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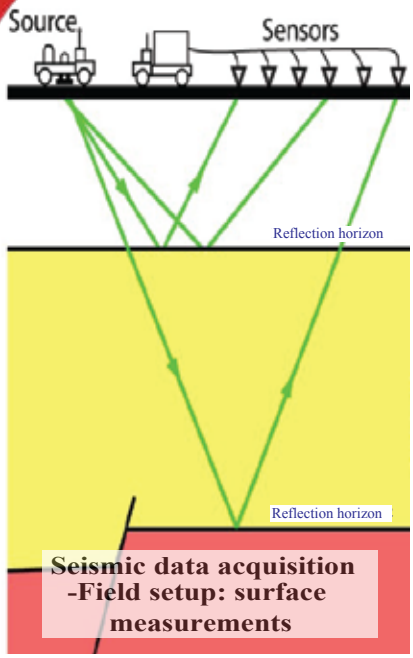
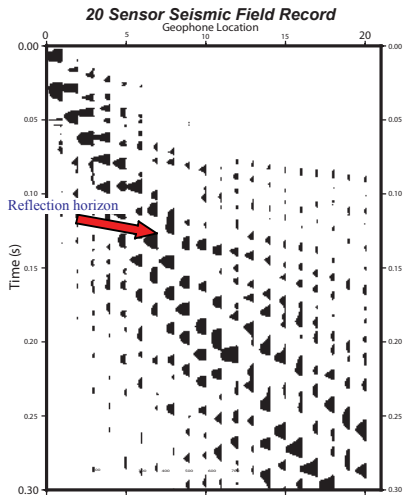
New era in seismic data acquisition:
3C broadband landstreamer!

Overview of the seismic method





Seismic methods are based on detecting differences in physical properties in the media in which waves propagate through. Subsurface materials exibit differences in lythology, fluid content, degree of fracturing, all of which may affect seismic wave propagation.

Seismic investigations require :

- Source to generate seismic waves, such as sledgehammers, explosives, vibrators etc.,
- Sensors – devices to detect ground motion, reflections, refractions, ...
- Recording equipment – a system to record the signal detected by all sensors.

Seismic Landstreamer

In conventional seismic surveys, sensors need to be placed firmly on the ground – "planted". This is often one of the most time consuming steps in data acquisition, especially if the whole array of sensors needs to be moved many times, which offen happens.

In contrast, a landstreamer array setup can be defined as an array of geophones designed to be towed along the ground or in tunnels without planting.

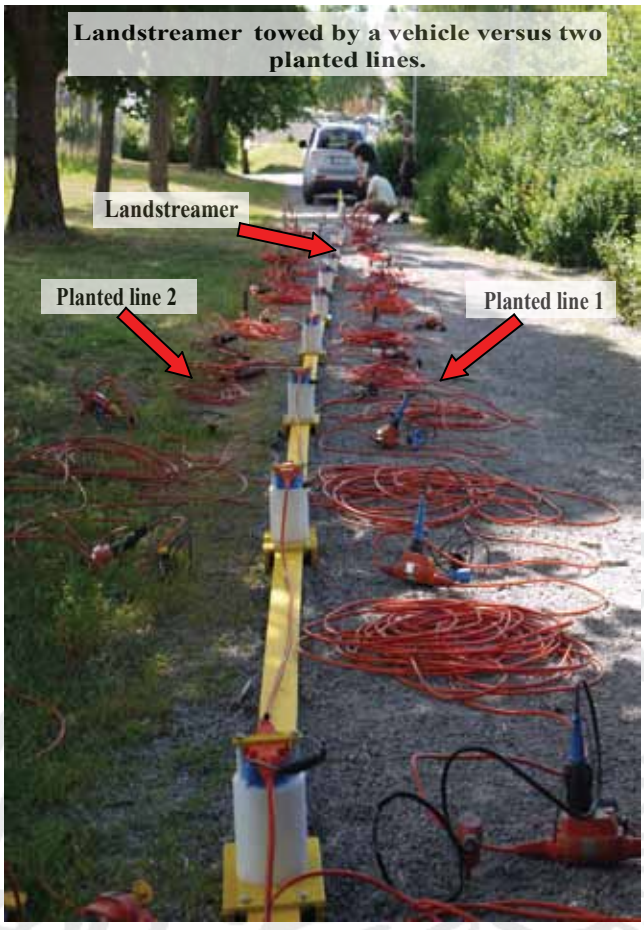
Three component (3C) sensors enable recording and definition of the full seismic wave field. Both *P*- and *S*-waves can be used, hence better resolution images can be obtained. Different waves have distinct sensitivity to different properties of the subsurface materials, especially the presence of fluids.

