Documentary Film Festival this week

The ‘art and science’ of predicting hurricane paths

By Matt Rocheleau

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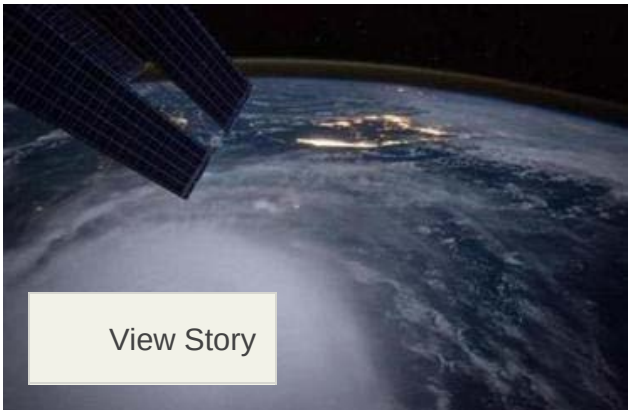
Over the past several days, you may have seen on social media or your local TV weather forecast a graphic covered with a bunch of confusing scribbles.

It was a map of the East Coast with some sort of dot or symbol showing the current location of Hurricane Joaquin and, extending out from that spot, a mess of different-colored lines showing potential paths for the storm.

Some of the lines showed the storm poised to make a sharp turn east, drifting farther into the vast Atlantic Ocean and avoiding any significant disruption for communities along the coast. Other lines went in the other direction, heading squarely for land.

How helpful, you might have thought.

But for forecasters such maps — so-called “spaghetti plots” — provide a wealth of clues about where a major storm might be headed.



Where is Joaquin headed?

A look at the National Weather Service’s latest projections about the storm’s projected path.

Threat to US East Coast is fading

Astronaut captures dramatic photo

Map: Tracking Hurricane Joaquin

Each line is based on a forecasting model, a series of mathematical algorithms that factor in data

about current weather conditions — collected by satellites, ships, aircraft, and other instruments — to try to predict the future of the weather.

“The models take data from many different types of platforms — temperatures, wind, humidity,” said Eric Blake, a hurricane specialist at the National Hurricane Center.

“While each model generally has access to the same data, how they use it is different,” he said.

The center’s website lists more than 40 different “commonly used” models.

“Forecast models vary tremendously in structure and complexity,” the site explains. “They can be simple enough to run in a few seconds on an ordinary computer, or complex enough to require a number of hours on a supercomputer” that is performing myriad calculations per second.

Some of the models provide a global outlook. Others focus on a certain region.

No model is perfect, but each “has pluses and minuses,” said Blake.

For example, the Navy Operational Global Atmospheric Prediction System, or NOGAPS, model “cannot provide very skillful intensity forecasts, but can provide skillful track forecasts,” the center’s website said.

Some models are evaluated and undergo tweaks annually to try to make them more accurate.

Forecasters tend to prefer “consensus forecasts,” which are derived by combining the predictions made by multiple models.

“On average, consensus forecasts are more accurate than the predictions from their individual model components,” the center says.

But the center says it ultimately takes all models into consideration. And the center says another key ingredient is mixed into its weather predictions: “forecaster experience.”

“It’s a mix of art and science,” said Blake.

Yet even with all the computerized number crunching and personnel expertise, predictions can be wrong.

“Uncertainty exists in every forecast,” the center says.

“Sometimes the model is just flat wrong,” said Blake.

Hurricane Joaquin has been “extremely difficult to predict,” Blake said. “For example, in this particular case, early on, none of the models had any idea that this storm was going to get this strong and move in the direction of the Bahamas.”

Graphics issued by the center showing the official predicted track of Hurricane Joaquin changed several times this week, wavering from side to side.

Blake said there are lot of factors at play with this particular storm, including multiple competing high- and low-pressure systems in the area.

“There’s just a lot of complicated steering factors,” said Blake. “It’s an extremely complex scenario.”

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