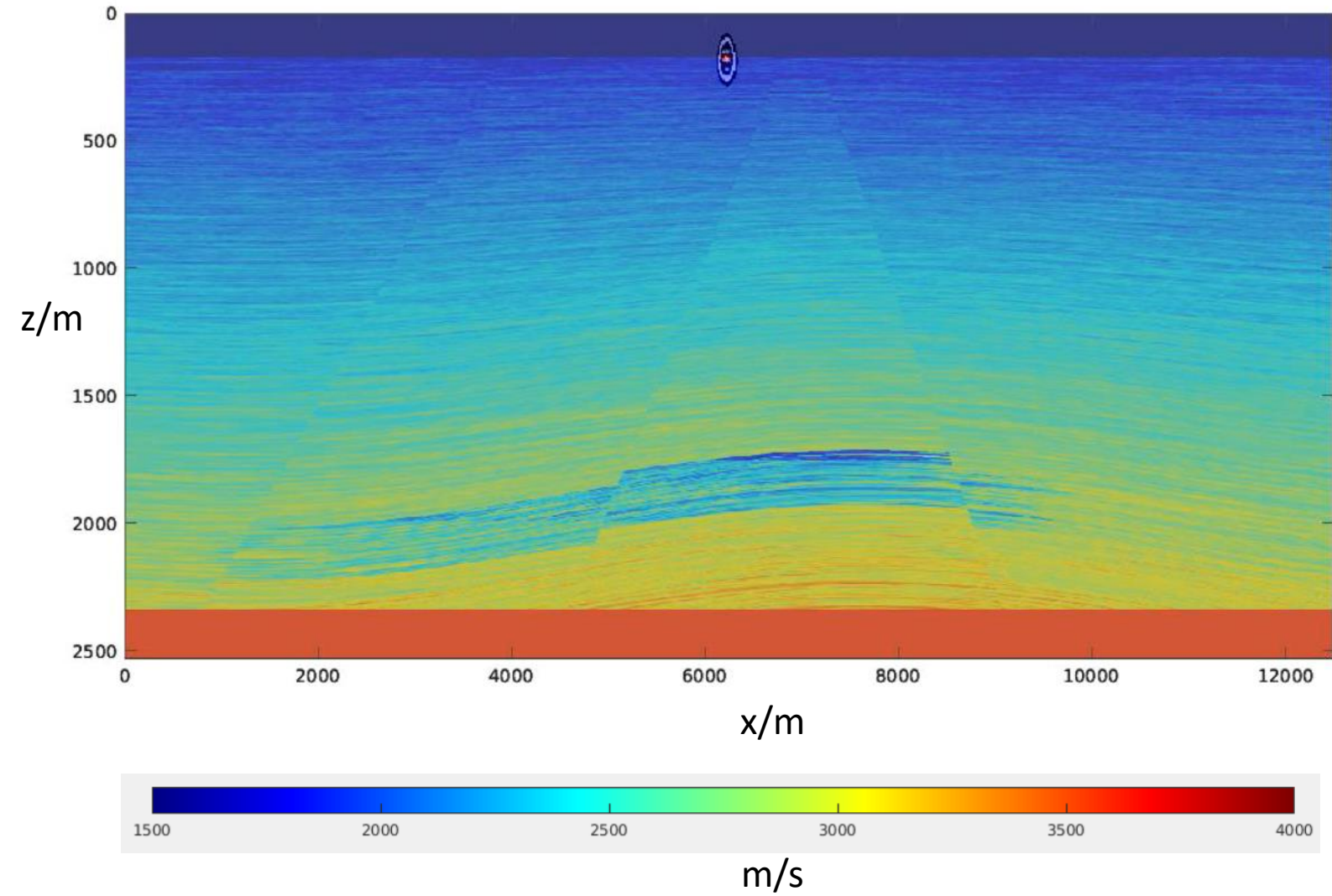# Geoscience mini-talks : Waveform Inversion
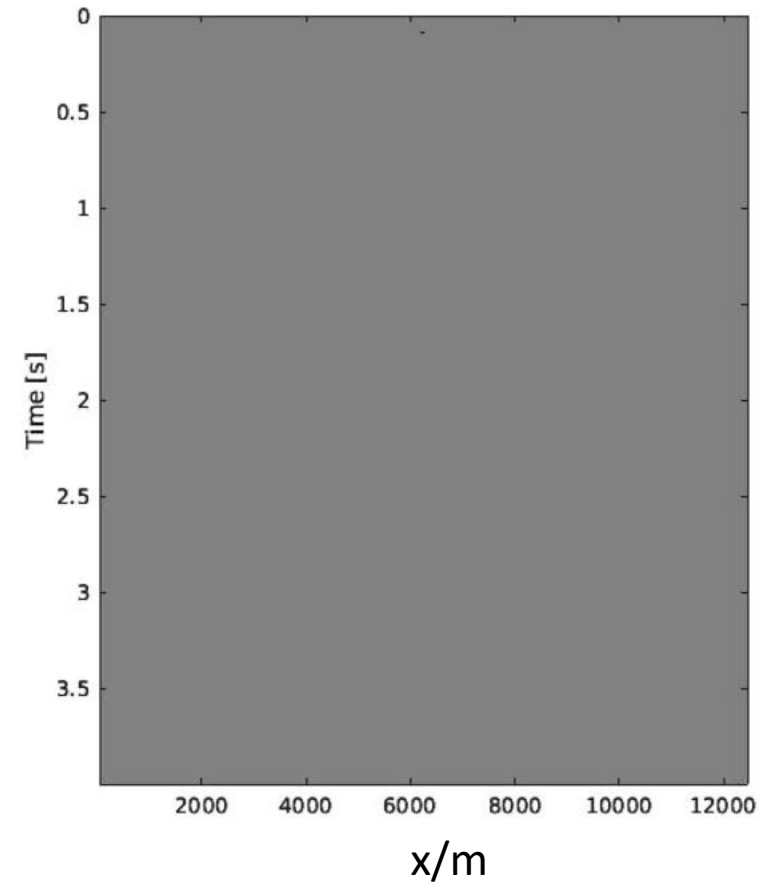
Student: Kai Xiong

