

Transcript for “Shawn Dahl, service coordinator at NOAA's Space Weather Prediction Center in Boulder, CO”

Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond

July 15, 2025

Kelly Savoie (00:00):

Hello, clear skies ahead listeners. This is Kelly Savoy 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 Savoy and I'm here with Emma Collins 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.

Emma Collins (00:49):

We're happy to introduce today's guest, Shawn Dahl, the service coordinator at NOAA's Space Weather Prediction Center in Boulder, Colorado. Welcome, Shawn. Thanks so much for joining us today.

Shawn Dahl (01:01):

Thank you, Emma. Thank you, Kelly. Glad to be here.

Kelly Savoie (01:03):

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

Shawn Dahl (01:09):

Yeah, sure, Kelly. It's an interesting path, an interesting beginning. So I grew up in Western North Dakota and between the wild terrain, the low population, the wildlife, the geology there, the meteorology that we experienced there, all those wild weather conditions in that part of state really got me interested in the science. I plus my dad had quite an influence on me just as a hobbyist in science. So there I started, and when I went to college, eventually it all came together as environmental science. So I was working on an environmental science degree, but while I was taking those college courses, I kept deviating from the main curriculum and found myself taking more physical science related classes like geomorphology and petrology and geology and these kinds of things. So my path was beginning to shift a little bit already, but in the end, I ended up leaving college early because of peer pressure from a friend who talked me into joining the Air Force because the college I was going to had an Air Force base right next to it and I thought, wow, maybe I can go in there and get into meteorology weather.

(02:14):

I didn't get into weather immediately. I got into the deep intelligence world. So my first assignment was West Berlin, west Germany when I was actually there when the wall came down. So that was quite the experience. So then I started getting interested in history. Then that led me to taking more college

classes. I'd already had a whole bunch of physical science classes for my two to three year stint at the university. But then I started working on a degree to be a teacher, especially in history. And once again, that shifted because one of my assignments in the Air Force, not only did I eventually become a weather forecaster in the Air Force, I cross-trained into that, but one of those assignments, I started hearing something about the solar observatories that the Air Force staffs, I couldn't believe. I was like, what a solar observatory, what goes on there? And come to find out that the United States Air Force has a little fleet of solar observatories that optically look at the sun and report on activity on the sun. They do sunspot drawings and they send information to their headquarters unit in the Air Force as well as right here at the Space Weather Prediction Center. So I got one of those assignments eventually for a four year stint on the island of Puerto Rico. That was really tough duty, right?

Kelly Savoie ([03:26](#)):

I know. Sounds good to me.

Shawn Dahl ([03:29](#)):

And there I went from there, I got into space weather even more, and it'd be in a forecaster in space weather for several more years. And then eventually what was supposed to be a four year Air Force career, 22 years later I retired from the Air Force, but kept working as in the meteorology side. And eventually 10 years ago, getting a side here to the space weather prediction sector. And the last thing I'll bring back up is the astronomy side of this and the weather side all come together. So my day job is looking at the sun as a space weather, the forecaster, even though we do shift work, so it could be a night job too. But my night hobby is astronomy and backyard telescopes and photography. And that really came along going all the way back to my hometown in North Dakota in a total solar eclipse in February of 1979. Went right over my hometown and that was an extraordinary experience to me, and that really got me interested in the astronomy side, and thus, that's my main path all the way here to doing what I do today.

Kelly Savoie ([04:24](#)):

Wow. So that is interesting. Now, when you were applying for colleges, did they just not have meteorology degrees or was environmental science just the school you wanted to go to? Where did you end up going? What university?

Shawn Dahl ([04:38](#)):

I went to mine, yeah, mine at state at the time in North Dakota. So not too far from my hometown, just a couple hours away. But that environmental science seemed like the best path for me to bring my interest in wildlife and in preservation and in sciences together. And I really seemed to lean that direction on that path. But as I mentioned, a lot of the classwork I started doing got me interested in other things. So I took these other classes that eventually got me kind of, I guess where I am today.

Kelly Savoie ([05:08](#)):

And your friend that twisted your arm, did they stay in the military as long as you did?

Shawn Dahl ([05:13](#)):

He did. He went longer than me. He came and stayed in almost 30 full years,

Kelly Savoie (05:17):

And he's like, oh, you can thank me later.

Shawn Dahl (05:20):

That's right. He did get beyond this path.

Kelly Savoie (05:22):

So I assume that you really liked being in the military or you wouldn't have stayed in there for so long. But was there ever a point in time where you're like, oh my gosh, I shouldn't have taken his advice and done something differently? Or were you happy on that path?

