

# Siyi Feng



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## EDUCATION

### Doctor of Natural Sciences

Sep. 2011-Feb. 2015

Universität Heidelberg & Max-Planck-Institut für Astronomie, Heidelberg, Germany

•Major: Physics & Astronomy

*Thesis for degree:* Chemical and dynamic sub-structures of the high-mass star-forming regions (HMSFRs)

### Master of Science in Astrophysics

Sep. 2008-Jun. 2011

Nanjing University, Jiangsu, China

•Major: Astrophysics

*Thesis for degree:* Study on the Gamma-Ray Burst (GRB) in Fermi Era

### Bachelor of Science in Astronomy

Sep. 2004-Jun. 2008

Nanjing University, Jiangsu, China

•Major: Astrophysics

*Thesis for degree:* Late Internal Shock Model for the X-ray Flares of the GRB Afterglow

## RESEARCH INTEREST

- Star & Planet Formation
- Astrochemistry
- Radio Astronomy

## APPOINTMENTS

### Xiamen University (CN)

Oct. 2021-Present

-Professor (Nanqiang A) @Department of Astronomy

Since Jan. 2023

-Associate Professor (Nanqiang B) @Department of Astronomy

Oct. 2021-Dec. 2022

### East Asian Core Observatories Association

Dec. 2017-Sep. 2021

-East Asian Core Observatories Association (EACOA) postdoc fellow @NAOJ, NAOC, ASIAA

• Lead the **Multiwavelength line-Imaging survey of the 70  $\mu$ m-dArk and bright cLOUDs (MIAO)** project. This project carries high-spatial-resolution line-imaging survey towards a sample of 25 high-mass star forming regions. Each region contains a pair of neighbouring 70  $\mu$ m dark/bright clumps, serving as space laboratory for comparative chemical and kinematic study. In particular, the 70  $\mu$ m dark clump has  $L/M < 1 L_{\odot}/M_{\odot}$ . Using JVLA-GBT, IRAM-30 m (120 h, completed, *Feng et al. 2019a, Feng et al. 2020b*), ALMA (90 h, 90% completed), this survey was carried out at 1.3 cm, 3 mm and 1 mm wavelengths, allowing us to characterise the physio-chemical properties of the initial conditions of low-mass and high-mass star formation.

• Lead the multi-scale (1 pc down to 1000 AU) kinematic and chemical study (1 mm/3 mm, NOEMA-IRAM 30 m, SMA-IRAM 30 m) of the high-mass disk candidates NGC 7538 IRS9 (*two 1st-author paper, in prep.*);

• Lead the **effect of infrared bright rim bubble (TIME)** line-imaging survey (1mm/3mm, Nobeyama-45 m, IRAM-30 m, Effelsberg-100 m, ALMA) towards the infrared bright rim bubble N2, in understanding the effect of the expanding HII in star formation (*one 1st-author paper, in prep.*);

• Sub-group leader of ALMA large project **Fifty AU Study of the chemistry in the disk/envelope system of Solar-like protostars (FAUST)** on the chemistry of low-mass disk candidate GSS30 (*one 1st-author paper, in prep.*);

-Hosts: Dr. K. Tatematsu (2018 in NAOJ); Dr. D. Li (2019 in NAOC); Dr. S. Liu (2020–2022 in ASIAA)

### Max-Planck-Institute for Extraterrestrial Physics (DE)

Mar. 2015-Nov. 2017

-European Research Council (ERC) postdoc fellow @The Center for Astrochemical Studies

• Lead the high spatial resolution line-imaging survey (1mm/2mm/3mm/1.3 cm, NOEMA, SMA, IRAM-30 m, VLA) of sulfur (S-)bearing species and carbon-chains towards the low-mass shocked region L1157-B1 (*Feng et al.*

