

## **Transcript of “Jake Carstens, Graduate Research Assistant at Florida State University in Tallahassee”**

Clear Skies Ahead: Conversations about Careers in Meteorology and Beyond

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### **Kelly Savoie:**

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 Rex Herbst-Horner 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.

### **Rex Herbst-Horner:**

We're happy to introduce today's guest, Jake Carstens, a Graduate Research Assistant at Florida State University in Tallahassee. Welcome, Jake. Thanks very much for joining us.

### **Jake Carstens:**

Thanks for having me, Rex and Kelly. I've really enjoyed following along with the podcast as you guys have been producing these over the last few months. And I think it's especially great because as I was coming into school, I really didn't have an idea as to the wide variety of careers that were out there in meteorology and something like this really can enlighten young peoples to all the opportunities that are out there. So really do appreciate it on behalf of all of them.

### **Kelly:**

Well, it's great to have you. So, Jake, what got you interested in meteorology and how did it influence your educational path?

### **Jake:**

Yeah, so I think my story, like many in our field, comes from a young age. Albeit mine wasn't necessarily a personal experience, it was more of a recollection of memories from past generations in my family, where, as a child, I've always been afraid of thunderstorms and had this respect for the power of weather. But what really set me down the path was learning about this whole tornado outbreak that happened in my hometown of Oakland, Illinois, back in 1967, this included an F4 tornado that pretty much went straight through the center of town, it hit the high school that I would've gone to and learning about those different stories from my family members that were living there at the time really took that to the next level for me. And then I moved to Florida and really started to become exposed to tropical cyclones, which is what I've been studying now.

### **Jake:**

And at first I didn't really have a storm that really sent me down that path, but as I was in college Hurricane Hermine hit Florida in September of 2016 and it was the first time a hurricane had made landfall in the State of Florida in eleven years. And myself and a group of about a dozen other students here at FSU actually went into the studio in our meteorology building and did live TV coverage until we lost power. And seeing the impacts that it had in the Tallahassee area, which is really the strongest

storm we had around here in about thirty years, that's really what convinced me that tropical cyclones is going to be the way to go for me. Just seeing what a category one storm could do and really gaining—again—a respect for the destructive potential that weather can sometimes bring and trying to obviously contribute to our efforts to better forecast and communicate.

**Kelly:**

Definitely exciting, but scary at the same time, for sure.

**Jake:**

Yeah, no doubt about that.

**Rex:**

So, Jake, did you move to Florida to go to school here?

**Jake:**

No, actually. I moved to Florida when I was 14 years old. My family got a job down in South Florida, so we moved from suburban Chicago down there and I basically been there since the start of high school. And then came up to Tallahassee in 2014 to study meteorology.

**Rex:**

And how did you find out that Florida State was the place you wanted to study meteorology compared to the other fifty-odd states in the country?

**Jake:**

Yeah. Well, first of all, in-state tuition is great, that's obviously a motivating factor.

**Kelly:**

Yes, it is.

**Jake:**

And FSU had the largest program in the state that offered meteorology. Because I didn't really realize this until I was a couple of years into high school was just how small and compact of a field it was, where not many schools in the Southeast really offered the major as a whole. I really thought that I could go pretty much anywhere for school and be able to study meteorology, but yeah, that really helped to narrow down my interests really quickly. And then as I started to experience life in Florida and really start to feel things like sea breeze convection, and experienced the peripheral impacts of tropical cyclones, that's where studying meteorology in Florida and continuing to be in the state really started to feel more appealing to me.

**Rex:**

So were you able to find any opportunities in high school, either in class choice or anything extracurricular or going into while you were at Florida State? Were there any opportunities there that felt beneficial to helping you figure out what job you wanted in your profession of meteorology?

**Jake:**

Yeah. So I think, when I was in high school, honestly, I think I could've done a little bit more to really start to get involved in the field a little bit sooner. And one of those was to learn about AMS local chapters, for example, and getting involved with groups like that in the area, or people that had similar interests as me. Ironically enough, I actually did a summer school class in Illinois when I was in elementary school that was basically all about weather and took place for only about three to four weeks, but of course, we finished it up by watching *Twister*, as many of us do from a young age, that was the first chance I had to really get a classroom experience with it. But as I've come to progress through school, I've really learned just how receptive many of the professionals are in meteorology to taking young students under their wing.