Shawn Dahl (05:36):

I was surprisingly quite happy in the beginning because when I got into the deep intelligence world, and by bad I'm talking the deep classified top secret code word type work that I was doing there in West Berlin really was fascinating. It was like living in a Tom Clancy novel, anybody who's familiar with Tom Clancy's stories, especially Red Storm Rising because of, I mean, you'd see a contra trail flying up overhead and you know that that's not a United States asset or ally asset. That's a MIG 25 Fox bat from the Soviet Union flying overhead. I mean, you're deep in that realm. So that was really fascinating work. But that underlying thing of wanting to get into weather that the Air Force does weather and has weather personnel kind of overwrote all that in the end, and I shifted and managed to get that career changed and it took off from there.

Emma Collins (06:30):

So were there any opportunities that stand out in your mind that you did pursue that you knew would be beneficial to getting those more weather based jobs?

Shawn Dahl (06:38):

Yeah, I think the weather experience I had in the Air Force, it's really mostly aviation meteorology, although you are doing some protection for the base, so you're doing regular base weather forecasting, but it's really about those TAFs and the writing that you're doing on 'em. And that was a lot of fun. I really enjoyed all that work when I first came in. It was back in the days when you'd actually have to physically go outside to take an observation and look at the sky note, the cloud type sling, a cyclometer, make sure the wick was wet with water and all these old things that we don't have to do anymore. But it was still a lot of fun and interesting. You had to put it all together. Now the computers and equipment do all that work for you, and it's really about the forecasting side of it.

(07:17):

But when I heard about these solar observatories, I really worked hard to try to get to one of those because it's a very limited career path. Very few people get to get in there and do it. But I managed to get in there, and that was so extremely fascinating and eye opening. I started understanding more about the sun and what it ultimately means here at and around our planet and how much we rely upon the technology today. So as I was continuing my Air Force path, I realized more and more that I think in the end, if I could do it somehow I wanted to work here at the Space Weather Prediction Center as a forecaster. It took a while. It was a long arduous path, right? You've heard about a lot of it, but hey, I eventually got there. I had to take some risks along the way, take some assignments that I maybe didn't

want some career paths after I retired from the Air Force that maybe I didn't want to do. But in the end it worked out, and I've been here 10 years now and I've even graduated, if you will, been promoted into the service coordinator position.

Kelly Savoie ([08:16](#)):

So speaking of that, what was your first job in the fields or what jobs were you in before you got the position that you're in today?

Shawn Dahl ([08:25](#)):

Exiting from the Air Force? When I retired, I first took a job as a lead forecaster at one of the bases in Illinois Scott Air Force Base. That one is a specialized weather center for forecasting for worldwide aviation meteorology, for all the transports and air refueling missions. So when I first got out of the Air Force in 2007, I went to work there at Scott Air Force Base. Man, it was busy because we were involved in the Afghanistan war, we were involved in the Iraq War. We had planes. We'd be forecasting the weather from Antarctica where planes are flying in or to do resupplies for the scientists there to desert forecasting with limited information out in the field in Afghanistan and Iraq to across the Atlantic and Pacific flights. I distinctly remember on that first gig for five years, a situation where a soldier was so injured from battle that they needed to fly him all the way from Germany to the mainland United States, and they couldn't experience any turbulence whatsoever. That's how bad shape that soldier was. So you can imagine the types of decisions and responsibility we had in that role trying to do that. It really brought it all home and what all that means.

Emma Collins ([09:44](#)):

Sorry, I'm just sitting with that for a second. That's a lot to think about. So for our listeners out there who aren't familiar with space weather, how would you define it? What are its main components?

Shawn Dahl ([09:54](#)):

Yes, I do this all the time. For all the core partners and interested parties in space weather, most simply stated, space weather is what's taking place in the sun, 93 million miles away in that huge vacuum of space between the Sun and the Earth. And ultimately here at and around our planet space, weather is composed of many different things, but there's three primary things that we focus on. It's all related to the NOAA space, weather scale, one through five scale, very similar to the hurricane scale. It focuses on solar flares and the impact that can have solar energetic particle events and the effects that that can have, and then geomagnetic storms and the broad range of impacts and effects that that can have here at and around our planet.

Kelly Savoie ([10:39](#)):

Geomagnetic storms, what is that exactly?

