

# Emerging Investigator Series

## International Association of GeoChemistry (IAGC)

Mang Lin, January 2024

**Mang Lin** is a Professor in the State Key Laboratory of Isotope Geochemistry at Guangzhou Institute of Geochemistry, Chinese Academy of Sciences (GIGCAS). He holds a Ph.D. in Chemistry from University of California San Diego and M.Sc. and B.Sc. in Environmental Sciences from Sun Yat-Sen University. Prior to joining GIGCAS, he was a JSPS postdoc fellow at Tokyo Institute of Technology. Lin's expertise and research interests are in analytical and physical chemistry related to multiple oxygen and sulfur isotope systematics and their applications in Earth and planetary sciences. He received the D.F. Hou award, CIFAR Global Scholar, and NSFC award of distinguished young scientists. His recent paper entitled "40 years of theoretical advances in mass-independent oxygen isotope effects and applications in atmospheric chemistry: A critical review and perspectives" was published in the special issue "Atmospheric Geochemistry" of *Applied Geochemistry*, selected as the Editor's choice, and featured together with the Emerging Investigator Series.



*What excites you most about the work published in Applied Geochemistry?*

The paper is a review focusing on mass-independent isotope effects and their applications in atmospheric chemistry. Conventionally, isotope fractionation in chemical reactions was believed to adhere to the mass-dependent rule, until Mark Thiemens' 1983 Science paper revealed mass-independent characteristics in ozone formation. This discovery led to extensive research in quantum chemistry of isotope effects, sparking a broad spectrum of applications spanning the origins of the solar system and life, atmospheric ozone chemistry, climate change, paleo-atmospheric chemistry, and biogeochemical cycles.



*Mang Lin and his former PhD supervisor Mark Thiemens in UCSD, with the isotope ratio mass spectrometry built by Harold Urey*

### Reference:

Lin, M., Thiemens, M. H. (2024). 40 years of theoretical advances in mass-independent oxygen isotope effects and applications in atmospheric chemistry: A critical review and perspectives. <https://doi.org/10.1016/j.apgeochem.2023.105860>

In 2023, marking the 40th anniversary of Thiemens' groundbreaking work, we decided to distill the collective knowledge accumulated over the past four decades and to critically examine key unsolved problems within the field. I am excited to contribute this review to the special issue "Atmospheric Geochemistry" by highlighting the collaborative achievements of physical chemists, geochemists, and atmospheric chemists in advancing mass-independent isotope effect research over the past 40 years.

*You were selected as a CIFAR Azrieli Global Scholar in 2023. Can you share with us the story behind this award??*

The awards are granted to ~16 early-career investigators worldwide each year, spanning various research domains. Recipients receive funding, communication and leadership development training, and global networking opportunities, all designed to support their growth into future research leaders. Awardees' research interests must align CIFAR research program's interdisciplinary theme areas. I join the "Earth 4D: Subsurface Science & Exploration" program co-led by Profs. John Mustard and Barbara Sherwood Lollar. The program aims to unravel the interactions among life, water and energy across the vast subsurface and surface environments of Earth (and other planets). The diverse academic backgrounds of the Earth 4D team members provide a rich learning environment, allowing me to explore new interdisciplinary research directions.



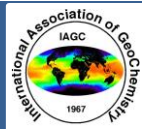
*The Earth 4D Program 2023 Fall Meeting in Toronto*

*Your research group is also academically diverse, like the Earth 4D team that you mentioned. How do you build your group and initiate new research projects as an early-career investigator??*

I did my Ph.D. in the Department of Chemistry and Biogeochemistry at UCSD. The founding chemists of this department (e.g., Harold Urey, Linus Pauling, Jim Arnold, and Stanley Miller) built a strong tradition of interdisciplinary research, and I am delighted to continue in their footsteps. With expertise in isotope chemistry applicable across diverse research domains, I seek students and postdocs with educational backgrounds distinct from mine but who share common research interests with me. We discuss and propose new projects together. Collaboration with colleagues is also important. Trained as an analytical chemist, I develop new analytical techniques in my lab, equipping me with a unique tool to tackle my colleagues' scientific challenges. I learn a lot through close collaboration with my group members and colleagues, resulting in several exciting discoveries in both independent and collaborative research endeavors. I appreciate the support from GIGCAS, which includes not only generous start-up funding for establishing my lab from virtually nothing but also an open environment for interdisciplinary research collaborations.



*Group photo of Lin Research Group (left to right: Zhengwen Niu, Jiarui Lin, Longye Du, Binyan Yin, Mang Lin, Hao Guo, Erhu Wang) at Binyan Yin's master's degree thesis defense*



*Could you share more about your current research interests, as well as yourself beyond your role as a scientist?*

My initial research focus was on isotope chemistry and its applications in atmospheric sciences, but I have always maintained a longstanding interest in the origin of life. I consider myself fortunate to have pursued my Ph.D. in UCSD, where Stanly Miller was a faculty member, and engaged in postdoc training at Tokyo Tech, where my host Yoshida Naohiro was a PI of the Earth-Life Science Institute. This experience allowed me to gain insights into prebiotic chemistry before my independent research career. While my current research continues to revolve around the physical and analytical chemistry of isotopes, I am expanding the applications of these principles to investigate planetary habitability and search for biosignatures beyond Earth. When I am not doing research, I enjoy watching arthouse films at cinemas. To me, the greatest film of all time is Stanley Kubrick's "2001: A Space Odyssey". It is a masterpiece that philosophically explores the origins of humanity and our world.

The aim of the [IAGC Emerging Investigator Series](#) is to highlight excellent work by independent researchers in their early career that bring new insights into the field of geochemistry or to promote geochemical applications. Multidisciplinary work related to applied geochemistry, biogeochemical processes, and environmental geochemistry are also highly welcomed. Featured articles as well as the authors as emerging investigators will be extensively advertised to diverse disciplines and communities through multiple platforms of the journal and the International Association of GeoChemistry.