2020a, and two 1st-author paper, in prep.);  
-Director: Prof. Dr. Paola Caselli

### Harvard-Smithsonian Center for Astrophysics (US)

Dec. 2013-Feb. 2014

-Visiting Scholar

- Lead the high spatial resolution line-imaging survey (1mm/3mm, IRAM-30 m-SMA) towards four IRDCs, conclude that the initial fragmentation is a non-thermal, non-quiescent process (*Feng et al. 2016c*);
  - Detect two bipolar, high-velocity (up to  $40 \text{ km s}^{-1}$ ) outflows (NOEMA) towards a “classic high-mass starless core”, conclude that star formation has already begun in this  $> 40M_{\odot}$ ,  $< 10L_{\odot}$  region (*Feng et al. 2016b*). **This work has been cited by a graduated-level astrochemistry textbook “Dynamical Astrochemistry” (ISBN-13: 978-1782627760; ISBN-10: 1782627766).**
- Host and collaborator: Dr. Qizhou Zhang

### Max Planck Institute for Astronomy (DE)

Sep. 2011-Feb. 2015

-Marie Curie Early Stage Researcher (ESR/PhD) @Planet and Star Formation Group

- Study the chemical structure of the high-mass star-forming regions NGC 7538 S and IRS1 by comparing observations (NOEMA) with gas-grain model fittings, conclude that the fragmentation is hierarchic and that chemical history of the cores collapsed from the same natal cloud is asynchronized (*Feng et al. 2016a*);
  - Study the chemical substructure of the nearest high-mass star-forming region Orion-KL (SMA-IRAM 30 m), conclude that the different spatial distributions of the complex organics indicate their different gas-grain forming paths (*Feng et al. 2015*). **This work has been cited by a graduated-level textbook “Molecular Astrophysics” (ISBN-13: 978-1107169289; ISBN-10: 1107169283).**
- Advisor: Prof. Dr. Henrik Beuther

### Nanjing University (CN)

Sep. 2008-Jun. 2011

-Graduated Research Assistant @High Energy Group

- Construct a model of “structured ejecta sweeping up the density-jump medium” to the Gamma-Ray Burst (GRB), which well explains both the flares / bumps on the late afterglows at lower-energy band and the early steep-rising of GeV lightcurve observed by Fermi/ LAT, suggesting the external origin of the GeV photons (*Feng et al. 2011*);
  - Simulate the polarization evolution in a relativistic wind bubble, which fits the observed GRB data.
- Advisor: Prof. Zigao Dai

### University of Sheffield (UK)

Jul.-Aug. 2007

-Summer Student Researcher @Department of Applied Mathematics

- Revise the models for solar internal f/p/g-modes, including the combined effects from the changes of atmospheric magnetic field, temperature and steady state during a solar cycle (*the Best Oral Presentation*);
- Advisor: Prof. Róbert von Fáty-Siebenbürgen

### Nanjing University (CN)

Sep. 2007-Sep. 2008

-Undergraduate Advanced Project Student Researcher @Department of Astronomy

- Built numerical codes for the dynamic and radiation processes of the “late internal shock” phenomenon towards to GRB, which fits well with the observation of X-ray flares (*Excellent Thesis for the Bachelor Degree*).
- Advisor: Prof. Zigao Dai

## SELECTED OBSERVING PROPOSALS

### Accepted proposals

- **PI, 32.0 h Band 2, JCMT #M22BF001:**  
Dust distribution and chemical segregation in the L1157 molecular outflow
- **PI, 9.0 h (12 m)+47.0 h (ACA), ALMA #2019.1.00733.S:**  
The initial gas flow towards extremely young high-mass clumps
- **PI, 3.5 h (12 m)+18.1 h (ACA), ALMA #2019.1.00408.S:**  
The sequential star formation towards the IR bright rim of an HII bubble
- **PI, 11.4 h (12 m)+90.4 h (ACA), ALMA #2018.1.00101.S:**  
The initial gas flow towards extremely young high-mass clumps
- **PI, 4.4 h (12 m)+20.6 h (ACA), ALMA #2018.1.00215.S:**  
The sequential star formation towards the IR bright rim of an HII bubble
- **PI, 5.8 h (12 m)+5.6 h (ACA), ALMA #2018.1.00375.S:**  
Sulfur chemistry in the transition zone of low-mass protoplanetary systems
- **PI, 30 h, JVLA #18A-067:**  
Temperature and density structure of high mass, low luminosity/mass ratio clumps
- **PI, 18 h, JVLA #18A-068:**  
Detailed physical structure of the protostellar shock region L1157-B1
- **PI, 83 h (30 m), IRAM #115-17:**

