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 Horner. We're excited to give you the opportunity to step into the shoes of an expert working in weather, water and climate sciences.

Rex Horner:

We're happy to introduce today's guest, Javier Fochesatto, Professor and Chair of the Department of Atmospheric Sciences at the University of Alaska in Fairbanks. Welcome, Javier. Thank you so much for joining us.

Javier Fochesatto:

Thank you for having me in this interview, thanks.

Kelly:

Javier, could you tell us a little bit about your educational background and what sparked your interest in atmospheric science?

Javier:

Okay yes. So actually my first career is engineering, electrical engineering that I studied in Buenos Aires. But my enthusiasm comes from physics and engineering. So basically at the end of my career, I mean I was always fascinated about optics and about lasers. So and because of that, once I finished, I started working as a scientist in laser engineering and developing what everybody knows as LiDARs, which is optical remote sensing systems. So after a couple of years that I worked as a scientist in Buenos Aires, I started communicating with the scientists in France and I imagine this is where the time that I started to look at one specific subject within the atmosphere. That subject was one of the most complicated as it is turbulence and atmospheric boundary layers.

Javier:

There I was at the very beginning with this background in physics and engineering and trying to make a signature within the studies of boundary layer meteorology. That's why I went to France to study and to do my PhD in Laboratoire de Météorologie Dynamique in Ecole Polytechnique in France. So at that point, I transformed myself from being an engineer and a scientist into producing or thinking about meteorology and the science that comes with it.

Kelly:

So did you find that the coursework you took for engineering transferred over well when you were pursuing your PhD, or did you find that you were at a bit of a disadvantage with some of the atmospheric science courses?

Javier:

No, because I was a true STEM integrator. In order to make atmospheric sciences successful, you have to know physics. You have to have a little bit of love for applied mathematics. Well you can do most, because most of the result is like having instruments everywhere, or you can do experiments as I do and develop experiments or develop instrument to do experiments. So there is the engineering part. Also,

you may say well you did these studies in Argentina then moved to France, but the point here is that you have to have physics and mathematical background. Those can be obtained anywhere basically. So when a student think about what is what you're going to learn in a PhD, this is not about just about physics and mathematics. You may have to learn something else like some special mathematics that you may need to solve the problem that you are investigating.

Javier:

But the main thing that you have to learn is about how to do research, how to ask yourself good scientific questions, and obviously how to solve those. For that, you need a good background of physics and mathematics. No advisor will tell you that or will teach you that.

Rex:

So Javier, for you personally, once you knew that you wanted to focus on atmospheric boundary layers, what opportunities did you pursue while you were in school that you knew would be beneficial to finding a job in this specific field or finding the next career step that would allow you to pursue this interest further?

Javier:

Well the atmospheric boundary layer has this complexity of flows and tools and dynamics and thermodynamics that is fascinating. First, you have to be fascinated about what you do, and that is an entanglement between yourself and the subject. This has to happen, so you have to marry that, and this marriage is forever, if I'm allowed. But the point here is that then I have to imagine myself and after France I have to turn back to Argentina, and this is what I wanted to do basically, but that was the year 2001 and 2002 which was a catastrophic economic crisis and political problems. So it was very difficult to do research under those conditions. But the questions you ask about how the boundary layer actually is, I mean the boundary layer is actually very important for at this moment for two main elements, one is air quality, and the other is wind energy.

Rex:

Both extremely valuable in society.

Javier:

Exactly, as we move forward and coping with climate change and things like that. So the point here is that sometimes you have to realize that the little thing that you want to study probably is not in the focus of the main agencies, but with a little bit of an extra thought, you turn around and then you can do air quality and at the same time do and advance the fundamentals that you are looking for. So this is something that I learned coming to the U.S. because in other countries like in Canada or in France or in Argentina, there is more acceptance I will say in the organizations to be more fundamental.

Kelly:

So what was your first job in the field, and how did you end up all the way in Alaska?

Javier:

So my first job actually was after doing electrical engineering. So I started working in laser physics and laser engineering, and then developing new lasers to actually apply to develop LiDAR remote sensing

systems, for example for Doppler wave LiDARs or differential absorption LiDARs for ozone in the troposphere. After accepting four or five years working in laser engineering, I moved into LiDARs. I started developing with my colleagues obviously the first backscatter LiDAR for atmospheric studies in South America. Besides the one that was already in Manaus in Brazil that was basically for atmospheric studies. After that, I found myself that I needed to take a scientific subject, and that was the boundary layer — the one that I choose.

