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## Using COVID19 as an Opportunity to Measure Seismic Silences and Bring Geoscience Projects to Students

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On 11 March 2020, the World Health Organization declared Covid19 a pandemic. Countries around the world rushed to declare various states of emergencies. Canada also implemented emergency measures to restrict the movements of people including the closure of borders, non-essential services, and schools and offices to slow the spread of Covid19. I used this opportunity to measure changes in seismic vibrations registered in Canada before, during, and after the lockdown due to the slowdown in transportation, economic, and construction activities. I analyzed continuous seismic data for 6 Canadian cities: Calgary and Edmonton (Alberta), Montreal (Quebec), Ottawa, and Toronto (Ontario), and Yellowknife (Northwest Territories). These cities represented the wide geographical spread of Canada. The source of data was seismic stations run by the Canadian National Seismograph Network (CNSN). Python and ObSpy libraries were used to convert raw data into probabilistic power spectral densities. The seismic vibrations in the PPSDs that fell between 4 Hz and 20 Hz were extracted and averaged for every two weeks period to determine the trend of seismic vibrations. The lockdown had an impact on seismic vibrations in almost all the cities I analyzed. The seismic vibrations decreased between 14% - 44% with the biggest decrease in Yellowknife in the Northwest Territories. In the 3 densely populated cities with a population of over 1 million - Toronto, Montreal, and Calgary, the vibrations dropped by over 30%.

To enable other students to undertake similar projects for their cities, I created a comprehensive online training module using Jupyter notebooks available on Github. Students can learn about seismic vibrations, how to obtain datasets, and analyze and interpret them using Python. They can share their findings with local policymakers so that they become aware of the effectiveness of the lockdown imposed and are better prepared for lockdowns in the future. When we make data and technology accessible, then lockdowns because of pandemics can be an opportunity for students to take up practical geoscience projects from home or virtual classrooms.