Environmental geophysics

Giorgio De Donno

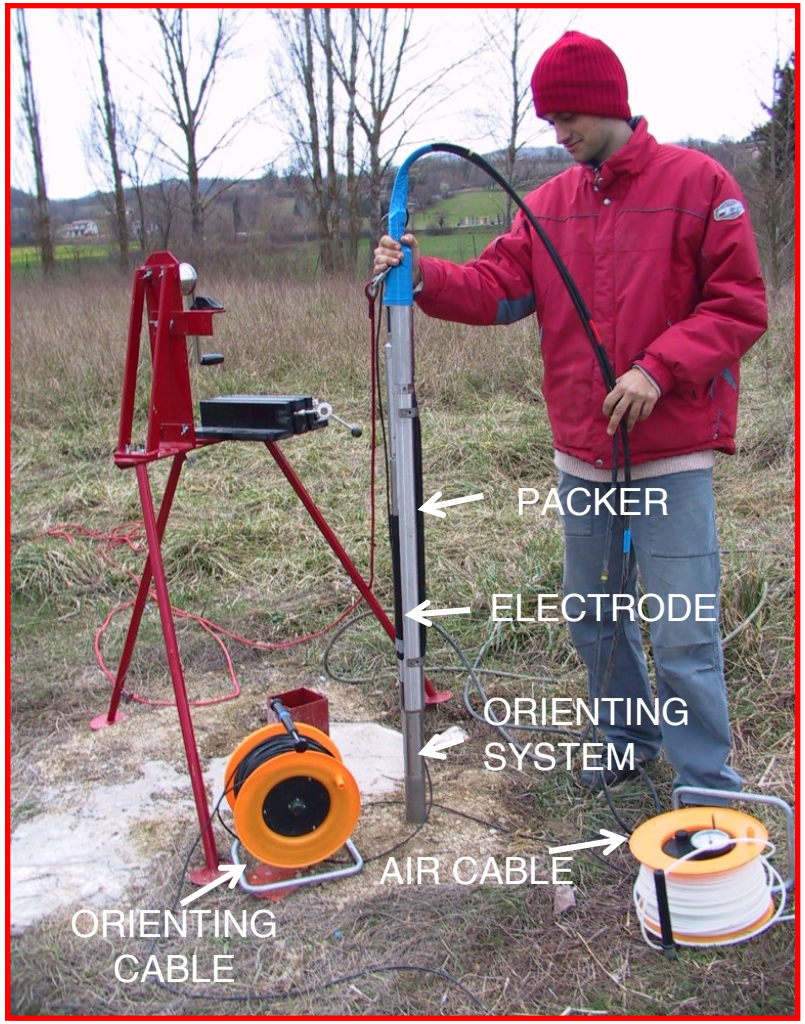
Cross-hole and down-hole

*"**Sapienza" University of Rome** - DICEA Area Geofisica*