Javier:

Obviously as it comes along, LRS [Lidar Remote Sensing] and clouds once in a while I work on that as well. But the main subject is the boundary layer and applications. So the first time actually was after the studying engineering in the National Research Council in Argentina, and then after that, I moved to France, and then I came back to Buenos Aires for three years. After that, I took a post doctoral in the University of Waterloo in Ontario, Canada to work in chemical physics. There I developed a new instrument for aerosol chemical speciation. After that, I was ready to apply for a faculty position, and one of those positions that came out was in the UAF, in the University of Alaska Fairbanks. So if you wanted to know why, well because in pursuing your scientific objectives, you will have to conjugate life okay?

Javier:

So at one point, I found that one of the most critical elements to understand are the stable boundary layers, and the boundary layers with weak and sporadic turbulence which are the ones that we have here in this latitude. So and I think that is I was lucky enough to actually spot this area, and work for example now we are conducting an international experiment that is called ALPACA. That is the air pollution in the cold and the dark. Understanding the chemicals that are in particle matters and in the cold and the dark, but to understand that, and to understand the sources and how those chemicals get attached to those particles, there is a background understanding that needs to be done in terms of radiation turbulence and flow dynamics within the atmospheric boundary layer.

Javier:

So at the beginning I will say that my first job was about laser engineering, then after that I move into LiDARs, and then I concentrated in one scientific area.

Rex:

So for some folks Javier, here in Massachusetts, they find it quite intimidating just to move from the south shore of the state to the north shore of the state or vice versa. So you've mentioned living and working in different countries, and I'm curious and this question could be helpful for international students who are listening in, what is it like to move from country to country as you're pursuing your academic and professional career? What sort of steps did you have to go through along the way that maybe folks wouldn't think of or wouldn't anticipate?

Javier:

Well I mean like I said at the beginning, you have to have very clear scientific objectives. Sometimes those objectives sound like a dream, but you have to be able to put fire in those lanes. You have to have discipline. You have to work every day. You have to move the edge. So obviously I was very lucky to be educated in Argentina because it is a country where the national universities are free, and obviously lucky as well to be in France because it is a similar system, and again, like I said before, it wasn't I mean

the level of physics and mathematics — I had that. The thing that I wanted to learn is how to do research, and that is a key element in the life of a scientist.

Javier:

So and that element comes with interaction. You cannot leave your students alone. You have to interact with them. So research and the scientist get a forum and the interaction. With that interaction, nowadays and in order for the international student to be successful in our country, it is very important that we integrate in those discussions diversity and be in an inclusive atmosphere. A space to be wrong for example, this is something that we don't hear much, but enabling as a faculty enabling those spaces to students allow us to have them closer to us so that we can instill the science they need to receive. This is very important. But for international students I will say that if you think about what is the mathematics that would be different here or anywhere, not going to mention any university.

Javier:

It is known for 200 years, the physics are basically the same, at least to the undergrad level. The undergrad level is different. Then you need to if you will like to study a PhD in climate or in high latitude meteorology, probably you will have to come here, because here we're dealing every day with that.

Kelly:

Is it easier to get a work visa or to get a position in the US if you're in a STEM field? Did you have to apply for the position at the University of Alaska and then get a visa? How do international students, what types of paperwork and things do they need to do in order to get employed in the U.S.?

Javier:

I mean if we're talking about students that are coming to the country to do grad studies, MS or PhDs, the first thing that they have to do is to get in contact with the faculty. In general, the students fire out applications without even talking to the faculty. The most important thing is here the first step is to talk to the faculty, write emails, try to get in touch, see what they are doing and how what they are doing actually matches what you want to do. So and this is the first exercise that everybody has to do. After that, then you will have to apply. You have to send your paperwork, and the department will evaluate your credentials, and then one thing that I didn't know when I was in Argentina was that actually in the STEM field you can get paid to do the master's and the PhD. I really didn't know that, seriously.

