

Predicting which African storms will intensify into hurricanes

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Hurricanes require moisture, the rotation of the earth, and warm ocean temperatures to grow from a mere atmospheric disturbance into a tropical storm. But where do these storm cells originate, and exactly what makes an atmospheric disturbance amp up full throttle?

A new study published in *Geophysical Research Letters* by Tel Aviv University's Prof. Colin Price and his graduate student Naama Reicher of the Department of Geosciences at TAU's Faculty of Exact Sciences finds most hurricanes over the Atlantic that eventually make landfall in North America actually start as intense thunderstorms in Western Africa.

"85 percent of the most intense hurricanes affecting the U.S. and Canada start off as disturbances in the atmosphere over Western Africa," says Prof. Price. "We found that the larger the area covered by the disturbances, the higher the chance they would develop into hurricanes only one to two weeks later."

Watching the clouds gather

Using data covering 2005-2010, Prof. Price analyzed images of cloud cover taken by geostationary satellites, which orbit the Earth at the precise speed of the earth's rotation and take pictures of cloud cover every 15 minutes. This enabled Prof. Price to track the variability in [cloud cover](#) blocking the earth's surface in West Africa between the months of June and November—hurricane season.

The coverage of clouds acts as an indication of [atmospheric disturbances](#). The more clouds in an area, the larger the disturbance. Using infrared cloud-top temperature data gathered from satellites, Prof. Price assessed the temperatures of the [cloud tops](#), which grow colder the higher they rise. He then compared his cloud data with hurricane statistics—intensity, date of generation, location, and maximum winds—from the same period using the National Hurricane Center data base.

"We first showed that the areal coverage of the cold cloud tops in tropical Africa was a good indicator of the monthly number of atmospheric disturbances—or waves—leaving the west coast of tropical Africa," said Prof. Price. "The disturbances that developed into tropical storms had a significantly larger area covered by cold cloud tops compared with non-developing waves."

What makes them special

According to Prof. Price, only 10 percent of the 60 disturbances originating in Africa every year turn into hurricanes. And while there are around 90 hurricanes globally every year, only 10 develop in the Atlantic Ocean.

"We wanted to know what was so special about these 10% of disturbances that develop into hurricanes. Was there something different about

these storms at their genesis?" said Prof. Price. "By looking at each of these storms individually, we found again that the larger the cloud coverage originally in West Africa, the higher the value of the accumulated cyclone energy in a future hurricane. The conclusion, then, is that the spatial coverage of thunderstorms in West Africa can foretell the intensity of a hurricane a week later.

"If we can predict a hurricane one or two weeks in advance—the entire lifespan of a hurricane—imagine how much better prepared cities and towns can be to meet these phenomena head on," Prof. Price says. He is currently examining the thunderstorm clusters around the eyes of hurricanes to study the intensification process of those destructive phenomena.

Provided by Tel Aviv University

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