass Star Forming Filamentary Clouds” (24 hours).

ASTE (10 hours completed)

2017 | “Densities of Massive Molecular Clouds in the Central Molecular Zone with N_2H^+ Lines” (10 hours).

IRAM 30m (9 hours completed)

2014	"Filamentary Structure, Infall Convergent Flow and Massive Star Formation" (9 hours).

Participated Large Scale Projects

2017–2018	ALMA, PI: F. Motte, "ALMA-IMF: ALMA transforms our view of the origin of stellar masses".
2014–2017	SMA, PIs: C. Battersby & E. Keto, "CMZoom: The SMA Legacy Survey of the Central Molecular Zone".
2015–2017	The Submillimeter Telescope (SMT), PI: K. Wang, "ESO-ARO Public Survey on Planck All-Sky Cold Clumps".

Observing Experience

Jul. 2019	ASTE, remote observing, 6 nights, Mitaka, Japan.
Nov. 2017	ALMA, on-site observing, 14 nights, San Pedro, Chile.
Jul. 2017	ASTE, remote observing, 10 nights, Mitaka, Japan.
Jan. 2016	SMT, remote observing, 3 nights, Nanjing, China.
Nov. 2015	SMT, remote observing, 2 nights, Nanjing, China.
Sep. 2014	SMA, on-site observing, 5 nights, Mauna Kea, HI, USA.
Apr. 2014	Caltech Submillimeter Obervatory (CSO), remote observing, 3 nights, Cambridge, MA, USA.
Jun. 2012	Combined Array for Research in Millimeter-wave Astronomy (CARMA), on-site observing during CARMA summer school, 2 nights, Big Pine, CA, USA.
May 2012	SMA, on-site observing, 5 nights, Mauna Kea, HI, USA.
Jan. 2012	DLH 13.7m telescope, on-site observing, 5 nights, Delingha, Qinghai, China.

Honors and Grants

2020	JSPS Grant-in-Aid for Early-Career Scientists (KAKENHI), 1,900,000 JPY (∼17,600 USD).
2019	NAOJ Visiting Joint Research Grant, 145,000 JPY (∼1,330 USD).
2017	JSPS Grant-in-Aid for Early-Career Scientists (KAKENHI), 910,000 JPY (∼8,200 USD).
2017	Outstanding Doctoral Thesis Prize of Jiangsu Province, China.
2016	NAOJ ALMA project research fellowship.
2016	Excellent Projects of Program A for outstanding PhD candidates of Nanjing University, 10,000 CNY (∼1,500 USD).
2016	IAU Travel Grants, 700 EUR (∼800 USD).

2015	Program A for outstanding PhD candidates of Nanjing University, 80,000 CNY (∼12,000 USD).
2015	Nanjing University outstanding graduate students scholarship, 1,000 CNY (∼150 USD).
2012	The SMA pre-doctoral fellowship, ∼30,000 USD per year for three years.
2011	Nanjing University Zhengzhiwei enterprise scholarship.
2009	Nanjing University social activity scholarship, second prize.
2008	Nanjing University people's scholarship, second prize.
2007	Nanjing University people's scholarship, second prize.

List of Publications

Available on ADS as a public list:
https://ui.adsabs.harvard.edu/public-libraries/bCiWtf2ZRuKQ3aBXI4DUCA

