East Asian Observatory
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Birth Year: 1993

Junhao Liu

Research Interests

- Magnetic fields and dust polarization in star-forming regions
- Initial condition of star formation in massive infrared dark clouds and low-mass starless cores.
- Magneto-hydrodynamic (MHD) turbulence in self-gravitating media
- Jets and outflows associated with star formation activities.

Employment

2021-now **EAO Fellow (post-doctoral)**, East Asian Observatory (EAO), Hilo, Hawaii, USA.

Research Experience

2018-2021 **SAO pre-doctoral Fellow**, Center for Astrophysics (CfA) | Harvard & Smithsonian, Cambridge, Massachusetts, USA. Supervisor: Dr. Qizhou Zhang.

Education

2015-2021 **Ph.D. in Astronomy**, Nanjing University, Nanjing, Jiangsu, P.R. China. Supervisor: Prof. Keping Qiu.

2011-2015 **B.S. in Astronomy**, Nanjing University, Nanjing, Jiangsu, P.R. China.

Skills

Programming	Python
Software	CASA, STARLINK, IDL/MIR, MIRIAD, POLARIS, RADEX, GILDAS
Data reduction&imaging	SMA, ALMA, JCMT, IRAM-30m, Tianma-65m, PMO-13.7m
Languages	English (proficient); Mandarin & Sichuanese (native speaker); Japanese (elementary)

Approved PI Proposals

* **JCMT**: 97.8 hours allocated and 80.8 hours observed.

2022 JCMT 2022B: M22BP047; continuation; Tier 1; 15.2 hours allocated and and successfully observed. "Dust polarization survey of massive dense cores in Cygnus-X"

2022 JCMT DDT: M22AD003; 16 hours allocated and 5 hours observed. "A dust polarization survey of IRDCs"

2021 JCMT 2022A: M22AP018; Tier 1; 11 hours allocated and 10 hrs observed. "Are sub-virial clumps in IRDC G28.34 supported by magnetic fields?"

2021 JCMT 2022A: M22AP019; continuation; Tier 1; 19 hours allocated and successfully observed. "Dust polarization survey of massive dense cores in Cygnus-X"

2019 JCMT 2020A: M20AP048; continuation; Tier 1; 12 hours allocated and successfully observed. "Dust polarization survey of massive dense cores in Cygnus-X"

2019 JCMT 2020A: M20AP023; Tier 1; 10 hours allocated and 8 hours observed. "Does Magnetic Field Suppress Star Formation in Galactic Center Massive Clouds?"

2019 JCMT 2019B: M19BP037; continuation; Tier 1; 4.6 hours allocated and successfully observed. "Dust polarization survey of massive dense cores in Cygnus-X"

2018 JCMT 2018B: M18BP047; Tier 2; 10 hours allocated and 7 hours observed. "Dust polarization survey of massive dense cores in Cygnus-X"

* **SMA**: 14 tracks allocated and 6 tracks observed; 1 track is about 6-10 hours

2022 SMA 2022A: 2022A-S040; continuation; 8 B tracks allocated and 5 tracks observed. "A pilot dust polarization survey of massive dense cores in Cygnus-X"

2021 SMA 2021A: 2021A-S008; 3 B tracks allocated and a half-track observed. "A pilot dust polarization survey of massive dense cores in Cygnus-X"

2019 SMA 2019B: 2019B-S028; 3 A tracks allocated but a half-track observed. "A pilot dust polarization survey of massive dense cores in Cygnus-X"

* **ALMA**: 30.6 hours allocated and 1.5 hours observed.

2021 ALMA Cycle 8: 2021.1.01083; Grade-C; 16.1 hours allocated and 1.5 hours observed. "A dust polarization survey of massive dense clumps in IRDCs"

2021 ALMA Cycle 8: 2021.1.01091.S; Grade-C; 14.5 hours allocated. "A dust polarization survey of dense cores in IRDC G28.34: are magnetic fields aligned with outflows?"

