Project Bedrock

Measurement and interpretation at NGI test area Onsøy

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- Bedrock introduction
- Measurement area
- Profile setup
- Seismic data
- Basic interpretation

Bedrock introduction

- simplistic refraction based detection of basement rock / bedrock / fast-fjellet
- 2D layer of half space assumption
- single moving geophone
- stationary highly reproducible seismic source

- simple outcome : is there shallow bedrock
    - if yes: how deep is it
    - if no: what is the assumed depth range of absence

- ultimately : given the nature of my construction project, do I have to consider rock-blasting

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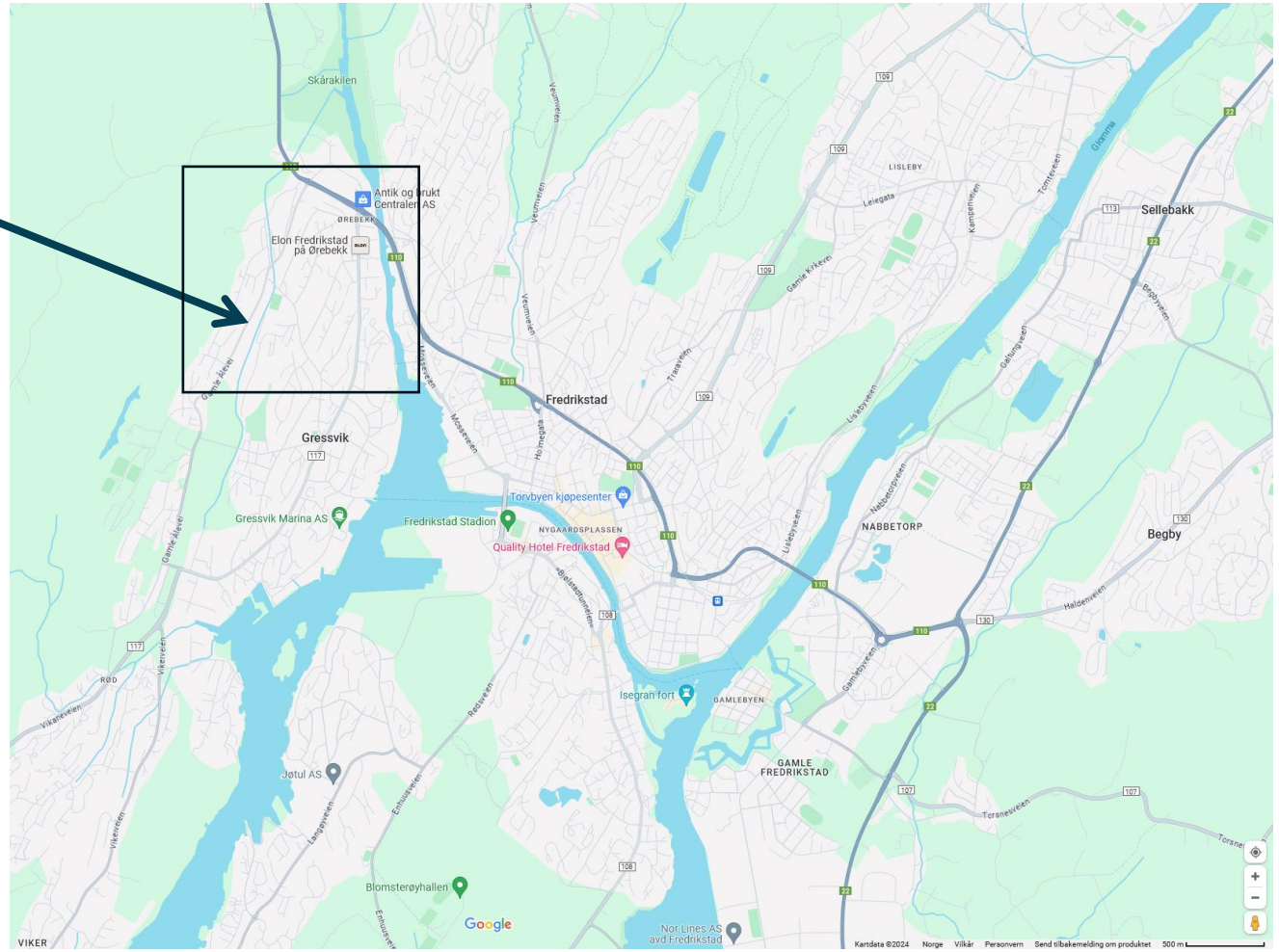
Measurement area

- NGI test area Onsøy



Measurement area

- NGI test area Onsøy

Measurement area

- NGI test area Onsøy
- Profile origin
- Power generator

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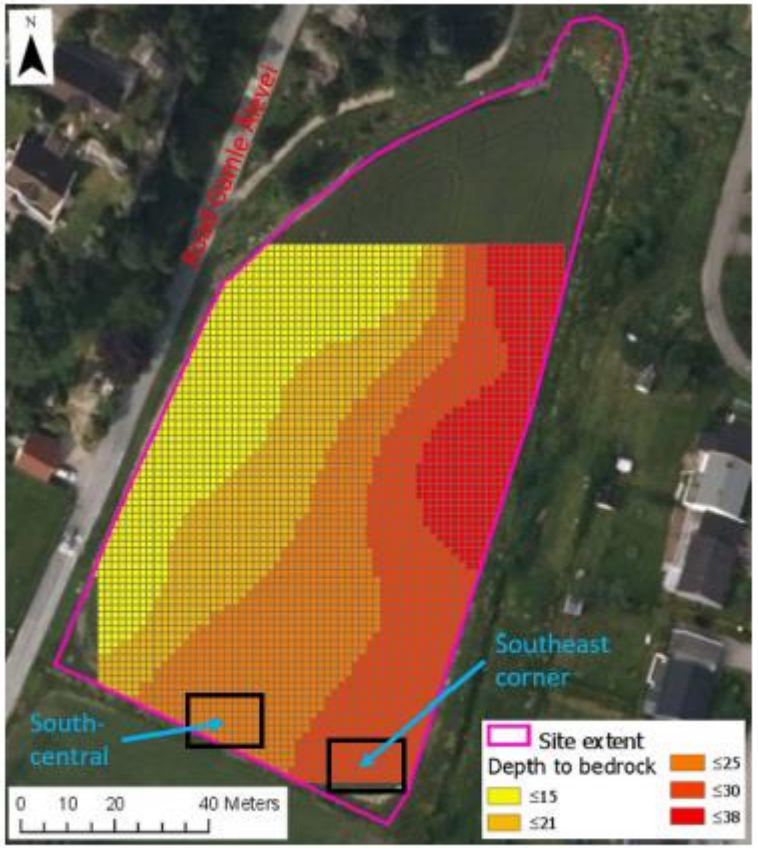


Figure 6. Approximate depths to bedrock at the NGTS Onsøy site.

