Transcript for Maria Molina, Assistant Professor in the Department of Atmospheric and Oceanic Science at the University of Maryland

Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond

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Kelly Savoie:

Hello, Clear Skies Ahead listeners. This is Kelly Savoie and I'm hoping you can take a moment of your time to rate and review our show wherever you listen to podcasts. We have produced over 60 episodes and you can help us reach even more individuals that will benefit from the diverse experiences shared by our guests. Thanks so much for listening, and I hope you enjoy this new episode.

Welcome to the American Meteorological Society's podcast series, Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond. I'm Kelly Savoie and I'm here with Matt Moll and we'll be your hosts. We're excited to give you the opportunity to step into the shoes of an expert working in weather, water, and climate sciences.

Matt Moll:

We're happy to introduce today's guest, Maria Molina, assistant professor in the Department of Atmospheric and Oceanic Science at the University of Maryland. Welcome, Maria, and thanks so much for joining us today.

Maria Molina:

Thank you so much for having me. I'm looking forward to spending some time with you both.

Kelly Savoie:

Maria, could you tell us a little bit about what sparked your interest in meteorology and how it influenced your educational path?

Maria Molina:

Yes. So, I became interested in meteorology at a pretty young age, when I was five years old. At that time, I was living in south Florida. And this was way back in 1992 when Hurricane Andrew, which was rated Category 5 hurricane, made landfall in South Florida. So, that was a really significant event in my life as a child that really sparked that initial interest in extreme weather events. And at the time, I recall very little, I was very young, so there are very few memories. But a couple of things that I remember was my parents not really knowing what to expect with that danger.

I also remember some of that night where there were some really strong winds and you can hear the howl and other strange sounds. My parents remember windows shattering from some of our neighbors' apartments. And so, this was an experience that made me interested in being able to communicate the science of weather and also to be able to warn the public when any extreme weather events were going to potentially occur. And so because of that, I ended up pursuing a bachelor of science degree in meteorology at Florida State University and became a broadcast meteorologist for about six to seven or eight years.

During that time, I wanted to study storms a bit deeper, right? So, I realized that while I was really fulfilled in the sense of going to my job every week and getting to warn the public and create forecasts and...I was fulfilled in terms of the science communication side, but I felt that I really wanted to dig deeper and build an understanding on storms and do some research. And so I ended up going back to graduate school and that prompted some research on severe convective storms, became obsessed with being a research scientist, and then was very fortunate to get a post-doctoral fellowship to work at the National Center for Atmospheric Research in Boulder, Colorado.

Stayed there for a few years as a project scientist continuing to do research and this time picking up some data science skills and machine learning and applying them to other questions within the domains of climate and weather. And that eventually led me to this path where I am now as an assistant professor at the University of Maryland in College Park. And I've been here for about eight months, so I'm still relatively new.

Kelly Savoie:

So Maria, going back to when you had that initial interest in meteorology, you said it was a very young age. So, you know, fast-forward to high school where, you know, you're preparing to figure out what you want to do in college, did you know that there was a major in meteorology or atmospheric sciences? Did you have any mentors or anyone who helped you along the way?

Maria Molina:

That's right. So very important question because I was researching schools that had four-year programs and that meteorology was a possible major. So I was looking for schools and at that time I knew that Florida State was an in-state school that offered the meteorology major. There was a high school teacher who was an alumni from Florida State, so I was able to talk to her about her general experiences in Tallahassee, Florida and what attending school there was like. And also, Florida offered a scholarship program for Florida residents that wanted to stay in-state.

So it was like this coalescence of opportunities that really led me and encouraged me to pursue this path at Florida State. And to be 100% transparent as well, I actually did have moments where I wondered if I might pursue a different major. That was initially. So when I started at Florida State University, I was quite interested in chemistry and I wasn't sure if I wanted to be a chemist instead. So that was something that was kind of lingering there in the back of my mind.

Fortunately, meteorology and the atmospheric sciences has a lot of chemistry as well. So you can still pursue that if that is, for example, someone's interest here, that's listening, maybe they really like chemistry. And so just so you know, you do have specialties in atmospheric science where you can dig deeper. There was a time as well during high school that I thought I might want to try to pursue a career as an astronaut, which is obviously-

Kelly Savoie:

Haven't we all?

