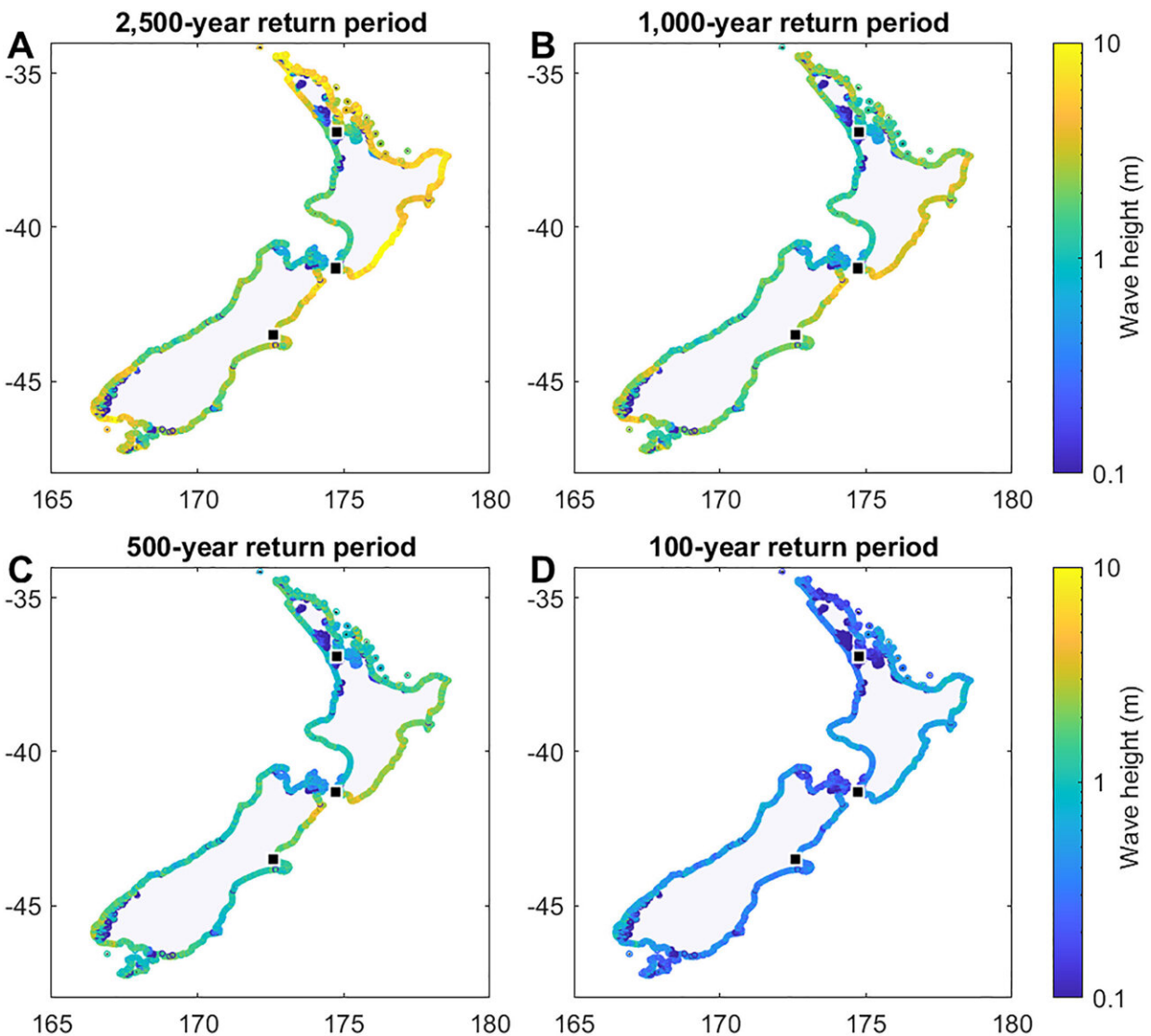


Model shows New Zealand should expect 15-meter tsunami every 580 years

December 12 2023, by Bob Yirka



Tsunami hazard from local earthquake sources posed to New Zealand over differing return periods. (a) 2,500-year (b) 1,000-year (c) 500-year (d) 100-year.

Key population centers, Auckland, Wellington, and Christchurch, are shown by the black squares. Note. A log scale is used to show the expected maximum tsunami wave heights at the coast. Credit: *Journal of Geophysical Research: Solid Earth* (2023). DOI: 10.1029/2023JB027207

A team of geographers, Earth scientists and environmental scientists affiliated with several institutions in New Zealand, working with that country's National Institute of Water and Atmospheric Research, has found that it is possible to model the number and type of tsunamis that are likely to strike a given area over a given period of time.

In their paper [published](#) in the journal *Journal of Geophysical Research: Solid Earth*, the group describes the model they built and the types of data they gave it to help them gain some insight into the number and types of earthquakes New Zealand is likely to experience in the coming years, along with possible tsunamis.

New Zealand is known for its periodic earthquakes—just seven years ago, the 7.8 magnitude Kaikōura quake struck parts of Marlborough and northern Canterbury. Less well known are its tsunamis. This is likely because they happen far less often. The last major [tsunami](#) to strike New Zealand was in 1868, and that was triggered by an [earthquake](#) in Chile.

Still, because New Zealand sits near two subduction zones, scientists know that one is likely to strike sometime in the future. The only questions are when and how big will it be. To make some educated guesses, the researchers involved in this new study created a model designed to show earthquakes and related tsunamis that have struck in the past and to predict when they may strike in the future.

Prior research efforts have uncovered historical records of earthquakes

but they only go back approximately a century and a half. Prior geological research has also revealed evidence of older quakes and resulting tsunamis, but such studies have not been able to reveal much about the long histories of earthquakes striking New Zealand. The researchers used data from such studies to create their model and added other data, such as information about the geometry of the region, fault system physics and the physical locations of faults in the region, and the amount of friction that has been measured.

They then ran simulations covering 30,000 years of simulated history showing all the likely earthquakes that have struck the region during that time. It showed 2,585 earthquakes with magnitudes ranging from 7.0 to 9.25. The model also showed which [subduction zones](#) are likely to be the source of earthquakes causing locally generated tsunamis. They then calculated the size of tsunamis based on earthquake strength and found that the largest would likely be approximately 28 meters. The model also suggested that New Zealand is likely to experience a tsunami of at least five meters every 77 years, and one of 15 meters every 580 years.

More information: Laura Hughes et al, A Novel Method to Determine Probabilistic Tsunami Hazard Using a Physics-Based Synthetic Earthquake Catalog: A New Zealand Case Study, *Journal of Geophysical Research: Solid Earth* (2023). [DOI: 10.1029/2023JB027207](https://doi.org/10.1029/2023JB027207)

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