**Jake:**

And I guess I'm jumping a little bit ahead to one of the questions you threw at me for later, but as a high school student, I wish I would have reached out to the National Weather Service in Miami, for example, and maybe tried to shadow. For example, when I was an undergraduate student, I was here over Thanksgiving and I had nothing to do and I reached out to one of the forecasters of the Tallahassee WFO [Weather Forecast Office] and she responded saying, "Come here, sit with us for a few hours and you can launch the radiosonde. And that was a really cool experience and really made me feel welcome. And I think that there are so many people out there in this field that prioritize that and are more than happy to help people that are just trying to explore their interests and getting involved in opportunities like that. So yeah, those opportunities were there, I didn't take advantage of them as much as I maybe should have, but it's great to know that those are out there now.

**Kelly:**

So now you're a Graduate Research Assistant, so for our listeners who might not be familiar with the path to get that position, tell us a little bit about how you became a Graduate Research Assistant and what you do as one.

**Jake:**

Yeah. So it's basically a fancy term for going to grad school. So as a graduate student, my number one job is to conduct research while taking some advanced level courses. And a lot of my early time in graduate school—I'm in my fourth year total now—involved a little bit more of coursework and going beyond some of the things you take as an undergraduate meteorology major. But I think one of the important points to consider when you're considering graduate school is the fact that it can really help you out no matter what career path you're considering. For me, I've been interested in going down the academia route for a while and ultimately becoming a professor and working to teach and mentor young meteorology students, and that's really been motivating me for the last several years. But going to graduate school can enhance your resume if you're applying for a job like the National Weather Service, as well as just teaching you a lot more of the nitty gritty about how weather works, for example.

**Jake:**

And it can even just help you figure out what you want to do, if you're through your undergraduate experience and maybe aren't quite sure yet. And it gives you an opportunity to contribute directly to the science that you're trying to study, which I think is a very rewarding aspect. And oftentimes it can be a bit of a grind in terms of going through peer review processes and everything else that can be frustrating

about the day-to-day experiences, like having your code not work or something as simple as that. But I think that those end results and knowing that the work that you put in is going towards that bigger purpose, which really goes for every sector of meteorology. But that really, I think, completed my justification for going to grad school, knowing that was the case.

**Kelly:**

So does a graduate research assistant, is that just part of grad school? Do you get a stipend for it? Anything like that?

**Jake:**

Yeah. So I think that's another thing that when I was going into college for the first time I wasn't aware of, is that most meteorology grad schools out there, yeah, you do get a stipend, you do get paid. Whether that be as a teaching assistant, where you basically help to teach and grade for various classes, or if you have this project you're working on with a professor from the get-go and are in the position that I am, where you're classified as a research assistant and your number one job is to basically, yeah, just do research. You don't necessarily have to pay an arm and a leg to go to grad school, like you would with many other fields, which I think is something that when I learned that I, once again became much more interested in going to grad school. Because now that's something that can oftentimes scare people off, in terms of having to take out student loans and all that kind of stuff. Most schools, yeah, they'll pay your way through it.

**Kelly:**

So is it as easy as just going to your advisor and saying, you'd like to do that, or is there an application process to be a graduate research assistant?

**Jake:**

Yeah. So just like applying to an undergraduate school, yes, you have to go through an application and admissions process, but it's a little bit different than it would be when you're applying to undergraduate institutions. And that mainly stems from the idea that, yes, it's not necessarily that you're applying to a particular school anymore, it's more that you're applying to work with a particular professor or set of professors on a particular research project. And oftentimes they'll have grants from various agencies like NASA or NOAA or the National Science Foundation, for example, that will fund them to do a particular project over the span of maybe three to five years. And that's where a lot of the research assistant opportunities come from. And these will repopulate as the years go by, and different students complete these projects and these different proposals essentially evolve over time.