Initial star-forming activities towards the high-mass, low luminosity-to-mass ratio clumps

- **PI, 40 h, Nobeyama-45 m #CG171006:**

Initial star-forming activities towards the high-mass, low luminosity/mass ratio clumps

- **PI, 25.9 h (30 m), IRAM #009-17:**

String the beads: Sequential physical and chemical properties of the molecular clumps along the rim of an infrared bubble

- **PI, 37 h (30 m), IRAM #017-17:**

Deuterated organics in the earliest phase of high-mass star formation

- **PI, 44 h (30 m), IRAM #024-17:**

Sulfur chemistry in the shocked region L1157-B1 & B2

- **PI, 9 h, APEX #M9505b-99:**

Deuterated formaldehyde in the earliest phase of high-mass star formation

- **PI, 20 h, Effelsberg-100 m #105-16:**

Temperature and density structure of the infrared (IR) bubble rim N2

- **PI, 28 h, SMA #2016B-S029:**

Sulfur and organic chemistry in the shocked region L1157-B1 and B2

- **PI, 16 h (NOEMA)+ 1 h (30 m), IRAM #W16AF & 204-16:**

The main reservoir of sulfur on dust grains in the shocked region L1157-B1

- **PI, 15.4 h (30 m), IRAM #036-16:**

Deuteration in the earliest phase of high-mass star formation

- **PI, 32 h (NOEMA), IRAM #W14AB:**

Dynamics and chemistry in the earliest phase of high-mass star formation

- **PI, 13 h (30 m), IRAM #036-14:**

Chemistry in the earliest phase of high-mass star formation: SMA & 30m in concert

- **PI, 20 h, SMA #2013A-S011:**

Fragmentation and dynamical collapse of high-mass starless gas clumps

- **PI, 2 h (30 m), IRAM #033-12:**

The chemical substructure of Orion-KL: SMA & 30 m in concert

- **Co-I, 17.8 h (30 m), IRAM #E01-21:**

Unveiling the cold Gas Evolution of MaNGA Merging Galaxies (PI: Q. Yu, XMU)

- **Co-I, 25 h (30 m), IRAM #121-20:**

Filamentary accretion flows in high-mass star-forming molecular clouds (PI: H. Beuther, MPIA)

- **Co-I, 64 h (NOEMA)+32.5 h (30 m), IRAM #W20AV & 190-20:**

CORE+: Deuterium and shock chemistry in high-mass star-forming regions (PI: C. Gieser, MPIA)

- **Co-I, 8 h (NOEMA), IRAM #W20BB:**

Investigating the deuterium fraction in the diffuse and translucent clouds through sensitive absorption observations (PI: G. Luo, NJU)

- **Co-I, 520 h (band3), JCMT #M20AL021:**

ALOHA IRDCs: A Lei Of the Habitat and Assembly of Infrared Dark Clouds (PI: D. Li, NAOC)

- **Co-I, 84 h (band3), JCMT #M20AP020:**

Dust distribution and chemical segregation in the L1157 molecular outflow (PI: H. Liu, ASIAA)

- **Co-I, 10.7 h (30 m), IRAM #143-19:**

Linking density structures and fragmentation in high-mass star formation (PI: H. Beuther, MPIA)

- **Co-I, 16.3 h, ALMA #2019.1.00280:**

First detection of magnetic fields in the very central regions of starless dense cores (PI: T. Liu, KASI)

- **Co-I (the 3rd), 15 h (NOEMA)+13 h (30 m), IRAM #S19-AL & 100-19:**

Kinematic and chemical signatures during high-mass cloud and star formation (PI: H. Beuther, MPIA)

- **Co-I, 32 h (band2), JCMT #M18BP002:**

Are supercritical filaments supported by magnetic fields? (PI: X. Lu, KASI)