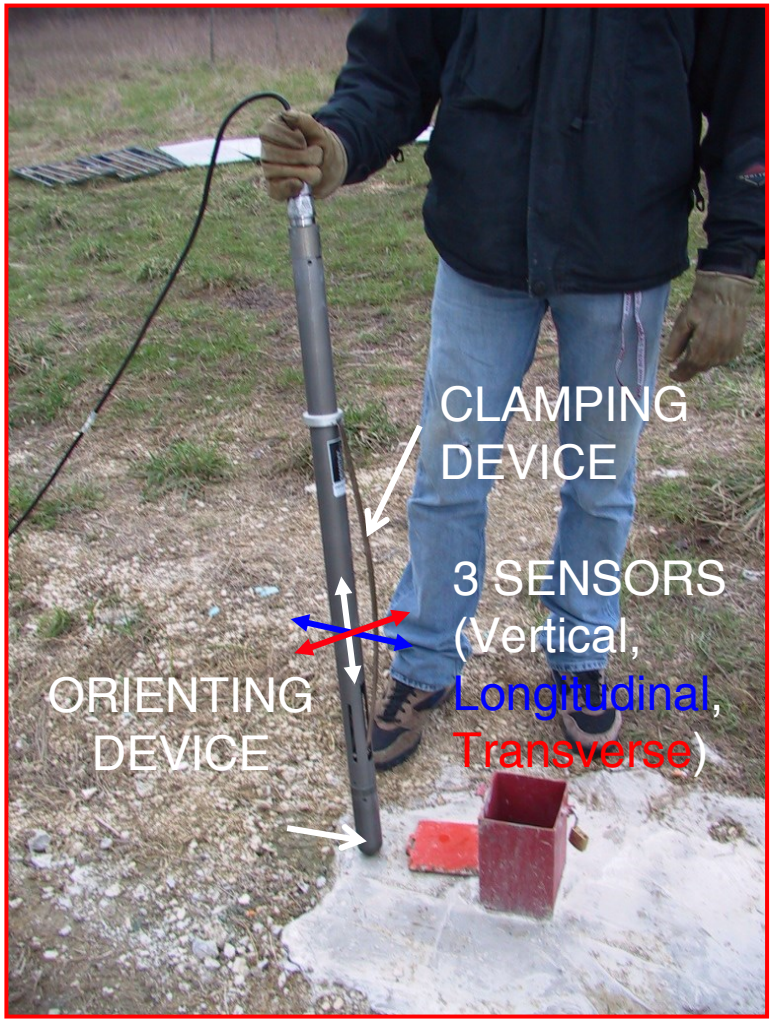
phone: +39 06 44 585 078
email: giorgio.dedonno@uniroma1.it

Cross-hole instruments

Borehole source (Sparker)



Borehole receiver (3C geophone)

