

We present results from multicomponent seismic land streamer systems that operate along city streets with source and receiver sampling every few meters. We use this system to characterize soil and fluid (V_p and V_s) distributions in the upper ~ 30 m and stratigraphic/structural controls for the upper few hundred meters. This system is controlled by a single operator where real time seismograph recording, programmable weight drop systems, and source and contact-coupled geophone locations are collected at a rate of about 400 m/hour. Depending on objectives and logistics, we use one-, two-, and three-component 4.5, 10, 40, or 100 Hz geophones at a range of geophone spacings and aperture lengths. We show results from three seismic surveys. In downtown Salt Lake City, we generate a detailed city wide V_s30 site response map, a liquefaction susceptibility map, late Quaternary fault distribution map, and ground water contour map to determine the tectonic setting and earthquake risk in a step over region of the Wasatch fault. For this survey, we find a strong connection between active faulting, liquefaction and ground shaking potential, and depositional setting. In Charleston, we map stratigraphy and structures to more than 500 m depth related to the 1886 earthquake. We compare these results to legacy seismic data that are currently being used for earthquake hazard assessments. In Hawaii, we present an example where V_p and reflection images show the distributions mechanically and chemical weathered fronts beneath steep walled valleys to support contaminant transport models. In all of these examples, we are able to provide a rapid and robust hazard and resource assessment in high noise urban environments. With the proliferation of self-driving vehicles, we anticipate a fully autonomous seismic system to operate along city streets to develop detailed hazard and resource maps for urban centers.