Supervisor: David Lumley
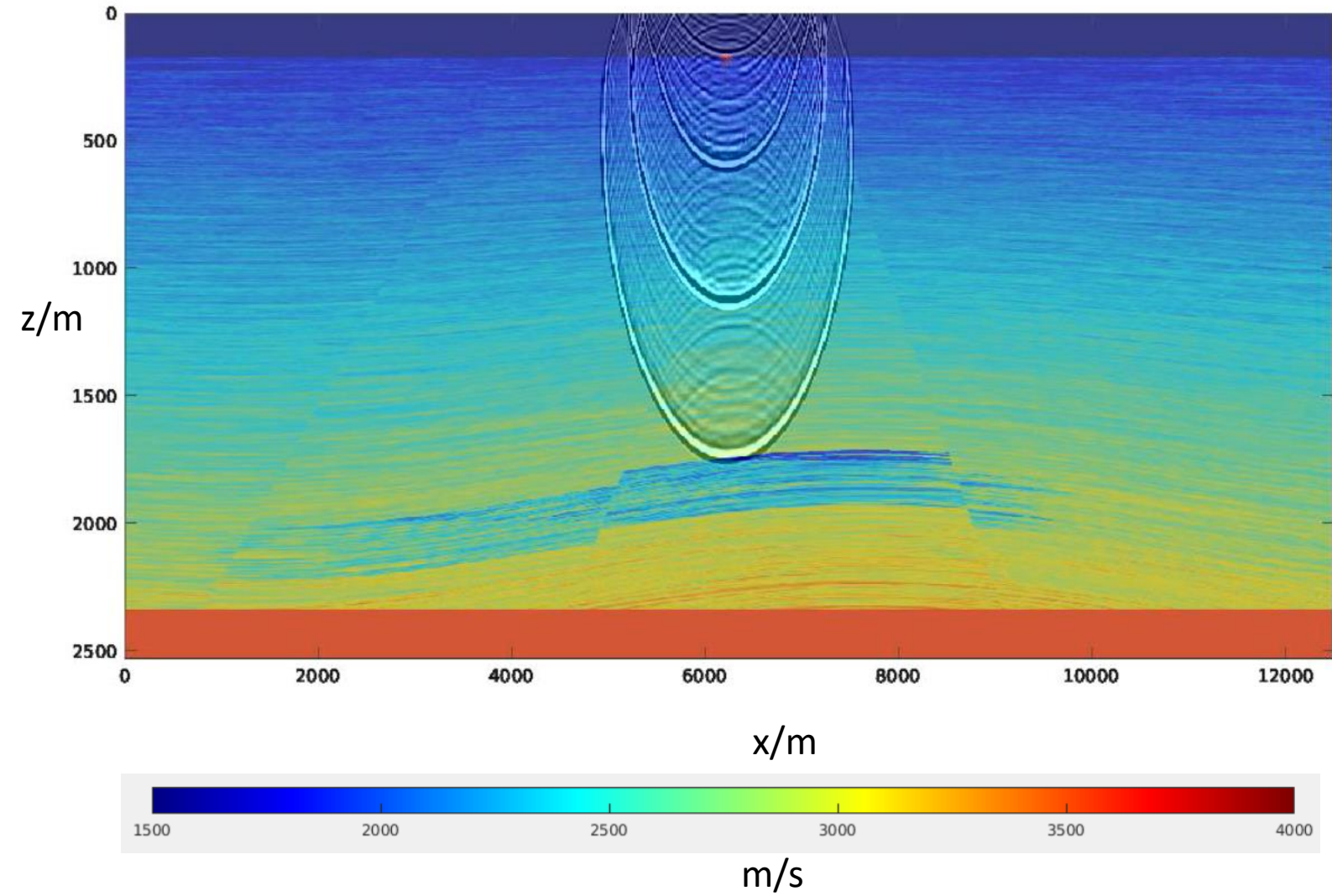
Seismic modeling