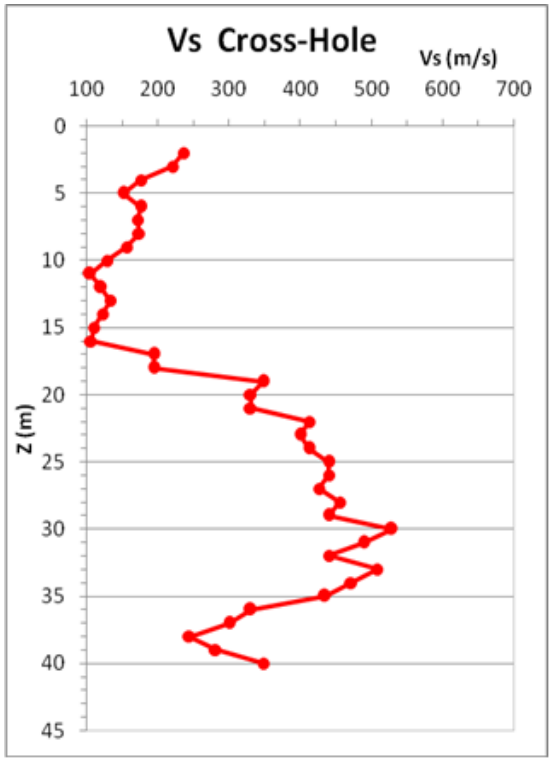


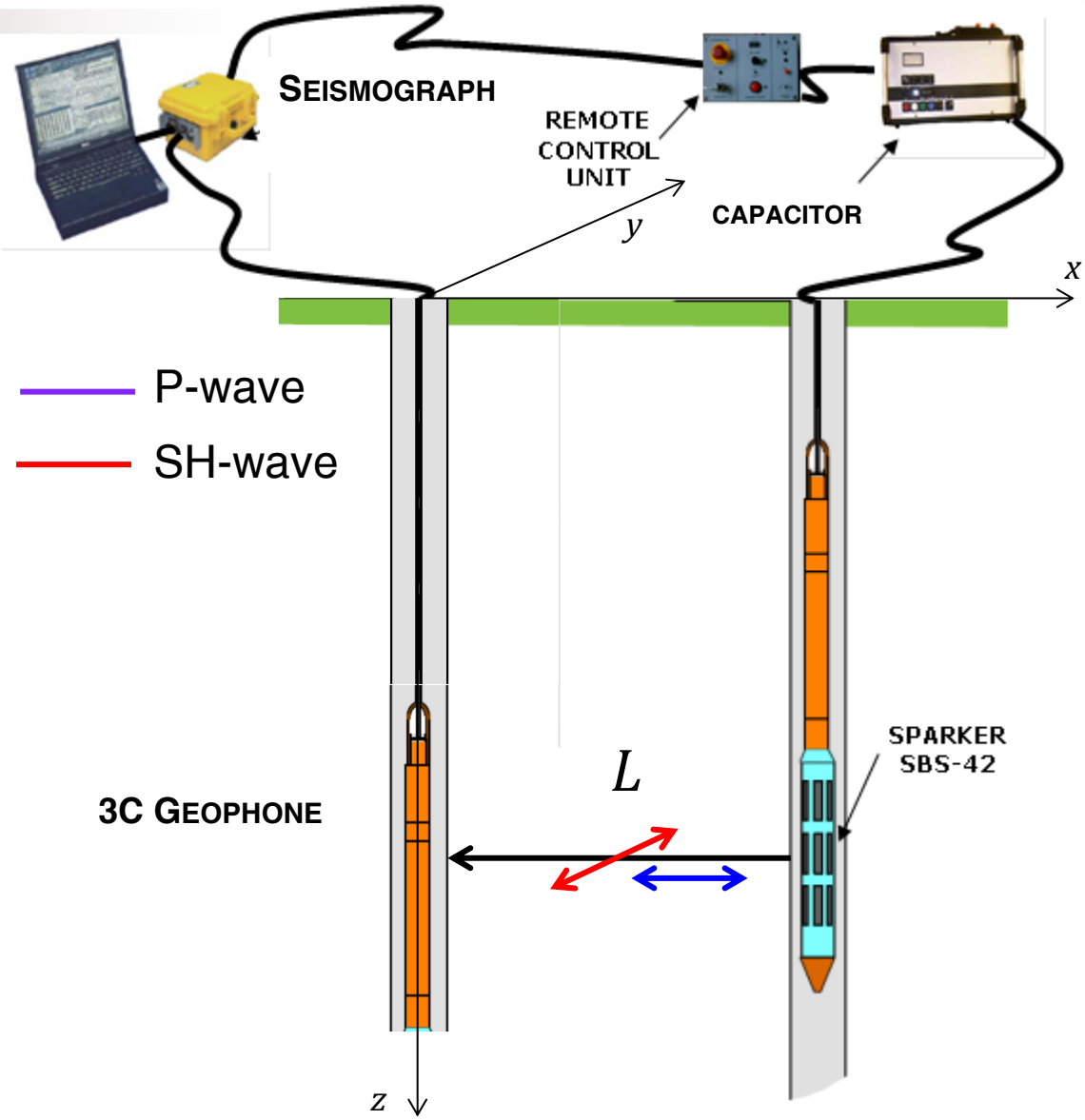
Cross-hole

$$v_i = \frac{L}{t_{v,i}}$$

