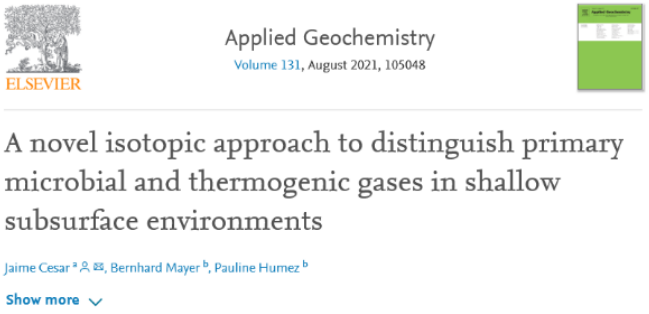
Emerging Investigator Series

International Association of GeoChemistry (IAGC)

Jaime Cesar, August 2021

Jaime Cesar is a Research Scientist at the Geological Survey of Canada, Calgary. He obtained a B.Sc. in Geochemistry from the Universidad Central de Venezuela and holds a PhD in organic and isotope geochemistry from Curtin University, Australia.

Jaime combines molecular, compound-specific, and site-specific stable isotope tools to study organic compounds from petroleum basins and other environments to optimize the exploration and production of hydrocarbon resources and perform paleo-environmental reconstructions. Jaime's research is part of the Geoscience for New Energy Supply (GNES) program funded by Natural Resources Canada (NRCan). When not in the lab, Jaime is performing arts in different expressions such as singing, acting, and poetic writing. His recent paper "**A novel isotopic approach to distinguish primary microbial and thermogenic gases in shallow subsurface environments**" was published in *AG* this month and is featured with the Emerging Investigator Series.



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

In science, there often is an elephant in the room that we prefer to ignore because we do not know how it got there. However, despite its unknown provenance,

it all starts here, where we isolate a specific compound class for analysis.

the elephant may answer many of our questions. That is what happens with ethane gas. This molecule is often found with primary microbial methane, but we tend to ignore it because the mechanisms for microbial generation of ethane are not well understood. However, this does not mean that we cannot use its geochemical characteristics, for instance, to distinguish primary microbial gas from early mature thermogenic gas. Our work probably brings more questions than answers, but that is great. Perhaps we now

start looking at ethane, the elephant in the room, more often.

Describe your research group at Geological Survey of Canada. What are you working on and with whom are you collaborating?

The Organic Geochemistry and Petrology Section of the GSC is responsible for the characterization of (i) conventional and unconventional hydrocarbon systems; (ii) existing and potential environmental impacts of fossil resource extraction and development on the surface and underground; (iii) the origin and fate of organic matter and its interaction with water, minerals and metals in lake, river and ocean sediments, and in soil and peats from both pedosphere and hydrosphere.

I currently work with Dr. Andrew Kingston and Dr. Omid Ardakani. We combine several geochemical approaches to understand the occurrence and distribution of H_2S gas in low-permeability hydrocarbon reservoirs from the Montney Formation, Western Canada. I particularly focus on the organic and isotope geochemistry of the petroleum fluids. Additionally, I support Dr. Majid Bizhani in the evaluation of organic geochemical changes due to enhanced-oil-recovery practices, with focus on CO_2 as a recovery agent, and with implications on CO_2 storage. Working at the GSC has also given me the opportunity to contribute to studies that evaluate the role of organics in mineral prospecting as well as peat formation and degradation. We actively collaborate with the University of Calgary, the University of North Dakota, The Imperial College of London, The GSC-Quebec, and several petroleum companies in Canada.

In the organic petrography lab. From left to right: Majid Bizhani, Jaime Cesar, and Omid Ardakani.

Where do you see your research program heading, and what topics are you most interested in pursuing?

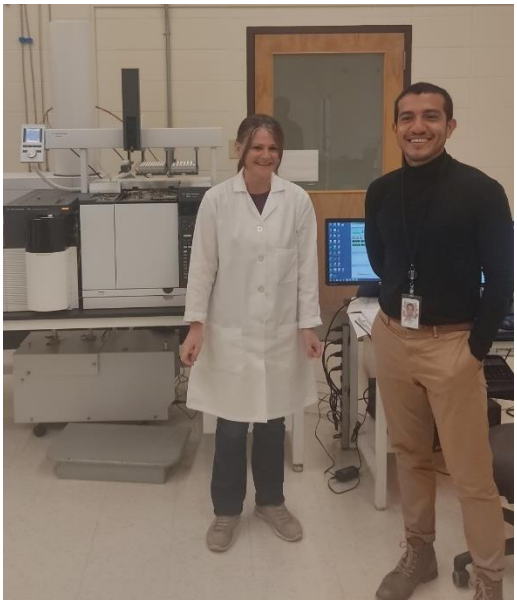
I am very excited to see that we do not know everything about gas geochemistry. The occurrence of isotope equilibrium in gases from tight rocks, for instance, is only gaining relevance recently after some of our work and that of other scientists at Caltech. As a next step, I am interested in evaluating to what extent the geochemistry of low-molecular-weight liquid hydrocarbons (C_7-C_{18}) from low-permeability reservoirs is different from what we know about conventional systems.

I have also started to introduce methods that will allow us to study organic matter from recent environments (e.g., peats, lakes), and we aim to perform more environmental organic geochemistry studies soon. Canada is famous for being an excellent record of macro and microfossils of past life. However, little is known about molecular fossils from the same geological archives. I am fascinated to potentially contribute to the field of early life as well.

Jaime Cesar with the team that makes sure that samples are well prepared and ready for analysis. From left to right: Carlo Gallotta, Marina Milovic, Jaime Cesar, and Keegan Nagy.

Importantly, I am always interested in becoming a better communicator. I believe scientists should not only be in the lab but also onstage. We ought to take

the platform and communicate what we do in ways citizens can understand.



Jaime Cesar in the instrumental lab with Rachel Robinson, who makes sure that the instruments provide excellent results. She and Marina are very patient every time Jaime asks them to modify a method/procedure.

As an early career investigator, do you have any insight to share with the audience of Applied Geochemistry?

I will probably think the same in some years, but for now, I would like to say that "you can't do it alone." Be open to learn and receive support from your supervisors, the lab staff, and everybody else working around you and with you. Also, building a career feels like you are always projecting to the future, but do not forget the present. Enjoy the experiment that turns out amazing and the one that fails, treasure the resources you have right now even if little. Be authentic. I know science feels like a place filled with methods to follow, but you can still be you.

One more thing, science is also about service. In everything you do, always consider how you are helping others with that. Ah, and though this is a word we seldom write in our papers, trust! Trusting is great.

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.