Clustered hurricanes reduce impact on ecosystems

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Credit: NOAA

New research has found that hurricane activity is 'clustered' rather than random, which has important long-term implications for coastal ecosystems and human population. The research was carried out by Professor Peter Mumby from The University of Queensland Global Change Institute and School of Biological Sciences, Professor David Stephenson and Dr Renato Vitolo (Willis Research Fellow) at the University of Exeter's Exeter Climate Systems research centre.

Tropical cyclones and hurricanes have a massive economic, social and ecological impact, and models of their occurrence influence many planning activities from setting insurance premiums to conservation planning.

Understanding how the frequency of hurricanes varies is important for

the people that experience them and the ecosystems that are impacted by hurricanes.

The findings published in the journal Proceedings of the National Academy of Sciences USA map the variability in hurricanes throughout the Americas using a 100-year historical record of hurricane tracks.

Short intense periods of hurricanes followed by relatively long quiet periods, were found around the Caribbean Sea and the clustering was particularly strong in Florida, the Bahamas, Belize, Honduras, Haiti and Jamaica.

Modelling of corals reefs of the Caribbean found that clustered hurricanes are 'better' for coral reef health than random hurricane events as the first hurricane always causes a lot of damage but then those storms that follow in quick succession don't add much additional damage as most of the fragile corals were removed by the first storm.

The following prolonged period without hurricanes allows the corals to recover and then remain in a reasonable state prior to being hit by the next series of storms.

It is important to consider the clustered nature of hurricane events when predicting the impacts of storms and climate change on ecosystems. For coral reefs, forecasts of habitat collapse were overly pessimistic and have been predicted at least 10 years too early as hurricanes were assumed to occur randomly over time, which is how most research projects model the incidence of future hurricanes.

'Cyclones have always been a natural part of coral reef lifecycles', says study author Professor Peter Mumby. 'However, with the additional stresses people have placed upon ecosystems like fishing, pollution and climate change, the impacts of cyclones linger a lot longer than they did

in the past.'

Mumby adds, 'If we are to predict the future of coral reefs it's really important to consider the clustering of cyclone events. For a given long term rate of hurricanes (e.g., once per decade), clustered events are less damaging.'

Clustering of storms and other weather events is a global phenomenon that needs to be better quantified statistically in risk assessments' says study author Professor David Stephenson. 'We didn't at first expect clustering to have advantages but this study has clearly shown that clustering can help by giving ecosystems more time to recover from natural catastrophes'

Professor Stephenson adds, 'This research also has wider implications for other systems such as the dynamics and viability of insurance companies and the provision of reinsurance protection.'

"Reinsurance companies are a bit like ecosystems and so need time to recover after major losses - so clustering of hurricanes allows the industry to build profits before the next cluster of storm losses. They are different from corals in that they actually need a few hurricanes for them to be able to grow." Said Professor Stephenson.

Provided by University of Queensland