- **Co-I, 28 h (band2), JCMT #M18BP041:**

Role of magnetic fields in dense core formation in filamentary clouds- II (PI: A. Soam, KASI)

- **Co-I, 19 h (band2), JCMT #M18BP055:**

Mapping Magnetic Fields in the Filamentary Cloud NGC 7538 (PI: H. Chen, NTHU)

- **Co-I, 106.2 h, ALMA #2018.1.01205.L:**

Fifty AU STudy of the chemistry in the disk/envelope system of Solar-like protostars (PI: S. Yamamoto, UT)

- **Co-I, 15.7 h, ALMA #2018.1.01449.S:**

Magnetic fields from infrared dark clouds to hot molecular cores (PI: H. Beuther, MPIA)

- **Co-I (the 1st), 8 h (NOEMA), IRAM #S18-AN:**

Linking large and small scales for two high-mass protostars in NGC7538 (PI: J. Mottran, MPIA)

- **Co-I (the 1st), 37 h (NOEMA)+21 h (30 m), IRAM #S18-AO, W18-AX, & 222-18, 104-18:**

Chemical layers of the high-mass disk candidate NGC7538 IRS9 (PI: Y. Wang, MPIA)

- **Co-I, 53 h (30 m), IRAM #035-18:**

Early phases of high-mass star formation: kinematics and chemistry in different environments (PI: S. Zhang, OAMP/LAM)

- **Co-I, 48 h, SMA #2018B-A004:**

Internal structures of high-mass starless clumps in different environments (PI: J. Yuang, NAOC)

- **Co-I, 21 h, JVL A #18A-422:**

Outflow feedback in early stages of clustered star formation (PI: K. Wang, ESO)

- **Co-I, 7.8 h (12 m)+7.4 h (ACA), ALMA #2018.1.00302.S:**

Fragmentation and substructure of dense cores close to the onset of star formation in the Orion complex (PI: T. Liu, KASI)

• **Co-I, 8.5 h (12 m), ALMA #2017.1.00526.S:**

Where and when do low-mass stars form in high-mass protoclusters? (PI: X. Lu, NAOJ)

• **Co-I, 9 h (12 m)+77.6 h (ACA), ALMA #2017.1.00687.S:**

From filaments to cores: Dynamics in infrared dark clouds (PI: A. Barnes, MPE)

• **Co-I, 7.8 h (12 m)+27.9 h (ACA), ALMA #2017.1.00523.S:**

Gas accretion onto dense cores from early to late evolutionary phases of massive filamentary clouds (PI: X. Lu, NAOJ)

• **Co-I, 11.7 h (ACA), ALMA #2016.2.00058.S:**

Physical and chemical properties of cold Orion cores very close to the onset of star formation (PI: K. Tatematsu, NAOJ)

• **Co-I (the 1st), 24 h, Nobeyama-45 m #CG161011:**

Star formation on the rim of the infrared (IR) bubble N2 (PI: Y. Ao, NAOJ)

• **Co-I, 25 h, VLA #16B-259:**

Grain growth in the star-forming cluster rho Oph A (PI: A. Coutens, UCL)

• **Co-I, 41 h, IRAM-30 m #012-16:**

Measuring isotopic ratios in Galactic massive star forming regions with HC3N lines (PI: J. Wang, SHAO)

• **Co-I, 9.6 h, ALMA #2015.1.00492.S:**

Magnetic field structure at the onset of high-mass star (PI: H. Beuther, MPIA)

• **Co-I, 618 h, ESO public survey:**

Probing the Early Stages of Star Formation: Unravelling the Structure of Planck Cold Clumps Distributed Throughout the Sky (PI: K. Wang, ESO)

• **Co-I, 4 h, VLA #15A-115:**

Disk and jet formation around the 30Msun protostar NGC7538IRS1 (PI: H. Beuther, MPIA)

• **Co-I, 299 h (NOEMA)+8 h (30 m), IRAM large programme #L14AB & 247-13:**

Fragmentation and disk formation during high-mass star formation (PI: H. Beuther, MPIA)