Measurement area

- NGI test area Onsøy

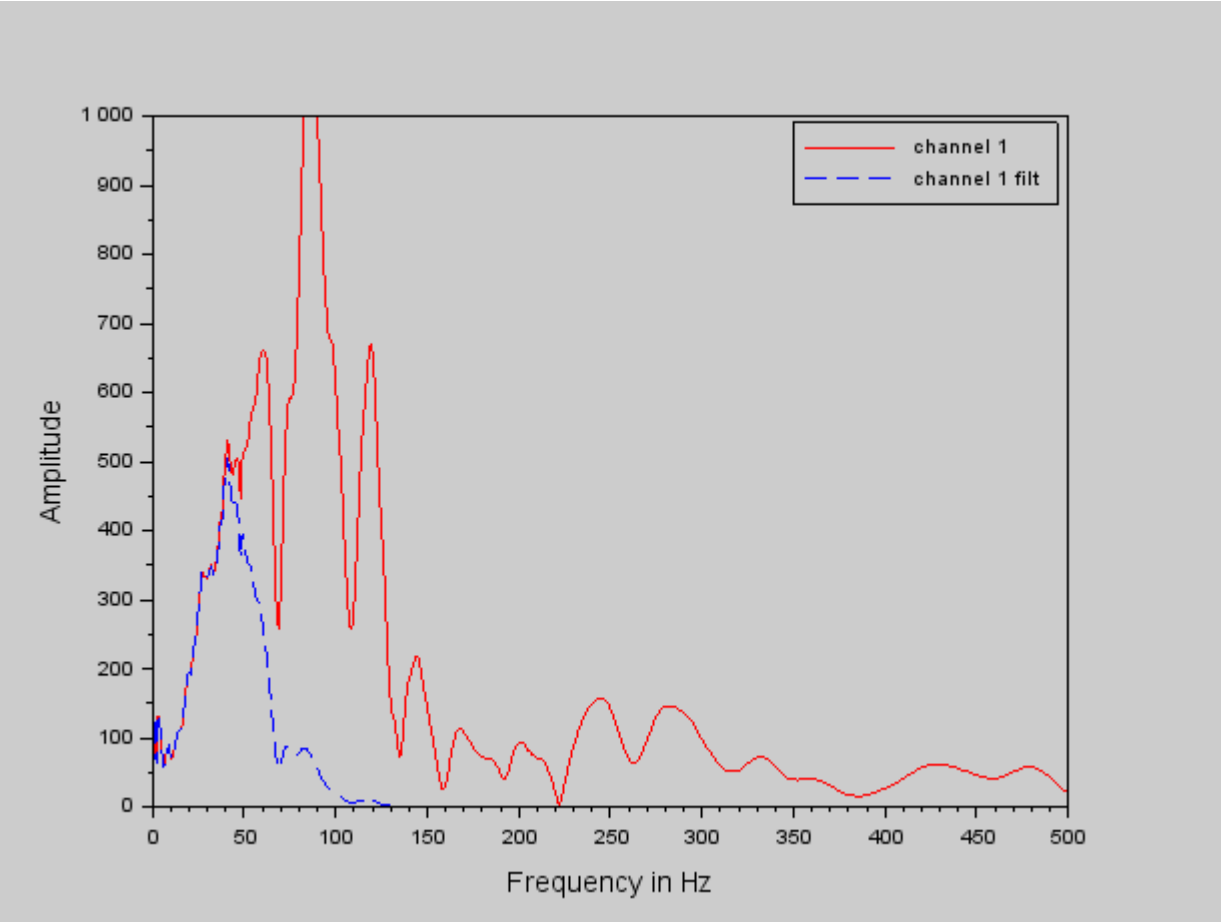
- Profile origin
  Source point

- 1st 3C geophone

Profile setup

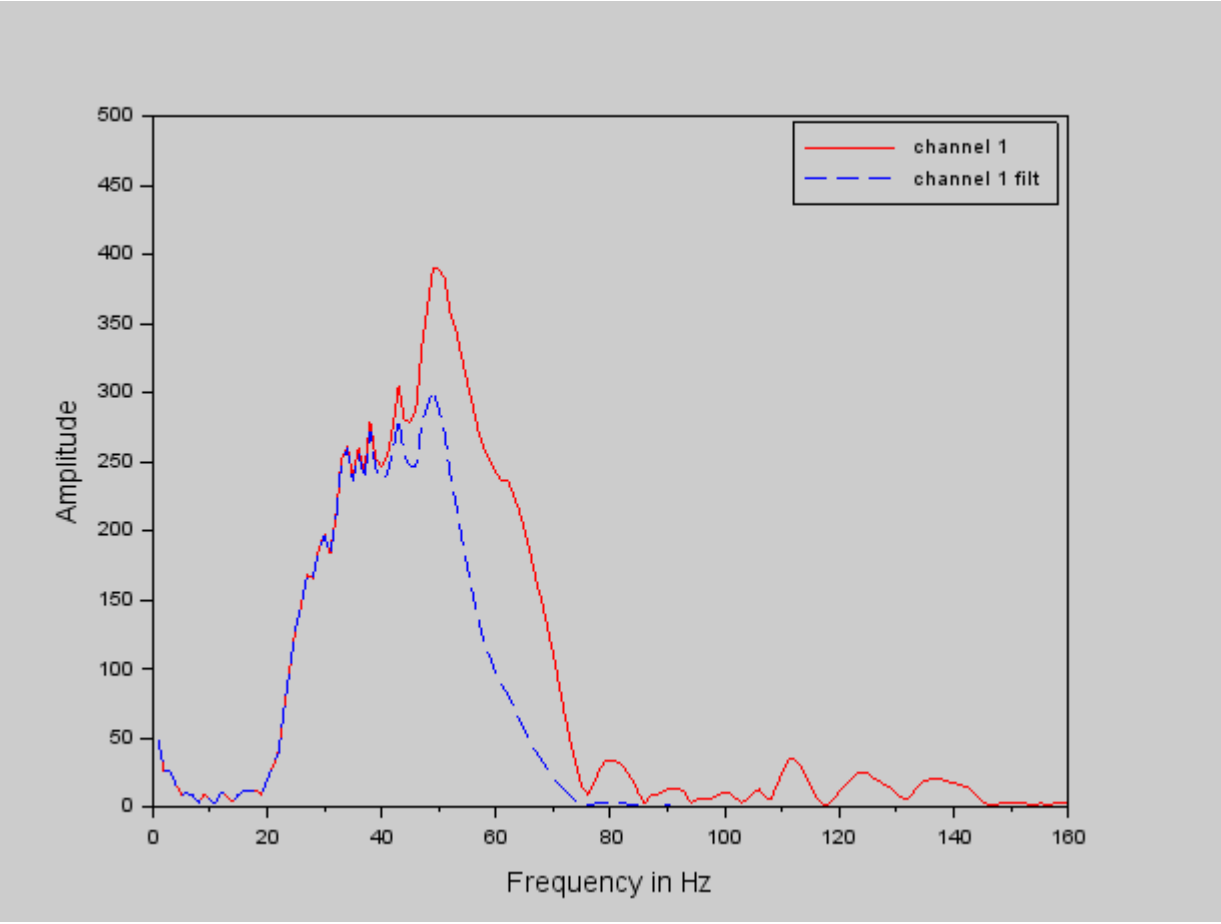
- NGI test area Onsøy
  - Profile 1
  - Profile 2
  - Profile 3
- profiles 14 m long
