Guang-Yao Zhao

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Summary

I am a radio astronomer, currently working at the Instituto de Astrofísica de Andalucía - CSIC as a postdoctoral researcher funded by the Severo-Ochoa project. I am also a member and a working group coordinator of the Event Horizon Telescope (EHT) Collaboration. My research interest is primarily high-angular resolution imaging and astrometric studies of supermassive black holes (SMBH) and active galactic nuclei (AGN) with very long baseline interferometry. My work also include developing relevant calibration and imaging methods for radio interferometric data.

Education

- Ph.D. in Astrophysics at **University of Chinese Academy of Sciences** 09/2007 – 07/2013
- Bachelor in Applied Physics at **Shandong University at Weihai** 09/2003 – 06/2007

Current Position

Instituto de Astrofísica de Andalucía - CSIC since 01/12/2019

- **Department:** Radioastronomy and galactic structure department
- **Job Title:** Severo Ochoa Postdoc
- **Assigned Tasks:**
  - EHT data analyses (imaging; scattering mitigation; multi-wavelength support)
  - Data analyses of multi-epoch GMVA+ALMA observations of OJ 287

Previous positions

Korea Astronomy and Space Science Institute 01/01/2016 - 30/11/2019

- **Department:** Radio Astronomy Division
- **Job Title:** KRF (Korea research fellowship) Fellow
- **Assigned Tasks:**
  - Multi-frequency AGN survey with the KVN (MASK)
  - Global implementation of simultaneous multi-frequency receiving systems
  - EHT observations and data analyses

Korea Astronomy and Space Science Institute 01/09/2013 - 31/12/2015

- **Department:** Radio Astronomy Division
- **Job Title:** Postdoctoral Researcher
- **Assigned Tasks:**
  - Source-frequency phase-referencing (SFPR) observations of AGNs
  - 43 GHz monthly monitoring of Sgr A* with KaVA

Research Projects

Supermassive black holes and relativistic jets at the highest resolution 01/06/2020 - 31/05/2023

Agency: Ministerio de Ciencia e Innovación (Spain), PID2019-108995GB-C; PI: José Luis Gómez (IAA-CSIC); Amount: 223,850 €. Role: Team member;

Supermassive black holes and blazar jets. 01/01/2020 - 31/12/2022

Agency: Junta de Andalucía (Spain), P18-FR-1769; PI: José Luis Gómez (IAA-CSIC); Amount: 139,625 €. Role: Team member;

Launching and evolution of AGN jets 01/01/2016 - 31/12/2019

Agency: Ministry of Science, Technology, and ICT (S. Korea); PI: Bong Won Sohn (KASI); Amount: 1,280,000,000 ₩. Role: Team member;

Multi-frequency VLBI studies of AGN jets (KRF Grant) 01/01/2016 - 30/11/2019

Agency: National Research Foundation (S. Korea), NRF-2015H1D3A1066561; PI: Taehyun Jung (KASI); Amount: 270,000,000 ₩. Role: KRF Fellow;

Core-shift in AGN jets 01/01/2015 - 31/12/2015

Agency: Korea Astronomy and Space Science Institute (S. Korea); PI: Taehyun Jung (KASI); Amount: 100,000,000 ₩. Role: Team Member;

Teaching & Mentoring

Ph.D. Thesis: I. Cho (Co-tutored with Dr. T. Jung) 09/2014 - 12/2020

Title: VLBI studies of Sagittarius A* at centimeter-millimeter wavelengths

MS Thesis: J.-U. Kim (Co-tutored with Prof. S. Yoon & Dr. B. W. Sohn) 10/2018 - 06/2019

Title: Periodic Variation in the Inner Jet Direction of 3C 66A

MS Thesis: R. Dahale (Co-tutored with Dr. J. L. Gómez & Dr. R. Lico) 10/2021 - 07/2022

Title: Magnetic Fields in Relativistic Jets of Supermassive Black Holes

Awards & Fellowships

- Group Award of the Royal Astronomical Society *(as a member of the EHT collaboration)* 2021
- Nelson P. Jackson Aerospace Award *(as a member of the EHT collaboration)* 2020
- Bruno Rossi Prize *(as a member of the EHT collaboration)* 2020
- Einstein Medal *(as a member of the EHT collaboration)* 2020
- Breakthrough Prize in Fundamental Physics *(as a member of the EHT collaboration)* 2020
- Diamond Achievement Award of the US National Science Foundation *(as a member of the EHT collaboration)* 2019
- Chief Director Prize of NST Korea *(as a member of the EHT-Korea team)* 2019
- Outstanding project award in the KRF annual evaluation 2017
- Korea Research Fellowship 2016-2019
- President Award of Shanghai Astronomical Observatory 2009