First-authored Publications

8. "ALMA Observations of Massive Clouds in the Central Molecular Zone: Jeans Fragmentation and Cluster Formation",
Lu, X., Cheng, Y., Ginsburg, A., Longmore, S. N., Kruijssen, J. M. D., Battersby, C., Zhang, Q., & Walker, D. L. 2020, ApJL, 894, L14.
7. "A Census of Early Phase High-Mass Star Formation in the Central Molecular Zone",
Lu, X., Mills, E. A. C., Ginsburg, A., Walker, D. L., Barnes, A., Butterfield, N., Henshaw, J., Battersby, C., Kruijssen, J. M. D., Longmore, S. N., Zhang, Q., Bally, J., Kauffmann, J., Ott, J., Rickert, M. & Wang, K. 2019, ApJS, 244, 35.
6. "Star Formation Rates of Massive Molecular Clouds in the Central Molecular Zone",
Lu, X., Zhang, Q., Kauffmann, J., Pillai, T., Ginsburg, A., Mills, E. A. C., Kruijssen, J. M. D., Longmore, S. N., Battersby, C., Liu, H. B & Gu, Q. 2019, ApJ, 872, 171.
5. "Filamentary Fragmentation and Accretion in High-mass Star-forming Molecular Clouds",
Lu, X., Zhang, Q., Liu, H. B., Sanhueza, P., Tatematsu, K., Feng, S., Smith, H. A., Myers, P. C., Sridharan, T. K., & Gu, Q. 2018, ApJ, 855, 9.
4. "The Molecular Gas Environment in the 20 km s^{-1} Cloud in the Central Molecular Zone",
Lu, X., Zhang, Q., Kauffmann, J., Pillai, T., Longmore, S. N., Kruijssen, J. M. D., Battersby, C., Liu, H. B., Ginsburg, A., Mills, E. A. C., Zhang, Z.-Y., & Gu, Q. 2017, ApJ, 839, 1.
3. "Deeply Embedded Protostellar Population in the 20 km s^{-1} Cloud of the Central Molecular Zone",
Lu, X., Zhang, Q., Kauffmann, J., Pillai, T., Longmore, S. N., Kruijssen, J. M. D., Battersby, C., & Gu, Q. 2015, ApJL, 814, L18.
2. "Initial Fragmentation in the Infrared Dark Cloud G28.53-0.25",
Lu, X., Zhang, Q., Wang, K., & Gu, Q. 2015, ApJ, 805, 171.
1. "VLA Observations of Ammonia in High-mass Star Formation Regions",
Lu, X., Zhang, Q., Liu, H. B., Wang, J., & Gu, Q. 2014, ApJ, 790, 84.

Co-authored Publications

13. "Cloud-cloud collision as drivers of the chemical complexity in Galactic Centre molecular clouds".
Zeng, S., Zhang, Q., Jiménez-Serra, I., Tercero, B., **Lu, X.**, Martín-Pintado, J., de Vicente, P., Rivilla, V. M., & Li, S. 2020, MNRAS in press.
12. "CMZoom: Survey Overview and First Data Release".
Battersby, C., Keto, E., Walker, D., Barnes, A., Callanan, D., Ginsburg, A., Hatchfield, H P., Henshaw, J., Kauffmann, J., Kruijssen, J. M. D., & 12 co-authors including **Lu, X.** 2020, ApJS in press.
11. "The ALMA Survey of 70 μm dark High-mass clumps in Early Stages (ASHES). I. Pilot Survey: Clump Fragmentation".

Sanhueza, P., Contreras, Y., Wu, B., Jackson, J. M., Guzmán, A. E., Zhang, Q., Li, S., **Lu, X.**, Silva, A., Izumi, N., & 13 co-authors 2019, ApJ, 886, 102.