**Jake:**

And ultimately, it's a first bit of advice for people considering grad school is to really start to reach out early to this professors that you would consider working with and try to make that impression and just introduce yourself, even if you're a sophomore or junior in college. Because it shows that you're really interested in furthering your own education, helping them to advance the science and really just showing that motivation to learn more. And I think that that can be an intimidating experience at first, but just like how I talked about with the different resources I would have had in South Florida, that's most of what a professor's job is, is mentoring these students and helping them to become their own independent researchers. So of course, they're going to be open to having those conversations with students and really starting to give them a better idea of what's out there for them.

**Rex:**

So it sounds like you really like being in this environment, you feel it is the right place for you, you like the real world application of your science in addition to what the benefit is for your own education. But let's go past that. Talk a little bit more about in your words, what do you like most about your job at the moment or your life in meteorology at the moment?

**Jake:**

While I've transitioned back to research starting this summer and going through the rest of my PhD, which I'll finish up next year, I actually had a chance to teach a class, which was a really exciting experience. Not necessarily just to be a teaching assistant and help grade papers and things like that, but to actually lead the class, it was a weather analysis and forecasting class at FSU that was composed of sophomores and juniors. And while it was an entirely virtual class, given the pandemic, which obviously took away some of the personal face-to-face components of it, I think that was the most rewarding experience that I've had in school so far. Because I've always been interested in going down that route and I think that that class in particular was a big influence on me when I took it as an undergrad, because first of all, it was a class in synoptic meteorology that basically was what you thought meteorology would be like when you went to college for it.

**Jake:**

Maybe you didn't think that there was going to be a whole lot of multivariate calculus and Navier-Stokes equations and all that kind of stuff that's essential to really build an understanding of the weather. But in terms of doing surface frontal analysis and those kinds of things, forecasting or learning about models and how they help forecast tropical cyclones and things like that. That was really influential when I took it and I wanted to take that opportunity to really empower the students that were in my class because I know oftentimes that meteorology can be a rigorous major that does involve a pretty hefty load of math and physics. And I know sometimes that students can be discouraged by that and that it can be scary when they'll see a post on Twitter or something like that. And it'll be like, "Oh, you think you can understand meteorology, here's the QG Omega Equation behind me."

**Jake:**

I think going at that from a different perspective and learning really how to communicate those kinds of concepts from visual perspectives, from the mathematical side of things, from pretty much every way that a student can learn and reminding students that, sure these equations might have 20 terms in them, but you have the ability to understand what that means because you're passionate about the science. That passion and the support of your peers and your instructors like me can really help you get to the mountain top and achieve those goals that you're looking for. And I think the students were pretty receptive to that, which is really good. I wanted to really try to give them as much encouragement as I could, especially given how difficult it was to really stay engaged in this virtual learning environment that we've gotten accustomed to over the last year and how hard it's been to really stay focused and remind yourself of just how cool the science is.

**Kelly:**

It's just such an amazing opportunity that you had and also an amazing opportunity for the students because you sound very passionate about it and I'm sure you were an excellent instructor. And that's experience you can use on a resume, so I think that's excellent. So what are the biggest challenges then, on the flip side?

**Jake:**

Going back to the research role a little bit, there's a lot of pitfalls you can run into. And I guess this is going to be a tip number two or three or not really sure, I guess the second one that I formally introduced, computer programming can be a real trip sometimes. I would encourage students that are interested in going down a research path or really even no matter what sector you want to go into, it's a useful tool and many programs require taking some kind of course in programming, but try to pick up some language. Even in many high schools will offer computer programming classes just to get yourself introduced to how these different programming languages work and how you can use them to help plot, visualize and understand scientific data. I've learned in my time, I've been exposed to programming for close to seven years now, and I find myself learning something new every day and really the same goes for meteorology as a whole, I'm always learning something new about the weather.