P wave velocity model (how fast P wave propagates)
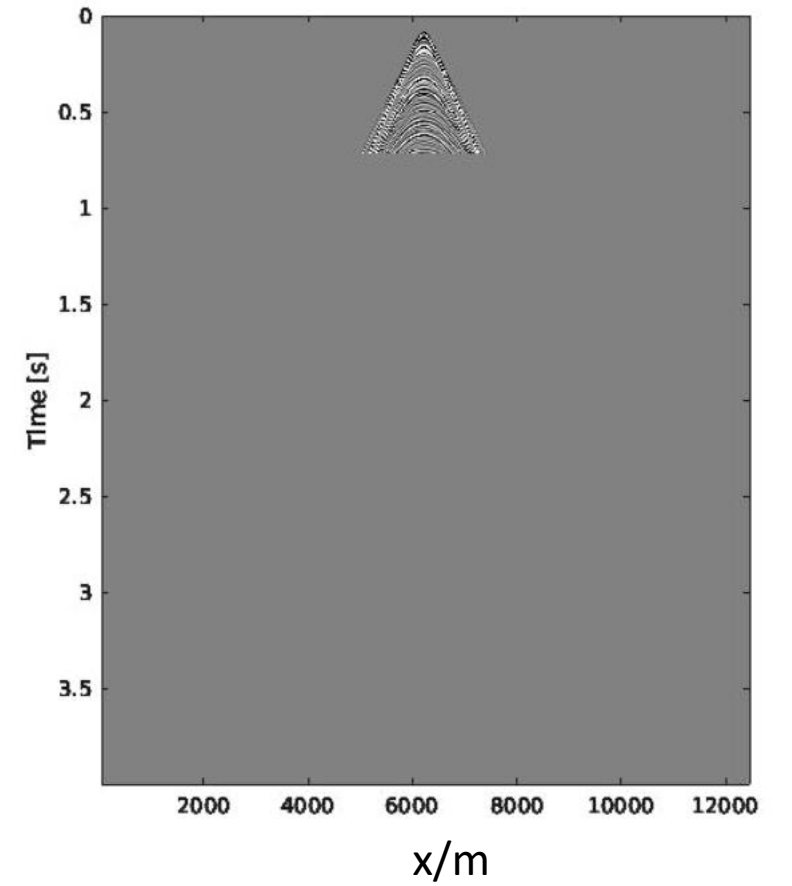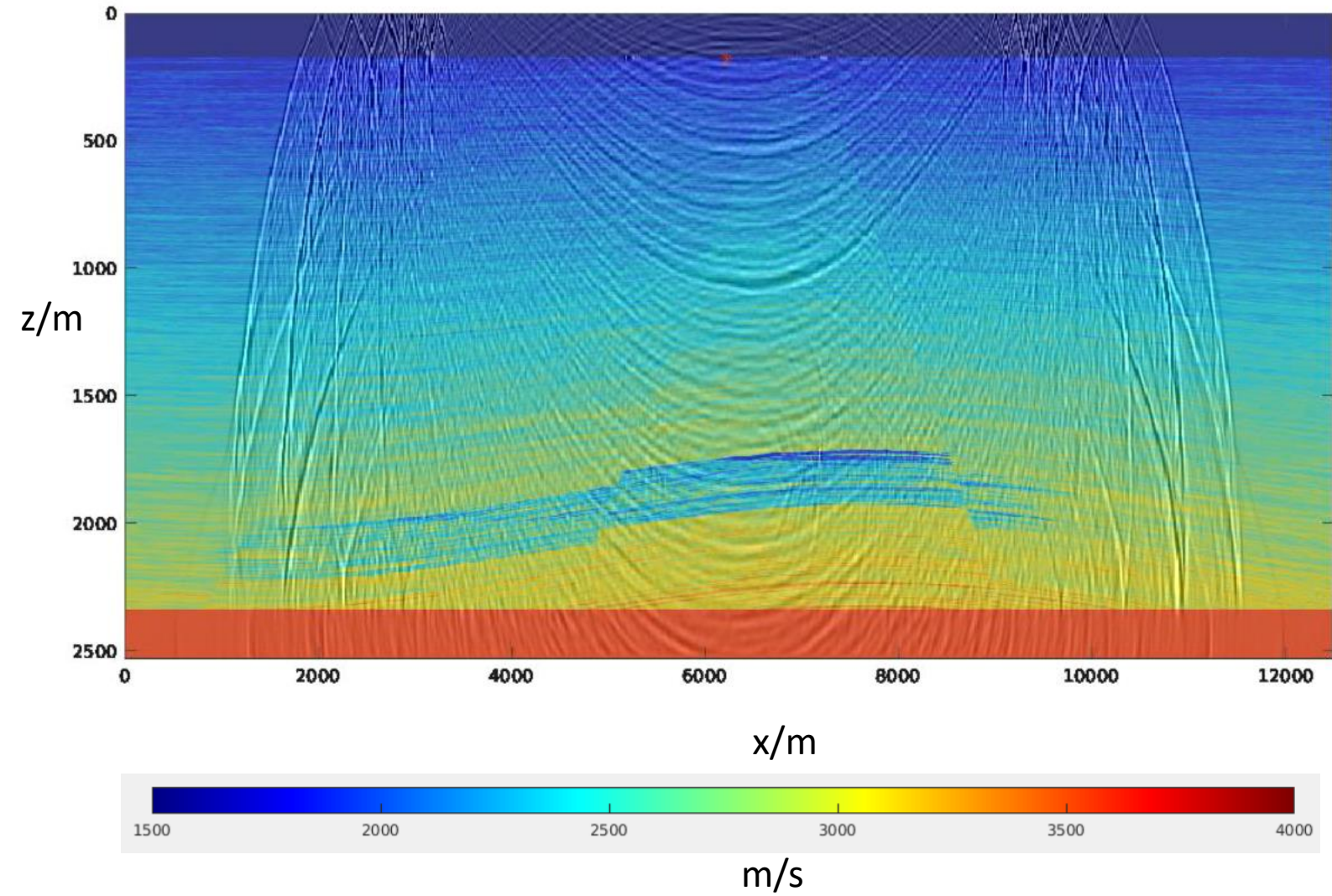