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Earthquakes have long lasting impacts on forests

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Earthquakes are often seen through the lens of human experience – their immediate destruction, the rebuilding of communities, and the loss of lives. However, forests too, experience the force of these powerful events. A new study by Dr. Shan Gao from the Chinese Academy of Sciences reveals how forests survive earthquakes and adapt later.

the tree grew in that year.

Factors like weather, water availability, and sunlight influence how much a tree grows, leaving a record in the ring's width. Wider rings point to good years with plenty of rain and warmth, while narrow rings tell the story of tougher times like droughts or cold spells.

Record of the past

Scientists use this information to understand the environment in the past. By studying the rings of trees from different times and places, they can piece together a timeline of changes, uncovering how climate and ecosystems have shifted over time.

This method, called dendrochronology, is especially helpful for studying climate change because it offers long-term evidence of how ecosystems responded to past climate variations, even before we started keeping detailed records.

Comparing tree rings

The researchers compared the thickness of tree rings before and after earthquakes to see how these powerful events impacted tree growth. They carefully examined data from forests all over the world for over 100 years, separating the effects of earthquakes from the impacts of weather. By studying these natural records, the scientists learned how forests adapt and survive, even after the ground shakes beneath them.

Earthquake impact on dry forests

of trees and plants which normally struggle in dry conditions.

This “deep drink” of water provides trees with much-needed moisture and nutrients, leading to increased growth rates. The deeper water infiltration also releases nutrients trapped in the upper soil layers, further boosting the trees’ health. In these regions, earthquakes act as a temporary relief from the usual dry constraints, allowing the forests to flourish.

Interestingly, this positive effect is not temporary. The impacts of an earthquake can actually strengthen a forest’s resilience and growth for over twenty years. This extended period of benefit demonstrates the remarkable ability of forests to adapt and utilize changes in their environment, transforming a disruptive event into a long-lasting advantage.

Earthquake impact on humid forests

However, the story is quite different in forests with abundant rainfall. In these areas, too much water can be detrimental, causing soil erosion and leaching away valuable nutrients. Earthquakes can worsen these problems by further saturating the soil, highlighting how the benefits experienced in dry regions are specific to their environmental context.

This means that in places like New Zealand, known for its lush landscapes and heavy precipitation, forests struggled to recover, showing decreased growth rates in the years following an earthquake.

Furthermore, it can take just as long for forests in these wet places to recover from the damage of erosion as it takes for forests in dry places to

Understanding how forests react differently to earthquakes is crucial for both appreciating the complex relationship between earth movements and ecological health and informing how we manage and conserve these ecosystems. This study emphasizes the resilience of nature and how even seemingly destructive forces can have beneficial consequences in specific situations.

Dr. Gao suggests that changes in how a forest recovers after a weather-related event (like a drought or storm) might last only five years. However, when the forest has been through an earthquake, the changes in how well it recovers might last 20 years or even longer.

Study implications

The study challenges the view of earthquakes as purely destructive forces. They can have complex effects, even potentially positive ones. This shift in perspective encourages a more nuanced understanding of natural disturbances and their role in shaping ecosystems.

Dry forests, it turns out, can benefit from earthquakes due to improved water access. This suggests creating similar disruptions in the soil could help these forests, especially in drought-prone areas.

On the contrary, earthquakes worsen the environment in humid regions. This knowledge is crucial for disaster planning, as recovery efforts should be tailored to specific forest types and address erosion concerns.

Climate impacts of earthquakes

This means that earthquakes might have a bigger impact on the amount of carbon stored in the earth than we previously thought. In some places, forests might actually absorb more carbon dioxide after an earthquake because they grow faster. However, in other areas, earthquakes might make it harder for forests to store carbon dioxide.

Understanding how these changes work is important for creating accurate models of the climate and developing effective ways to combat climate change.

The study is published in the journal *Nature Geoscience*.

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