**Jake:**

And so on top of the issues that we can always have and code not working or having difficulties processing different meteorological data sets and things like that, you can always run into issues with computing networks that might come up at random times. For example, we have our own high-performance computing cluster here at FSU, and sometimes they have to go for maintenance. So at a time where maybe you're in a bit of a crunch to, I don't know, run a simulation or do something that requires a lot of computing power and you're not able to do that for maybe a couple of days at a time. So it throws you off of your rhythm a little bit. Those kinds of pitfalls can come up frequently. In addition, just at the very beginning, balancing out your coursework with getting involved in the research environments and everything like that. Yeah. It can be a lot to balance from time to time and as you have deadlines coming up for writing papers and things like that.

**Jake:**

And I think something that's, I need to remind myself of frequently is that, yeah, it's okay to step away for half a day or a day or two, if things are feeling a little bit overwhelming for you, that's normal in the graduate school environment, that's normal as an undergraduate students, no matter what your major is. And it's also normal if you're working in some kind of operational setting, for example, a high stress or high impact weather event, which I think AMS has done a really good job over the last couple of years in really helping to advance the mental health conversation in meteorology, especially from this perspective of these high impact weather events that folks at the National Weather Service will have to work through and things like that. And learning about those different resources that are available on campus to you.

**Jake:**

And again, just knowing when, or prioritizing your own wellbeing and just taking a day from time to time to be like, okay, I'm just going to go play a round the golf or something like that. It's a hobby of mine that I like to do, when I feel stressed out about things. So I think just for me, I have trouble oftentimes telling myself that that's okay, I've gotten myself into a bit of a workaholic state of mind, but consider this me holding myself accountable.

**Kelly:**

So I guess some good advice would be not to procrastinate much because you never know when that system is going to go down.

**Jake:**

Yeah. Just try to make some progress every day, anything is good.

**Rex:**

So Jake, could you tell us a little bit about some of the research that you've been working on and why it's interesting to you and why it's interesting to the community?

**Jake:**

My work mostly deals with these idealized high resolution simulations. So I don't really work with observations all that much, I basically just let weather happen in a bubble and see how things evolve from there. And my work in particular relates to tropical convection, so just looking at general thunderstorm activity and how that can interact with its surrounding environment and organize without any other kind of forcing mechanisms or any other disturbances like an easterly wave or some other kind of tropical disturbance that you might see out there. And what my master's thesis focused on was actually getting hurricanes to spin up from randomly distributed tropical convection, which was a very aesthetically pleasing project and movies that I got to make were a lot of fun to watch. But it was really cool to boil things down to their most simplistic level and ask, "Okay, if we just let these clouds and this thunderstorms operate on their own free will, how do they actually want to go about organizing and forming that hurricane?"

**Jake:**

And we found a couple of different pathways by which that could happen just based on how much rotation we put in our model. So simulating the latitude that this is all happening at. One of the things that really motivated the start of that project was my advisor, Alison Wing, here at FSU. She had some old simulation stashed away that she made while she was a grad student and hadn't really done anything with them. And this one simulation that she gave me as a means to just practice my programming and making sure I'm plotting things correctly and everything, was basically the simulation where yeah, we're just blowing up all these thunderstorms all over the place. And the rotation that we put in the model was basically the same as if we were sitting on the one degree latitude line. So basically, right on the equator where the Coriolis force is almost equal to zero, you don't really get hurricanes there. Think the closest to the equator we've ever gotten a tropical cyclone is 1.4° latitude, which was somewhere in the West, North Pacific in 2001 or something along those lines.

**Jake:**

And I let it run for tens of days, it took a long time, but it actually spun up a tropical storm, which we found fascinating because we've never really shown before that that's possible and that can be done from randomness. So as I've worked through time, I've evolved my work a little bit from looking at how hurricanes form to just the actual processes of how this convection organizes and looking at basically how it interacts with moisture and radiation and circulation patterns and things like that that can basically be self-generated. So it's something you're probably not going to see on a real earth because there's always something else going on to force things to happen, but those kinds of processes can help to accelerate how hurricanes form or intensify, for example. And I think it's important to really complete our understanding and therefore improve our forecasts or climate projections and everything along those lines to really get that basic understanding as best as we can.

