Host: Robert Frederick
Hello and welcome to The Conjectural — an experiment to figure out a better way to decide what science news is and how we should talk about science. The data for this experiment? Your feedback to TheConjectural.com. I'm Robert Frederick. In this episode, a story about nature's most violent storms and how they've changed over the past forty years.

It's springtime, so peak tornado season here in the United States. It's also the start of the baseball season.

Interviewee: Harold Brooks
I've spent a long time as a hobby as a baseball researcher.

Host: Robert Frederick
Harold Brooks is senior scientist at the National Severe Storms Laboratory in Norman, Oklahoma.

Interviewee: Harold Brooks
The Oklahoma city minor-league team—the early 1990s—I went to about 20 games per year from them, at least. And there was one player that I thought was completely terrible. He had—and I looked back at all the box scores that I kept and everything and in that time—he had hit about .100.

Host: Robert Frederick
That's 100 out of 1000 — so the hitter was only successful about 10% of the time.

Interviewee: Harold Brooks
He was not a very good hitter.

Host: Robert Frederick
The worst recorded batting average ever in the major leagues was George McBride, who played back in the early 1900s. His career batting average was .218—so even though McBride had the worst batting average in major league history, he was still twice as good as the minor league player Harold Brooks saw — or thought he saw.

Interviewee: Harold Brooks
But you look at actually his whole 140 games of the minor league season, and he was about a .280-.290 hitter. I happened to have been to basically the 20 worst games that he played in the entire year. My impression was that he was not a very useful baseball player, but if would actually step back and look at the broad range of all of the observations that were taken of his performance — taken by lots of other people and analyzed by lots of other people — he actually was a reasonably good baseball player.

Host: Robert Frederick
You know where this is going, right?

Interviewee: Harold Brooks
And so that's one of the things when we look at climate, a lot of people tend to think of "I've seen the weather here today, therefore I know what's going on."

Host: Robert Frederick
Indeed, that was the argument made by Senator James Inhofe of Oklahoma when he brought a snowball onto the Senate floor as an argument against climate change.

Speaker: James Inhofe
The national attention, in case we have forgotten because we keep hearing that 2014 has been the warmest year on record, I ask the chair, do you know what this? It's a snowball. And it's just from outside here. So it's very, very cold out. Very unseasonable. So here, Mr. President, catch this.

Host: Robert Frederick
And yes, he tossed the snowball. But back to baseball statistics and Harold Brooks.

Interviewee: Harold Brooks
My first peer-reviewed article was on looking at what was called "clutch performance" by hitters back in the 1980s. And one of the things I noticed from my own empirical thing, is that the statistics of baseball — when you look at, people talk about being a stat geek or something like that as opposed to watching players play — what really the statistics were systematically collected observations.

Host: Robert Frederick
So the stat geeks make their predictions by taking advantage not only of their own observations, but the observations of dozens, hundreds, thousands, even millions of other people over multiple years. So what's all this got to do with how tornadoes have changed over the past forty years?

Interviewee: Harold Brooks
When we have an individual event — and this has happened forever — people tend to think, "Oh, this is the, you know, the worst whatever that's ever happened" or "the worst whatever that's ever happened in my area." And one of my jobs in some sense is to look back historically and say, "Well, given all the records we have, you know, that's not the worst thing we've seen in your area" or "that may well be just about the worst thing we've seen in your area."

Host: Robert Frederick
And so for tornadoes?

Interviewee: Harold Brooks
We've got no evidence that we've seen any changes in intensity. We really evaluate it based on the observed damage. We've had five of the six earliest starts to the season have happened in the last 18 years and four of the five latest starts in the last 18 years. So we're starting to see a much larger range of that starting date. The number of tornadoes overall we see — say if you look at a 10-year average — the number of tornadoes in the U.S. that we see hasn't changed much. There's about 500 a year that cause some damage out of about 1300 now that we observe.

Host: Robert Frederick
But whether tornado season starts early or late, Brooks says it also has become more concentrated Those five hundred tornadoes — on average — that cause damage each year are happening in a fewer number of days overall.