Matt Moll:

Yeah.

Maria Molina:

Right.

Kelly Savoie:

That is so cool.

Maria Molina:

Being a Floridian and, you know, growing up only a few hours away from NASA Kennedy Space Center, so I was really inspired by scientists that worked there. But no, I ended up sticking with meteorology and that led me on this path that has brought me to where I am today.

Matt Moll:

What type of opportunities did you pursue both inside of school and outside of school that were beneficial to you securing a job in your profession right now?

Maria Molina:

That's right. So, when I was in middle school, I was researching high school programs. So there are several, like magnet school programs, that offer you an opportunity to kind of start specializing in a certain path. And I ended up not pursuing that track because I wasn't aware of any programs that offered you a specialization in meteorology at that stage. But I did start taking advanced placement courses knowing that they could potentially give me credit for a, you know, four-year degree.

So that was where I was able to get some experience with advanced placement calculus, advanced placement physics, advanced placement chemistry, and so on. And that kind of reinforced or confirmed my interest in a STEM degree, and a STEM career. So that was kind of me testing the waters at that stage and just confirming with myself that this was a viable path.

Kelly Savoie:

When you were in college, did you participate in any internships or did...you know, because you mentioned something about being interested in broadcast meteorology at first. So did you try out different sectors?

Maria Molina:

Yes, great question. I pursued several internship programs during the summer semesters. So I was a broadcast meteorology intern at WAVY-TV in Portsmouth, Virginia. And so I got experience with shadowing several meteorologists that were on television. And so I got to observe them, put together a forecast, look at models, put together their graphics, and then, you know, create their slideshow that they would use for their segments and working in that day. And I got to learn a little bit about the differences between a morning TV show and what an evening TV show would be like, right, in terms of news coverage.

And I then also pursued, during the next summer, a television internship in South Florida. This was in Miramar, Florida, which is really serving the Miami, South Florida television market working at Telemundo and NBC. So NBC 6 and Telemundo in that television market are based in the same building. I am of Hispanic and Latinx origins, and I'm bilingual, I speak Spanish, so that actually offered me an opportunity to work in a building where I was exposed to Spanish television and also English television.

And then finally, another experience I had as an undergraduate was on the research side. So I did pursue an honors thesis at Florida State. This is a certain track that an undergraduate student can take. And so I completed about two years of undergraduate research working on tropical meteorology with a professor

that very kindly took me under his wing and helped train me a bit on research. So that was another experience that stuck with me because I did really enjoy the research.

But I wasn't clear on what a pathway forward looked like in a career in research, like what does it mean to be a research scientist? But I was more sure, or at least at that time clear, as to what the pathway forward looked like for a broadcast meteorology, and what the steps that I needed to take were. So that was, again, another experience that probably had a pretty significant impact on my life.

Kelly Savoie:

So you,you know, started as a broadcast meteorologist, and I'm assuming that after doing that for several years, you did learn more about what the path would be to do research. So, when – at what point – were you thinking, "Oh, I really enjoyed the research path and I'm going to give it a go." Was there a certain turning point in your career where that happened?

Maria Molina:

There is. I was pursuing a master's degree in a program called Climate and Society at Columbia University. So I was a broadcast meteorologist at that time working in New York City for the Fox News Channel. And I had been working on television for about two years or so when I started that grad program. And I knew I wanted to dig deeper and ask questions, but I was pretty scared to take that leap into grad school. So I was like, "There's no way I'm leaving my career as a broadcast meteorologist and taking this risk." So I ended up doing both for a couple of years.

Folks at Columbia and I had a chat about, you know, my fear and they were very flexible and allowed me to do the program part-time. So I was able to just do about one or two courses a semester to try to balance that workload between being a broadcast meteorologist and going to graduate school. And so that enabled me to start testing the waters in a grad degree program. Then I found people that were working at that university researching topics that I was interested in. Then I was paired up with them. And so this is a couple of years in.