**Rex:**

Looking back on yourself as a freshman, do the concepts you're thinking of now feel like they are [evolved] the amount of time in years—as far as your understanding has built up to this point. So if you were to go back to your freshman self and explain what you're working on now, where would you track how this problem you're trying to solve relates to your original understanding of the field? Does that make sense?

**Jake:**

Yeah, I think I have grown up a lot since day one in 2014. Yeah. I came into school always having an interest in the weather, but never really knowing, not really knowing much. I knew what cold fronts were, I knew what ridges were, all those kinds of things, but I think there's actually a really impressive group of people that I've seen on social media and stuff like that that are high school weather enthusiasts. And they're out here talking about vorticity advection and the really nitty-gritty physics of tropical cyclones and how they work and things like that. And I'm like, how do you people know this stuff? You're like sixteen, that's so impressive. And yeah, I wasn't like that. I think it's been a steady progression where I really, I think learned a lot, my senior year of my undergraduate experience, where at FSU, we have our so-called big three, which is basically our advanced dynamics and physics and synoptic meteorology and stuff like that. And that really helped to kind of tie everything together.

**Jake:**

And I think that's where that coincided with the timing that I knew I really wanted to study hurricanes and work with that as a career going forward. And I think that's also around the time that I really started to have that passion to go beyond the classroom. And I think that's where I've really learned a lot is from just waking up at eight o'clock on a Tuesday and not having class necessarily, but I'll go on to TropicalTidbits.com and then I'll go look at how the GFS [Global Forecast System] is going to evolve this random wave out near the African coast and see if that develops, trying to go the extra mile and connect those different dots together, I think has been really important. And another thing that's been really good in terms of learning weather beyond the classroom that I wanted to give a shout out to was our television show, FSU Weather, which I never saw myself getting involved in broadcasting one bit as a student.

**Jake:**

People always told me when I was high school, "Oh, you're going to be on TV." And my response is always, "Oh, there's other things I can do with this, I'm not going to go on TV," but I gave it a shot when I was a sophomore here and I found it really enjoyable. And I also found it to be a great way to really understand how these different things were going on. And this goes in line with what I was saying, going back to when I was teaching the class is through, a TV show like that, which is entirely student produced. And students made all the graphics and we're the ones that are on air and everything like that. That really helped me to really learn this stuff because it really is an exciting challenge to be able to communicate these different concepts to a wide variety of different audiences.

**Jake:**

And being able to step outside of a room that's filled with other meteorology majors, who I can speak on a similar technical wavelength to, and translating this stuff to a generalized audience, I think was a really important tool that helped me both to become a better communicator and teacher and also to just

really understand things to their most basic levels. So I think those different experiences were instrumental in helping me build up from there, but I've come a long way. I was not good, seven years ago.

**Kelly:**

I was going to say, you're a very good communicator. And that is definitely a way to really learn something is to be able to explain it to someone who doesn't really know the concepts and to explain it well. It just proves that you have a very good understanding of it. So by communicating to others and explaining things to the public or someone who might not know much about the science is definitely really good practice. So Jake, you had given us a little bit of information about some of the things that you thought you could have done differently in your career as a student and beyond. What are some of the other do's and don'ts that you might be able to offer to student listeners or job seekers who are interested in getting jobs in meteorology?

**Jake:**

Yeah. So I mean, the number one do that I've already highlighted before is just don't be afraid to reach out to people. Again, I'm still intimidated to go knock on a professor's door that I've never really talked to before, but that's the point, that's why we're here, this is a community. And I think the meteorology community is honestly a special one in that there really is so much support that can be offered to these younger generations of scientists. And this is exactly the kind of group that we should be giving this attention to because it really is an important time in our field and this is the group that's coming up that's really going to spearhead this whole thing going forward. So whether you're a high school student that has a National Weather Service office in the general area, feel free to just drop them a DM on Twitter or send an email or something along those lines and ask, "Can I shadow? Can I just take a tour of the office? Or can you just send me more information about such and such weather phenomenon?" Or anything along those lines.