One velocity value at each depth

1-D velocity model



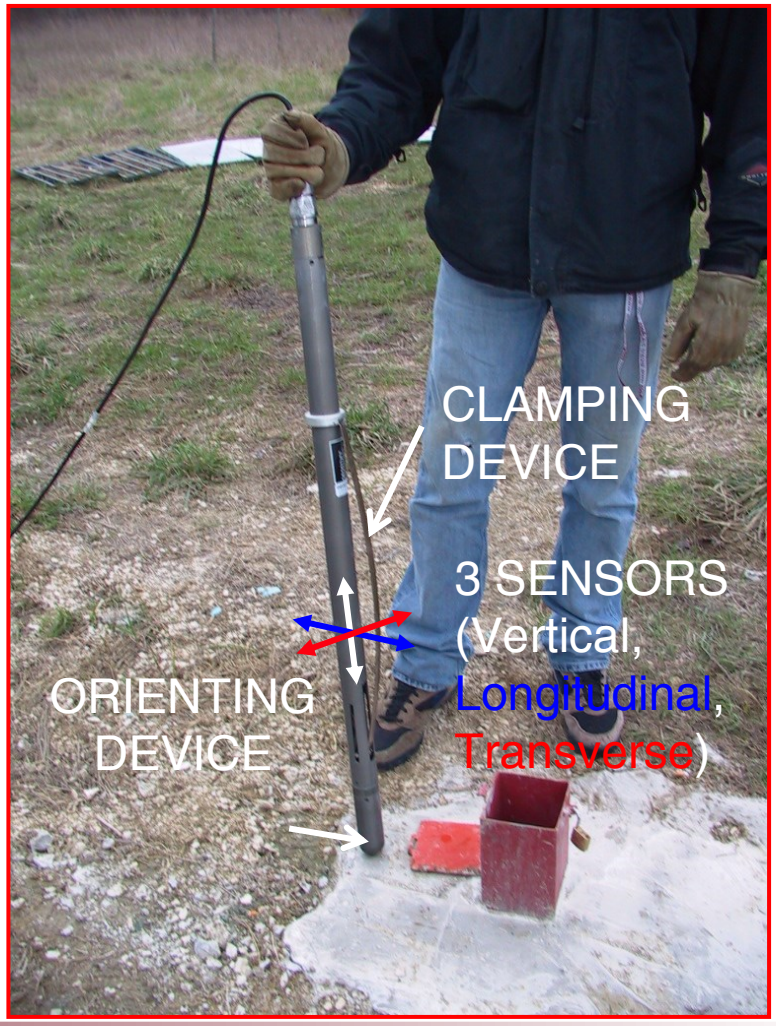


Down-hole instruments

