

Dr. Betsy Pugel interviews Dr. Jeff Halverson for “Straight from the Scientist’s Mouth”

[music: “Rock You Like a Hurricane” - Scorpion]

Betsy: Jeffrey Halverson is going to rock us with his hurricane knowledge today on “Straight from the Scientist’s Mouth.” Dr. Halverson is a severe weather meteorologist at NASA’s Goddard Space Flight Center. We’ll also learn about some playa-related weather phenomena, including dust devils and flash flooding.

Jeff: I think I have this reputation that anytime someone sees me on TV something bad is coming, and I don’t know if that’s something you want associated with yourself.

[music: “Rock You Like a Hurricane” - Scorpion]

Betsy: The basics.

[music: “Africa” - Toto]

Betsy: Where do hurricanes come from?

Jeff: They come out of the tropics. Yeah, they come out of latitudes south of 30 degrees North or north of 30 degrees South. Here in the United States, most hurricanes are actually born in Africa of all places, half a world away, the other hemisphere.

[music: “Africa” - Toto]

Jeff: And there are wave disturbances that come off Africa, and they start rotating as they move over the Atlantic Ocean, and about August, September, we know what happens.

Betsy: What happens?

Jeff: What happens is that these storms re-curve into the northern latitudes, and they undergo something called a transition process, where they lose some of their tropical characteristics, but they gain the intensity to produce very heavy rainfall over large areas, so that’s one of the huge impacts we have here in the Eastern U.S., freshwater flooding.

[music: “Force Ten” - Rush]

Betsy: Have you ever been inside the eye of a hurricane?

Jeff: I think I have one of the neatest jobs on the face of the planet because I get to fly inside hurricanes. It is a cool place to be, and I’d much rather be at 40,000 feet in a plane, in a Category 5 hurricane than on the ground getting tossed all over creation.

[music: “Force Ten” - Rush]

Jeff: Believe it or not it's a lot calmer and there is a lot less turbulence up there than there is right above the ocean.

Betsy: So it is really calm inside the eye of a hurricane?

Jeff: Yeah. Well, you see, you have to get through the rough part first, so you have to bust through the eye wall, and that's sometimes a non-trivial exercise. Then you hope you can get out once you're inside. You've got to find that gap, right, so we've gotten out successfully. Here I am talking to you.

Betsy: How many times have you been inside a hurricane?

Jeff: Well, I don't know. I think it's probably at least a dozen times. It started back -- the first storm I ever flew was Typhoon Olive over the Coral Sea, off Northern Australia. And the last storm I flew, I think was the beginning of Ernesto as it came off Africa in 2006.

Betsy: And the first, the typhoon that you went through, when was that?

Jeff: That was back in '93, uh, '94, so it was the Australian summer, which is our winter, up here in the Northern Hemisphere.

Betsy: And, do you need a special plane to fly through the hurricane?

Jeff: The more rugged, the better, obviously, and NASA has some really high-flying aircraft that can get up to 30,000 or 40,000 feet. One even gets up to 70,000. The pilot -- it's so high he's got to wear a spacesuit to be pressurized.

Betsy: It's like the U-2.

Jeff: It's the U-2 spy plane, right, that NASA has and does research with. And some of our colleagues in NOAA fly around in these old, these beater aircraft. They're P-3 sub-hunters, P-3 Orions, but they are the most rugged aircraft out there, and here's some trivia for you. There's two aircraft that they fly. Do you know the names of those aircraft?

Betsy: No.

Jeff: Miss Piggy and Kermit.

[music: Theme from "The Muppet Show"]

Betsy: Let's change gears a moment and talk about some severe weather that many of our listeners may experience while spending their time here at Burning Man. Dust devils are a known event here, and I'm wondering if you can talk to our listeners about what dust devils are, and how they form, and what risk factors are associated with them.

Jeff: So, you're talking about Nevada?

Betsy: Yep.

Jeff: So, you're talking about the hot, dry Southwest. It's been in a perpetual drought for, what? Six, seven years now. So, all you've got is spinning dust, right? These are the dust devils. Dynamically they're very similar to hurricanes, in that they are vortices; however they don't have a preference for rotating counter-clockwise or clockwise, contrary to popular belief. Wind circulation is tiny enough like that. It's not influenced by the planet's rotation, and so anything from a toilet up to -- and you hear about this, if you flush a toilet it's going to rotate [a particular direction depending on what hemisphere you're in], that's a bunch of baloney, that's not the case at all -- all the way up to dust devils and tornadoes. Once we get up to hurricane scale, then we start to get influenced by the spin of the Earth. So, that's counter-clockwise in the Northern Hemisphere.

Betsy: And do dust devils tend to form at certain times of day or under certain conditions?

Jeff: Sure. The dust devils require that the hot air is rising rapidly upward like a hot-air balloon, so what that does is it draws the rotating air inward, and when the air is forced to move inward, it spins faster. That's just conservation of angular momentum. That's the ice skater, right? It's the same principle.