10. "Young massive star cluster formation in the Galactic Centre is driven by global gravitational collapse of high-mass molecular clouds".
Barnes, A. T., Longmore, S. N., Avison, A., Contreras, Y., Ginsburg, A.; Henshaw, J. D., Rathborne, J. M., Walker, D. L., Alves, J., Bally, J., & 12 co-authors including **Lu, X.** 2019, MNRAS, 486, 283B.
9. "SMA Observations of Extended CO (J=2–1) Emission in Interacting Galaxy NGC 3627",
Law, C. J., Zhang, Q., Ricci, L., Petitpas, G., Jiménez-Donaire, M. J., Ueda, J., **Lu, X.**, & Dunham, M. M. 2018, ApJ, 865, 1.
8. "Distributed Star Formation throughout the Galactic Center Cloud Sgr B2",
Ginsburg, A., Bally, J., Barnes, A., Bastian, N., Battersby, C., Beuther, H., Brogan, C., Contreras, Y., Corby, J., Darling, J., & 17 co-authors including **Lu, X.** 2018, ApJ, 853, 171.
7. "The TOP-SCOPE Survey of Planck Galactic Cold Clumps: Survey Overview and Results of an Exemplar Source, PGCC G26.53+0.17",
Liu, T., Kim, K.-T., Juvela, M., Wang, K., Tatematsu, K., Di Francesco, J., Liu, S.-Y., Wu, Y., Thompson, M., Fuller, G., & 146 coauthors including **Lu, X.** 2018, ApJS, 234, 28.
6. "Star formation in a high-pressure environment: an SMA view of the Galactic Centre dust ridge",
Walker, D. L., Longmore, S. N., Zhang, Q., Battersby, C., Keto, E., Kruijssen, J. M. D., Ginsburg, A., **Lu, X.**, Henshaw, J. D., Kauffmann, J., & 7 co-authors 2018, MNRAS, 474, 2373.
5. "SMA Observations of the Hot Molecular Core IRAS 18566+0408",
Silva, A., Zhang, Q., Sanhueza, P., **Lu, X.**, Beltran, M. T., Fallscheer, C., Beuther, H., Sridharan, T. K., & Cesaroni, R. 2017, ApJ, 847, 87.
4. "The Galactic Center Molecular Cloud Survey. I. A steep linewidth-size relation and suppression of star formation",
Kauffmann, J., Pillai, T., Zhang, Q., Menten, K. M., Goldsmith, P. F., **Lu, X.**, & Guzmán, A. E. 2017, A&A, 603, A89.
3. "The Galactic Center Molecular Cloud Survey. II. A lack of dense gas and cloud evolution along Galactic center orbits",
Kauffmann, J., Pillai, T., Zhang, Q., Menten, K. M., Goldsmith, P. F., **Lu, X.**, Guzmán, A. E., & Schmiedeke, A. 2017, A&A, 603, A90.
2. "A Massive Prestellar Clump Hosting No High-mass Cores",
Sanhueza, P., Jackson, J. M., Zhang, Q., Guzmán, A. E., **Lu, X.**, Stephens, I. W., Wang, K., & Tatematsu, K. 2017, ApJ, 841, 97.
1. "Fragmentation of Molecular Clumps and Formation of Protocluster",
Zhang, Q., Wang, K., **Lu, X.**, & Jiménez-Serra, I. 2015, ApJ, 804, 141.

Non-refereed Publications

6. "First Data Release of the ESO-ARO Public Survey SAMPLING—SMT All-sky Mapping of Planck Interstellar Nebulae in the Galaxy",

Wang, K., Zahorecz, S., Cunningham, M. R., Tóth, L. V., Liu, T., **Lu, X.**, Wang, Y., Cosentino, G., Sung, R.-S., Sokolov, V., & 10 co-authors 2018, RNAAS, 2, 2.

5. "How maser observations unravel the gas motions in the Galactic Center",
Immer, K., Reid, M., Brunthaler, A., Menten, K., Zhang, Q., **Lu, X.**, Mills, E. A. C., Ginsburg, A., Henshaw, J., Longmore, S. N., & 2 co-authors 2018, Proceedings of IAUS, 336, 176.
4. "Deeply Embedded Protostellar Population in the Central Molecular Zone Suggested by H_2O Masers and Dense Cores",
Lu, X., Zhang, Q., Kauffmann, J., Pillai, T., Longmore, S. N., Kruijssen, J. M. D., Battersby, C. 2017, Proceedings of IAUS, 322, 99.
3. "A Brief Update on the CMZoom Survey",
Battersby, C., Keto, E., Zhang, Q., Longmore, S. N., Kruijssen, J. M. D., Pillai, T., Kauffmann, J., Walker, D., **Lu, X.**, Ginsburg, A., & 9 co-authors 2017, Proceedings of IAUS, 322, 90.
2. "Little Massive Substructure in CMZ Molecular Clouds",
Kauffmann, J., Pillai, T., Zhang, Q., Menten, K. M., Goldsmith, P. F., **Lu, X.**, Guzman, A. E. 2015, EAS Publications Series, 75-76, 93.
1. "SMA Observations towards Massive Clouds in the Central Molecular Zone",
Lu, X., Zhang, Q., Kauffmann, J., & Pillai, T. 2014, Proceedings of IAUS, 303, 191.