Shawn Dahl ([10:42](#)):

Yeah, yeah. And space weather. We have a lot of terms that sound scientists get made fun of all the time for having these crazy sounding terms. Well, in space weather, ours really sound crazy and they sound like they come right out of a science fiction novel.

Kelly Savoie ([10:55](#)):

Yeah, like a Marvel movie. It's like the Avengers.

Shawn Dahl ([10:59](#)):

Yeah, Earth is about to get impacted by a solar radiation storm. Oh my gosh, what does that mean for me? So yeah, geomagnetic Storm is one of these things, and that is the giant magnetic disturbance that happens here around earth because of our protective magnetic barrier. And that interaction from the sun's magnetic field that literally connects here with Earth during certain types of events and activity can drive those forces of energy into our outer atmosphere and induce currents here on the planet that are really of concern to some sectors, especially the power grid of the entire continent and around the world for that matter, because these currents can cause jolts of electricity in the form of direct current that don't belong there on an alternated current system. And that is why we warn and protect the power grid of this country. And that's just talking about geomagnetic storms alone.

Kelly Savoie ([11:52](#)):

So I'm going to skip to a question further down because I think it's a little more related to what we're talking about. In what ways can space weather disrupt or affect certain types of communications and technologies?

Shawn Dahl ([12:07](#)):

Yeah, lots of ways. I'm glad you have that question on here because that's really the heart of what we do in the National Weather Service. By the way, we at the Space Weatherproof Center are part of the National Weather Service under NOAA. We are one of the nine national centers out there, maybe growing to 10 national centers. But either way, it affects so many different things. So we're talking about the aviation industry having to divert flights impacts to communications between air traffic troling pilots, and I'll give you a nice example of what happened about a year and a half ago that almost brought aviation to a standstill across the domestic United States because of a space weather event, and you have energetic particles from the sun in the form of protons that can flood towards our planet and around it and affect satellites at those geosynchronous orbit levels.

([12:55](#)):

They can funnel into the polar regions and prevent certain types of communication from happening for days at a time. It can cause issues with astronaut health, which is why we are the supporting factor for NASA and the return to the moon for the Artemis two missions. In fact, we just did a two week scenario bringing in the whole industry field and NASA here together and went through some scenarios about what could happen during a radiation storm that would make the astronauts have to build a protective shelter to help shield themselves from that harmful particles that can penetrate human tissue to the geomagnetic storms, which can affect communications, especially in the realm of high frequency communications that can cause distortions in the ionosphere that cause signals to get delayed. So GPS signals will suddenly become inaccurate on a precision needs. I have a great example of that from the storm last May to include my own brother-in-law farmer in North Dakota who had to shut his tractor down.

([13:53](#)):

But we can talk about that later to the federal government and FEMA and the work we do with the emergency management community, and they're planning for in case there's one of those catastrophic space weather events that actually does collapse the power grid because it was so powerful. We know it

can happen. We've seen it happen in the past on smaller scales, and that's why we do what we do here is to warn and provide decision support to all these sectors and factors to include satellites trying to maintain orbit. The lower Earth orbiting satellites, the storm back in May, that ended up being the largest satellite migration in modern history because satellites were burning fuel at the same time to combat the changes in the outer atmosphere that they're flying orbiting through that make some slow down and then atmosphere will win the war and gravity will burn 'em up in the atmosphere. So they're burning fuel and nobody knows where anybody is as they're burning fuel. So collision avoidance has become a real thing, and that was the largest satellite migration in history until the storm we had in October several months later because there's more satellites that's now the largest satellite migration in history. So yeah, there's a lot going on that people probably aren't aware, but that's what we do here, is to provide that support to those sectors and the federal government so they understand what's going on and what the implications could be.

Kelly Savoie ([15:12](#)):

Well, that's so wild. I feel like this could be, you need to write a screenplay for the next disaster movie. I don't know if it's ever been one on that specifically. I mean, there's been disaster movies about meteorites and things like that, aliens, but not about actual, the stop in communication or how it affects everything else. I don't think a lot of people even know that. I didn't know

Shawn Dahl ([15:41](#)):

That. Yeah, a lot of people don't understand or realize that's why I've been making a big campaign in this role I have now with the press and media, all those broadcast meteorologists out there. I want 'em to understand what space weather is, what we do about it, what they should be checking on, because not only do their viewing audiences have an interest in seeing the Aurora or not as a story, but I want 'em to be able to talk about it in a meaningful way just like they do when they talk about a tornado warning that the weather service put out. They let their viewing audience know and they're a major core partner about keeping Americans safe. We do the same thing, but I want the broadcast meteorologist to do something similar. Not that anybody's life's going to be directly hurt by a space weather, a storm, but those farmers back in May, for instance, how great would it have been if the broadcast meteorology community was aware and savvy enough to talk about it, to tell their audiences, Hey, although these are here in Iowa or North Dakota, it's planting season, it's seed planting time for your crops, you may experience some GPS issues with your equipment, so don't attribute it to maintenance.

