New tropical cyclone outlook model has potential to save lives in the Pacific

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People in Fiji, New Zealand, Solomon Islands, New Caledonia, Vanuatu, Papua New Guinea, Tonga and other island nations in the Southwest Pacific will have months more to prepare for tropical cyclones, thanks to

a new outlook model published today in *Scientific Reports*.

The new model could improve early warnings, support advanced disaster management preparedness and save lives during the Southwest Pacific tropical cyclone season.

Developed by a team of climate scientists from the University of Newcastle and the National Institute of Water and Atmospheric Research (NIWA), in New Zealand the new outlook model will generate predictions for the number of tropical cyclones at an individual country level, up to four months before the start of the tropical cyclone season.

The Southwest Pacific tropical cyclone season typically runs from November to April and the island nations and territories in this area are extremely vulnerable to tropical cyclone related impacts, including extreme and damaging winds, intense storm surge, and prolonged rainfall and flooding, which adversely affect people, infrastructure and economies.

Dr. Andrew Magee from the Center for Water, Climate and Land at the University of Newcastle said that as current operational outlooks only offer guidance one month before cyclone season starts, the team's findings and the new outlook model are key to ensuring more effective disaster management for tropical cyclone impacted nations and territories in the Southwest Pacific region.

"Tropical cyclones aren't a new phenomenon and they will continue to wreak havoc across the Southwest Pacific region," said Dr. Magee.

"The provision of accurate and timely seasonal tropical cyclone outlooks are essential for informed decision making, and if we can just make small incremental steps in reducing disaster risk and informing the population of the risks associated with the coming cyclone season, then

it has the potential to save lives. Rising sea levels and changes to tropical cyclone related exposure and vulnerability will amplify future tropical cyclone related impacts for Pacific Island nations and territories. Our new outlook plays an important role in building a more resilient future for Pacific Island communities."

Tropical cyclones account for 76 percent of disasters across the Southwest Pacific region, and since 1950, have claimed the lives of nearly 1,500 people and significantly impacted a further 3.1 million.

"Tropical cyclones are erratic, spatially and temporally, and every season is different. This makes it difficult for island nations and territories to prepare in the weeks and months before the official start of the tropical cyclone season," said Dr. Magee.

The model—Predicting a tropical cyclone season

The researchers have previously explored how the complex interactions between the ocean and atmosphere, including large-scale modes like the El Niño-Southern Oscillation and Indian Ocean sea surface temperature variability, impact where and when tropical cyclones form and move.

This research culminated in the development of the new tropical cyclone model which uses ocean temperatures and other measurements representing the variability in our atmosphere, to predict the number of tropical cyclones that will occur during the cyclone season. The outlooks will be updated every month between July and January, offering continuous refinement and consideration of the most recent changes in ocean temperatures and atmospheric variability.

This is expected to help bridge current sub-seasonal and seasonal climate guidance that indicates where cyclone activity may be elevated or reduced, which can change quickly depending on intra-seasonal

developments of processes such as the El Niño-Southern Oscillation.

Who will it help?

The new outlook model will better equip Pacific Island National Meteorological Services, government and aid agencies, decision-makers and the general public in communicating and preparing for future tropical cyclone seasons across the Southwest Pacific.

"Our tailored and bespoke tropical cyclone guidance for Pacific Island nations and territories will improve early warnings and support preparations ahead of the tropical cyclone season," said Dr. Magee.

"This will allow government and aid agencies to prepare enough supplies for the season ahead and will mean that there is more time for decision makers to communicate with communities and people on the ground, allowing for sufficient planning."

Dr. Magee said the reason this new model is of such importance is because not only do tropical cyclones cost significant amounts of money in terms of financial loss, they also cause significant injury and claim lives.

"Tropical cyclones are major catastrophes and anything we can do to improve our understanding of what the upcoming season will look like is really beneficial," said Dr. Magee.

Where is it being applied?

In total, 12 subregional and individual country outlooks are derived for the Southwest Pacific region, which considers all tropical cyclone impacted nations and territories across the region. Fiji, Solomon Islands,

New Caledonia, Vanuatu, Papua New Guinea and Tonga feature individually in the model due to the high risk and impact of tropical cyclones in those countries. New Zealand also features individually in the model due to the impacts associated with ex-tropical cyclones.

This guidance will be updated and freely available on the Long-Range Tropical Cyclone Outlook for the Southwest Pacific (TCO-SP) website to support end-users (including meteorological and government agencies, civil defense managers, non-governmental aid organizations and the general public) who can access it in support of decision making and to promote the benefits of expanding early warning systems for weather extremes.

More information: Andrew D. Magee et al. A new island-scale tropical cyclone outlook for southwest Pacific nations and territories, *Scientific Reports* (2020). DOI: 10.1038/s41598-020-67646-7

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