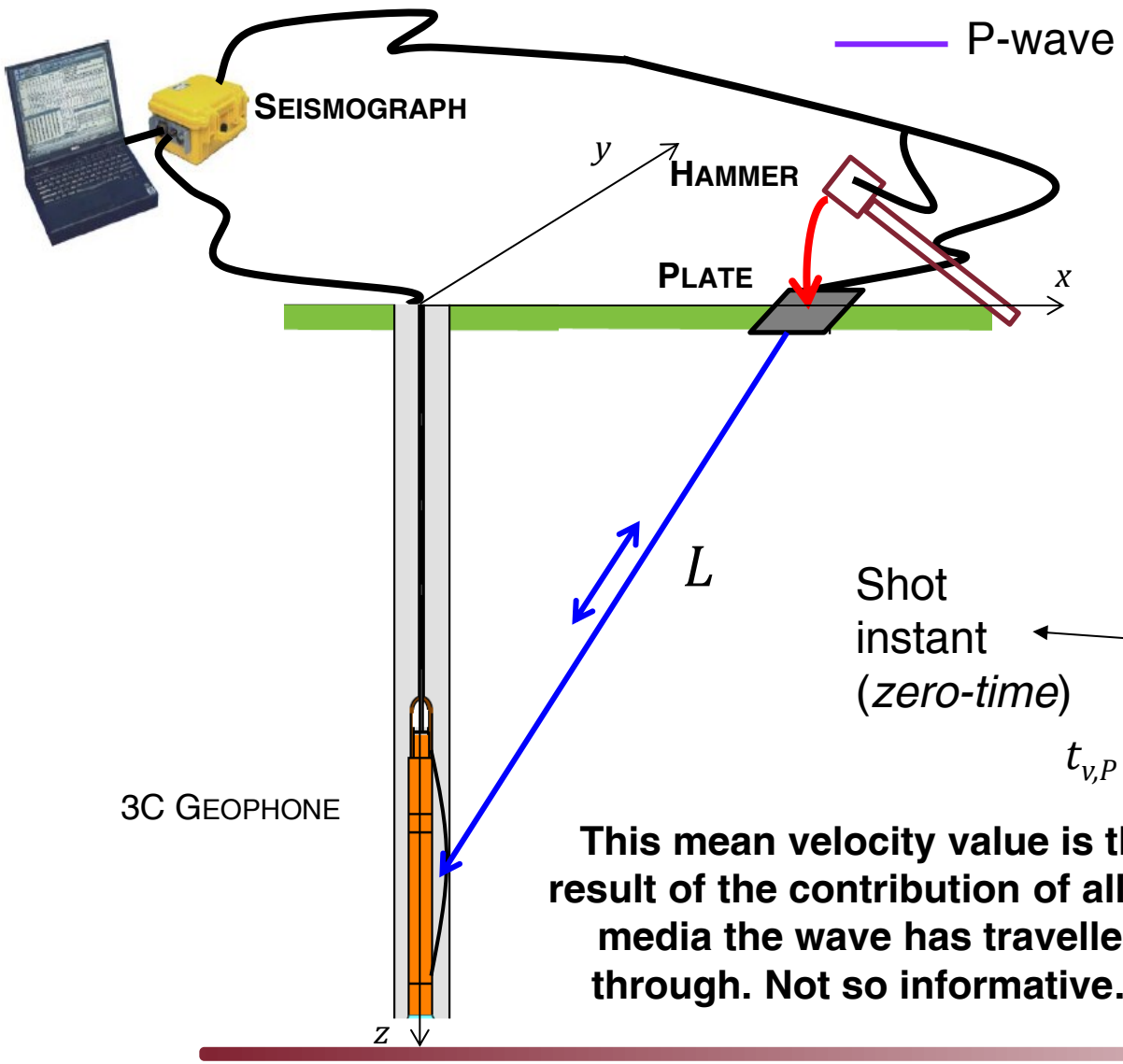
P-wave source

S-wave source

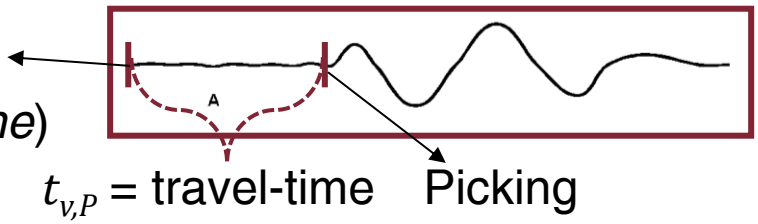
Borehole receiver (3C geophone)