I'm starting to work with them, they're mentoring me, they're showing me how you would go about conducting a research project. Through that relationship, I was able to see what their job looked like as a research scientist working at Lamont, which is affiliated with Columbia. So that was really that path. And I would say by the time I completed my master's degree, which was, you know, about three years that it took me, again taking courses part-time and a bit slower, then I was like, "I know I-

Kelly Savoie:

You were hooked.

Maria Molina:

I was, yeah, all about the research and ready. But it's scary. It's really, really scary taking a leap and changing a career path. I will say my parents were concerned. They were like, "Are you sure you want to leave a career in broadcast meteorology to go back to school?" They thought they were done with their child that went off to school and got a job and was off working already. But anyway, you know, you take a risk.

Kelly Savoie:

Yeah, you did it the right way though. You did it slowly just to give yourself the confidence that you needed to know that it was the right decision. So it worked out well. That was a great idea actually.

Maria Molina:

Thanks. If I knew it was going to turn out well, I would have been not as anxious for so many years. But I was pretty scared. Even once I was in my PhD program and, you know, you're deep into textbooks and coding and going through the peer review process, which can be slow, so yeah, lots of time in there to doubt yourself. But it all worked out. So.

Kelly Savoie:

Right. But you could also always go back to broadcast meteorology. You probably said that to yourself, "I could always go back and get a job in broadcast meteorology if I find that this isn't going to work out for me."

Maria Molina:

Yeah. I will just say, I give a lot of props to my fellow broadcast meteorologist because it is so hard to get a good,you know, a good job that you're happy in and in a city that you want to live in. So I will say, I love New York City. So leaving that, it was quite scary. Yeah. So, I don't know if I thought that maybe I could always go back to a job in broadcast meteorology, just knowing how competitive it is. And I think that's probably what made me anxious because I was like, "I don't know if I can just that easily jump back in." But anyway, that's just how it goes.

Matt Moll:

Could you walk us through...what's a typical day like on the job as an assistant professor in the Department of Atmospheric and Oceanic Science at University of Maryland?

Maria Molina:

Yes. So, I am in my first year, and as a first-year faculty, I've been very fortunate that they have allowed me to kind of slowly warm up to the position, meaning that I am not teaching at this moment. So I don't have to carve time out of my day to generate lesson plans or to go to class or office hours. So that is a component of my job that is pretty significant and I can't really share at this time because I'm not there yet. But at this time, I do have a research group. So we have two PhD students working in my group, and a few undergraduate students.

So my job entails having chats with them, mentoring them, guiding a research project. So putting together a couple of questions that they are interested in and talking about what the necessary steps are to try to answer that question. Right, so like, what are the statistical or mathematical methods that we're going to need to ask this question? What are the data sets that we need to use? What would be an appropriate sample size to actually answer that question robustly? And so that is, to me, that is the most fun part of my job. I've only been here for about eight months, but my students are just so bright and so...They're just go-getters.

And so I have already, just in the short time, already seen them grow and develop their skills and come quite a long way. So I'm excited to see where they end up and in their careers as we move forward in the next few years. But otherwise, other components of my job entails writing proposals to try to get research funding and also conducting my own independent-led research, which entails doing a lot of coding, writing, looking up data sets. And it's a pretty iterative process, right? So, Initially, I thought one would create a figure for a paper and that was it, that's the figure.

So I used to spend all this time creating a figure and then I quickly learned that actually, just like writing is an iterative process where you have to edit quite a bit, so are figures, so are results. So everything is

just, again, iterative and just a draft. And so I've learned to become comfortable with the very big contrast between a career in broadcast meteorology where things are on a short deadline... When it's done, it's done, right? That was your segment for the 6:00 PM newscast and there's no more segments for that 6:00 PM newscast until the next day.

Whereas in research, again, everything's a draft, everything gets edited, and it's really until the paper is out there and the final copy and the final version that it's out. And even then you can still submit edits and updates. So again, it's just very different careers, very different timelines.

Kelly Savoie:

So, you mentioned…I was going to ask you what you like most about your job. It sounds like you like mentoring students and helping them along with their research. So I'll ask you the opposite. What have you found to be the most challenging at your position?