([16:43](#)):

There could very well be a geomagnetic storm implicating and affecting your systems. Wow. How valuable would that have been because that storm back in May proved to be well over a \$500 million loss to the precision agricultural industry. All those farmers.

Emma Collins ([16:59](#)):

Oh my gosh.

Shawn Dahl ([16:59](#)):

Because they were unable to operate their equipment, and that's how they do it today. They needed to be accurate within a centimeter and it's off by 12 feet. This is the first time in my life I ever received a storm report from a family member about a space where the storm, and it wasn't about seeing the Aurora, my brother-in-law called me from Western North Dakota that Friday night that the storm was

kicking into high gear back in May when we hit G5 conditions the top of our scale and said, what is going on? My tractor wasn't working today on the GPS. I had to shut it off and give up. It was taking me in circles. I couldn't turn in odd directions. It was taking me out in the middle of nothing. And I said, yeah, sorry, that's space weather. That's an effect we had from an event that's ongoing right now. And that bled over into the next day and even somewhat into the next day, even though the storm was over because the ionosphere was so dramatically changed in the molecules and electrons that are up there, but that still caused issues with the signals back and forth. So very, very impactful event. And that's just one example of how core partners like broadcast meteorologists or meteorologists in general can help get the message out there.

Kelly Savoie (18:09):

So how often do those types of things happen historically?

Shawn Dahl (18:14):

Yeah, they're very rare to get to that level of activity. The last time we experienced the top of our scale a G5, and mind you, that's just the top of the scale. Just like the hurricane scale, you can have a category five hurricane that's here, but a category five hurricane that is two times higher than if you could have seen me pointing my hand here up there. Same thing with this storm. The storm we had back in May, that's the first time we reached that category five of a geomagnetic storm, what we call extreme since the year 2003. So a long time two decades ago. They just don't happen that frequently. And we almost hit a G5 storm again back in October. We got on the high end of a G4, so they're kind of rare, and we're still in solar maximum right now as we're doing this podcast, and that means that we could still have some enhanced activity anytime this year, even into 2026.

Kelly Savoie (19:07):

So can you predict it in advance or you just don't know until it's happening?

Shawn Dahl (19:13):

Yeah, well, that's what we do as part of our forecast role. If anybody wants to be humbled in the world of meteorology because the models have gotten really good, we can predict a blizzard that's going to happen seven days out, maybe even 10 days now. But then as you get closer, you can refine it and get it more accurate, but you kind of already know what's going to happen and a space weather be prepared to be wrong many, many times because we just don't have the observation network that we have when it comes to meteorology, right? We're using a few spacecraft planted between the Earth and the Sun in that vast 93 million mile distance. So the few that we have, we bleed for every bit of information we can get. I mean, just Monday of this week we're looking at activity and we're thinking about, okay, we're probably going to get a G1 to G2 storm on day two or three of the forecast showed up on day one.

(20:03):

I mean, it's 24 hours off. We don't like that. But in space weather, that's actually not too bad because of that vast distance you're talking about here. But yeah, we predict all those main three things I talked about out to three days in advance and we put out watches for geomagnetic storm activity. We don't do it for solar flares or radiation storms because hey, we're in solar maxim. We basically have a watch out for months for a couple of years. So it doesn't serve a purpose. But we do ward when it comes to solar radiation storms as well as geomagnetic storms. So solar flares we do not put warnings out for because

we never know when it's imminent. We can predict the probability that they'll happen out to three days and how strong up the scale they have a chance of getting to. That's all good.

[\(20:46\)](#):

We do well at that, but we have no way of knowing that a solar flare is about to happen. So we don't do warnings for that. Instead, we send out something called alerts and we send out alerts for all of these things I've been talking about when we reach the condition. So watches are like normal means it's likely we do that out to three days in advance for geomagnetic storms. A warning means that it's imminent, we expect it to now happen. And we do that for radiation storms, which is related to the solar energetic particle events and the geomagnetic storms. And then we do the alerts for just the flares, but we send alerts out for all these things that each level that they meet on that scale, by the way.