Betsy: So that's why you don't really see dust devils at night, then?

Jeff: Yeah.

Betsy: Primarily a daytime phenomenon.

Jeff: The air just isn't unstable enough. It's not rising vigorously [at night].

Betsy: Another lovely event that many people who have attended Burning Man in the past is flash flooding. And I'm wondering if you could talk a bit about how flash floods come about.

Jeff: Well, even in the drought-stricken West, this does happen occasionally, and it's a real serious problem out there, because there's so little in the way of vegetation to absorb the rainwater. The soils are very densely packed and they're non-permeable, so any rain that does occur is likely to runoff very quickly. And you have steeper [topography] out there, so you've got a real scenario for property damage and death. But these are just sudden rainstorms that come up in the summer months, most notably the summer monsoon, which hits the Southwestern U.S. around July, August, September, middle of the year.

Betsy: So finally, what expectations do you and your colleagues have about the effects of global warming on severe weather?

Jeff: Well, that's the big question now, and it's -- starting in 2005, we had 28 storms for some strange reason. That's when everyone started to get nervous. And so there's this huge debate, and you've actually got scientists [who] are calling each other names publicly. It's not down to fistfights yet, but this brings back the good old days of the Royal Society in England, when you'd go outside and duel it out with swords, right? We don't have quite that level of animosity today, but let me tell you, it's heating up, and I think the jury's out on the hurricane-global warming connection. Some scientists say, "Oh, there's a definite connection." Other scientists -- including myself, I will say -- say, "There [are] other things going on. There [are] natural cycles that are important. And if there is a global warming effect, it's very subtle, and it's going to take decades to fully realize it."

Betsy: Can you talk a little bit about those natural cycles that might be in play?

Jeff: Sure. There's a lot of them. Here in the Atlantic Ocean we have El Nino, which, believe it or not, is a big player, even though El Nino gets its start in the Pacific. The effects spill over into the Atlantic. We also have a cycle called the Atlantic multi-decadal oscillation, which shows that the hurricanes actually are behaving on multiyear, multi-decadal cycles, so you have a couple decades of really intense activity, followed by a couple decades of lull. And we're in one of those hyperactive periods right now. We started going into it in 1995, and so there's a prospect of another 10 or 15 years of this. And this is tied to the circulation changes in the deep ocean, so this has nothing to do with global warming per se. So those are a couple of the really key natural cycles.

Betsy: So, if I understand what you're saying, every few decades or so, something changes in the circulation whether it's the temperature or --

Jeff: That's right.

Betsy: -- something else that drives the number or frequency of hurricanes that appear.

Jeff: That's right. It's the temperature, so it's the deep conveyor belt that cycles the warm, tropical waters and the cold, polar waters, and this runs very, very slowly, but there are times when it moves faster than others. And when it speeds up, the North Atlantic gets warmer and we tend to see more storms for many, many years.

Betsy: So, what exactly drives that? Is it the motion of the volume of water in the ocean, going from the bottom to the top?

Jeff: Well, what drives it is two things. One is probably the freezing and melting of polar ice, is one thing that causes that dense water to start sinking. The other thing, believe it or not, is kind of a chicken or egg thing. Some people actually believe that hurricanes help drive this cycle. So now you've got the hurricanes mixed in with the ocean current, and it's hard to tell what drives what anymore. So it's a very complicated problem.

Betsy: How do the hurricanes potentially drive this?

Jeff: They stir up the upper layer of the ocean. They mix up cooler water from below, and they can actually help to speed up and accelerate this conveyor belt, this overturning in the Atlantic Ocean. But that's all just recent, theoretical work.

Betsy: Is there anything that you'd like to inform our listeners about when it comes to severe weather or climate change before we go?

Jeff: Don't buy property along the Outer Banks of North Carolina or Florida. Seriously, this is the problem. Our vulnerability as a society is a function of two things. It's the hazard, which is the frequency of occurrence of big storms, and it's also the risk. These are the behaviors that humans put themselves into harm's way. When you have this exponential buildup of property along the coast of the United States, you're setting the stage for a real disaster. It's going to happen again. Katrina was bad enough. Within 15 or 20 years, it's likely to repeat itself somewhere else along the coast. We just have to be smart and think about these things.

Betsy: Well, thank you very much for your time.

Jeff: You're welcome. It's been a lot of fun.

[music: "Hurricane" - Joan Osborne]

Betsy: For severe weather information tune into BMIR. For more information about hurricanes, dust devils, and other interesting severe weather phenomena, check out the Burningman.com Web site, and also check out [www.nasa.gov/goddard](http://www.nasa.gov/goddard). That's G-O-D-D-A-R-D. That's it for "Straight from the Scientist's Mouth." I'm Betsy Pugel.

[music: "Hurricane" - Joan Osborne]