Interviewee: Harold Brooks
We used to have tornadoes that cause damage 150 days per year. We now have about 100 days per year. But the number of days with 30 or more — it used to be half a day, 1 day every two years. Now it's about 3 days per year. So we're getting more days with lots of tornadoes. And that was based on the historical observations, and we didn't actually see it right away because we were sort of looking at sort of "What's the decadal average" — what's the average over a 10-year period — has that changed since the 1970s. And you'd find well no, that hasn't changed. And if I plot a map of where the tornadoes occur, they're about the same maps that I would have had years ago. And so we went through and as we did a little more digging into the data we discovered that — ah, we've changed the pattern.

Host: Robert Frederick
What's behind the change in pattern?

Interviewee: Harold Brooks
It's very tempting based on that time scale — from the 1970s until now — to think that it's likely related to global temperature increases. Well, we don't have a real good physical explanation for that at all right now. So we really need to think about is why would the tornado distribution days have changed, and one of the most obvious things is that, well it's likely then that the pattern in the atmosphere has changed, sort of the wave pattern of the atmosphere.

Host: Robert Frederick
Wave patterns: those are the moving high and low pressure areas that you see on weather maps

Interviewee: Harold Brooks
What we really are looking at is — most of the time when we have significant numbers of tornadoes, it's associated with an upper-level wave: a wave, say, at five kilometers above the ground, six kilometers above the ground, we see the wave coming through that sets up the right kind of conditions near the ground that are favorable for making storms.

Host: Robert Frederick
So if the history of the wave patterns that set up the kinds of conditions near the ground that are favorable for making storms match up with the locations of those tornado-producing storms, then at least scientists will know what's behind the changes in tornadoes over the past forty years. Or that's the thought anyway.

Interviewee: Harold Brooks
It's probably a better model than we currently have for relating the large-scale environmental conditions with the tornado-scale, because that's a big part of this question. But we can imagine looking and saying "Are we having fewer days where we have any kind of chance of having a tornado, but that we're having — on the days that we do have the chances — the geographic area that they cover is becoming larger," or is it "Are we getting more tornadoes in the same-sized area as we had before?" We need to address that question to try to figure out is it the atmosphere becoming more efficient in a unit area, or is that there's a larger area for storms to form in? So that's step 1, and it's a big step to make to try to measure those areas.

Host: Robert Frederick
Brooks says the data to address the waves of high and low pressure areas is already there. As is the data about the locations of tornadoes.

Interviewee: Harold Brooks
They've been collected. We've got to do a couple of big steps. One of them is we actually need to derive essentially better relationships between environmental conditions and tornadoes themselves because we really — that's sort of the — we use the environmental conditions in some sense as proxies for the occurrence of tornadoes that tell us, "Okay, one was very favorable in this environment, not so favorable in this other environment." We can kind of say, "When we have lots of favorable environments, we should get more tornadoes than if we don't have many favorable environments." So we need to work on that model that connects those two. We need to actually then do the analysis of the right variables because there's really not a whole lot of point in just analyzing a bunch of variables unless we have some idea that they're relevant to the problem at hand.

Host: Robert Frederick
But as thorough as scientists like Harold Brooks are in gathering and analyzing data, there's could be more data out there that's relevant to the problem of figuring out why the tornado season has changed — data that scientists haven't started collecting yet. No, I have no idea what it could be. But I'm willing to bet that it doesn't have anything to do with there being enough snow in February in Washington D.C. to make a snowball — even if the year has been the warmest year on record. Now, back to baseball. The Washington Nationals are currently leading the National League East having played 21 games and so are ahead of the New York Mets, Philadelphia, Miami, and Atlanta. Could this be the Nats' year to make it to the World Series? Does it help to know that they've never been there before?

Host: Robert Frederick
You've been listening to The Conjectural. Thanks to Harold Brooks of the National Severe Storms Laboratory for being on the show. Find us online at TheConjectural.com where you can give the feedback and support that makes this show happen, download a transcript, and subscribe to the show. Follow me on Twitter @TheConjectural. I'm Robert Frederick. Thanks for joining us!