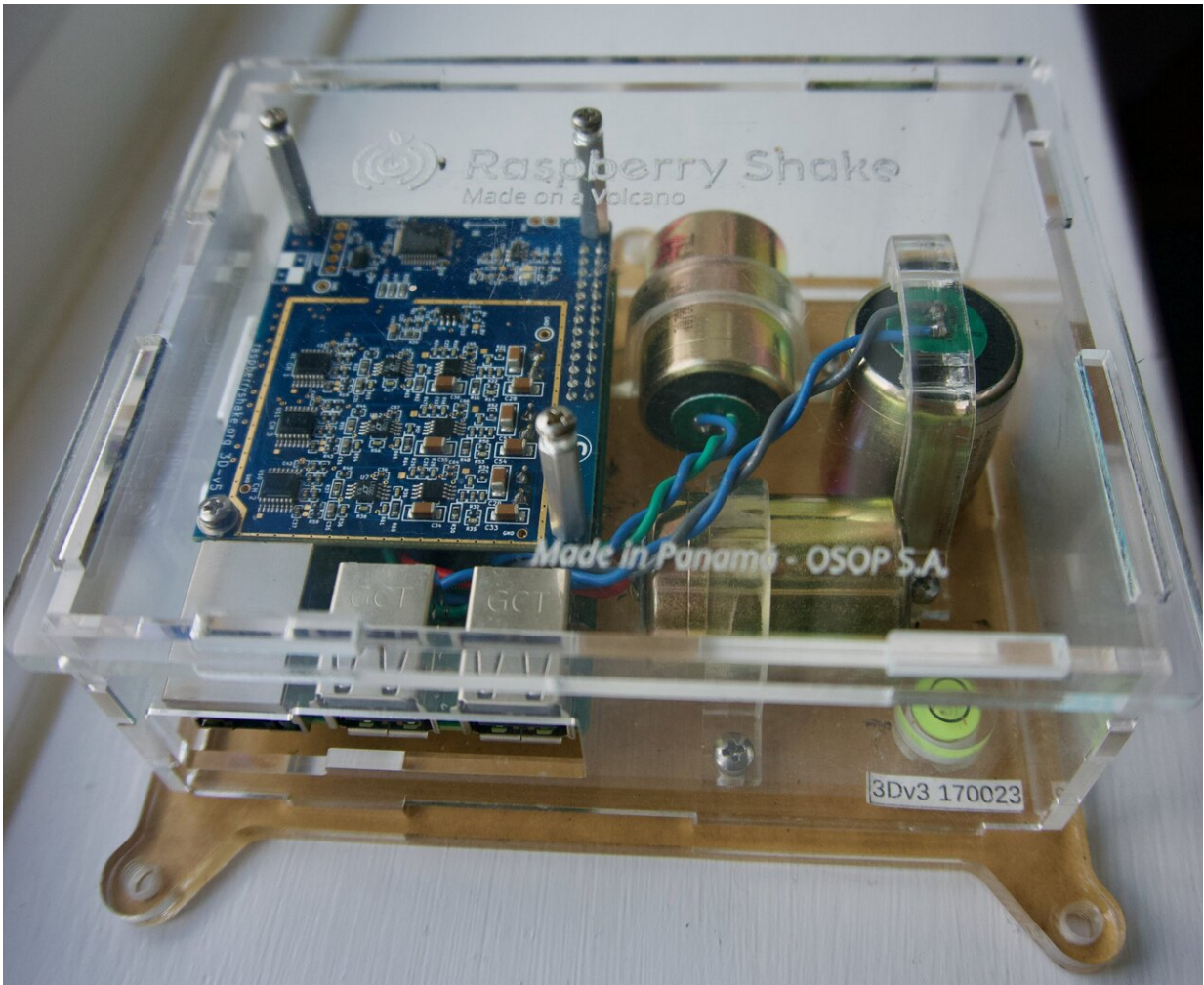


COVID-19 lockdown caused 50% global reduction in human-linked Earth vibrations

July 23 2020



Credit: Imperial College London

The lack of human activity during lockdown caused human-linked vibrations in the Earth to drop by an average of 50% between March and May 2020.

This quiet period, likely caused by the total global effect of social distancing measures, closure of services and industry, and drops in tourism and travel, is the longest and most pronounced quiet period of [seismic noise](#) in recorded history.