Down-hole – P-wave



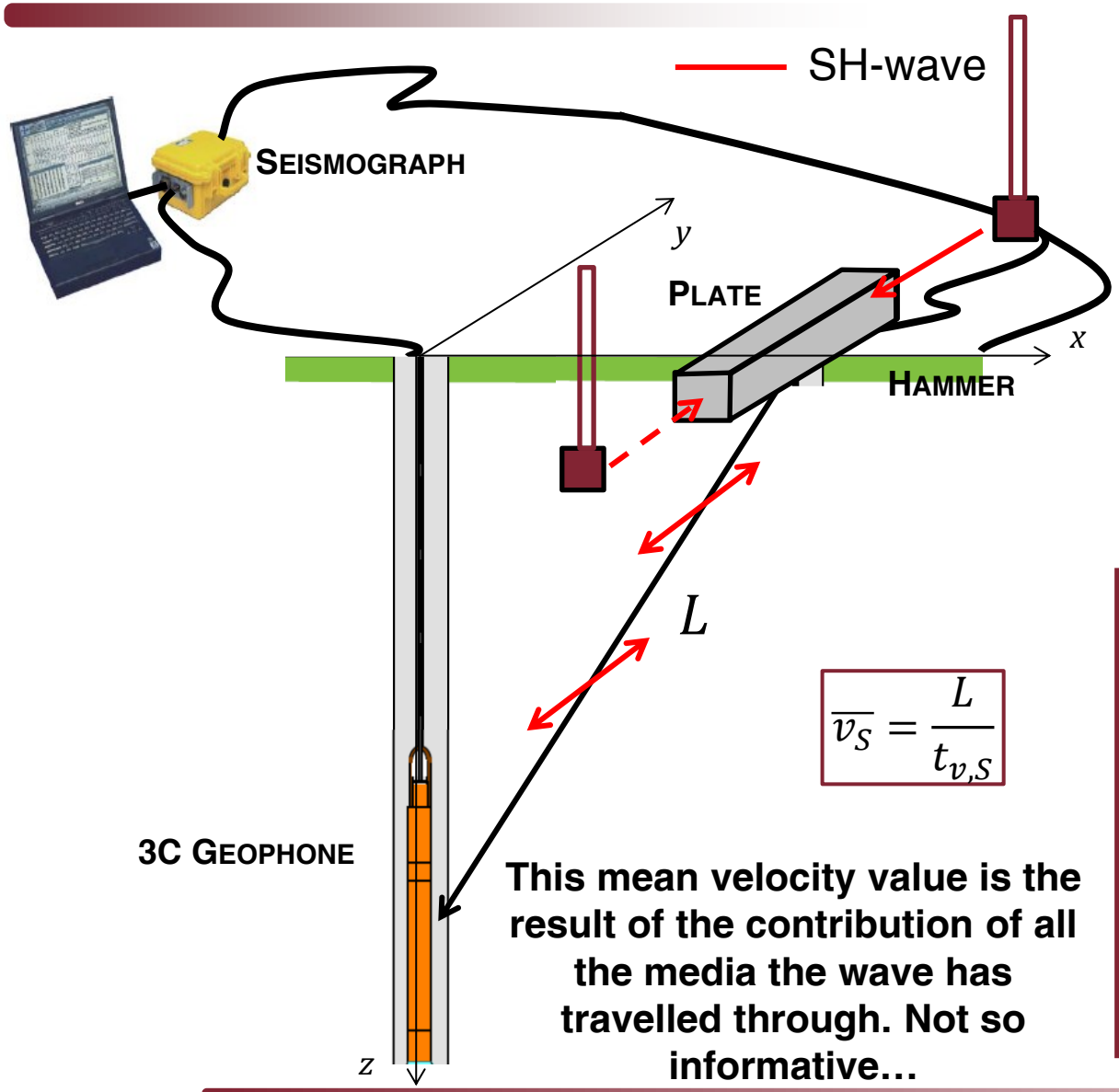
Geophone signal



This mean velocity value is the result of the contribution of all the media the wave has travelled through. Not so informative…