**Jake:**

And I think that you're going to get a lot of useful feedback and you're also going to get a professional connection to start from, no matter what your interest is, whether you're interested in going on to television, your local broadcast meteorologists, good chance they're going to be happy to talk to you. And the other big thing going off of what I said about programming is something I wish I would have done a little bit as a college student is just try to learn one thing every day. I think in the summer between my freshman and sophomore year, I stepped away from school for a little while and that was a good thing to do. I enjoyed my summer at home and I was able to relax a little bit, start to get ready for some of the more rigorous coursework I was going to be taking. But again, it could be as simple as just going and looking at a satellite loop for five minutes and seeing if there's just something that you can get out of that, and you can absorb that will help you to be a better meteorologist and a better communicator.

**Jake:**

And another thing I really like about this younger generation that I've seen on Twitter and things like that is just how open they are to having these scientific discussions with people and the ways that they will visualize this data. And something I've tried to do on my own social media accounts is to bring that to people by, I'll post a satellite loop of a tropical cyclone, but I'll just go ahead and label some different features on there and just point some arrows to different stuff that I find either cool or could provide a

little bit of extra information or could help people learn. I think that those kinds of things will just build up over time and by the time you're done in school, you're going to know a lot and you're going to be prepared for whatever job setting you go into. So I think those two things would be the main things I try to get across. Don't be afraid to talk to literally anybody and just try to learn at least one new thing every day.

**Rex:**

Great, Jake, it's really wonderful to hear your passion here, your outgoing nature towards the weather community. And I'm sure that others will listen and be able to take that in and let that inspire them. Before we end the podcast, we're going to get a look at the person behind the meteorologist a little bit more and ask you another question that's non-meteorological, let us know what your favorite band or musician is. And then our audience can know that, "Hey, it's not all about the weather, even if that's your passion."

**Jake:**

So I'm glad you guys gave me this option because those that know me would have no idea, but I'm actually a total headbanger. It's wavered over the years, but the band that's really caught my ear, I guess recently is actually a Danish rock band called Volbeat, which I saw in concert four years ago, they were opening up for Metallica. I went with my dad, yeah, this was the summer after I had graduated with my bachelor's degree. And yeah, I don't know, I just find rock music really empowering. And that's always been my thing since middle school, but I've seen pretty much all across the spectrum of rock concerts, I've seen everything from Metallica, to Paramore, to John Mayer and pretty much everything in between. So yeah, not necessarily the expected answer I think that many would get from me, but that's it.

**Kelly:**

Have you ever heard of Rammstein?

**Jake:**

Yes.

**Kelly:**

It's a German rock band. They're pretty cool. I heard them recently, that's probably right up your alley, right?

**Jake:**

Oh, yeah.

**Rex:**

I think there's a little fun connection between some metal music and meteorology or other sciences in that I think metal music can sometimes be mathematical in a way that some, maybe classic rock or more top 40 rock is not and that there's more interesting syncopation's, they're sometimes fitting in more notes per bar and more overlapping patterns of 16th notes, 32nd notes. And so I think for those of you that find an interest in the equations and the complexity of meteorological processes, I think metal

music has some of that in it too. And that it's layered and complex and fitting in a lot of musical and sonic information.

**Jake:**

If you don't mind, I'm just going to go ahead and steal that justification for every time I ever talk about this stuff with people, because that was awesome.

**Rex:**

Sure thing. Well, enjoy your next opportunity to see a band in concert and thank you so much.

**Kelly:**

Thanks so much for joining us and sharing your work experience with us. It's been a pleasure.

**Jake:**

Thanks for having me.

**Rex:**

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

**CREDITS:**

Clear Skies Ahead: Conversations about Careers in Meteorology and Beyond is a podcast by the American Meteorological Society. Our show is produced by Brandon Crose and edited by Peter Trepke. Our theme music is composed and performed by Steve Savoie and the show is hosted by Rex Horner and Kelly Savoie. You can learn more about the show online at [www.ametsoc.org/clearskies](http://www.ametsoc.org/clearskies) and can contact us at [skypodcast@ametsoc.org](mailto:skypodcast@ametsoc.org) if you have any feedback or if you would like to become a future guest.