- single geophone moved each 1 m
- min offset 1 m
- max offset 14 m
- common source stack
- ricker wavelet with center source frequency
  - 30 Hz
  - 50 Hz
- avoid rock traffic noise

Seismic data



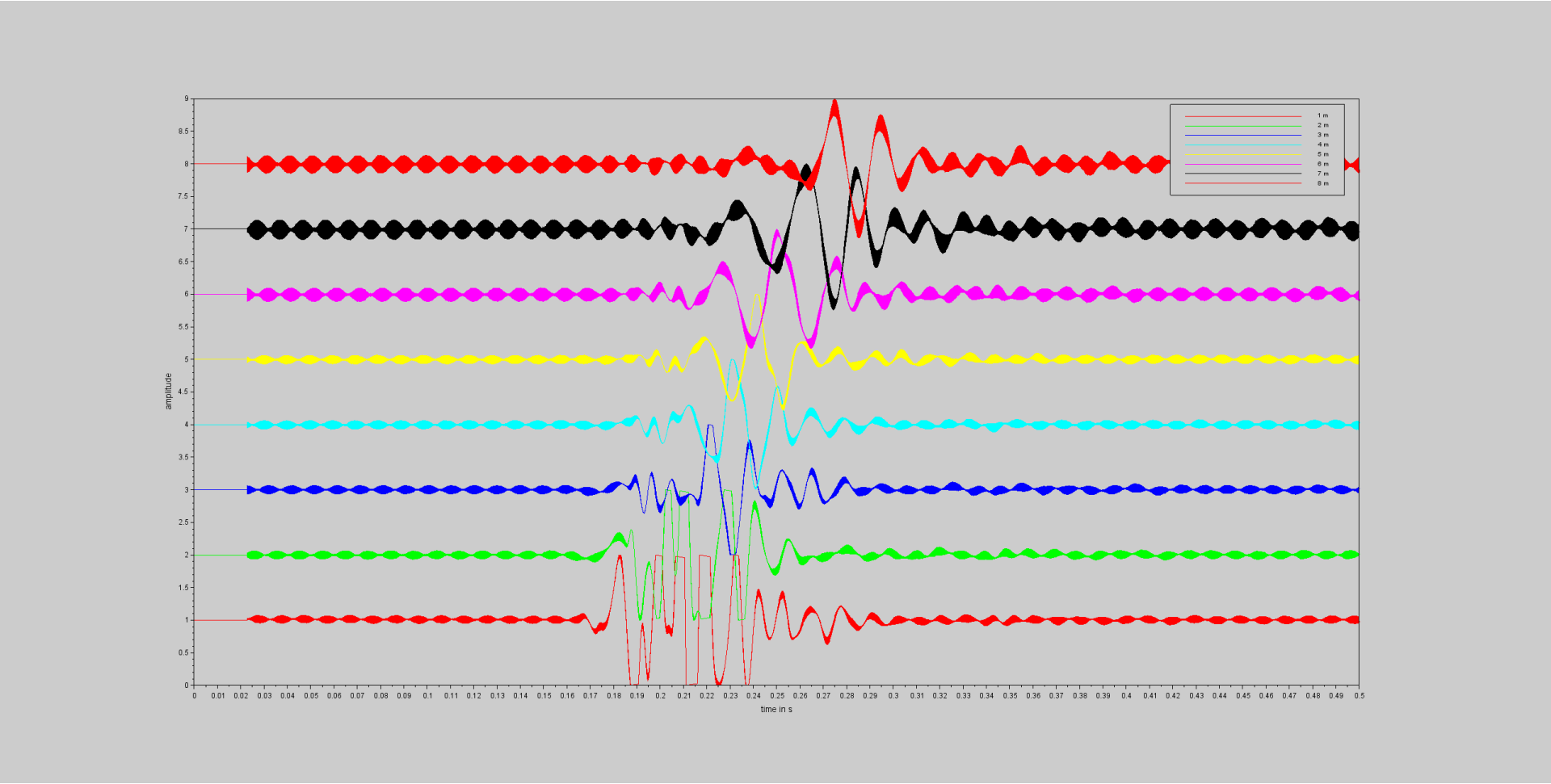
50 Hz 5th order butterworth low pass filter