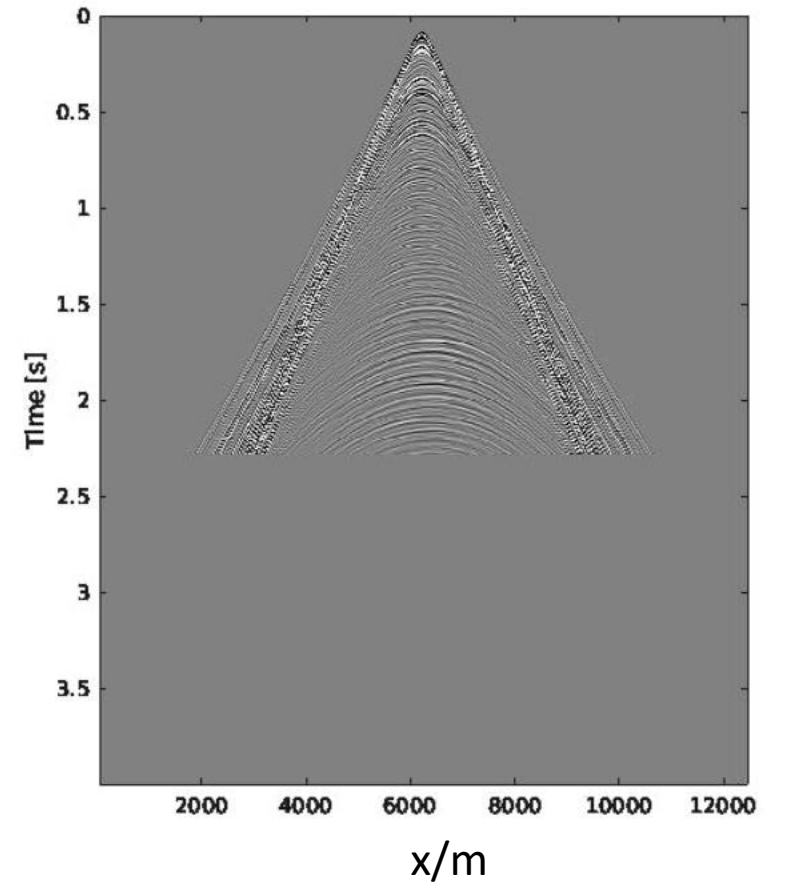
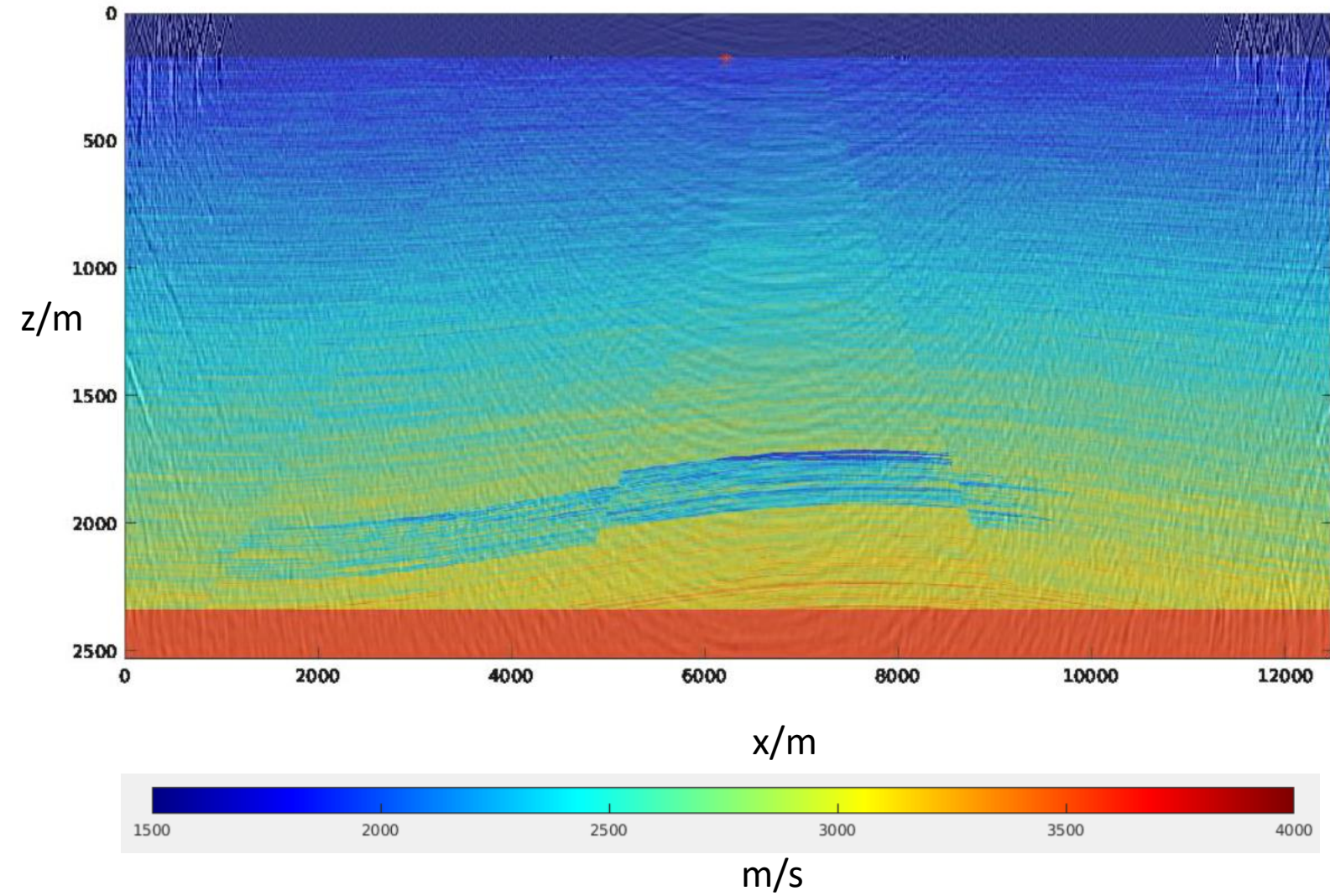Observed seismic data

