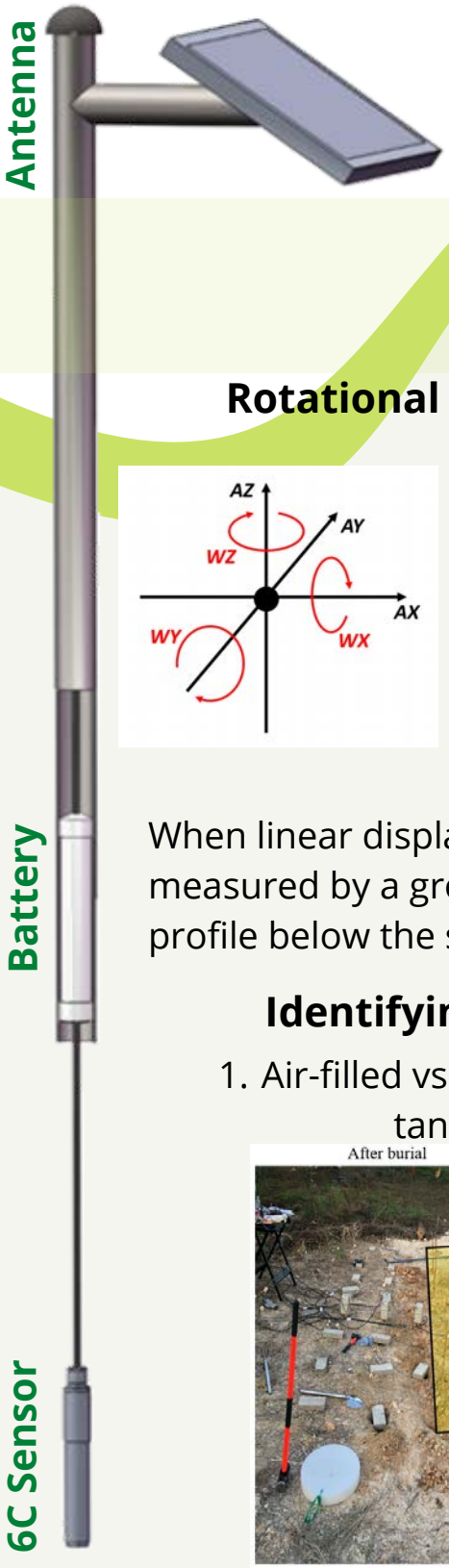
SeismicityAlert®

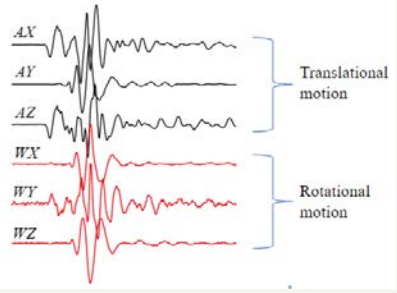
SensorEra

Near-Surface Imaging



6C Sensors for Velocity Profiling and Void or Buried Object Detection

Rotational Seismology using Six Components (6C) of Motion



Rotational displacement field: $\vec{\Omega} = \frac{1}{2}\nabla \times \vec{u}$

In the wavenumber domain, $\vec{\Omega} = \frac{1}{2}\vec{k}\times\vec{u} = \frac{i\omega}{2c}\vec{p}\times\vec{u}$

$\rightarrow \dot{\vec{\Omega}} = \frac{1}{2}\vec{k}\times\dot{\vec{u}} = -\frac{1}{2c}\vec{p}\times\ddot{\vec{u}}$

$\vec{u}$: displacement field.
$\vec{k}$: wavenumber vector;
$\vec{p} = \frac{\vec{k}}{|\vec{k}|}$: propagation direction vector;
ω: angular frequency;
c: wave propagation velocity.

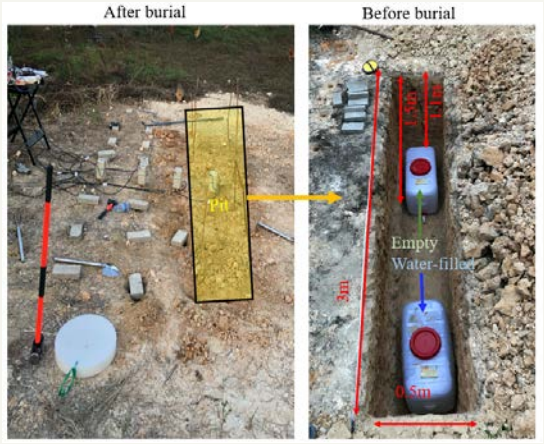
For near surface seismic problems, the wavefield $\ddot{\vec{u}}$ is dominated by surface wave, so we can assume that $\ddot{\vec{u}}$ and $\dot{\vec{\Omega}}$ correspond to the acceleration and rotational velocity of the surface wavefield. For Rayleigh wave, its phase velocity can be immediately obtained as

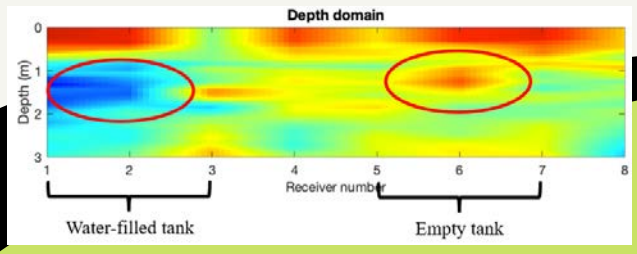
$$c = c(\omega) = \sqrt{\frac{\ddot{u}_z^2}{\dot{\Omega}_x^2 + \dot{\Omega}_y^2}}$$

When linear displacement and rotational displacement are measured by a ground-motion sensor, the subsurface velocity profile below the sensor is revealed.

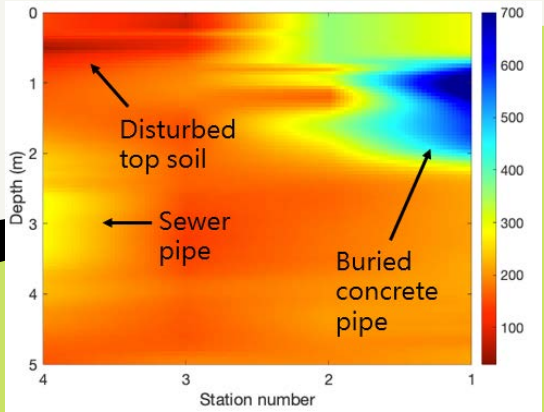
Identifying objects and voids with 6C velocity profiling

1. Air-filled vs water-filled buried tank detection





2.Buried pipe detection



For more information, please contact **info@sensorera.tech**