Kelly Savoie [\(21:24\)](#):

Well, that is super cool, and I think most people are just so unfamiliar with what's happening with the sun and space weather and how it affects us.

Emma Collins [\(21:35\)](#):

That's really interesting. I think I only ever associated it with solar flares. I don't think I ever thought about the other aspects that it's going to mess with GPS

Shawn Dahl [\(21:44\)](#):

And what's fascinating as we sit here and talk today, space weather's been getting a lot of attention lately, and I think there's a lot of reasons for that. One is we've really upped our messaging game. We are out there sending out key messages, a lot of graphical updates. Maybe you've seen some of these that get picked up by the press and the media or show up on our webpage, and that's been hugely helpful in getting not only the users of our information, but the general public, more space weather savvy and aware. And we also had a total solar eclipse last year, and annular eclipse last year. There was this awesome comment, the Aurora shows that were magnificent, right? People were looking up at the sky and saying, what is going on out there? And finally, people are beginning to come to us. Even this morning before we do our podcast, I was answering questions from press and media, even some of the big national international level press media entities about, Hey, what about these solar flares? Last week, we're hearing that there was this radio communication issue out in Asia. Can you tell us about that? We never got those questions three or more years ago, but we're getting them now, and that's where they should be coming. They should be coming to us because we are the ones that are providing that support.

Kelly Savoie [\(22:52\)](#):

So this is a good segue. What is a typical day on the job for you as a space weather forecaster?

Shawn Dahl [\(23:00\)](#):

Yeah, it can range from anything from total boredom to the day that you wish you could leave early because it's so hectic and busy. We all as meteorologists in this field, anybody knows they have their bad days. The radar quits working or suddenly your main operating system to do forecasting and look at models is not working as well as it could be. We have those same kind of issues when it comes to space as well, probably even more so actually because of the complications to get information from a satellite that's 1 million miles from earth, for instance, and to make sure that's all right smoothly, we get it timely

enough. But yeah, right now today it's a pretty standard normal day in solar maximum. And there's not a lot happening at the moment, but there are sunspots of note in the sun and we're going throughout our normal day.

[\(23:49\)](#):

We have our scheduled routine products we put out just like any meteorologist at a weather service office or the forecast, the forecast discussion, we do those as well, but they're all space related and others scheduled products too. Suddenly something can show up in the solar wind out there that we were not expecting or anticipating. It's like, oh, what's going on? Now we suddenly have to shift gears. That's the complication of this business, right, is you're usually not caught unaware in terrestrial meteorology. You kind of know that a cold front's coming in or you kind of know that an outflow of boundaries are ready to pull your neighbor's trampoline into your yard. But in space weather, we get a lot of unknowns. They just suddenly show up and they're like, oh, maybe this was the filament eruption. I'm talking things people don't understand right now. That happened three days ago.

[\(24:38\)](#):

Maybe it was drifting along in the solar wind and we just didn't think it was going to hit earth and boom, it hits Earth. Things like that happen. So you can go from what you think is going to be a normal day and all of a sudden it gets a little bit busier. You're solving a puzzle, which is kind of fun really. Or you can be waiting for that CME. This is probably the hardest part of this job is what I'm going to tell you right now. The storm back in May. Let's use that as an example. The storm in May, we were very confident that we were going to get blasted by these things called coronal mass ejections. Here's another one of your science fiction words, right? CME for short. A coronal mass ejection is a blast of billions and tons of solar material, but more importantly, it contains energized particles from the sun as well as a very strong localized magnetic field.

[\(25:23\)](#):

And that localized magnetic field stretches all the way out to space and reaches earth ultimately if it's aimed towards us. So we saw at least seven of these CMEs that were all directed right towards Earth. I mean, it happened kind of just as the region that was responsible was near the center of the sun. It was pretty obvious they were going to hit earth. So we put out a G3 watch right in the middle that got upgraded to a G4 or greater watch. That's the top watch we put out. Do not do a G5 watch. And that was the first time we put something like that out since the year 2005. So almost as long as it took to get a G5 back in 2003, that level of confidence set a lot. And at that point, we started spinning up our decision support.

[\(26:06\)](#):

We upped our game. We started letting FEMA know. We started letting the government, the White House situation room, know they take interest when we started talking about the four and the five levels on that scale. But we upgrade to that watch, we start the messaging. I actually contacted the power grid of North America, what we call the North American Electrical Reliability Corporation or NERC for short, we call them. We have a hotline call that we have to make to them. This is mandated by the government when we get to a G three. So when we're talking about a strong geomagnetic storm, we warn the entire power grid of North America, all the southern Canadian provinces, all the 48 mainland United States. They're responsible, electrical reliability coordinators get on that phone call. There's about 20 that cover this vast area I just talked about. We call them when we're going to put a warning out for a G three or greater event and then an alert when we reach that level.