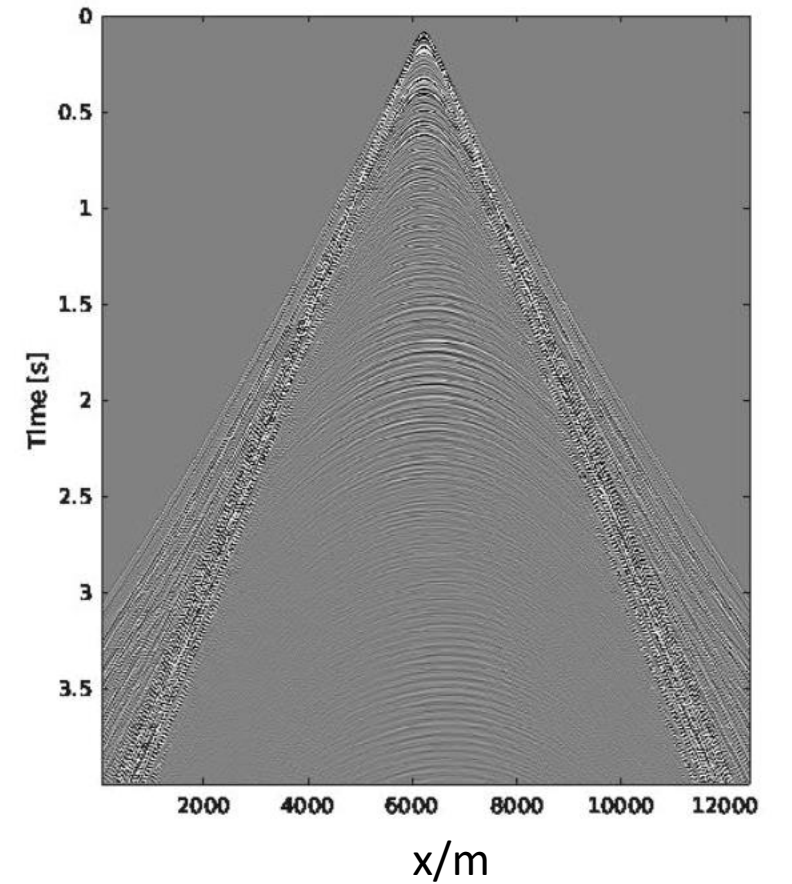P wave velocity model

Observed seismic data

P wave velocity model

z/m
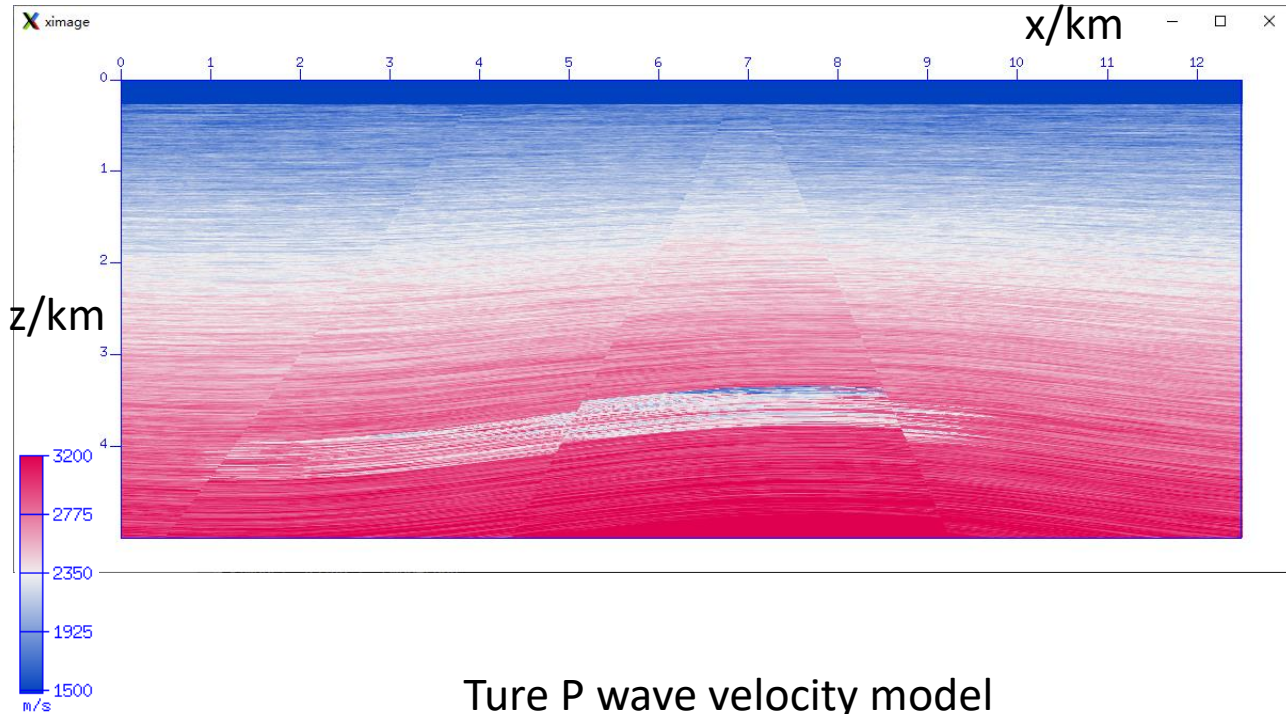
x/m

m/s

Observed seismic data
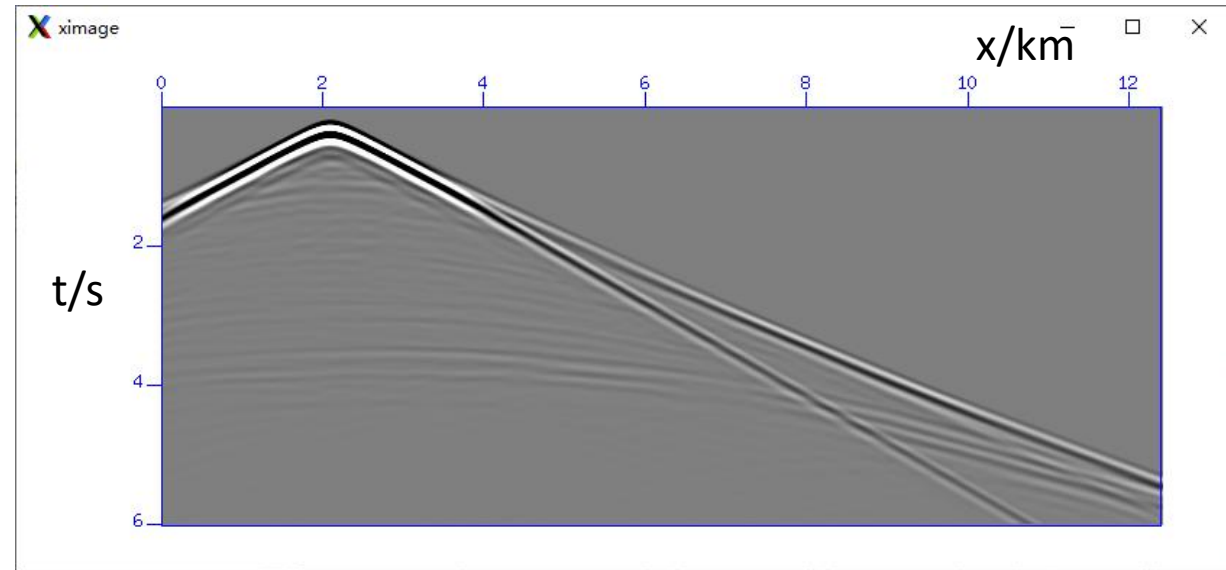

Time [s]