The new research, led by the Royal Observatory of Belgium and five other institutions around the world including Imperial College London, showed that the dampening of 'seismic noise' caused by humans was more pronounced in more densely populated areas.

The relative quietness allowed researchers to listen in to previously concealed earthquake signals, and could help us differentiate between human and natural seismic noise more clearly than ever before.

Co-author Dr. Stephen Hicks, from Imperial's Department of Earth Science and Engineering, said: "This quiet period is likely the longest and largest dampening of human-caused seismic noise since we started monitoring the Earth in detail using vast monitoring networks of seismometers.

"Our study uniquely highlights just how much human activities impact the solid Earth, and could let us see more clearly than ever what differentiates human and natural noise."

The paper is published today in *Science*.

Anthropause

Measured by instruments called seismometers, seismic noise is caused by

vibrations within the Earth, which travel like waves. The waves can be triggered by earthquakes, volcanoes, and bombs—but also by daily human activity like travel and industry.

Although 2020 has not seen a reduction in earthquakes, the drop in human-caused seismic noise is unprecedented. The strongest drops were found in [urban areas](#), but the study also found signatures of the lockdown on sensors buried hundreds of metres underground and in more remote areas.

Human-generated noise usually dampens during quiet periods like over the Christmas/New Year period and Chinese New Year, and during weekends and overnight. However, the drop in vibrations caused by COVID-19 lockdown measures eclipse even those seen during these periods.

Some researchers are dubbing this drop in anthropogenic (human-caused) noise and pollution the 'anthropause'.

Dr. Hicks said: "This is the first global study of the impact of the coronavirus anthropause on the solid Earth beneath our feet."

To gather the data, researchers looked at seismic data from a global network of 268 seismic stations in 117 countries and found significant noise reductions compared to before any lockdown at 185 of those stations. Beginning in China in late January 2020, and followed by Europe and the rest of the world in March to April 2020, researchers tracked the 'wave' of quietening between March and May as worldwide lockdown measures took hold.

The largest drops in vibrations were seen in the most densely populated areas, like Singapore and New York City, but drops were also seen in [remote areas](#) like Germany's Black Forest and Rundu in Namibia.

Citizen-owned seismometers, which tend to measure more localised noise, noted large drops around universities and schools around Cornwall, UK and Boston, U.S.—a drop in noise 20 percent larger than seen during school holidays.

Countries like Barbados, where lockdown coincided with the tourist season, saw a 50 percent decrease in noise. This coincided with flight data that suggested tourists returned home in the weeks before official lockdown.

Listening in

Over the past few decades, seismic noise has gradually increased as economies and populations have grown.

The drastic changes to daily life caused by the pandemic have provided a unique opportunity to study their environmental impacts, such as reductions in emissions and pollution in the atmosphere. The changes have also given us the opportunity to listen in to the Earth's natural vibrations without the distortions of human input.

The study reports the first evidence that previously concealed earthquake signals, especially during daytime, appeared much clearer on seismometers in urban areas during lockdown.

The researchers say the lockdown quietening could also help them differentiate between human-caused noise and natural signals that might warn of upcoming natural disasters.

Lead author Dr. Thomas Lecocq from the Royal Observatory of Belgium said: "With increasing urbanisation and growing global populations, more people will be living in geologically hazardous areas. It will therefore become more important than ever to differentiate

between natural and human-caused noise so that we can 'listen in' and better monitor the ground movements beneath our feet. This study could help to kick-start this new field of study."

The study's authors hope that their work will spawn further research on the seismic lockdown, as well as finding previously hidden signals from earthquakes and volcanoes.

Dr. Hicks said: "The lockdowns caused by the coronavirus pandemic may have given us a glimmer of insight into how human and natural [noise](#) interact within the Earth. We hope this insight will spawn new studies that help us listen better to the Earth and understand natural signals we would otherwise have missed."

More information: Thomas Lecocq et al. Global quieting of high-frequency seismic noise due to COVID-19 pandemic lockdown measures, *Science* (2020). [science.sciencemag.org/lookup/ ... 1126/science.abd2438](https://science.sciencemag.org/lookup/doi/10.1126/science.abd2438)

Provided by Imperial College London

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