Seismic data



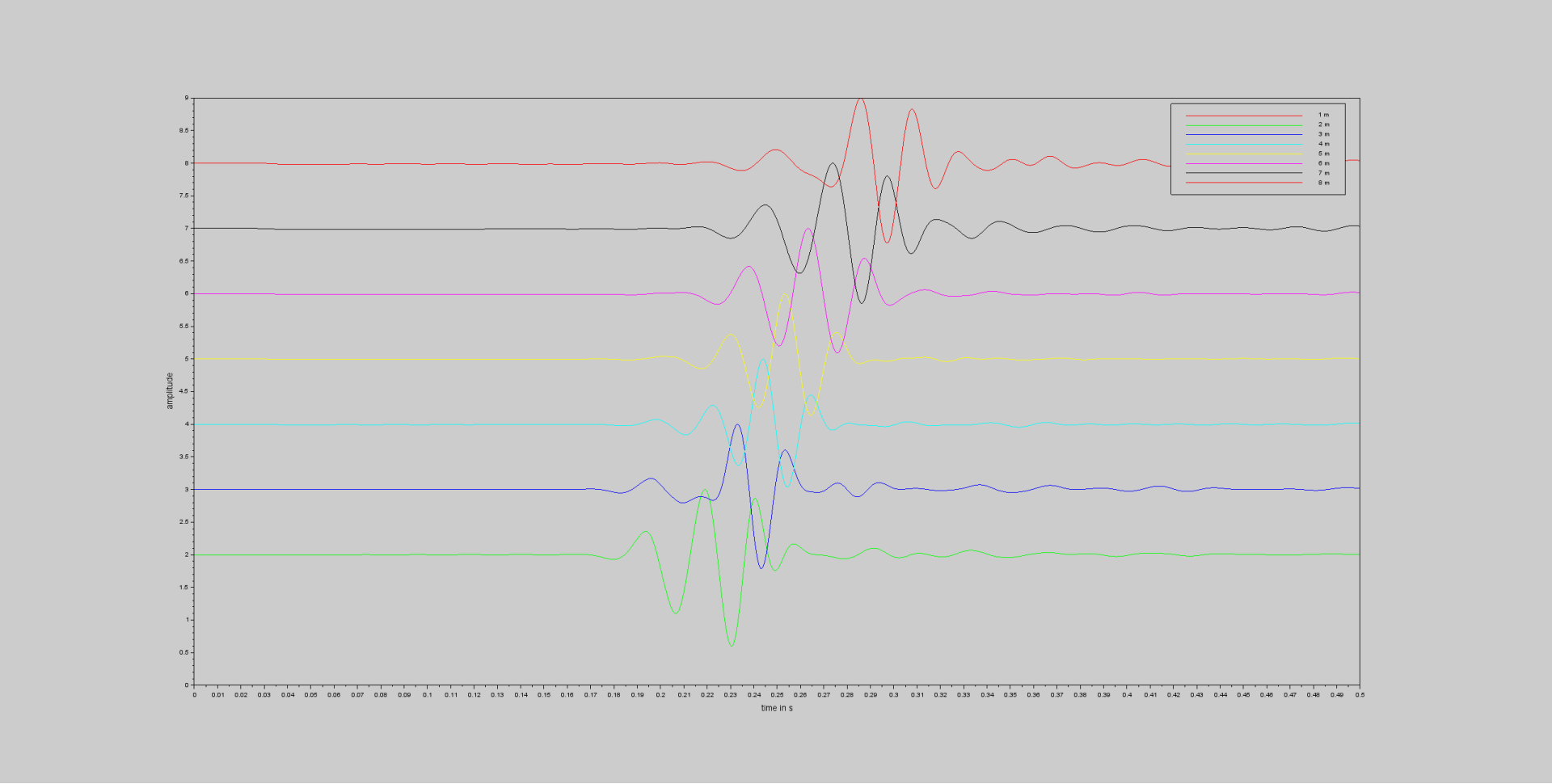
50 Hz 5th order butterworth low pass filter

Seismic data



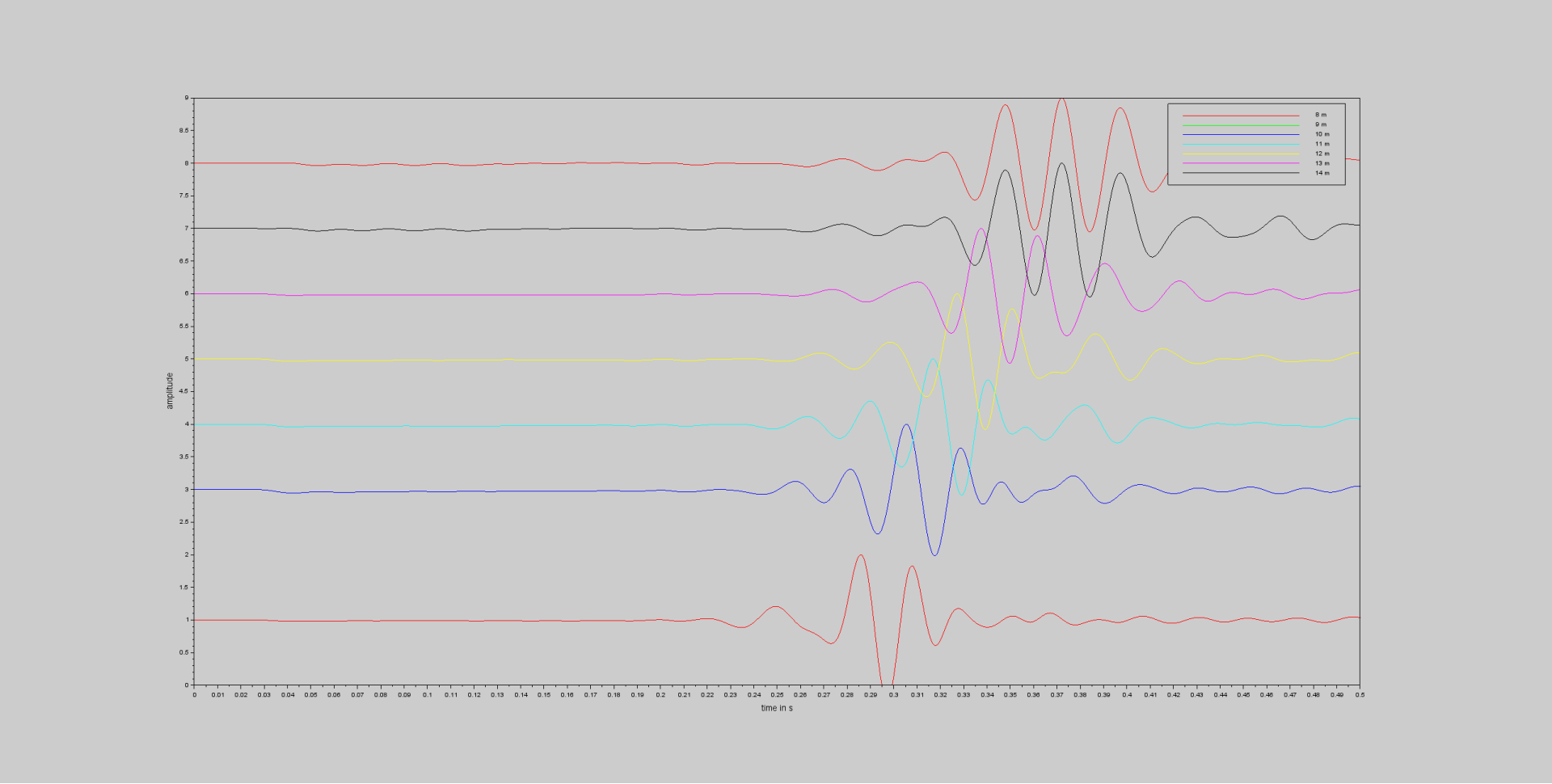
profile1, 30 Hz center source frequency, offset 1 – 8 m, time range cropped to 0 – 0.5 s,
first trace taken from 50Hz data