Invited & Solicited Talks

[1] **EHT observations of supermassive black holes and relativistic jets** 21/10/2022
The 9th Mid-Atlantic Radio-Loud AGN Meeting Online & JHU, Baltimore, USA

[2] **Scientific results from FPT and SFPR at KVN** 13/10/2022
Science Enabled with Multi-Band Receivers
at High Radio Frequency Workshop MPIfR, Bonn, Germany

[3] **Multi-frequency science with the KVN** 26/08/2022
Broadening Horizons: exploring multi-band
capabilities for the ngEHT Workshop Harvard Univ., USA

[4] **Observing supermassive black holes and relativistic jets with the Event Horizon Telescope** 13/07/2022
15th EVN Symposium and Users' Meeting UCC, Cork, Ireland

[5] **Scattering properties of Sgr A*** 22/06/2021
EHT 2021 Summer Virtual Collaboration Meeting Online

[6] **Application of FPT and SFPR with the KVN** 19/10/2020
EHT/ngEHT miniworkshop: KVN and multi-frequency VLBI Online

[7] **Multi-λ VLBI view of Sgr A*** 15/04/2019
Eating VLBI workshop 2019 INAF-IRA, Bologna, Italy

[8] **MWL VLBI observations of Sgr A*** 07/11/2018
EHT Collaboration Meeting 2018 Radboud Univ., Nijmegen, Netherlands

[9] **Mm-VLBI observations of Sgr A* with KaVA, KVN, and EAVN** 27/01/2018
Dawn of a new era for black hole jets in
active galaxies workshop Tohoku Univ., Sendai, Japan

[10] **Multi-frequency VLBI studies of AGNs** 17/12/2017
KRF Workshop 2017: Dissemination Forum
For Invited Outstanding Overseas Scientists KOFST, Seoul, S. Korea

[11] **KaVA AGN large program observations of Sgr A*** 18/01/2017
Workshop on "challenges of AGN jets" NAOJ, Tokoyo, Japan

[12] **Mm-VLBI observations of Sgr A* with KaVA, and KVN** 18/07/2016
IAU Symposium 322: The Multi-Messenger Astrophysics
of the Galactic Centre Palm Cove, Australia

Publications

[1] S. Issaoun, M. Wielgus, S. Jorstad, *et al.*, "Resolving the Inner Parsec of the Blazar J1924-2914 with the Event Horizon Telescope," *ApJ, vol. 934, no. 2, 145, p. 145, Aug. 2022.* DOI: 10.3847/1538-4357/ac7a40. *arXiv:* 2208.01662 [astro-ph.HE].

[2] G.-Y. Zhao, J. L. Gómez, A. Fuentes, *et al.*, "Unraveling the Innermost Jet Structure of OJ 287 with the First GMVA + ALMA Observations," *ApJ, vol. 932, no. 1, 72, p. 72, Jun. 2022.* DOI: 10.3847/1538-4357/ac6b9c. *arXiv:* 2205.00554 [astro-ph.HE].

[3] A. E. Broderick, R. Gold, B. Georgiev, *et al.*, "Characterizing and Mitigating Intraday Variability: Reconstructing Source Structure in Accreting Black Holes with mm-VLBI," *ApJL, vol. 930, no. 2, L21, p. L21, May 2022.* DOI: 10.3847/2041-8213/ac6584. *arXiv:* 2205.00554 [astro-ph.HE].

[4] B. Georgiev, D. W. Pesce, A. E. Broderick, *et al.*, "A Universal Power-law Prescription for Variability from Synthetic Images of Black Hole Accretion Flows," *ApJL, vol. 930, no. 2, L20, p. L20, May 2022.* DOI: 10.3847/2041-8213/ac65eb. *arXiv:* 2205.00554 [astro-ph.HE].