• **Co-I, 16 h (NOEMA)+2.5 h (30 m), IRAM large programme #W06E & 230-12:**

Small-scale fragmentation of genuine high-mass starless cores (HMSCs) (PI: H. Beuther, MPIA)

## CONFERENCE CONTRIBUTIONS

• **ICE project: The protostellar shocks as chemical laboratories**

-Invited Talk for 2022 ISM workshop, Nanjing, China

(Aug, 2022)

• **Travel through time and space**

-Invited Public Talk for Xiamen University Malaysia Campus

(Nov, 2021)

• **MIAO: how to draw the profile of initial star-forming regions**

-Invited Talk for the Cross-Strait Forum on Radio Astronomy 2022

(Oct, 2022)

-Talk for Astrochemistry workshop, Zhuhai, China

(Dec., 2021)

-Invited Talk for NAOJ ALMA-J seminar, Mitaka, Japan

(Jan., 2021)

-Talk for JingGuangXia workshop, Xiamen, China

(Dec., 2020)

• **What can chemistry tell us about the initial conditions and feedbacks of star-formation**

-Talk on PSF coffee, Heidelberg, Germany

(Oct., 2019)

-Talk on Nanjing University Seminar, Nanjing, China

(Sep., 2019)

-Talk for 2019 ISM workshop, Xinjiang, China

(Jul., 2019)

-Talk for NAOJ seminar, Mitaka, Japan

(Jun., 2019)

• **Astrochemistry tool: from the star formation to the cradle of life**

-Talk for UCL seminar, London, UK

(Jul., 2018)

-Invited Talk for EAO seminar, Hilo, USA

(May., 2018)

-Talk during visit ASIAA, Taipei

(Mar., 2017)

-Invited Talk during visit SJTU, ZJU, NJU, in China

(May.-Oct., 2020)

• **Star-forming activities towards extremely cold, young, high-mass star-forming regions**

-Talk on the "Tracing the flow", Windermere, UK

(Jul., 2018)

• **Sequential physical and chemical properties of the molecular clumps along the rim of an infrared bubble**

-Poster on the "ALMA/Nobeyama/ASTE workshop", Mitaka

(Dec., 2017)

• **Deuteration in the earliest phase of high-mass star formation**

-Talk on the "Workshop on interstellar matter 2018", Sapporo

(Nov., 2018)

-Talk on the "MPIA star formation coffee", Heidelberg

(Jul., 2017)

• **G28.34S, a prestellar or protostellar object?**

-Talk on the "EA-ALMA 2017 meeting", Taipei

(Mar., 2017)

• **Outflow detection in a 70 micron dark high-mass core**

-Talk on the "European Week of Astronomy and Space Science 2016", Athens

(Jul., 2016)

• **Chemistry and kinematics in high-mass star-forming regions**

-Invited Talk during visit NJU, NAOC, KIAA, SAO, China

(Jan, 2016)

• **Are the Infrared Dark Clouds Really Quiescent?**

- Poster on the "From clouds to protoplanetary disks: the astrochemical link", Berlin (Oct., 2015)  
 -Poster on the "Soul of High-Mass Star Formation", Puerto Varas, Chile (Mar., 2015)

• **Complex Organic Molecules in Hot Molecule Cores**

- Talk on the "Complex Organic Molecules in Space", Pisa (Mar., 2016)  
 -Invited Talk on the "Chemical diagnostics of star and planet formation with Cycle 3 ALMA", MPE (Jan., 2015)

• **Chemical Substructure in High-mass Star-forming Regions**

- Talk on the "Soul of High-Mass Star Formation", Puerto Varas, Chile (Mar., 2015)  
 -Joint colloquium of MPIA and LSW Talk, MPIA (Dec., 2014)  
 -Radio and Geoastrometry Lunch Talk, Harvard-Smithsonian Center for Astrophysics (Feb., 2014)  
 -Talk on the "Plane & Star Formation Seminar", MPIA (Dec., 2013)

• **Inferring the Evolutionary Stages of NGC 7538S and NGC 7538 IRS1 from Chemistry**