Participated Large Programs

2016-now JCMT large program. PI: Derek Ward-Thompson; "B-Fields in STar-Forming Region Observations (BISTRO)"

Honors and Grants

2021-2023 EAO Fellowship. Research funds 5000 USD per year

2018-2021 SAO pre-doctoral fellowship

2013 Jiangsu province undergraduate innovation and entrepreneurship training program. Grants 8000 CNY (∼1200 USD)

Observation Experience

2018/02 Tianma-65m on-site observation. 5 days. Shanghai, China

2017/09 JCMT on-site observation. 7 nights. Mauna Kea, HI, US

2015/06 CSO remote observation. 5 days.

Academic Activities

2022/11 Seminar Talk. SWIFAR at Yunnan University, remote

2022/09 Seminar Talk. KIAA at Peking University, remote

2022/08 Conference Talk. Molecular Clouds and Star Formation Colloquium, remote. My talk was awarded one of the two **Outstanding Young Scholar talks** for the conference.

2022/02 Seminar Talk. Shanghai Astronomical Observatory star formation group, remote

2021/07 Seminar Talk. EAO Science Seminar, remote

2021/06 Conference Talk. SOFIA/JCMT Magnetic Fields and the Structure of the Filamentary Interstellar Medium Online Workshop, remote

2021/03 Flash Talk. IAU Symposium 360 Astronomical Polarimetry 2020, remote

2019/11 Flash Talk. Harvard-Heidelberg Workshop on Star Formation in Cambridge, USA

2019/05 Poster Talk. Workshop on Polarization in Protoplanetary Disks and Jets in San Cugat, Spain

2018/08 Conference Talk. Molecular Clouds and Star Formation Colloquium in Lhasa, China

2017/11 Conference Talk. Molecular Clouds and Star Formation Colloquium in Yichang, China

2017/08 Conference Talk. Chinese Astronomical Society Meeting in Urumqi, China

Services

- Reviewer of JCMT and ALMA proposals.

2021-now EAO fellow's JCMT-related duties (50% of time): technical assessment of submitted proposals, data quality check, monitoring the performance of heterodyne instruments, user support, code maintenance for the large-program prediction model, monitoring JCMT publications, and updating the publication tracking database.

2021-now Organizer of EAO science seminars.

2022 Co-organizer of the JCMT 2022 Users Meeting. Chair for one session.

2019-2020 Co-mentor of two short-term visiting students at CfA.

References

* **Prof. Keping Qiu**. Email: kpqiu@nju.edu.cn. Nanjing University (NJU)
* **Dr. Qizhou Zhang**. Email: qzhang@cfa.harvard.edu. Center for Astrophysics (CfA) | Harvard & Smithsonian
* **Dr. Anaelle Maury**. Email: anaelle.maury@cea.fr. French alternative energies and atomic energy commission (CEA)

Publications (ADS link)

6 published (+1 submitted) first-author papers (including an invited review) with 78 citations. 21 total publications with 454 citations.

First-Author Papers (ADS link)

*) "Multi-scale physical properties of NGC 6334 as revealed by relative orientations between magnetic fields, density gradients, velocity gradients, and gravity", **Liu, J.**; Zhang, Q; and 14 coauthors, 2022, submitted to ApJ

6) "Magnetic field properties in star formation: a review of their analysis methods and interpretation", **Liu, J.**; Zhang, Q.; and Qiu, K.; 2022, **Invited review** in Frontiers in Astronomy and Space Sciences, vol. 9, id. 943556

5) "Magnetic Fields in Star Formation: A Complete Compilation of All the DCF Estimations", **Liu, J.**; Qiu, K.; and Zhang, Q.; 2022, ApJ, 925, 30

4) "Calibrating the Davis-Chandrasekhar-Fermi Method with Numerical Simulations: Uncertainties in Estimating the Magnetic Field Strength from Statistics of Field Orientations", **Liu, J.**; Zhang, Q.; Commercon, B.; Valdivia, V.; Maury A.; and Qiu, K.; 2021, ApJ, 919, 79

3) "Magnetic Fields in the Early Stages of Massive Star Formation as Revealed by ALMA ", **Liu, J.**; Zhang, Q;, Qiu, K.; and 5 coauthors, 2020, ApJ, 895, 142