Maria Molina:

I will say the most challenging sometimes can be the long deadlines. Right? For example, if I am working on a project...you know, when you're starting off a project, you're so excited, you're putting these new questions, these new...everything's new. And it could be a year or two before that project is done. And even when it's done, then you still have new questions that emerged as a result of this project. So it's never really being done. But then that part is also kind of exciting because it just shows that you're creating knowledge, and as a result, you're asking new questions that followed on and built on that past work.

Matt Moll:

So I want to ask a little bit more about the research that you're doing at the University of Maryland. I know it focuses on data science for climate extremes. Can you talk a little bit about that research and what are some of the findings that you've been uncovering?

Maria Molina:

Yeah, so we have a very broad focus. We generally look at time scales on climate and weather scales. So sometimes it can be very long processes or phenomena that have very long lifespans. So for example, the El Niño-Southern Oscillation. So one, El Niño can last about a year or so. And then weather extremes. So one of my students is working on tropical cyclones. So again, a very broad domain. But really focusing on the idea that we can use data science tools that are being developed in industry.

So like, for example, machine learning, neural networks, they've come quite a long way in just the past decade and still have computational resources that have really empowered us to ask questions in new ways, and use new tools that are exciting and take in lots of big data. So that's really where we work and specialize in. So for example, some of the projects that we have ongoing include work being done by a PhD student in my group named Girón Steven Perez Paraskevas. So he is from Columbia and he is working on sub-seasonal prediction of North American weather regimes using a convolution neural network.

So what he's doing is he's taking different components of the earth system, so the atmosphere, ocean, land, these processes...hey have processes that vary on different time scales. So then he takes variables from those different components of the earth system and predicts what these weather regimes will be like in me coming to through about eight weeks in the future. He has actually found already that there is quite a bit of skill that he can generate from using a convolution neural network and he's focusing on

identifying the sources of predictability within these different or system components. So that's been quite fun.

And another student is working on tropical cyclone genesis, so how are tropical cyclones born? And what we're learning is that different basins around the world have different mechanisms or environments that perhaps matter more for that local region and can influence genesis. So we can have different types of genesis. So that's what he's generally working on right now and he's focusing on building upon past work. While both Girón and Alvin, my other PhD student, are building upon past work. And I think that's something that is important to emphasize, that as scientists, we're not working in a vacuum.

There's centuries of research and advances that have occurred, and so the fun part is getting to, like that saying goes, stand on the shoulders of giants. So we get to continue to contribute to this body of research and knowledge and hopefully make a positive contribution.

Kelly Savoie:

Wow! It sounds like it's so much...I'm like, "Where would you start?" You know? Is it mostly just lots of research through...like you said, looking at past research that's done, or do you ever get to do field work, or is it more you're just at the university and it's a lot of computer work and library work?

Maria Molina:

Yeah. So there are some professors that work with field work, right? So they have tools and machines and let's say radars that they take out on the field and get to sample storms in real time or so on. But my research does not do that. Right, so I am on another side of things where I really just focus on using computers. And so our big tool are supercomputers. So for example, we like to use the machines at the National Center for Atmospheric Research, so the Cheyenne and Casper supercomputers.

And very soon we'll be having a new supercomputer that's going to go online named Derecho. We also have machines here at the University of Maryland within the University of Maryland Institute for Advanced Computer Studies. So those are our tools. So oftentimes we don't even get to ever see them because they may not be based where we are physically based. We're logging in online. But they are very powerful and are our tool to interrogate data and extract knowledge. So thank you to all the scientists out there who go out to the field and get data.

Kelly Savoie:

It sounds so interesting. Now that you're established in your career, what advice do you have for students wishing to pursue research opportunities when they graduate?

Maria Molina:

Yeah. So I will say that, again, for me as an undergraduate student, I just did not understand what a career looked like as a research scientist. So I would encourage students to ask their professors that are around them. So they might traditionally see their professors in a classroom, but it's possible or highly likely that they are working on research outside of the classroom and outside of that very specific scheduled time that they get to see them. So ask them, "What do you work on? What do you research?" Or, "What did you do for your grad school work?"

And ask them, "What does a career as a research scientist look like?" Or even just generally doing research, "What are the different pathways?" Right, so, I'm a professor and that is one possible career where you could conduct research. But you could be working in the private industry conducting research. You could be working at NASA, for example. It's not just astronauts, they also do Earth science

here. And we have our neighbor, NASA Goddard, in the College Park, Maryland area. Actually, they're in Greenbelt but still like our neighbor. Yeah, so just ask questions and be curious and, yeah, see if you can uncover what different career paths look like.

