# Towards near-surface monitoring by distributed acoustic sensing (DAS) and traffic noise

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Monitoring the near-surface changes in urban areas is crucial for groundwater resources management or geohazard assessment. Distributed acoustic sensing (DAS), which can record strain changes due to ground vibrations using pre-existing telecom fiber as discrete sensors, is an excellent tool for such purposes. Together with ambient seismic noise interferometry can become a cost-effective and completely non-invasive method to track geophysical (e.g., strain and seismic velocity) changes along the city routs. However, retrieving Rayleigh surface wave from only one horizontal DAS component in an urban area is nontrivial. Based on the 660-m long telecom fiber line as a part of the Penn State Fiber-Optic For Environment Sensing (FORESEE) array, we preset how road obstacles, local traffic, and weather conditions influence virtual shot gather (VSG) quality. The number of minutes for which Rayleigh surface wave can be identified on VSG varies in time and space along the line. We notice more minutes with good VSGs close to bumps, manholes, and some intersections. We also observe a significant VSGs quality drop on heavy rain days, particularly when the temperature decreases. Finally, we present the processing workflow on how we archive stable Rayleigh surface wave for each day over one month.

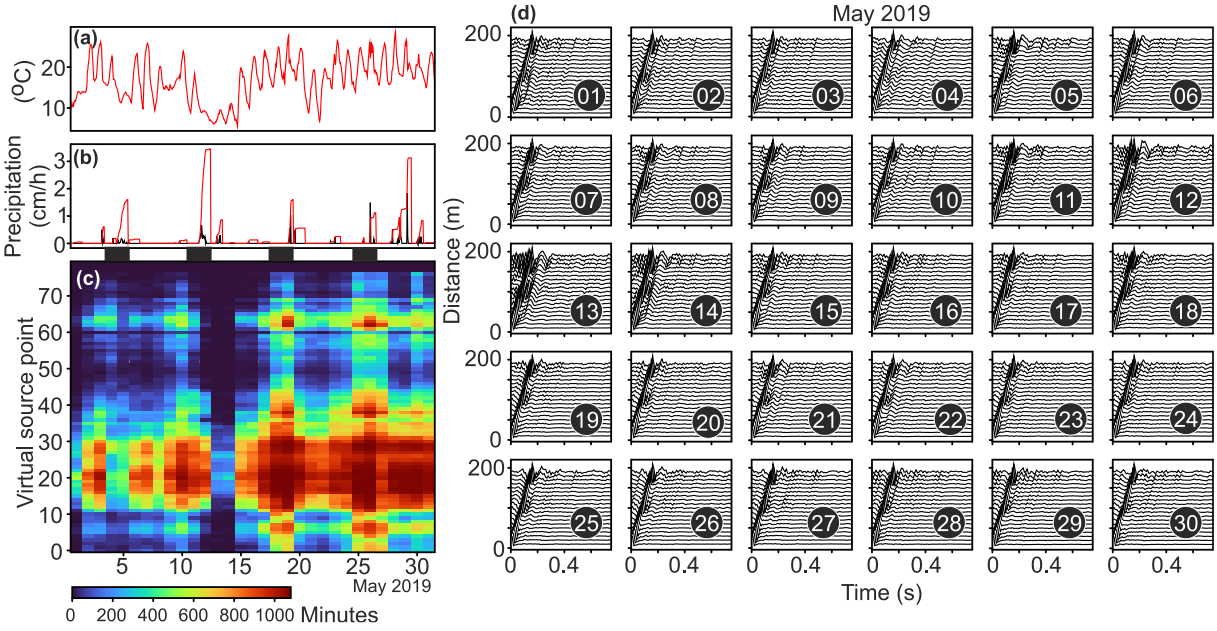


*Figure 1*. (a) Temperature, (b) precipitation, and (c) number of minutes for virtual source points for which Rayleigh surface waves can be estimated. (c) Rayleigh surface waves estimated between 15 and 25 virtual source points for every day of May 2019. Black rectangles between graphs (b) and (c) denote weekends