Seismic data



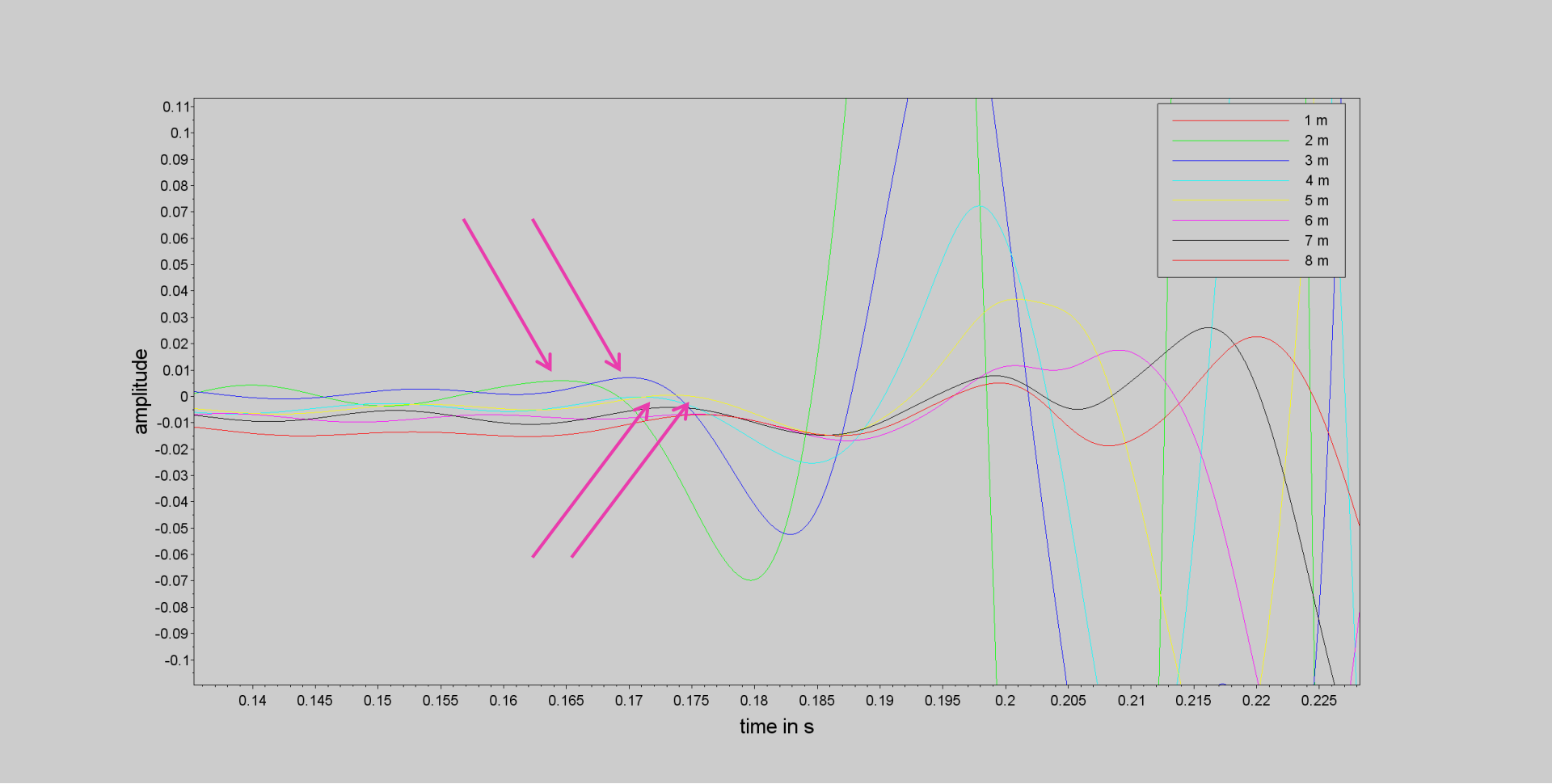
profile1, 30 Hz center source frequency, offset 1 – 8 m, time range cropped to 0 – 0.5 s,
first trace hidden, 50 Hz lowpass filter applied

