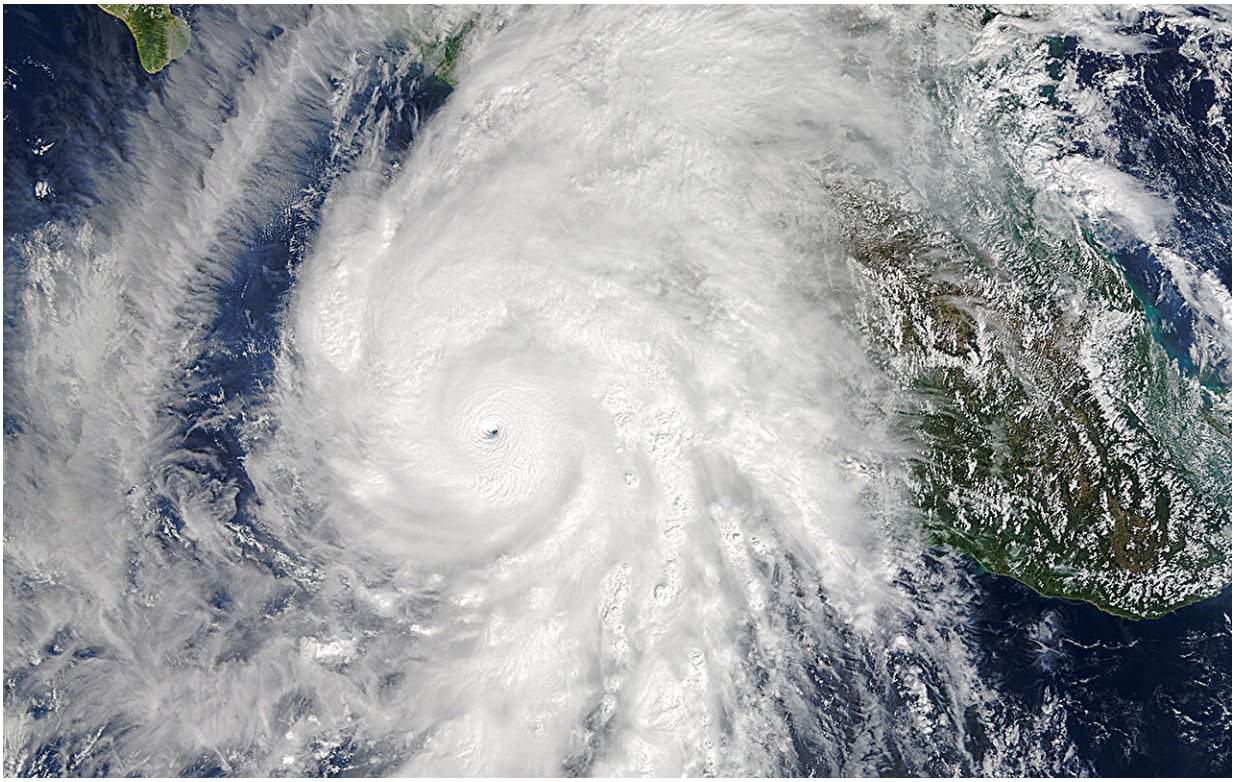
In a warming world, climate scientists consider category 6 hurricanes

February 5 2024, by Linda Vu



Hurricane Patricia over the eastern Pacific Ocean. Credit: NASA

For more than 50 years, the National Hurricane Center has used the Saffir-Simpson Windscale to communicate the risk of property damage; it labels a hurricane on a scale from Category 1 (wind speeds between 74–95 mph) to Category 5 (wind speeds of 158 mph or greater).

But as increasing ocean temperatures contribute to ever more intense and destructive hurricanes, climate scientists Michael Wehner of Lawrence Berkeley National Laboratory (Berkeley Lab) and James Kossin of the First Street Foundation wondered whether the open-ended Category 5 is sufficient to communicate the risk of hurricane damage in a warming climate.

So, they investigated and detailed their extensive research in a new article published in the *Proceedings of the National Academy of Sciences* (*PNAS*), where they also introduce a hypothetical Category 6 to the Saffir-Simpson Wind Scale, which would encompass storms with wind speeds greater than 192 mph.

"Our motivation is to reconsider how the open-endedness of the Saffir-Simpson Scale can lead to underestimation of risk, and, in particular, how this underestimation becomes increasingly problematic in a warming world," said Wehner, who has spent his career studying the behavior of extreme weather events in a changing climate and to what extent human influence has contributed to individual events.

According to Wehner, anthropogenic global warming has significantly increased surface ocean and tropospheric air temperatures in regions where hurricanes, tropical cyclones, and typhoons form and propagate, providing additional heat energy for storm intensification.

When the team performed a historical data analysis of hurricanes from 1980 to 2021, they found five storms that would have been classified as Category 6, and all of them occurred in the last nine years of record. They determined a hypothetical upper bound for Category 5 hurricanes by looking at the expanding range of wind speeds between the lower-category storms.

Hurricanes, tropical storms, and typhoons are essentially the same

weather phenomenon; their name difference is purely geographical: storms in the North Atlantic and Northeast Pacific Oceans are called hurricanes, events in the Northwest Pacific Ocean are called typhoons, and occurrences in the South Pacific and Indian Oceans are called tropical cyclones.

In addition to studying the past, the researchers analyzed simulations to explore how warming climates would impact hurricane intensification. Their models showed that with 2 degrees Celsius of global warming above pre-industrial levels, the risk of Category 6 storms increases by up to 50% near the Philippines and doubles in the Gulf of Mexico and that the highest risk of these storms is in Southeast Asia, the Philippines, and the Gulf of Mexico.

"Even under the relatively low global warming targets of the Paris Agreement, which seeks to limit global warming to just 1.5°C above preindustrial temperatures by the end of this century, the increased chances of Category 6 storms are substantial in these simulations," said Wehner.

"Tropical cyclone risk messaging is a very active topic, and changes in messaging are necessary to better inform the public about inland flooding and storm surge, phenomena that a wind-based scale is only tangentially relevant to. While adding a 6th category to the Saffir–Simpson Hurricane Wind Scale would not solve that issue, it could raise awareness about the perils of the increased risk of major hurricanes due to global warming," said Kossin.

"Our results are not meant to propose changes to this scale, but rather to raise awareness that the wind-hazard risk from storms presently designated as Category 5 has increased and will continue to increase under climate change."

More information: Wehner, Michael F. et al, The growing inadequacy of an open-ended Saffir–Simpson hurricane wind scale in a warming world, *Proceedings of the National Academy of Sciences* (2024). DOI: 10.1073/pnas.2308901121

Provided by Lawrence Berkeley National Laboratory