Javier:

So I thought that I should have to move here and then pay by myself everything, but this was a time 92, 93, we didn't even have emails. Actually my first email was to my PhD advisor in France, so.

Rex:

The golden days before email.

Javier:

Before email yeah. We had only one computer in the whole center.

Rex:

I love it. On the flip side for your students at UAF who are from the states or local, do you encourage them to go elsewhere during their studies and their research abroad?

Javier:

Oh absolutely, yes absolutely. One of my functions is actually over time I teach also in undergrad in engineering, mechanical engineering and electrical engineering. So beside my normal courses in atmospheric sciences in graduate, absolutely. Basically, what I'm saying always is before finishing your BS or BA, you have to get experience. Basically here's the thing, there are four elements that I evaluate for any graduates, level of mathematics, level of physics, experience abroad because when you go out, when you go somewhere, you change. It's very difficult to change the place where you arrive as we all know. But you experience experiment, and you change, and this is very important for you. Then the number four is do you have experience of writing, writing papers because graduate school is hit running.

Javier:

Nobody will wait for you to see if you know how to write. Many of the failures in PhDs actually are that no they don't know how to write. So not that I fail anybody, but. that's normally the thing, so four elements. Being abroad is absolutely very important in all disciplines, actually very important, so I encourage that, stimulate that because at the end when you finish your career, your BS or BA, you are going to have just the — very simple — recommendation letter from your faculty entourage, but also one external. The one that comes from those summer research experiences or your semester abroad or thing like that. You need to recognize the good things that you have in your own campus, and also the ones that probably need to be improved.

Javier:

So that's why students have to be abroad. Also, the university knowledge cannot or should not be restricted to just a few faculty that teach. You need to come from those experiences, the diverse experience that a student can have as they go abroad.

Kelly:

Could you walk us through a typical day on job? You said you teach some courses and I'm assuming you do research. What's your day to day?

Javier:

So there is one book that I always recommend that is *How to Write a Lot*. That book is very serious and significantly important I will say because the thing that I do I write two hours. I take two hours of my day to write, papers, advance my papers, advance my proposals, but it's interesting because the author actually makes a picture, a photo of his desk, and in the desk there is only the computer, the chair and the desk, that's it, eventually the printer, no emails. So you have to concentrate at least two hours every day. That's the only one way that you keep fresh, accommodating your ideas, getting synthesizing the experiments, and into the science that you would like to convey.

Rex:

No chess board, no video games.

Javier:

No, no.

Rex:

No beach reads or fiction.

Javier:

No WhatsApp or anything.

Rex:

Just the important stuff.

Javier:

Here's the thing. In the STEM fields like it happens, you were saying Rex that you have four years of French. Well let me tell you, I had seven years of Latin and Greek classical education. So you can imagine that I transpire science and engineering how I was traveling, navigating those environments. But the point here is that I'm trying to say is that when we are so driven into STEM fields, we don't like much writing, analyzing text, the semantic, the morphology, and stuff. But actually, this is absolutely very important because there is no use for a great scientific idea if it cannot be expressed, and the connection between our mind and the actual papers this is an interface that we have to work every day. This is an art, and we have to have it.

Kelly:

How many courses do you teach in a semester?

Javier:

Only one course per semester.

Kelly:

So the rest is just your research and writing. That's good. You have a variety.

Javier:

At the beginning Kelly you ask about a day. The day started with two hours of writing that you have to do it in isolation because in my case, I have an open door policy, so also because I'm the chair, and so therefore students and faculty and colleagues, I have to be open and that's the way I like to do that. So at the time that I arrived in my office, I have done my writing. So that's why I'm coming in very happy every day.

Kelly:

You must get up early.

Javier:

Yes absolutely, five or six depending the day. But the point here is that some days we do experiments, and some other days we concentrate in the lab or in the offices like everybody. The experiments here

are very diverse. Normally for the research that I do which is surface turbulence and land surface atmosphere interactions, I do turbulence sensing with lasers, with sonic anemometers. So and then sometimes we go to arctic tundra basins. Sometimes we develop instrumentation in the arboreal forest. In some other cases, we have to go to glaciers which are challenging and very dangerous as well. So it's fascinating I mean because also you get to interchange with glaciologists, with geoscientists and a very diverse community where you are an atmospheric scientist, and you bring your knowledge of the flows and the radiation, and it's so interesting.