x/m

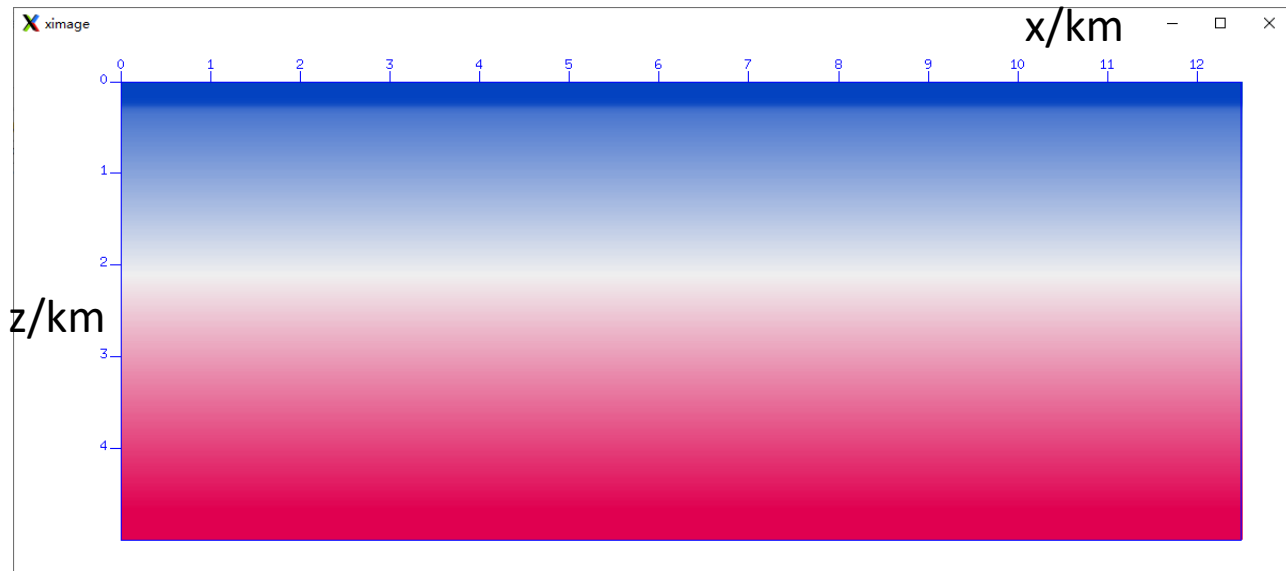P wave velocity model

Observed seismic data

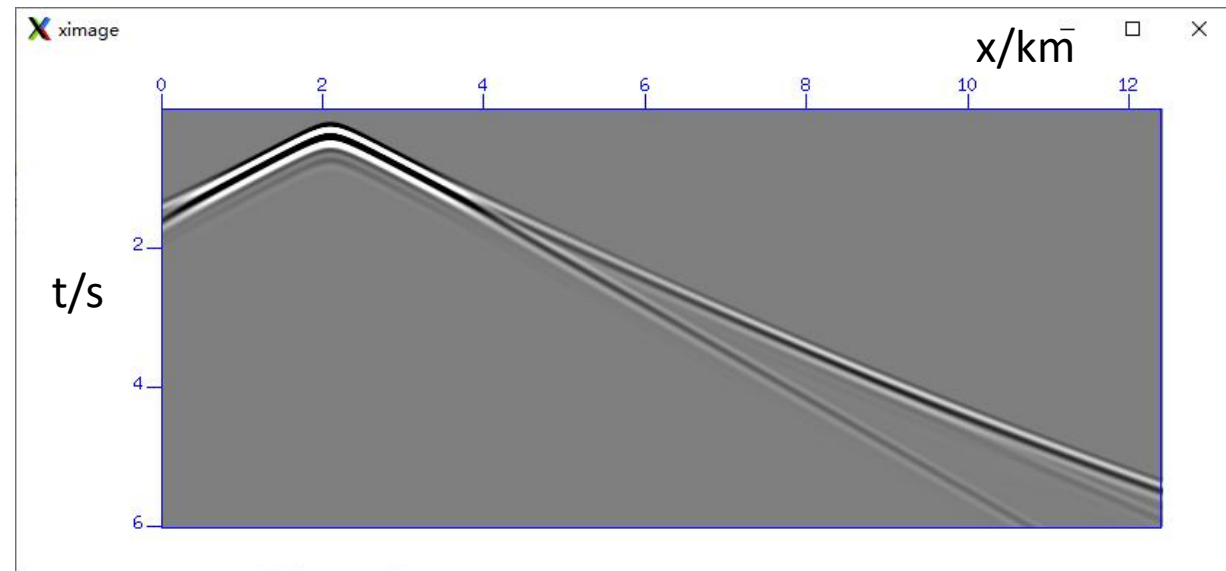Given the observed data, how can you estimate the model?

Ture P wave velocity model

Observed shot gather d_{obs}
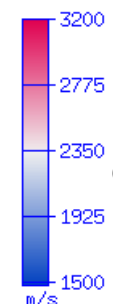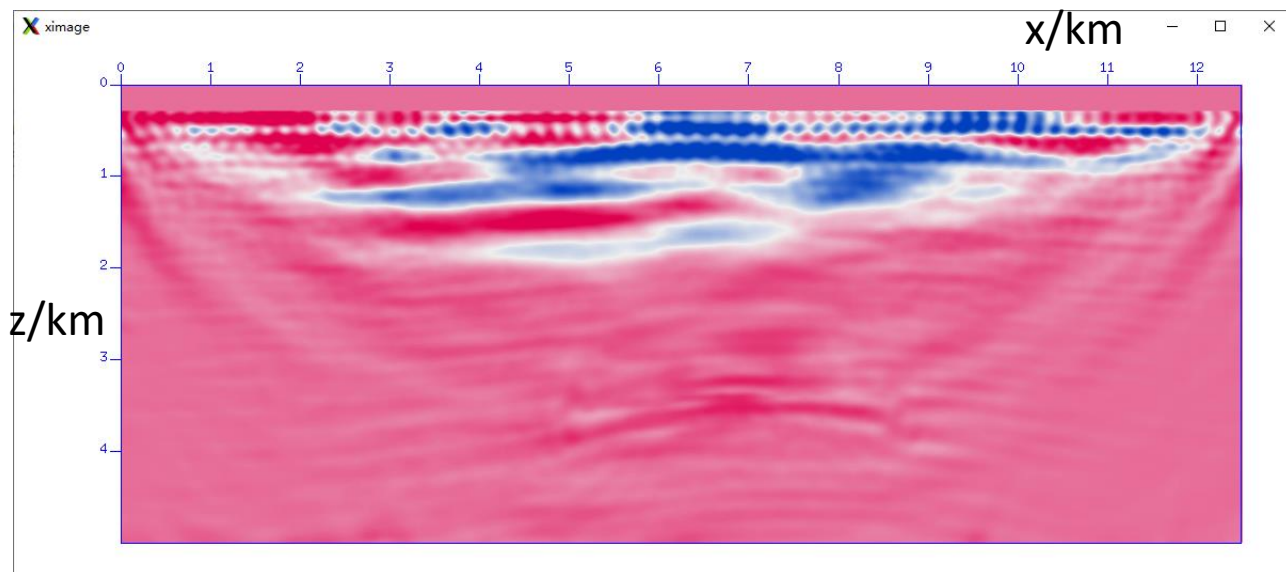
Initial P wave velocity model

Modeled shot gather d_{syn} based on initial P velocity model

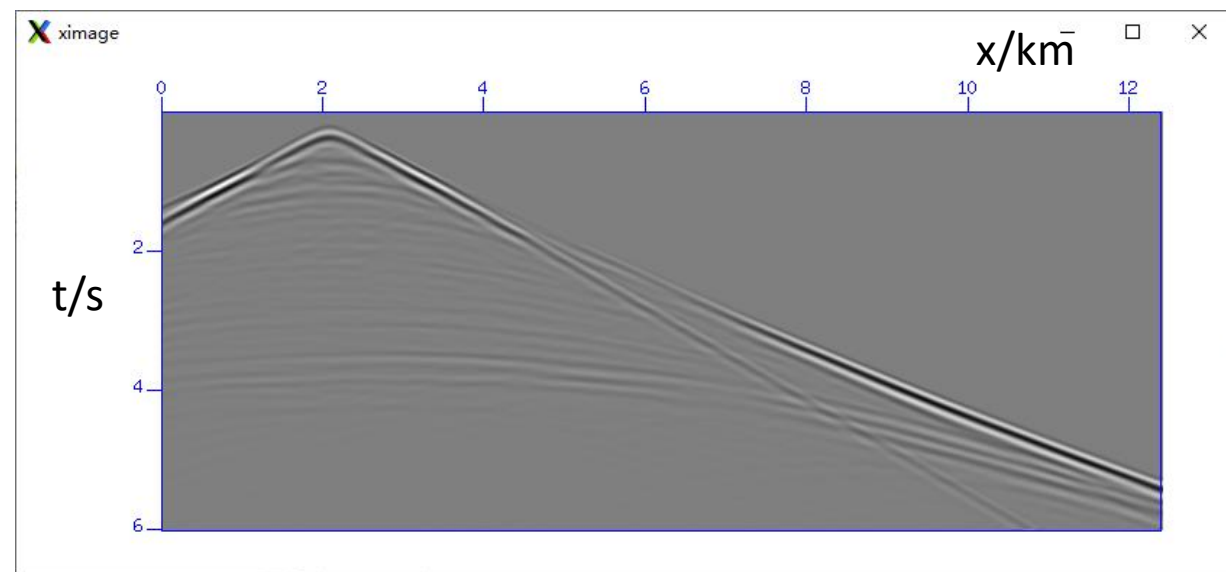- Objective function of the optimization question

$$J = \frac{1}{2}\sum_{sr}\int_0^T \left(d_{syn}(m) - d_{obs}\right)^2 dt \ (1)$$

where s denotes the sources, r denotes the receivers, d_{syn} denotes the modeled data and d_{obs} denotes the observed data.