Seismic data



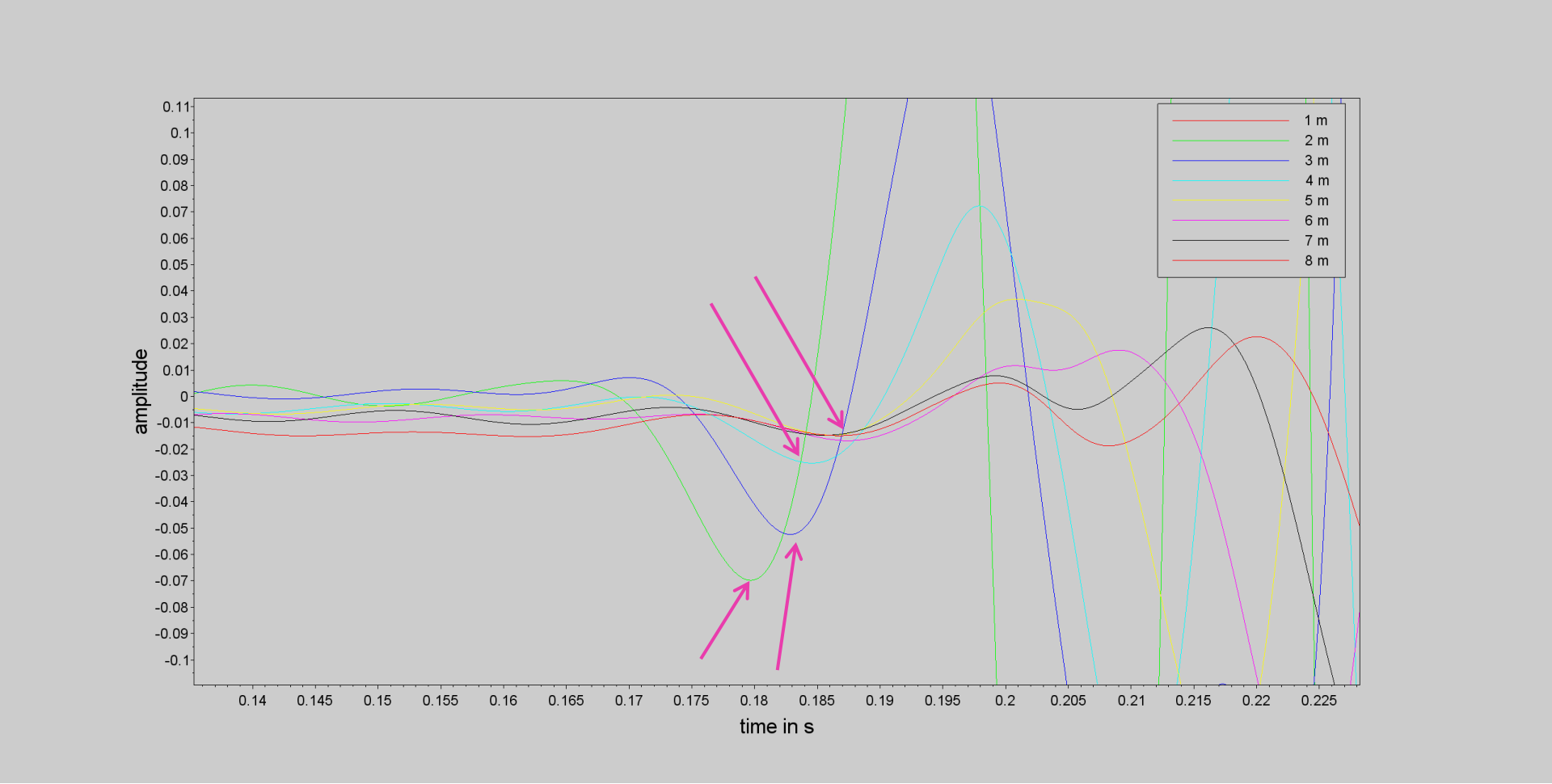
profile1, 30 Hz center source frequency, offset 8 – 14 m, time range cropped to 0 – 0.5 s, second trace hidden, 50 Hz lowpass filter applied

Seismic data



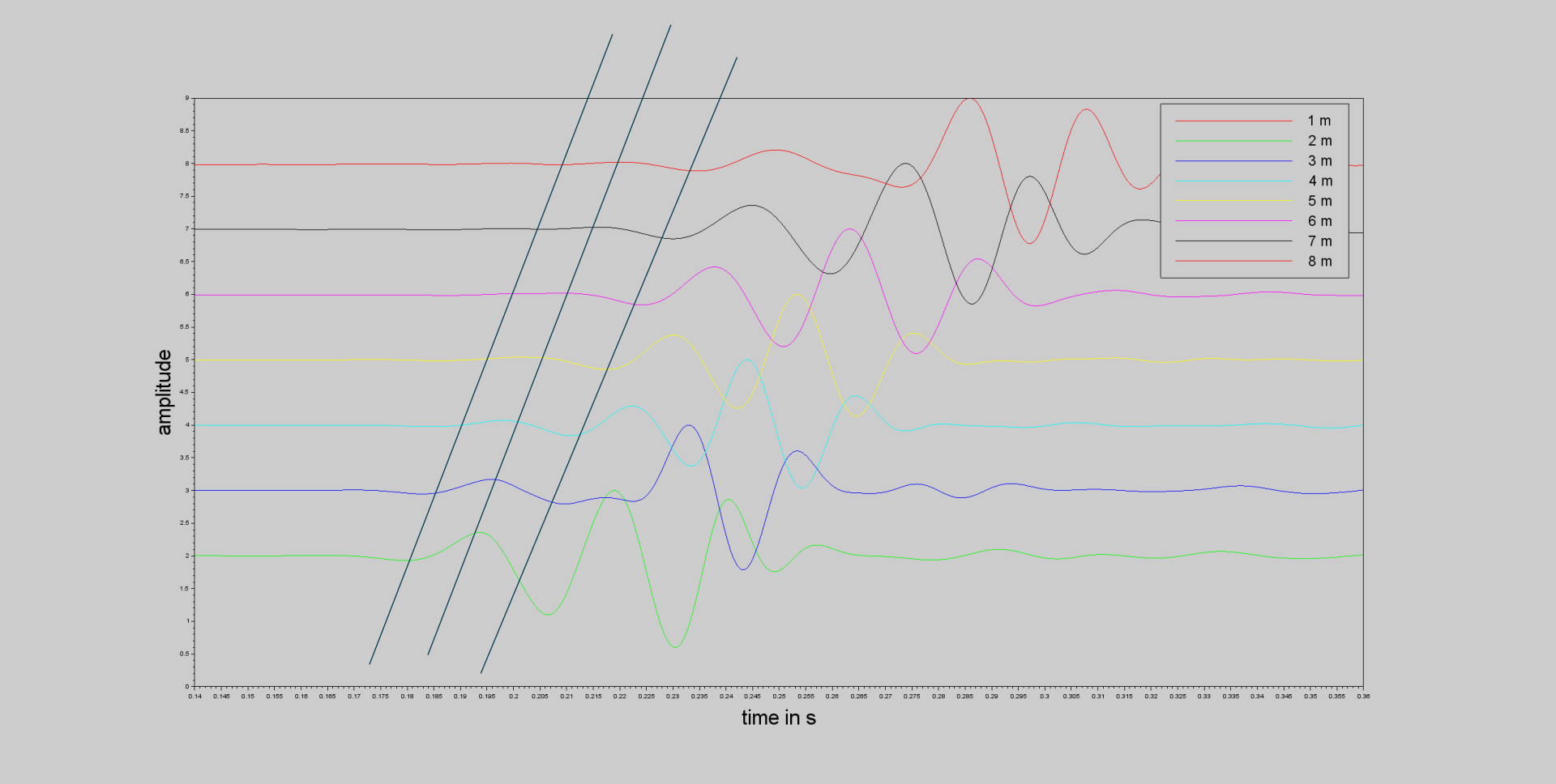
profile1, 30 Hz center source frequency, offset 1 – 8 m, time range cropped to 0 – 0.5 s,
first trace hidden, 50 Hz lowpass filter applied