2) "The JCMT BISTRO Survey: The Magnetic Field in the Starless Core ρ Ophiuchus C", **Liu, J.**; Qiu, K.; and 129 coauthors, 2019, ApJ, 877, 43

1) "An Isothermal Outflow in High-mass Star-forming Region G240.31+0.07", **Liu, J.**; Qiu, K.; Wyrowski, F.; Menten, K.; Güsten, R.; Cao, Y.; and Wang, Y.; 2018, ApJ, 860, 106

Co-Author Papers

15) "Surveys of Clumps, Cores, and Condensations in Cygnus X. II. Radio Properties of Massive Dense Cores", Wang, Y.; Qiu, K.; Cao, Y.; Cheng, Y.; **Liu, J.**; and Hu B., 2022, ApJ, 927, 185

14) "Does the Magnetic Field Suppress Fragmentation in Massive Dense Cores?", Palau, A; Zhang, Q.; Girart, J.; **Liu, J.**; and 14 co-authors, 2021, ApJ, 912, 159

13) "DR 21 South Filament: A Parsec-sized Dense Gas Accretion Flow onto the DR 21 Massive Young Cluster", Hu, B.; Qiu, K.; Cao, Y.; **Liu, J.**; Wang, Y.; Li, G.; Shen, Z.; Li, J.; Wang, J.; Li, B.; and Dong, J., 2021, ApJ, 908, 70

12) "Magnetic fields in the infrared dark cloud G34.43+0.24", Soam, A.; Liu, T.; Andersson, B.; Lee, C.; **Liu, J.**; and 9 co-authors, 2019, ApJ, 883, 1

11) "Surveys of Clumps, Cores, and Condensations in Cygnus X. I. A New Catalog of $\sim$0.1 pc Massive Dense Cores", Cao, Y.; Qiu, K.; Zhang, Q.; Wang, Y.; Hu, B.; and **Liu, J.**, 2019, ApJS, 241, 1

(Large-Program Co-Author Papers)

10) "B-fields in Star-forming Region Observations (BISTRO): Magnetic Fields in the Filamentary Structures of Serpens Main", Kwon, W.; and 151 co-authors including **Liu, J.**, 2022, ApJ, 926, 123

9) "The JCMT BISTRO Survey: An 850/450 μm Polarization Study of NGC 2071IR in Orion B", Lyo, A.; and 149 co-authors including **Liu, J.**, 2021, ApJ, 918, 85

8) "The JCMT BISTRO Survey: Revealing the Diverse Magnetic Field Morphologies in Taurus Dense Cores with Sensitive Submillimeter Polarimetry", Eswaraiah, C.; and 144 co-authors including **Liu, J.**, 2021, ApJ, 912, L27

7) "Observations of Magnetic Fields Surrounding LkHα 101 Taken by the BISTRO Survey with JCMT-POL-2", Ngoc, N., and 148 co-authors including **Liu, J.**, 2021, ApJ, 908, 10

6) "The JCMT BISTRO Survey: Magnetic Fields Associated with a Network of Filaments in NGC 1333", Doi, Y., and 137 co-authors including **Liu, J.**, 2020, ApJ, 899, 28

5) "The JCMT BISTRO Survey: The Magnetic Field of the Barnard 1 Star-forming Region", Coude, S., and 121 coauthors including **Liu, J.**, 2019, ApJ, 877, 88

4) "JCMT BISTRO Survey: Magnetic Fields within the Hub-filament Structure in IC 5146", Wang, J., and 132 coauthors including **Liu, J.**, 2019, ApJ, 876, 42

3) "Magnetic Fields toward Ophiuchus-B Derived from SCUBA-2 Polarization Measurements", Soam, A., and 123 coauthors including **Liu, J.**, 2018, ApJ, 861, 65

2) "A First Look at BISTRO Observations of the ρ Oph-A core", Kwon, J., and 121 coauthors including **Liu, J.**, 2018, ApJ, 859, 4

1) "First Results from BISTRO: A SCUBA-2 Polarimeter Survey of the Gould Belt", Ward-Thompson, D., and 113 coauthors including **Liu, J.**, 2017, ApJ, 842, 66