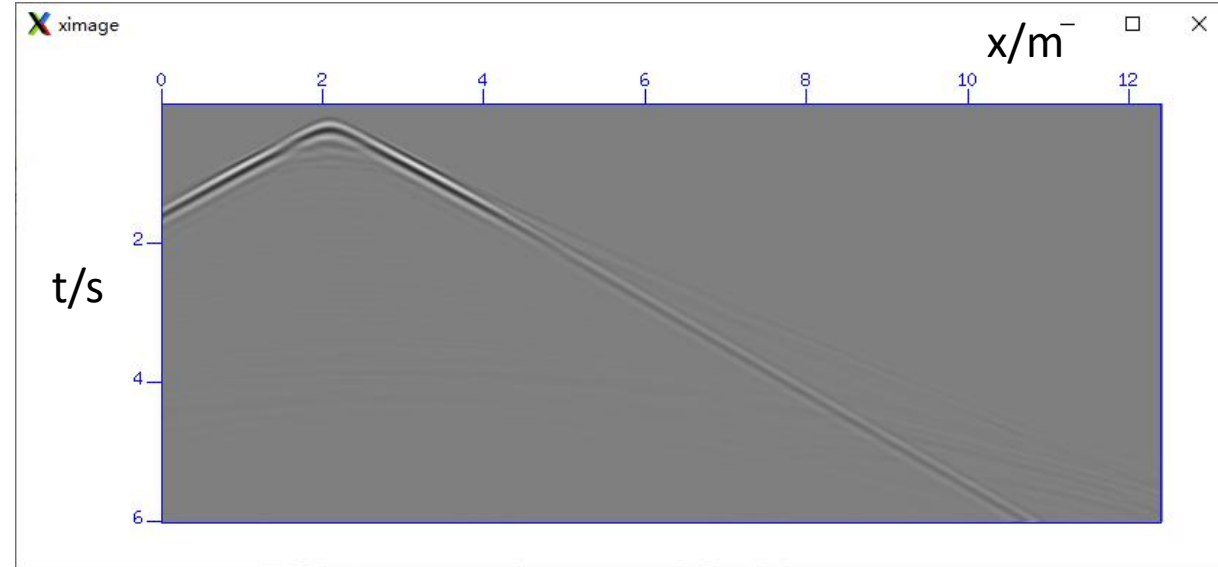Updated velocity
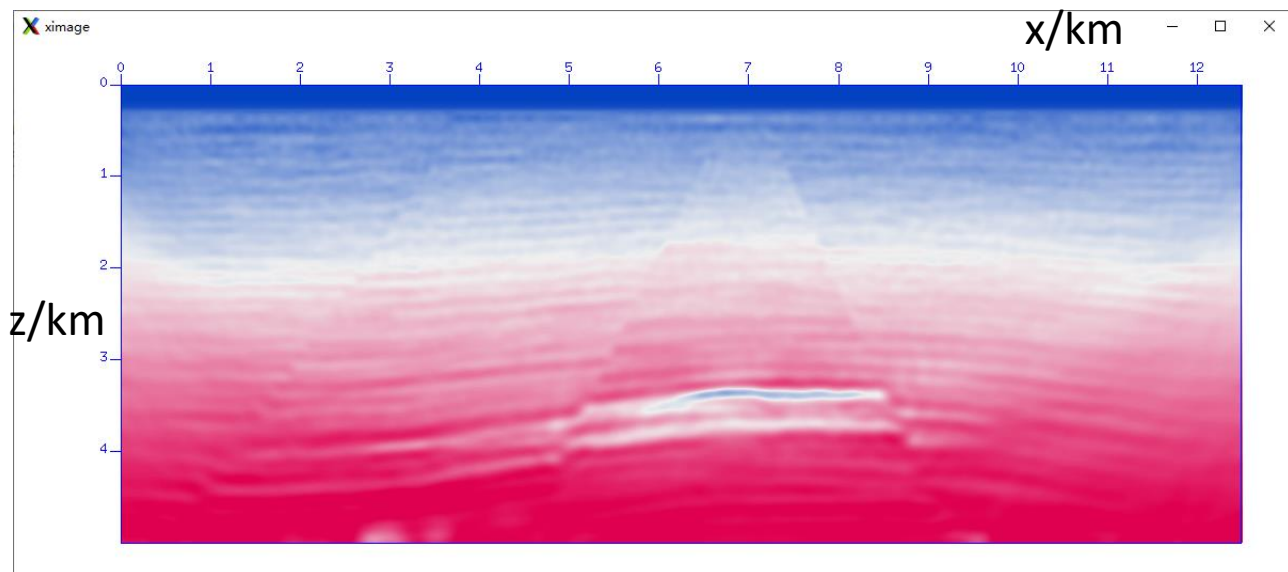
Difference(residual)