Seismic data



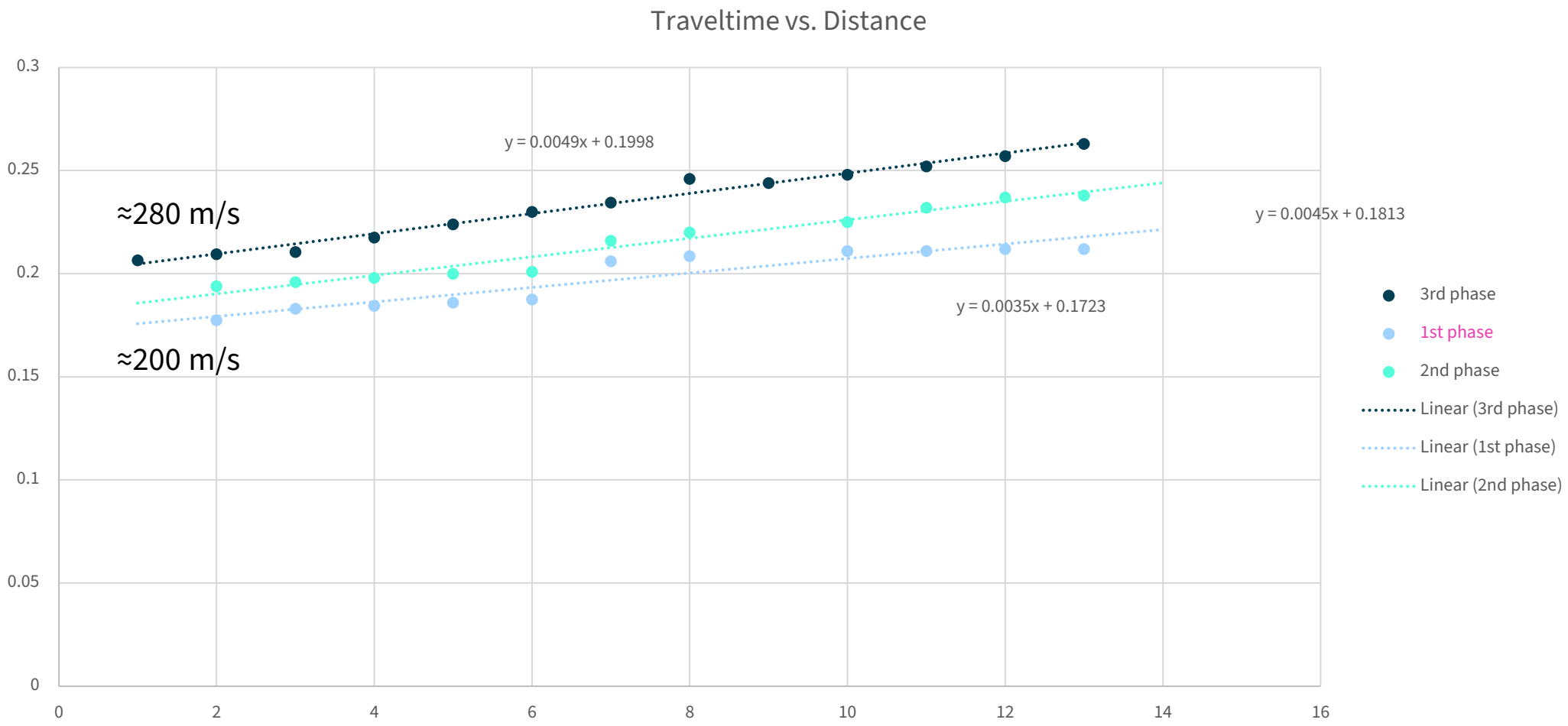
profile1, 30 Hz center source frequency, offset 1 – 8 m, time range cropped to 0 – 0.5 s,
first trace hidden, 50 Hz lowpass filter applied

Seismic data



profile1, 30 Hz center source frequency, offset 1 – 8 m, time range cropped to 0 – 0.5 s,
first trace hidden, 50 Hz lowpass filter applied

