Additional Questions & Answers

Geo-hazard Early Warning Systems to Protect Vulnerable Populations, April 22, 2022

How are you planning to provide power and internet to stations in the mountains?

Power via electric gridline is available in the mountainous regions where we are planning to deploy our sensors. We plan to use wifi/ethernet connection that uses cellular internet available in the region. However, we need to test the stability of both the internet and power connections. Future versions of the seismic sensor will be equipped with a solar panel, battery, and cellular internet connectivity so they can be more standalone in regions like this one.

I'm interested to learn more about the dead zone around the epicenter. In Utah, 85% of our population lives on top of the Wasatch Fault (large normal faults related to extension).

The earthquake early warning system takes roughly 10 seconds since the earthquake origin time to characterize the earthquake. This includes the travel time of earthquake primary waves from the hypocenter to closest stations, data transmission to server, data processing etc. At the time of 10 sec since the earthquake origin, damaging secondary waves will have already reached a region within about 40 km radius around the earthquake epicenter. Therefore, that region cannot receive the alert in time and the EEW system may help only in regions farther away from the earthquake epicenter.

What is the cost of the sensors?

The sensor is now manufactured by Grillo, Inc. and the price is a few hundred dollars (particular price depends on the type of enclosure, sensor with/without gps etc). The sensor design is open-source and published on github (https://github.com/openeew/openeew-sensor) so anyone can manufacture it themselves. In that case the total cost will largely result from the cost of individual components, which depends on the ordered quantity and other factors.

Would one potentially be able to use these types of earthquake sensors to detect earthquake events or submarine landslides and thus create an early warning system for local tsunamis originating very close to shore?

Unfortunately, I am not familiar with seismic signals of submarine landslides. The sensor needs to be deployed on land and cannot be used as an underwater sensor. On land, it can capture accelerations greater than about 40 micro-g. If underwater landslides create signals stronger than this threshold, the system can potentially work for the job. However, new processing methodology would have to be developed/adopted for this specific application.

Can we link Direct push with Electrical Resistivity Tomography (ERT) surveys for landslide studies?

We don't have direct push data for our study region. However, if you have both direct push and ERT data, it will be an exciting link to make.

Are you also using water gauge stations on the different rivers?

We are using groundwater well information.

Would it be practical to use the USDA soil profile (websoil/) in slope susceptibility analysis?

That will be something to explore. However, the question is whether USDA data has sufficient spatial resolution to perform slope stability analysis. Combining USDA data with some geophysical surveys can be promising.