

Early career researcher spotlight

Dr. Yuhan Rao

Dr. Yuhan Rao is a new member of the AIMES scientific steering committee. His current research focuses on leveraging advanced statistical learning techniques to create high-quality climate datasets with multisource data, including satellite products, in situ observations, and model simulations. Dr. Rao has actively served on a number of national and international committees including the Executive Committee for the Young Earth System Scientists (YESS) to strengthen early-career networking in the interdisciplinary field of Earth system science. In this new role on the AIMES SSC, he will continue to support and connect early career researchers in AIMES' activities and promote open science initiatives.

Where did you grow up?

I grew up in southern China and moved to Beijing for college. In 2014, I moved to Maryland for my Ph.D. and currently work and live in the Blue Ridge Mountains in North Carolina.

What was your path to your current position and area of research?

My career path has been nonlinear and by luck so far. I studied statistics and applied math during college, as a rebellion against my parents who have wanted me to study economics. During college, I was active in campus environmental conservation groups and was involved with various NGOs. I even attended an international youth conference organized by the UN Environmental Programme in 2010. These extracurricular activities also occurred at the time when I was exploring what I should do with my degree in statistics. Fortunately, a guest lecture on satellite remote sensing by Prof. Jin Chen, who later became my master's thesis advisor, led me to explore how I could apply my data analytical skills to satellite data for environmental research. Since then, my research has focused on using statistical models and satellite observations to monitor environmental change. My dissertation research examined how to combine satellite-based temperature estimates and in situ measurements to improve temperature data quality for regional and local climate studies. As a Research Scientist at North Carolina Institute for Climate Studies, my

current research leverages satellite climate data records and in situ climate data to quantify climate impacts on both the ecosystem and the society.

What is a challenge you had to overcome to get to where you are now?

I had an existential crisis during graduate school when I was buried in thinking about model accuracy and other technical aspects of my research. I started to question who else would care about my research and what is the meaning of research beyond publications. This crisis moment was challenging at that time, but it forced me to remove myself from my research, explore different opportunities, and reflect on my research and impact identity. Just like we need to recalibrate satellite data every now and then, we also need to recalibrate ourselves to align our experiences and research. I was fortunate to discover resources from universities, professional societies, and many mentors including my graduate school friends.

Who or what has inspired your research the most?

I was fortunate to have a robust network of collaborators and mentors that guided my research. One of the most significant events during my research path was my exposure to open data and open science, particularly through the fellowship with [Earth Science Information Partners \(ESIP\)](#). ESIP is a community of Earth science data professionals who are dedicated to promoting the use and value of Earth



Dr. Yuhan Rao exploring a state park in Georgia.

science information. I met many of my friends, colleagues, and mentors through ESIP. ESIP is critical to helping me shape my research identity and pursue a career path in Earth science data.

What has been the most significant moment in your career?

Without sounding like I'm repeating myself, ESIP has been critical in my current career path. When I first joined ESIP, I was scared by some technical terms that I was not familiar with, such as ontology and data stewardship. But members of the ESIP community's passion for open data and their inclusiveness made me feel welcome and want to contribute. I was deeply honored when I received the Catalyst Award from ESIP in 2020. The most recent theme of ESIP – ["Opening Doors to](#)

[Open Science](#)” – makes me excited about being part of the community and contributing my knowledge.

You have done a lot in your career to build and support early-career scientific networks – what are some of the accomplishments you’ve achieved? And what are some additional areas within the Earth system science community that could be better served?

As a member of various early-career networks, I am always excited to support early career researchers (ECRs) in developing their networks and professional skills. We have organized workshops and events through AGU, WCRP, and YESS. Since the beginning of the pandemic, networking and professional development have become even harder because of the lack of opportunities. YESS has been actively thinking about how we can provide a platform for ECRs to find what they need. We explored virtual coffee hours for different regions, hosted webinar series with international research projects, and implemented member-suggested learning activities on machine learning. These activities have been very successful, but we still have a long way to go in supporting ECRs when we explore the new normal caused by the pandemic. [YESS’s 2020 survey](#) suggested that we need to provide equitable support to all ECRs from different regions and with different backgrounds, which requires strong and sustained institutional support.

What future endeavors are ahead that excite you?

I am very excited about the movement of open science in Earth system science and other disciplines, like FAIR principles and the [Year of Open Science](#) that was just announced by the White House, which includes initiatives like [NASA’s Transform to Open Science \(TOPS\) mission](#). Also, I look forward to contributing to the convergence between Earth system science and data science. I am a member of the team supporting the emerging NOAA Center for AI and other collaborative efforts. Lastly, the Earth system science community’s increased awareness and focus on societal impacts and equity inspires me to imagine a sustainable and equitable future. In my personal view, these three endeavors are different pillars of solution-driven science that we need to tackle some of the most challenging issues. Open science enables broad and equitable participation of solution-driven science; data science builds on the open Earth science data and open source tools to develop solutions; societal impacts and equity guides the ethical and responsible development and use of solution-driven science.

What advice would you give to an early career researcher based on important lessons you have learned?

Embrace the unknowns and be flexible are my pocket advice for

every ECR. I took an improv course for science communication during my last semester in grad school. The guiding principles of improv – “Yes, and…” – applies to research, career, and personal life. It’s important to have a plan but don’t say no too quickly to other acts (either good or seemingly bad) that are not in the original plan. Failed attempts and other “curve balls” are inevitable and maybe that’s why it’s called “re-research”. When these happen, remember to keep the final target in mind and adjust your plan or maybe redefine your final target if necessary. These failed attempts or curve balls are all useful experiences (maybe not immediately) in the future.

What do you like to do outside of your scientific work?

My college experience with environmental conservation NGOs shaped me as a person. I enjoy all terrestrial outdoor activities, like hiking, camping, and climbing. Living in the mountains gives me easy access to good hiking options after work every day. I am also an amateur birder and bird bander who enjoy bird watching in the Blue Ridge Mountains during weekends. Volunteering with community groups, such as food banks and local parks, is my other form of relaxation outside of research. □



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