Kelly Savoie:

And at the universities, do professors sometimes list research opportunities so that graduate students or even undergraduate students are able to, you know, have one place to look online and be like, "Oh, this is interesting."? Is there ever a call for students to help with research?

Maria Molina:

You know, I wish that there was a more, like, standardized way where there is like one website that everyone can go on, see all of the opportunities. But I don't believe we have that. If we do, I would greatly appreciate it if someone could let me know. My understanding is, you know, being connected on the AMS community, being connected on social media platforms, being connected, or on listservs throughout your university, so oftentimes, these are the ways that we disseminate opportunities. And these could include different pathways.

Like, for example, NOAA has the Hollings Program, the National Weather Service has numerous offices around where you can ask if they would accept summer interns. So we actually have a graduate student here that will be volunteering with the National Weather Service this upcoming summer. And these are ways, again, to get some experience as a researcher during your undergraduate years. And there's other really big programs at various universities that are also very popular, like the Research Experiences for Undergraduates, so REUs. So I would encourage, again, students to try to use the internet to uncover these sources. But it would be really great if we could have one place where we all go and find these postings.

Kelly Savoie:

That would be perfect.

Matt Moll:

So you've worked as a bilingual meteorologist for a number of years. Could you tell us a little bit about some of the best ways that you would communicate weather and climate to varied audiences?

Maria Molina:

Yes. So I am bilingual where...actually because my mom forced me to speak Spanish growing up and even into high school. So I would go to school, speak English, go home, only Spanish. My mom would not reply to me if I did not speak Spanish. So that was a way to keep both languages alive for me. But I would say as far as on a professional level, yeah, it was a bit challenging to kind of figure out what are the words or ways that I will describe this weather phenomena or this forecast in Spanish.

And oftentimes, I would go on YouTube or I would watch the Spanish news to get examples as far as like how folks disseminate this information. But one of the big challenges that we are becoming more and more aware of, thanks to research by social scientists and other meteorologists and so on that are actually focusing on this sector of research, is that there are often not...like, there's no like perfect translation at times for certain weather phenomena or certain climate information. Unfortunately, we do have many different dialects in Spanish.

Right, so it's trying to find the word that is most common or that is more standard. And unfortunately, that does take away some of the uniqueness. Perhaps, let's say I am Nicaraguan and we have our own words that we use that may not be understood by other locations or other places. But it's important to try to communicate and all be on the same page when it comes to extreme weather anyway, right? So it's a bit of a challenge and just takes a lot of practice like everything.

One thing that I did when I started out was I kind of built a library, a list of terms that are commonly used. Right, like, how am I going to describe “light” rain? How do I describe “a shower”? This is a “tabasco,” in Spanish. So having that list and those common words that you would refer to available somewhere just to be able to keep track of them and, I don't know, just bring them...they're likely somewhere in your brain, but try to like, bring them forward, and easier to access on a short notice.

Kelly Savoie:

Yeah, that definitely sounds like a challenge. We recently translated our certified broadcast meteorologist exam into Spanish, and we did run into that a few times. We had a lot of volunteers. And like you said, there's lots of different dialects and there's lots of different terms. And it was a bit challenging, but we did what you did and we just tried to find the terms that would be the most obvious to the most people. So, I hear where you're coming from there. So, for professional development opportunities, what do you pursue now to keep current in the field?

Maria Molina:

Great question. For professional development opportunities, I make sure to keep an eye out for workshops. So often, the National Center for Atmospheric Research has these summer tutorials or workshops where there are learning opportunities. And those are great to sign up for to try to keep up or be current with skills, or even running certain numerical models that are commonly used for research. Maybe I want to try to use one of them for my research projects and so I like to sign up and attend those tutorials and learn directly from the experts that maintain those specific models.