Javier:

We have so much for atmospheric sciences in terms of all the other disciplines and building those interactions that is really very, very important. I think that this is the very good time to actually be an atmospheric scientist and meteorologist.

Kelly:

Yes, it sounds like you really love what you do.

Javier:

Well like I said, you have to love what you do.

Rex:

You're married to it.

Kelly:

Yes.

Rex:

You have no choice. Javier, I'm definitely interested to hear more about what it's like to do research in the arctic and the sub arctic regions. It's certainly an extreme climate, an extreme environment. You said you've been there how many months or days have you spent in the arctic, and for someone that's considering doing research there, what would you do either warn them or encourage them to do?

Javier:

Yeah well I mean safety is one of the most important tasks that we have to be fully aware not only in the winter, but also in the summer. So at the temperatures we experience here in the subarctic and even in the arctic in the winter, you have to prepare the experiments in a way that you cannot for example use tape for example because at 40 below, the tape will break apart. So you have to have everything prepared so that you can deploy in a short amount of times for example. The use of gloves for example is one of those, but sometimes you have to take the gloves off to-

Rex:

Protect the extremities.

Javier:

Yeah, yeah but sometimes you have to take the gloves out to set up the instruments and things, and then one of the big mistakes is to leave the gloves out at 40 below because immediately they will freeze up.

Kelly:

Oh cold.

Javier:

Yeah so then what you do is you open your jacket, you put your gloves inside your jacket and close it up, and then you do your work, okay, and then whenever you're done, so you can have the gloves warm you see? So in the summer for example, we do deployments in bear country okay? So therefore, everybody has to be trained to operate a shotgun, and normally what I do is I go with the students and I do the policeman while the students are yeah doing the programming the instruments or operating the instruments so that because if you have to work because I've been alone doing those things okay? It's very stressing the fact that you are head down, operating an instrument or programming an instrument. You might have some problems in the neighborhood.

Kelly:

An unwelcome visitor?

Javier:

Yeah.

Kelly:

Have you ever had to use the shotgun? Have you ever encountered a bear where you actually thought you might need to use it?

Javier:

No, no. Actually this summer we were entering with one of my glaciologists, a colleague actually from the university. We were walking towards the Kennicott Glacier down in the Alaska ranges, and across the bridge I saw this a grizzly. So but immediately the bear moved away, and it was interesting because it was a bear that was a young one. So the young bears in a sense tried to mingle with everybody. So sometimes it's dangerous, yeah.

Rex:

They're more playful.

Javier:

Yes.

Kelly:

Right.

Rex:

Like all kids, they just want to have fun.

Javier:

Yes exactly. In a level that it's a little difficult to follow.

Kelly:

So what do you like most about your job? If you had to pick one thing that you enjoyed more than others, would it be teaching, would it be the research? Would it be watching out for bears, the excitement of that?

Javier:

No, that is not really, but no, there are many things. Number one, I come to my classes so happy always seriously smiling, but this is not just an exercise. It's just the way it is because you are coming I know I mean I know that there are books around, but what these students need is my experiences beyond those books. That is something that I'm so willing to provide and listen to them, and interact and see how we can make a difference, how these environments are so different from the rest and yet so complicated. That's one activity that I really enjoy, and it's very important for me. In general, what I think that this is the excitement about atmospheric sciences and meteorology is — and especially in my case — about the fact that I do observations that are unique, and then I can at the time that I can build something that relates mathematics with the phenomenon that I am investigating, and then bring in a physical explanation that is where you have the excitation about doing atmospheric sciences.

Javier:

So being able to explain mathematically something that is a process in the atmosphere, and so this is one of the most interesting aspects that I enjoy very much.

Rex:

How long have you been the chair of your department?

Javier:

I started two years ago. Our department is only graduates, but we with the faculty in the department, we started developing the 400 level courses, and then immediately I and also looking at going back to what we were talking about, little countries and big countries well developed countries compared to small universities and large universities, the intermix between sciences and engineering is something that is fascinating. We created during these few years, we created several minors between atmospheric sciences and engineering and civil and environmental engineering across campuses in the University of Alaska system. Those minors are intended to reprofile and to provide engineering careers and also to provide newer skill sets to those engineering students.