[\(27:02\)](#):

That's a very scripted phone call. We do that. There's a roll call after the roll call is done. It's like five minutes or less and we're done. It's not our time to ask questions. They can ask questions of us, but we provide scripted information. They take note of it, log in their logs, and they do any preventative measures they need to think they do. That's for a warning or alert. So the warning means it's imminent, right? 15 minutes to 45 minutes away, we see something hitting the solar wind. This time we didn't wait. I called up our contact in the power grid and I asked him, what do you think about doing this phone call? Now that now was Friday morning, about six hours before the CME arrived at the satellite, 1 million miles from Earth. So there's still no sign. It's all quiet in space.

[\(27:42\):](#)

And I instituted that phone call. He wanted it done. That call I told you is about five minutes after the road call. This one went on 20 minutes because it was an opportunity to tell them more information. I didn't have to follow the script. So okay, here's what's going to happen next. We're going to see the arrival at the spacecraft a million miles away. That's where we may put out this thing called the sudden impulse warning. The industry knows what that is. So they may see a sudden buildup of current on their systems that doesn't belong there. They know what's causing it. They don't have to go out and investigate and burn up manpower and equipment, right? They know what's causing it. They took measures for that storm. They got ready, things they couldn't do with 15 to 45 minutes of notice, with six hours, they could get huge transformers ready to take on loads that weren't having a load attributed to them.

[\(28:26\):](#)

So when voltage alarms, irregularities and overheating starts happening from these geomagnetically induced currents on their systems, they can deflect to these other things that they were able to get ready with all that lead time, they could get high voltage transmission lines ready that weren't freeing a full current of electricity ready to take on additional current. They did that stuff during that storm back in May because they were able to prepare. So the industry's success on the power grid side mostly successfully mitigated that storm. Yes, there were some high voltage capacitor trips during that storm, maybe some isolated power outages, but there was no bulk transmission failure that affected 25,000 or more people because they were able to successfully mitigate that storm. But that's us saying the hardest part of this job is you do all that. You do all that prep work, you warn that, and then you gotta wait and you got to wait and you keep watching the solar wind and say, I hope to goodness I'm correct that that's actually going to show up.

[\(29:25\):](#)

Where is it? Where is it? And then boom, it's like a car hitting a brick wall. Suddenly you see the speed, like a really strong heart to cold front blasted through and the speed shoots up the magnetic field strength shoots up. And then here's the worst part. You talked about the science, and what it takes to do this job. Here's another thing we just don't know. Okay? All of this is our best guess so far until we can actually see measurements. The hardest part is putting out that watch and not having any idea how strong that magnetic field is coming from the sun and what the orientation of that magnetic field is. Remember, if you take two positive magnets and you're trying to put 'em together, they repel, right? But if you have a positive and negative magnet and you put together, they connect. Well, we never know if that's going to be connected or not connected when it arrives until we see it arrive.

[\(30:16\):](#)

So we could have that storm back in May could have very well just been G1 through G3, maybe at G4, but it turned southward opposite earth. So it connected and it stayed connected for almost 36 hours as

these CMEs passed over earth. That's why we had such a prolific storm. That's why people saw the aurora around the world. And that's why all these different sectors include the power grid, we're busy managing the activity from that store, but that's another unknown. We don't know what that magnetic field is like until we get to observe it. And that's only when it's some minutes away.

Kelly Savoie (30:51):

So this would be a worldwide event. It's not like, local to a certain area. So do you work with other countries as well? Are other countries as prepared as the US when it comes to these things? Do you work together or is it just all a complete separate process?

Shawn Dahl (31:08):

Yeah, we sure do. We work together quite a bit now. That was another thing that wasn't the case 20 years ago, but in the last five years, we've really beefed up these relationships with our international partners and to, this includes the United Kingdom's Meteorological Office. They do have a space weather desk that they staff 24 hours of the day as well. Partners in the Bureau of Meteorology in Australia. They have dedicated space weather forecasters just like we are here. And we do interface through one of the computer applications that's out there. So when we see a CME and we're all looking out, we're all modeling, trying to determine whether or not it's going to hit earth. We can collaborate with each other and say, what did you get for a result? What did you get for a result? And then we'll all come to an agreement because we don't want to have Australia telling their country and their customers that there's only going to be a G2 storm, and yet we're advertising a G four or greater storm.