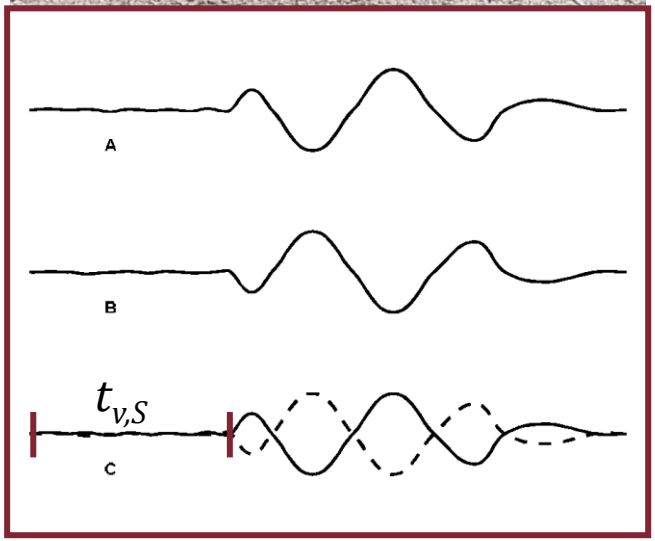
$$\overline{v_P} = \frac{L}{t_{v,P}}$$

Down-hole – S-wave



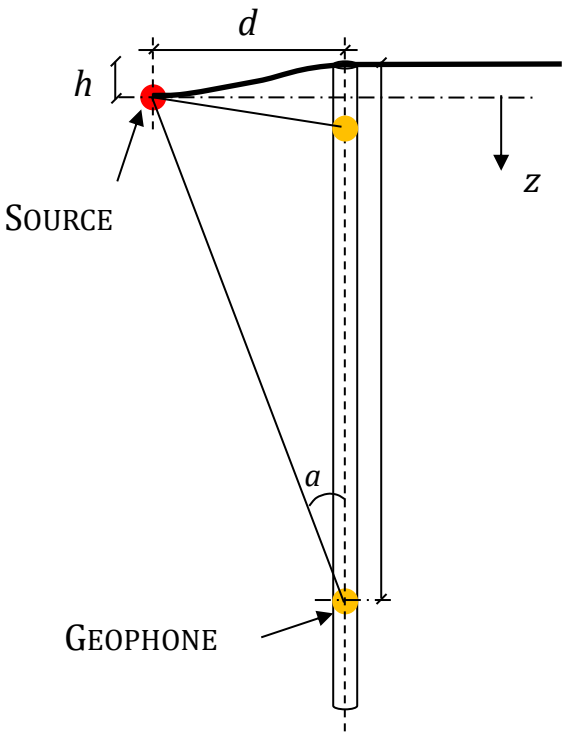
$$\overline{v_S} = \frac{L}{t_{v,S}}$$

This mean velocity value is the result of the contribution of all the media the wave has travelled through. Not so informative…



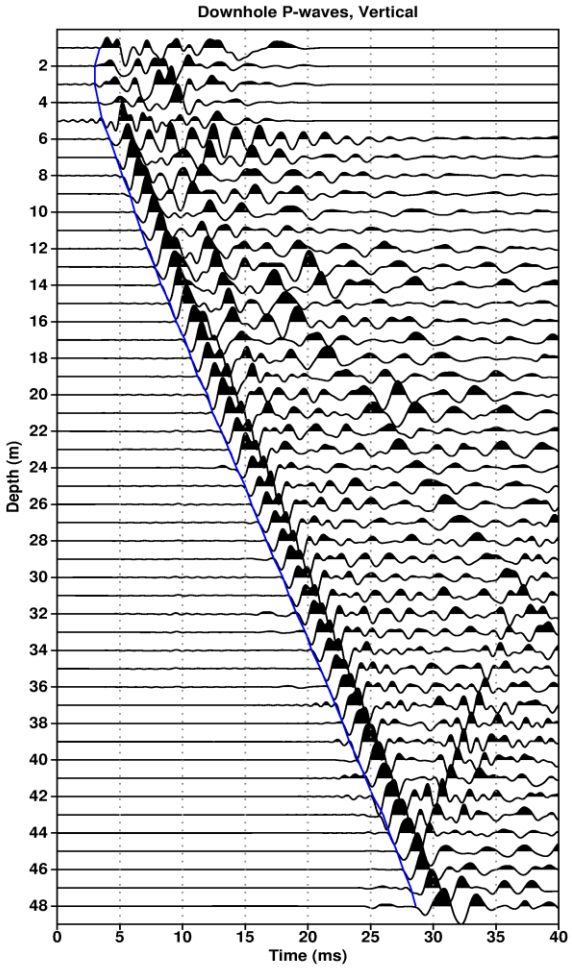
Down-hole – Data acquisition and picking