Javier:

For example, when the students are doing environmental engineering, but they are required to investigate if you look at the landscape in the north actually, at the snow melting season, well everybody is wondering around where the ice will go, and where the water will go because for every day that you lose of operations, it's approximately 100,000 that you lose in the industry. So in order to move into

that, well the snow that is there accumulating and the ice comes from the atmosphere. So therefore, there is a need for the best engineering we can provide is the one where we can understand the atmosphere. But in addition to that, the technology that we bring in using satellite remote sensing for example iSA 2 for NASA, this is something that supersedes all the engineering methodology that we have had from before.

Javier:

From before many years ago, faculties were going to the arctic tundra to test what the snow depth was. Now we can do this for space. We can measure with the laser altimeters. I'm just saying that the science and technology we bring from atmospheric sciences can impact engineering in a way that is revolutionary. But in addition, a student that is in engineering here learn not only how to do things in the arctic but also everywhere because the satellites are global for example.

Rex:

I wanted to ask Javier what do you find are some of the largest challenges that you face either in your job personally or in the research or science community at large that you're looking forward to facing and finding a solution to over the next months or years?

Javier:

Well yeah well there are many, but I think that we are on a crossroad here in terms of increasing diversity and inclusion and equity. So there are many talented students that I've seen in all the programs. We have programs that are only to do, only to reach out native Alaskans and the represented communities that all around that go from Alaska to California. So for example we interact with the MESA program: Mathematic Engineer and Science Achievement. So we have community college students come in to do research with us, and it is amazing to see students that are extremely very well trained and capable with profound desires to follow a professional career. Those students need to have an opportunity, so probably by being in California beside very large universities, so not everybody has that opportunity.

Javier:

Yet, across the country we have opportunities for those students. So I think that there is a need to integrate those communities and provide this pathway for the students to provide, because there are people interested in studying and getting a profession. We just have to produce that. We have to be more empathic and sensitive and obviously since I speak Spanish, it is easy for me to interface with the communities, but I have students from France, from Germany, and they all are looking for I'm always saying, "Look, let's talk," because you may think that I will try to convince you to join our university, and this is true, however, my ultimate goal and the most important goal is for me is for you — the student — to find your path. If I can help on that, I will be absolutely happy, because that is the way in which a faculty in this country is about is to help those students to find their path, whether that path is in our university or in any university.

Javier:

It doesn't matter. The point is that we need to help the students to transition to find the objectives and to find a way through life. It's so sometimes frightening for people to think in their future and not knowing that actually the future is in their hands, in their power in itself, but still there is a need for those opportunities.

Kelly:

Javier, thank you so much for everything you've shared with us. Before we end the podcast though, we always ask our guest one last fun question, and I wanted to ask you since you received your PhD from a university in Paris, could you tell us about a favorite place you frequented while attending school there, a place that we must visit if we travel to Paris at some point?

Javier:

Every Saturday I used to go to the Café Latin in Paris. In downtown Paris, to take coffee and croissants. I've been sampling croissants all the way from Alaska to Asia.

Kelly:

So what is the name of it again, the café?

Javier:

Oh there are many. One of them the Two Magicians. Les Deux Magots. That's the one that is so interesting because you can sit there, and it's so amazing. Your ears will be filled with all the languages that you can ever imagine. It's incredible.

Kelly:

Wonderful.

Javier:

Yeah and obviously one of the best ones, with croissants and coffee.

Kelly:

That's a great tip. I will definitely visit there.

Rex:

I could tell you Javier that when I spend a little bit of time in Italy, the first thing I learned to say was how to ask for coffee and a croissant at a café, and that was pretty much the most important few words I ever learned.

Javier:

Oh yeah.

Rex:

Thank you so much for joining us. Thank you for sharing your work experiences with us.

Javier:

More than happy, anytime. It is very important that we can have an opportunity to talk to students and to the organization and so, and see how we can make it better for everybody.

Kelly:

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

Rex:

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, edited by Peter Trepke. Our theme music is composed and performed by Steve Savoie, and the show is hosted by **Rex** and **Kelly**. You can learn more about the show online at www.ametsoc.org/clearskies, and can contact us at skypodcast@ametsoc.org if you have any feedback or if you would like to become a future guest.