Also, at the AMS annual meetings, there are tutorials and those are extremely useful. And we have experts from around the world altogether in one place and offering these training opportunities. I would also encourage students to keep up to date in that way. I guess not just students, but it can be anyone in the field really that wants to update their skillset. Something that's really exciting now is that a lot of us are using Python language or Python software. So, what's great about this is that it's open source, and you can go online and freely access a lot of software, a lot of tutorials, a lot of example notebooks that you could potentially run on your own machines or your own laptops.

So that is something else that I encourage folks to do, right. And perhaps the examples available online are not with data that you would use yourself, but it is a starting point to understand the concepts and see how that particular technique or method would be applied with code and getting to run it and troubleshoot and stuff like that. So I will say that is another big source of information.

Matt Moll:

Well, we're so grateful for everything you've told us about your career. However, before you go, we always like to ask our guests one last fun question at the end of our show. So, what is your favorite hobby?

Maria Molina:

My favorite hobby is skiing. I did not know how to ski. I grew up in South Florida and there are no mountains there as far as I'm aware. And so when I moved to Colorado for my postdoctoral fellowship, I

was like, "Wow! These are real mountains." The Colorado Rockies are amazing. Ended up doing a little mini ski school and learned how to ski. I would say I'm not a good skier, at all. I mean, I can manage and I manage to make it up to a black hill, which is a challenging one.

Kelly Savoie:

Well, you must be pretty good because those black diamonds are tough.

Maria Molina:

It depends who you ask. If you ask a professional skier, they would be criticizing my technique all day. But it's so fun, right? To be able to do something to disconnect, to not think about our jobs, not think about anything in the world except trying to stay alive on this mountain, going down the hill, it is quite fun. And just being outdoors, and the entire culture, and just being in the mountains, it's really fun. So that is my favorite hobby.

Kelly Savoie:

And so have you skied on the West Coast and on the East Coast? Because it's different. I've never skied on the West Coast. I heard the snow is fluffy and it's powder and it's great. Then when you ski on the East Coast, lots of times it's like a sheet of ice and it's really tough to ski. So have you done both?

Maria Molina:

No, I have been only a skier in Colorado. So I have been to very few limited places. I did go to Copper Mountain a lot because that was like the one place I just really loved being, maybe because I learned there, so now it has a special place in my heart. But no, I will say I am not an experienced skier at all. So like, when conditions change...Like, someone describes snow one day that I was skiing with that's like mashed potatoes or...I was like, "This is really difficult to ski." I'm like, "Suddenly I don't know how to ski again." But no, but fluffy snow sounds fun. So, maybe West Coast would be a fun holiday.

Kelly Savoie:

You should try skiing in New England. It can be challenging though because it's not fluffy, usually. It's very slick. But it would be a challenge and just be prepared. You might not want to go on the black diamond right away until you get used to the change. I am dying to go skiing in Colorado because I want that opposite. I want the mashed potatoes, you know, I think it sounds great.

Maria Molina:

Yeah. I am not one to push myself. So I am a very hesitant black diamond skier, only on the ones that I know I can do. And that happened because probably someone pushed me to go on and then I realized I could do it. But no, I'm very happy on the greens. I can have a great time on the bunny slope. No big deal.

Kelly Savoie:

Yep, me too.

Maria Molina:

Yeah. And yeah, I would just encourage folks to try to find a hobby that can help you disconnect and just have fun. Yeah. Skiing, because I'm not good at it, it's just fun. I know there's no pressure to perform well, it's just a day outdoors and with friends.

Kelly Savoie:

Well, thanks so much for joining us, Maria, and sharing your work experiences with us.

Maria Molina:

Thank you so much. And I will also share that I do have a dog named Cumulus, Maltese. So I guess another big hobby of mine is hanging out with my dog.

Kelly Savoie:

So cute. I love the name.

Maria Molina:

Thank you so much for taking the time to spend today with me.

Matt Moll:

Absolutely. Well, that's our show for today. Please join us next time, rain or shine.

Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond, is a podcast by the American Meteorological Society. Our show is edited by Peter Trepke. Technical direction is provided by Peter Killilea. Our theme music is composed and performed by Steve Savoie, and the show is hosted by Matt Moll and Kelly Savoie. You can learn more about the show online at www.ametsoc.org/clearskies. And you can contact us at Skypodcast@ametsoc.org if you have any feedback or would like to become a future guest.