[5] M. Wielgus, N. Marchili, I. Martı-Vidal, *et al.*, "Millimeter Light Curves of Sagittarius A* Observed during the 2017 Event Horizon Telescope Campaign," *ApJL, vol. 930, no. 2, L19, p. L19, May 2022.* DOI: 10.3847/2041-8213/ac6428. *arXiv:* 2207.06829 [astro-ph.HE].

[6] J. Farah, P. Galison, K. Akiyama, *et al.*, "Selective Dynamical Imaging of Interferometric Data," *ApJL, vol. 930, no. 2, L18, p. L18, May 2022.* DOI: 10.3847/2041-8213/ac6615. *arXiv:* 2207.06829 [astro-ph.HE].

[7] Event Horizon Telescope Collaboration, K. Akiyama, A. Alberdi, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. VI. Testing the Black Hole Metric," *ApJL, vol. 930, no. 2, L17, p. L17, May 2022.* DOI: 10.3847/2041-8213/ac6756. *arXiv:* 2207.06829 [astro-ph.HE].

[8] Event Horizon Telescope Collaboration, K. Akiyama, A. Alberdi, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. V. Testing Astrophysical Models of the Galactic Center Black Hole," *ApJL, vol. 930, no. 2, L16, p. L16, May 2022.* DOI: 10.3847/2041-8213/ac6672. *arXiv:* 2207.06829 [astro-ph.HE].

[9] Event Horizon Telescope Collaboration, K. Akiyama, A. Alberdi, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. IV. Variability, Morphology, and Black Hole Mass," *ApJL, vol. 930, no. 2, L15, p. L15, May 2022.* DOI: 10.3847/2041-8213/ac6736. *arXiv:* 2207.06829 [astro-ph.HE].

[10] Event Horizon Telescope Collaboration, K. Akiyama, A. Alberdi, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. III. Imaging of the Galactic Center Supermassive Black Hole," *ApJL, vol. 930, no. 2, L14, p. L14, May 2022.* DOI: 10.3847/2041-8213/ac6429. *arXiv:* 2207.06829 [astro-ph.HE].

[11] Event Horizon Telescope Collaboration, K. Akiyama, A. Alberdi, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. II. EHT and Multiwavelength Observations, Data Processing, and Calibration," *ApJL, vol. 930, no. 2, L13, p. L13, May 2022.* DOI: 10.3847/2041-8213/ac6675. *arXiv:* 2207.06829 [astro-ph.HE].

[12] Event Horizon Telescope Collaboration, K. Akiyama, A. Alberdi, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole in the Center of the Milky Way," *ApJL, vol. 930, no. 2, L12, p. L12, May 2022.* DOI: 10.3847/2041-8213/ac6674. *arXiv:* 2207.06829 [astro-ph.HE].

[13] I. Cho, G.-Y. Zhao*, T. Kawashima, *et al.*, "The Intrinsic Structure of Sagittarius A* at 1.3 cm and 7 mm," *ApJ, vol. 926, no. 2, 108, p. 108, Feb. 2022.* DOI: *10.3847/1538-4357/ac4165*. *arXiv: 2112.04929 [astro-ph.HE]*.

[14] R. Lico, C. Casadio, S. G. Jorstad, *et al.*, "New jet feature in the parsec-scale jet of the blazar OJ 287 connected to the 2017 teraelectronvolt flaring activity," *A&A*, vol. 658, no. 2, L10, p. L10, Feb. 2022. DOI: 10.1051/0004-6361/202142948. arXiv: 2202.02523 [astro-ph.HE].

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[16] J. L. Gómez, E. Traianou, T. P. Krichbaum, *et al.*, "Probing the Innermost Regions of AGN Jets and Their Magnetic Fields with RadioAstron. V. Space and Ground Millimeter-VLBI Imaging of OJ 287," *ApJ, vol. 924, no. 2, 122, p. 122, Jan. 2022.* DOI: *10.3847/1538-4357/ac3bcc*. *arXiv: 2111.11200 [astro-ph.HE]*.

[17] Y.-Z. Cui, K. Hada, M. Kino, *et al.*, "East Asian VLBI Network observations of active galactic nuclei jets: imaging with KaVA+Tianma+Nanshan," *Research in Astronomy and Astrophysics*, vol. 21, no. 8, 205, p. 205, Oct. 2021. DOI: 10.1088/1674-4527/21/8/205. arXiv: 2104.05525 [astro-ph.GA].

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