(32:00):

We kind need to be on the same message for exactly what you just said. This is a worldwide implication, and we here at SWPC, when I say SWPC I'm saying Space Weather Prediction Center, or for short SWPC. We are kind of the world leader in that, but we're not the world authority on it anymore because there are these international partnerships. So that's another cool thing about this job is that we do get to have these international collaborations. We collaborate daily with NASA and the Space Radiation Analysis Group. We do this for the benefit of the astronauts on the space station. We talk several times a day to the United States Air Force, our partners that do the same thing we do for the Department of Defense interests out there, and they follow our forecast. They pretty much tailor what we say down to all their Department of Defense customer needs. So pretty cool that we get to have all these interactions and engagements and partnerships around the world.

Emma Collins (32:51):

I did want to ask, because you talked a lot about the challenges that you might face in your role, but can you talk a little bit about some of your favorite aspects?

Shawn Dahl (32:57):

Yeah. The favorite aspect for me in the role I have is getting to do what we're doing today. Getting to do education outreach and explain things, try to make the world more space weather ready and understanding of what this all means. Talking to the key customers and core partners out there. I've really enjoyed working with the emergency management community over the last five years. Even when I was a forecaster, this was a project of mine because they really should have hazard risk assessment plans, whether they're at city, county, state levels, they really need to think about space weather. I've been proud of the fact that my home state, North Dakota, was one of those that has a magnificent space

weather aspect in their plan, and I didn't show any favoritism. They reached out to me and I was just glad to work with them. And they've got like 30 something pages in their hazard risk assessment plan, talking about space weather, what that means for North Dakota, because North Dakota, through the upper Midwest and the Appalachian chain and even the Upper Northwest are some of the most prone areas in our country to geomagnetically induced currents from geomagnetic storms that can cause issues on the power grid.

[\(34:02\)](#):

So that aspect is kind of my favorite role when I'm forecasting in there. My favorite aspect of that part is putting together a puzzle, especially when there's some uncertainty about what's going on. It can be frustrating, but it's also kind of enjoyable at the same time.

Emma Collins [\(34:16\)](#):

And you touched on this a little bit, kind of in that last comment too, but how does space weather compare to terrestrial weather in your opinion? Is it just a little more challenging, a lot more unknowns or...

Shawn Dahl [\(34:26\)](#):

It's a lot more challenging and less, we're forecasting fair weather, right? If we're expecting quiet weather, we can be right day after day after day, have a hundred percent verification score, but we start to run into problems when we know there's activity looming, mainly because we just don't have the angles of view that we need. We really need a satellite. That's the satellite we rely upon right now to look at these coronal mass adjust from the sun is right between the sun and the earth. So we don't know for sure what the main orientation is because a lot of these look like limb events, but we know they're expanding as they move out from the sun and 93 million miles. There is a lot of expansion time. So even if you visually think that one can't hit us, they can still clip us because they have so much expansion time as they move out into space.

[\(35:10\)](#):

So having a satellite that's at, say, a 45 degree angle between the sun and the earth, so you can see what's rotating the view so you can get a side view of A CME that gives us more of a confidence that yeah, this one's definitely aimed at earth that we're going to get hit by this one more than we are. These are the things that we still need out there. I often compare terrestrial weather and space weather, the state of our advancement, our science to evolution. So you have man up walking around and they're already evolved. This is kind of where terrestrial weather is at right now, very advanced in space weather. We're kind of like the fish that's come out of the water. Its fins have grown into limbs and it's starting to figure itself out, starting to learn how to breathe oxygen instead of water and convert it. That's kind of where we were maybe 10 years ago. And now we're starting to grow fast because not only has the government, regardless of the administration over the last several years, continues to be a priority and advancements and dedication to some of these spacecraft. We needed the research to operations, operations to research aspect has really come along tremendously unlike ever before. And these are all going to lead to great advancements. So for the next solar maximum, we're probably going to be 50% better than we are right now.

Kelly Savoie [\(36:28\)](#):

Well, I think once students listen to this podcast, they're going to be really interested in space weather. So Shawn, now that you're established in your career, do you have advice for students or job seekers who are looking to gain a job in space weather? Is it a tight industry? What are some of the things that they should do to make themselves more marketable?