After 40th iterations …

Difference(residual)
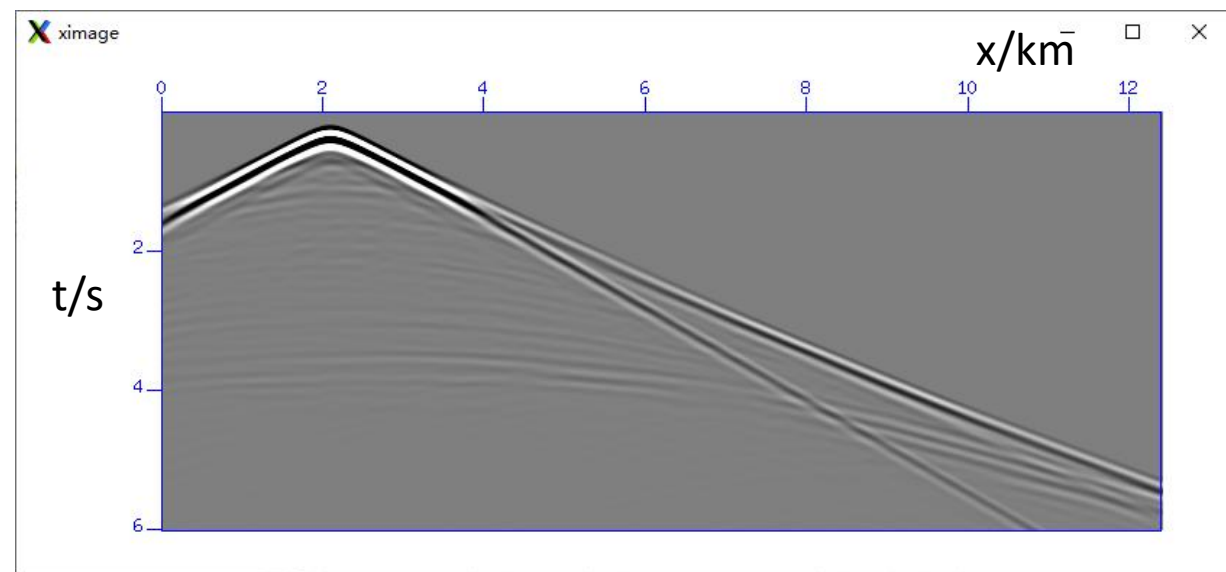
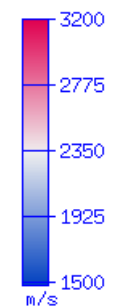- Objective function of the optimization question

$$J = \frac{1}{2}\sum_{sr}\int_0^T (d_{syn}(m) - d_{obs})^2 dt \ (1)$$

where s denotes the sources, r denotes the receivers, d_{syn} denotes the synthetic (modeled) data and d_{obs} denotes the observed data.
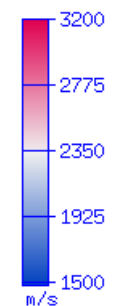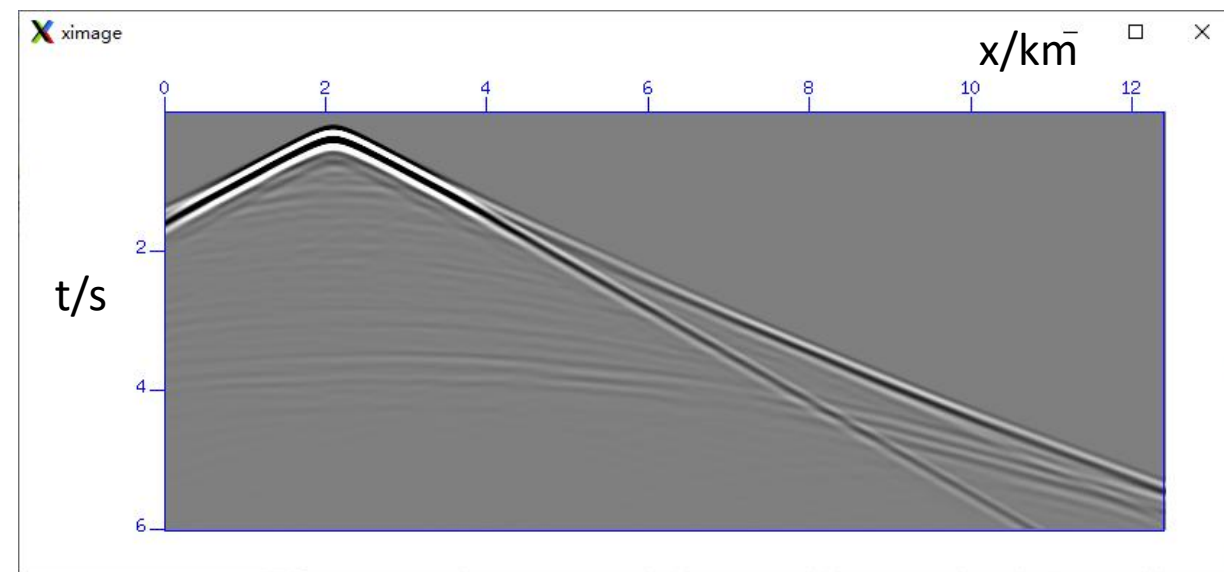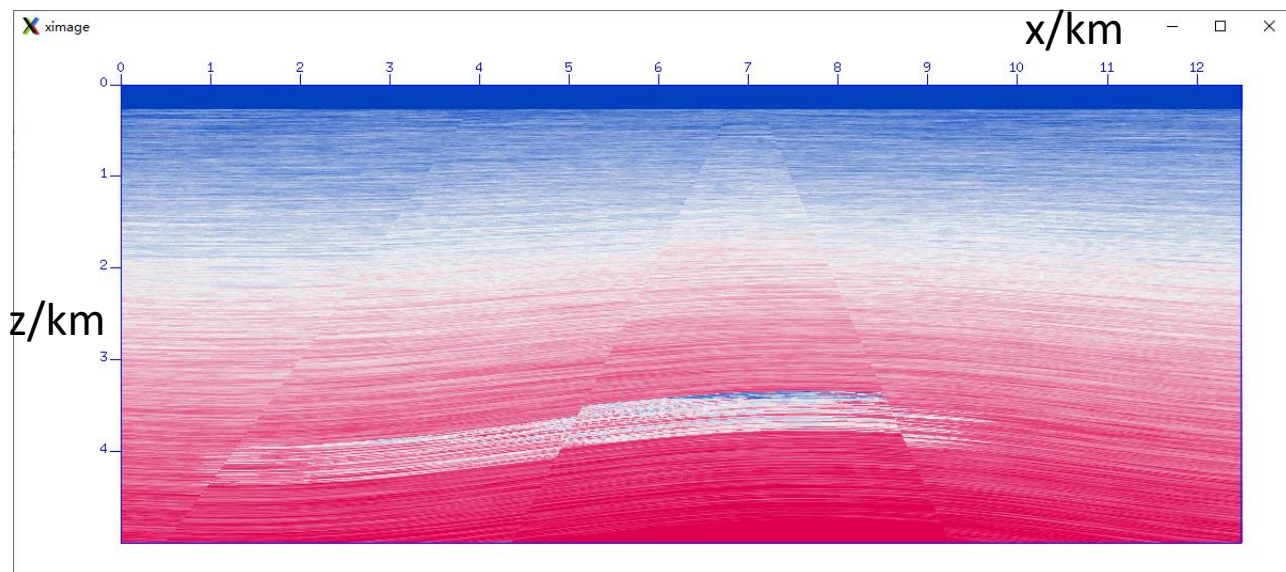
x/m

Inverted P wave velocity model

Modeled shot gather based on inverted P velocity model

x/km

z/km

Ture P wave velocity model

x/km

t/s

Observed shot gather

3200
2775
2350
1925
1500
m/s