Data acquisition

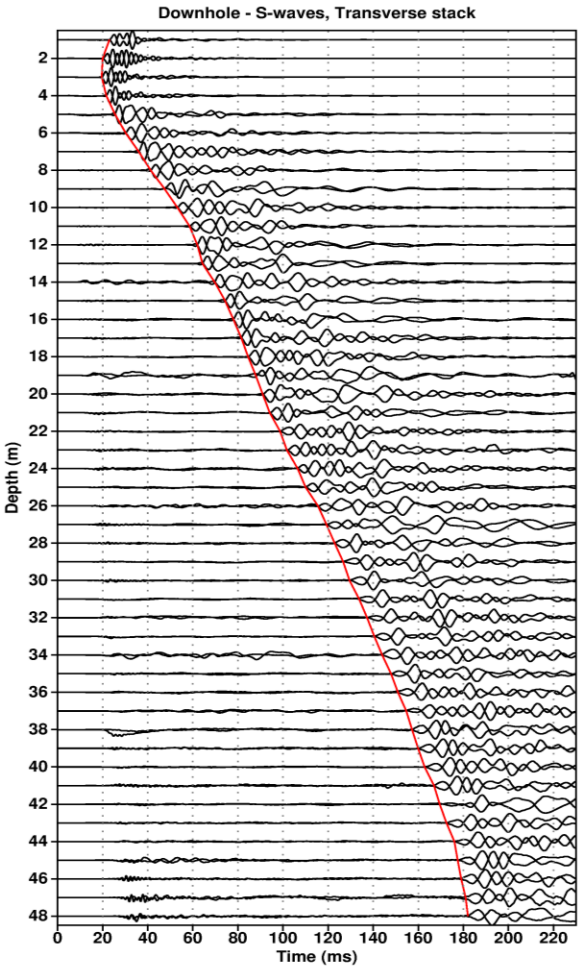


Traces and picked travel-times

P-wave



S-wave



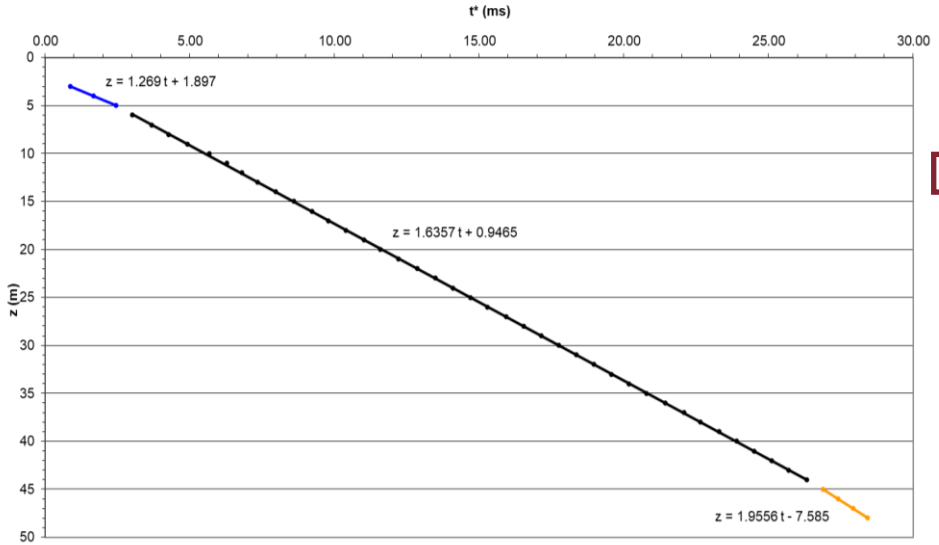
Down-hole - Processing

1. Travel-times correction

$$t_i^* = t_i \cos \alpha_i$$

$$\alpha_i = \tan^{-1}\left(\frac{d}{(z_i - h)}\right)$$

2. Knee-method (corrected time vs. depth)



3. 1-D velocity models P- and S-wave