Shawn Dahl ([36:49](#)):

Yeah, I think 20 years ago, going back to that again, in the past space weather was not really in any curriculums at all out there. It was kind of an unknown entity out there, but there was a pretty effectual event that happened in 2001 and 2003 that started bringing things more to the forefront. That's why we're at today is things like that, that were much more impactful in the past. So now there are some universities right here at Colorado University here in Boulder. They have a space weather certificate kind of thing that they offer. So they don't have a space weather curriculum, but they have coursework and projects and things that allow you to get this space weather certificate that helps. So whatever degree you're working on, whether it's atmospheric sciences or some other related field, something like that helps Millersville University out east. I think they have a kind of space weather.

([37:40](#)):

I don't remember what it is, but it's kind of almost a space weather curriculum. It's related to guidance and directives and policy. That's a space weather policy and such. That's a growing program, and that's something somebody can look at. But as far as the industry and the field itself, yeah, there's not a lot of job opportunities in here. But the expertise, the education that's needed to get here makes the pickings kind of slim when we do need to fill these as well. So beefing up one's college coursework, maybe with these certificates, maybe some stuff online that people could do that are out there that would certainly help 'em on this path. Because if somebody, even if they don't want to be a forecaster, if you know what Heliophysics and the sun science really sounds interesting, there seems like there's a lot of need. Maybe I could discover something in that field.

([38:30](#)):

This is the place to really find that because there's a lot of things that we still don't know and new things, the Parker Solar probe, now we're learning a lot more. So there's going to be a lot more science that we'll be able to turn around to operations eventually advancements in the field. So that would be my best advice is look for those colleges that offer some of those space weather certificates. Maybe there's more out there than I realize some of the programs that deal with space weather that's out there and focus on that to beef up that side of your education. And then also, hey, don't be afraid of the military. It may be a longer—

Kelly Savoie ([39:05](#)):

I was going to bring that up.

Shawn Dahl ([39:07](#)):

It may be a longer and more arduous path to get there, but it's also very rewarding and eye opening and a worldwide experience at the same time.

Emma Collins ([39:15](#)):

Well, Shawn, we're so grateful for everything you've told us about your career. However, before you go, we always ask our guests one last fun question at the end of our show. So if you could meet one famous person, alive or dead, who would it be?

Shawn Dahl ([39:27](#)):

So many to choose from, especially what I was going to be a history teacher. But for me, there's no doubt anymore. It would be a former 26 president of the United States, Theodore Roosevelt, fondly known as Teddy Roosevelt. Why not only did he live in North Dakota, which is part of that, he's always stepped at his time. Ranching in North Dakota was what led him to the presidency of the United States. And I firmly believe it, as I've read about his life and what he's done, I mean, he was an environmentalist. He kind of brought us into that age. He protected the bison buffalo, which were going to be extinct. He started national parks on a larger scale.

([40:06](#)):

He was really a visionary for somebody in a conservative party that really, and he brought America up. I mean, he became president in 1901, and he could have been a third term president because he came in because of an assassination. But he just considered his two terms as it, and he had such a great path as well. He went on from his, he went to be a rancher because he lost both his wife and his mother the same day. I think it was like Valentine's Day or something like that.

Kelly Savoie ([40:38](#)):

That's awful.

Shawn Dahl ([40:39](#)):

So he just kind of packed up his rich roots in the east in New York or wherever he was in. Went out west to be a rancher, and it kind of turned his life around. And next thing you know, he's in politics. He served as a secretary or vice secretary of the Navy, something like that. He charged San Juan Hill when we were involved in the Cuba down there and all the way up to be the president. So yeah, that's who I would just love to sit down and just chat with that guy's energy and just see how he actually was in real life.

Kelly Savoie ([41:09](#)):

Yeah, I didn't realize he was from North Dakota. I did know that he started the National Parks, which is really cool.

Shawn Dahl ([41:15](#)):

Yep. He spent a lot of time here in Medora, North Dakota, and they still keep his ranch there. It's kind of a little national monument. And the national parks over there are named after him, Theodore Roosevelt National Park.

Kelly Savoie ([41:26](#)):

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

Shawn Dahl ([41:31](#)):

Hey, you're very welcome, Kelly. Emma. Thanks for having me. My pleasure to be on here and reach out anytime.

Emma Collins ([41:36](#)):

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

Kelly Savoie ([41:41](#)):

Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond is a podcast by the American Meteorological Society. Our show is edited by Johnny Le. Technical direction is provided by Peter Killelea. Our theme music is composed and performed by Steve Savoie, and the show is hosted by Emma Collins 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.