- Talk on "Chemical Diagnostics in the ALMA/NOEMA Era", Heidelberg (Jul., 2014)  
 -Talk on "The Star Formation: Data, Models and Visualization–Harvard-Heidelberg Workshop" (Jun., 2014)  
 -Poster on "The Early Phase of Star Formation", Ringberg Castle, Germany (Jun., 2014)  
 -Talk on the 223rd American Astronomical Society Meeting, Washington DC, USA (Jan., 2014)  
 -Talk on the 17th Annual German Conference of Women in Physics (Nov., 2013)  
 -Talk on Conference of "Astrochemistry in the ALMA era", Copenhagen (Jan., 2013)  
 -Poster on "High-Mass Star Formation, From Large to Small Scales in the Era of Herschel & ALMA", Lorentz Center, Leiden (Jan., 2013)

• **Resolving the Chemical Substructure of Orion-KL**

- Poster on "Protostar & Planet VI", Heidelberg (Jul., 2013)  
 -Poster on Conference of "Astrochemistry in the ALMA era", Copenhagen (Jan., 2013)  
 -Talk on "2012 MPIA Students Workshop", Bar-sur-Seine (Mar., 2012)

• **Statistical Characteristics of Interstellar Turbulence,**

- Talk on the 7th Generation IMPRS Seminar (Jan., 2012)

• **Chemical sub-structure of high-mass star-forming regions,**

- Poster on Young Astronomers' Meeting (YAM) , at Observatoire de Paris (Nov., 2011)

• **Multiband Fitting to 3 Long GRBs with Fermi/LAT Data:**

**Structured Ejecta Sweeping up a Density-Jump Medium**

- Talk on "Mini Workshop for the Frontier of GRB Research", Nanjing University (Nov., 2010)

## SKILLS

### Language

*Chinese (Mandarin)*: Mother Language

*English*: Professional

*German*: Beginner

*Japanese*: Beginner

### Technology and Computer

Package (MIRIAD, IDL, GILDAS, CASA)

Coding (C, F90, Matlab, Mathematica, Python, LaTeX)

Digital graphic and database development

Web-site development

## AWARDS/FELLOWSHIP

- 2017-2020: East Asian Core Observatories Association (EACOA) fellow  
 2017-2020: NAOJ-ALMA fellow (declined)  
 2015-2017: MPE European Research Council (ERC) postdoc fellow  
 2011-2014: Marie Curie Seventh Framework Program Early Stage Researcher (ESR/PhD)  
 2010: Outstanding Contribution To Chinese Astronomical Society Award  
 2008: Graduate with the Highest Honor (top 5%) of Nanjing University  
 2008: Excellent Bachelor Thesis of Nanjing University  
 2005-2008: Undergraduate Student's Outstanding Contribution to Astronomy Outreach Award  
 2005-2008: People's Scholarship for Excellence in Undergraduate Study  
 2006: Outstanding Undergraduate Student Association President in Jiangsu Province of China

## TEACHING & SERVICE

- 2021–: Referee for Elsevier  
 2020–2021: TAC of James Clerk Maxwell Telescope  
 2021/2022 (expected): LOC of "Soul of High-Mass Star Formation" (international conference every 4 years)  
 2021/2022 (expected): LOC of "The 2020 East-Asian Young Astronomer Meeting" @Beijing, China  
 2014.6: LOC of "The Star Formation: Data, Models and Visualization–Harvard-Heidelberg Workshop"  
 2014.6: LOC of "The Early Phase of Star formation" (EPoS) @Muenchen, Germany  
 2013.7: LOC of "Protostar & Planets VI" (PPVI) @Heidelberg, Germany  
 2012.3-4: Teaching assistant on the "Shack-Hartmann Wavefront Sensor" @ Heidelberg University & MPIA  
 2011-2015: Guide tours for the planetarium @ Haus de Astronomie, Heidelberg  
 2008.7: LOC of 2009 "CAS-IAU Joint Solar Eclipse Meeting" @Suzhou, China  
 2008.7: LOC of 2008 "Gamma-Ray Burst Conference" @Nanjing, China