Essential benefits:

- No need for planting, an issue in big cities, mines, etc.
- High-res imaging using densely spaced sensors
- Covering large areas relatively fast

Combined with wireless units:

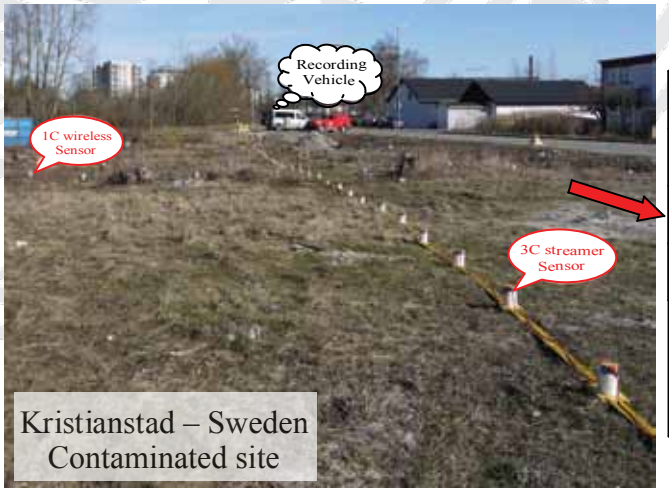
- Easy to use in rough terrains
- Highly curved and inaccessible roads
- Necessity for longer profiles and offsets
- Continuous data acquisition
  - Active or passive



Specifications

Technical details

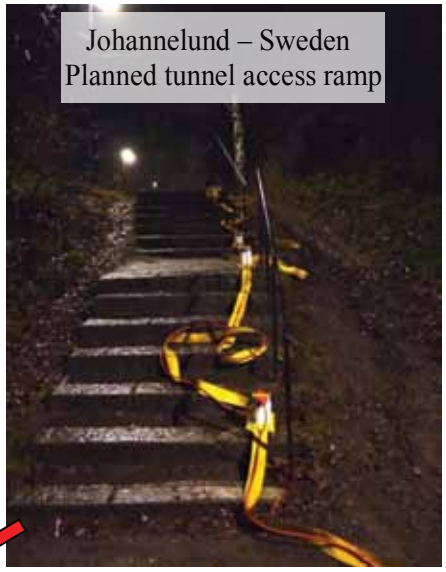
Sensor type:	**DSU3** – Three component MEMs based sensors
Number of sensors: (currently available)	**Landstreamer (GPS time stamped)** **100 DSU3 sensors** • 4x20 units 2 m geophone offset • 1x20 units 4 m geophone offset • Possibility of shorter offsets, if needed **Wireless units – Σ 76** • 24 – Three component • 52 – Single component

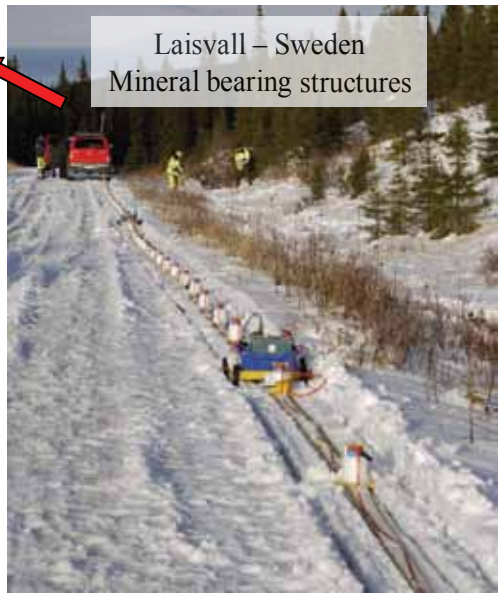


Kristianstad – Sweden
Contaminated site

Areas of applications

- Civil engineering
- Mineral exploration
- Environmental issues
- Groundwater
- Geological and structural setting studies


Johannelund – Sweden
Planned tunnel access ramp


Laisvall – Sweden
Mineral bearing structures

Field setup

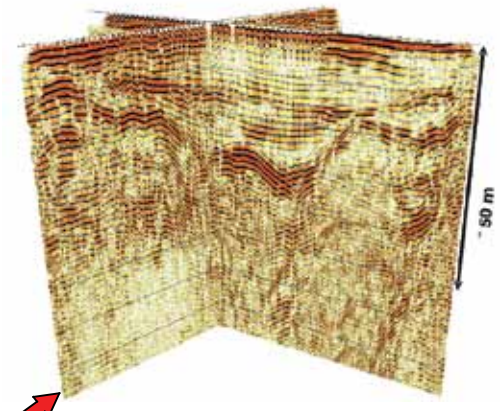
Length:	Maximum a couple of 100s of meters towed over several 100s of meters (depending on the targets)
Source:	Sledgehammer, accelerated weight drop or vibrator (NB: seismic waves can hardly be felt a few meters away from it)
Acquisition speed:	500 - 1000 m/day @ 2 - 4 m source spacing

Measurement

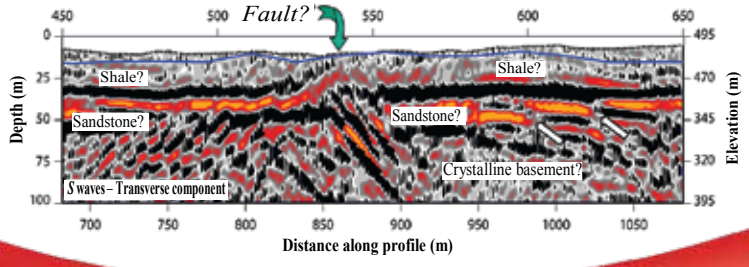
Vertical resolution:	Can be as good as 1 - 2 meters in terms of imaging
Depth of investigation:	From a few meters to a few tens of meters, or even a few 100s of meters depending on the target requirements and the geological setting
Size of the seismic images:	About the length of the profiles (a few hundreds of meters or even a few km)

Major output

Image of the subsurface structures
Elastic properties of the materials (*P*-and *S*-wave velocities, dynamic Poisson's ratio, rock quality...).



Example of two 2D seismic profiles from a geotechnical site



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Prepared: April 2014