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The COVID-19 Seismic Noise Quiet as Seen by Two Raspberry Shake Seismographs Located at Boston College

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Abstract Text:

Observations of seismic noise around the world that reveal up to 50% noise reduction due to COVID-19 lockdowns (Lecocq et al., 2020; L20) are individually likely the result of an entangled mix of very local sources and the broader global phenomenon. Here we use two Raspberry Shakes (RSs) at Boston College (RA2DE and R57EC, separated by ~200 m), both of which were part of the L20 study, to explore and attempt to untangle very local (within ~200 m) vs global effects. Vertical component seismograms from these sites (beginning with 01/01/20) were bandpass filtered in the 4-20 Hz band, and signal envelopes were calculated for different sub-bands of that frequency range (with 15 min and 4 hr Gaussian smoothing). The resulting envelopes show diurnal noise cycles, with an overall decrease after the March 18 Boston area lockdown. These sites have overall patterns of post-lockdown decrease similar to other sites in the L20 study, but the patterns of course also vary due to local sources. We compare the locally-observed noise with independent measures of human activity and with the global pattern of COVID-19 quieting.

RA2DE is in a student athletics center, and R57EC is in a classroom building. RA2DE (~130 m from Beacon St) is closer to commuting activity than R57EC (~260 m from Commonwealth Ave). We compare seismic noise at these sites with measures of Boston area human activity, here depicted by the Apple Mobility Index (AMI, available for transit, driving, and walking activity) showing a 60-85% decrease after March 18, and more recent recovery to higher levels. The broad trends of the noise data generally correlate with the AMI data, which reflect activity over the larger Boston region, but that broad pattern is undoubtedly mixed with noise from sources near the RSs (e.g., people walking, and vehicles driving by). The fit of the AMI data to the noise data varies with the sub-band of the frequency range studied, sometimes correlating well for RA2DE and sometimes for R57EC. We suspect those differences are due to differences in sources near the site, such as RA2DE being nearer to vehicle traffic. While details of the noise data are likely affected by such very local sources, these two inexpensive seismographs, in noisy environments, also appear to provide a window into the same global pattern of noise reduction seen at many sites across the globe.

Session Selection:
S025. Social Seismology - The effect of COVID-19 lockdown measures on global seismic noise

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