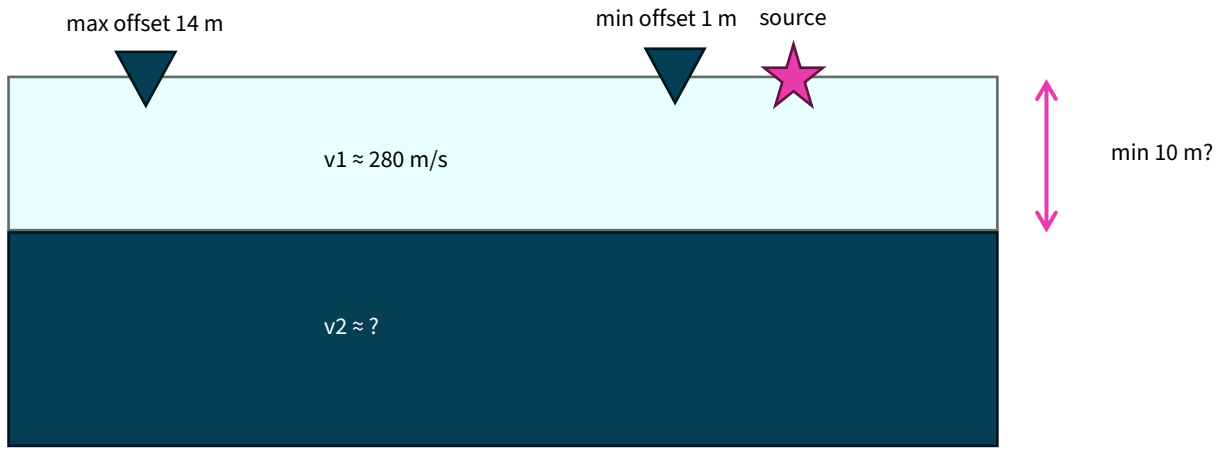
First arrival times



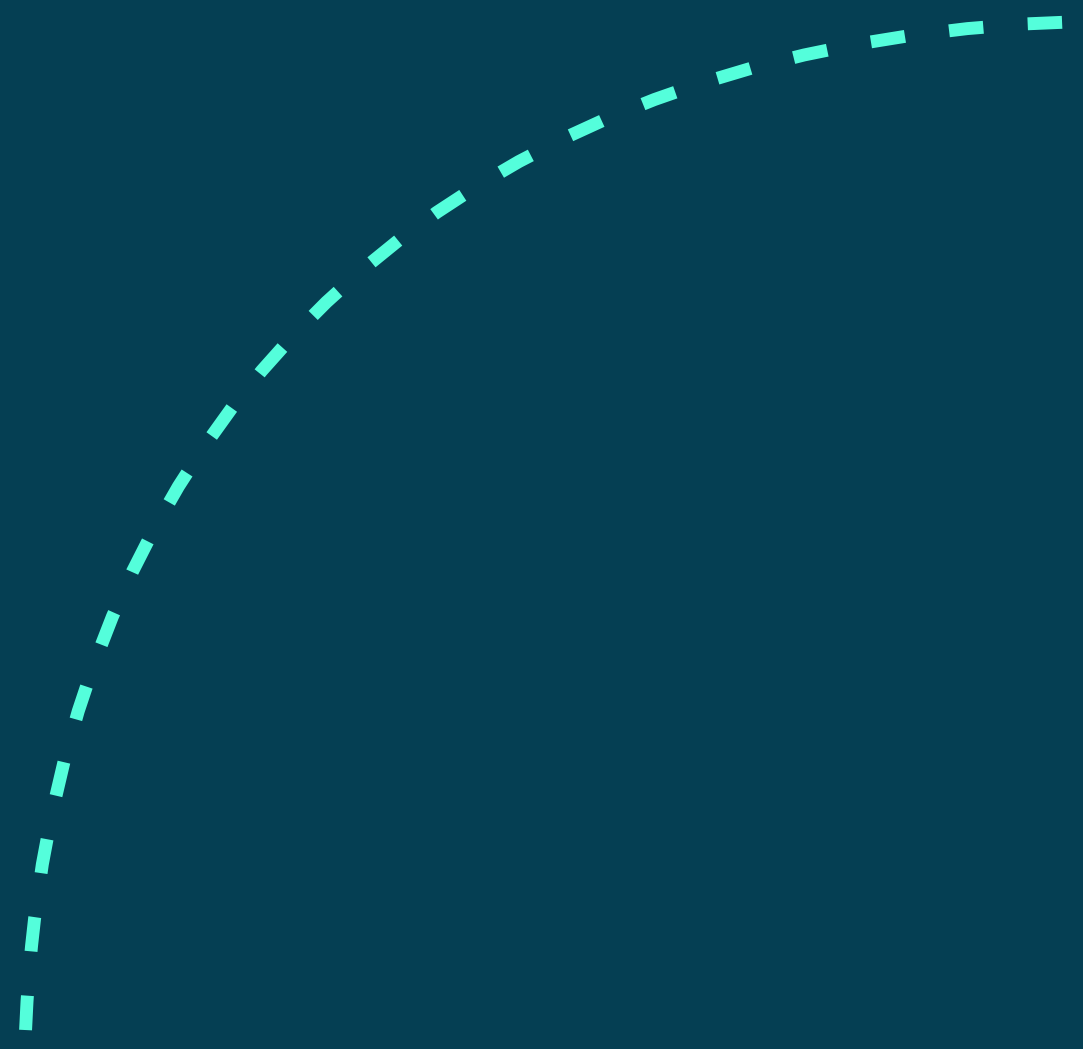
picking several phases for continuous “first arrival” times, partially ignoring dispersion effects, layer velocity can be associated to typical soil properties
estimated offset/intercept time not 0, indication for missing the real first phase or timing issue

Interpretation

- assuming
  - change of velocity (to 2000 m/s) on last geophone at 14 m
  - deviation in intercept time from first layer regression curve (0.1 s)
- depth of layer interface can be estimated to approximately 10 m
  - matches with NGIs report “Characterization and engineering properties of the NGTS Onsøy soft clay site”
  - depth of bedrock 8 m < $d_{bedrock}$ <15 m
- with the considered offset range 1 – 14 m, no bedrock interface can be detected
  - offset needs to be increased (cable length of geophone)
  - signal / noise ratio needs to be increased for better picking



Takk for oss.

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