SLIM

# Forward Problem

Can be expressed as linear operator

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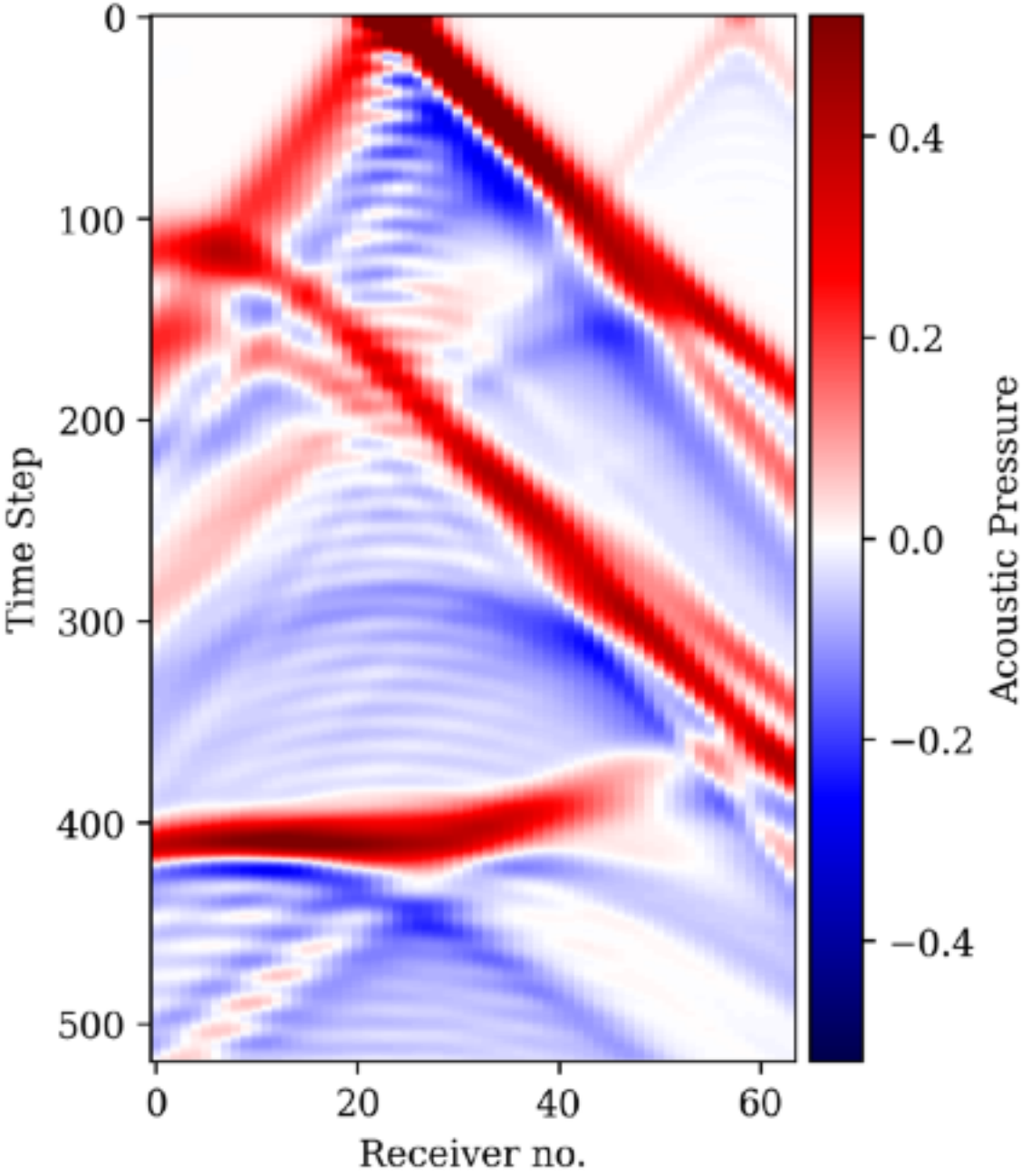
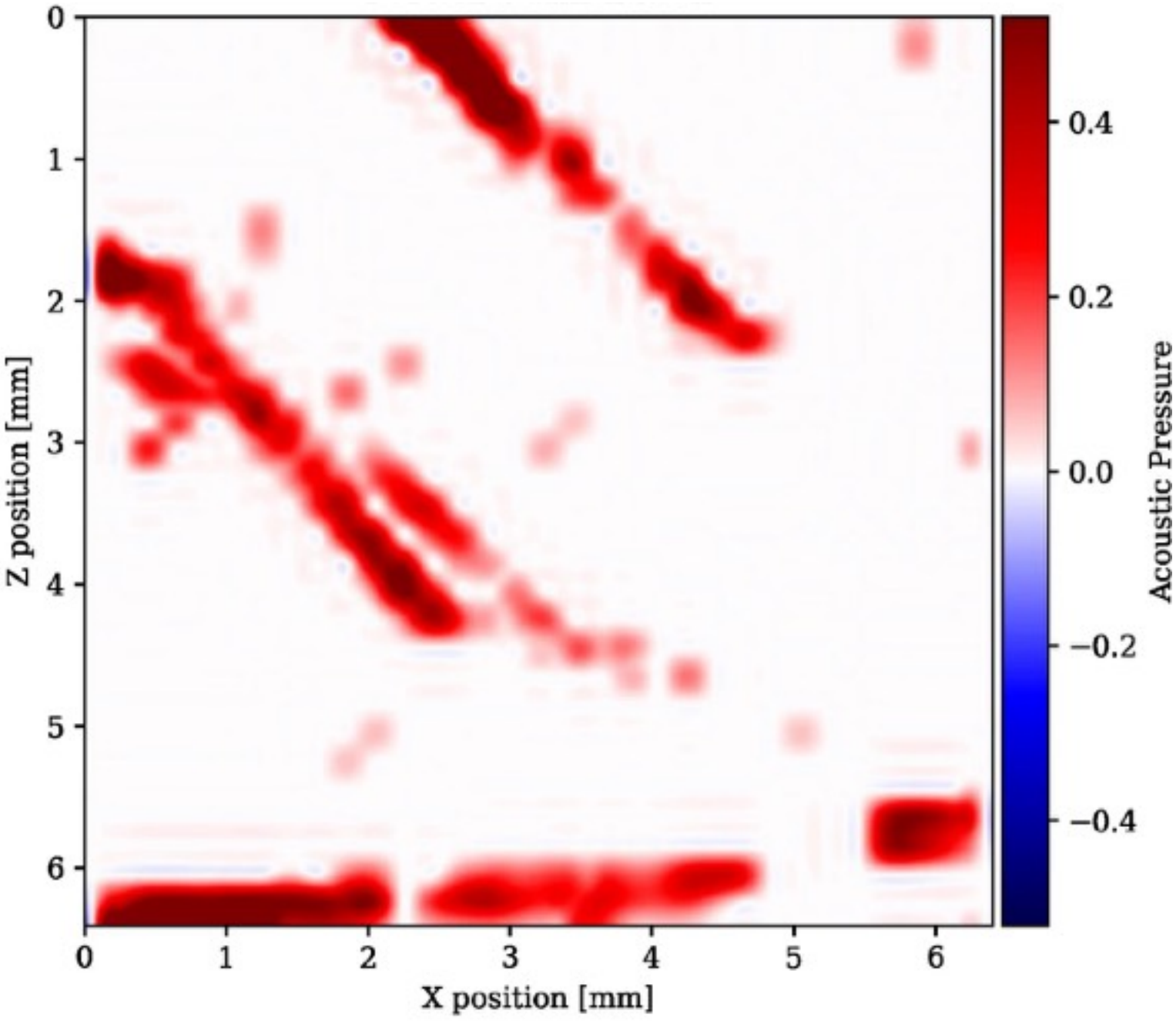
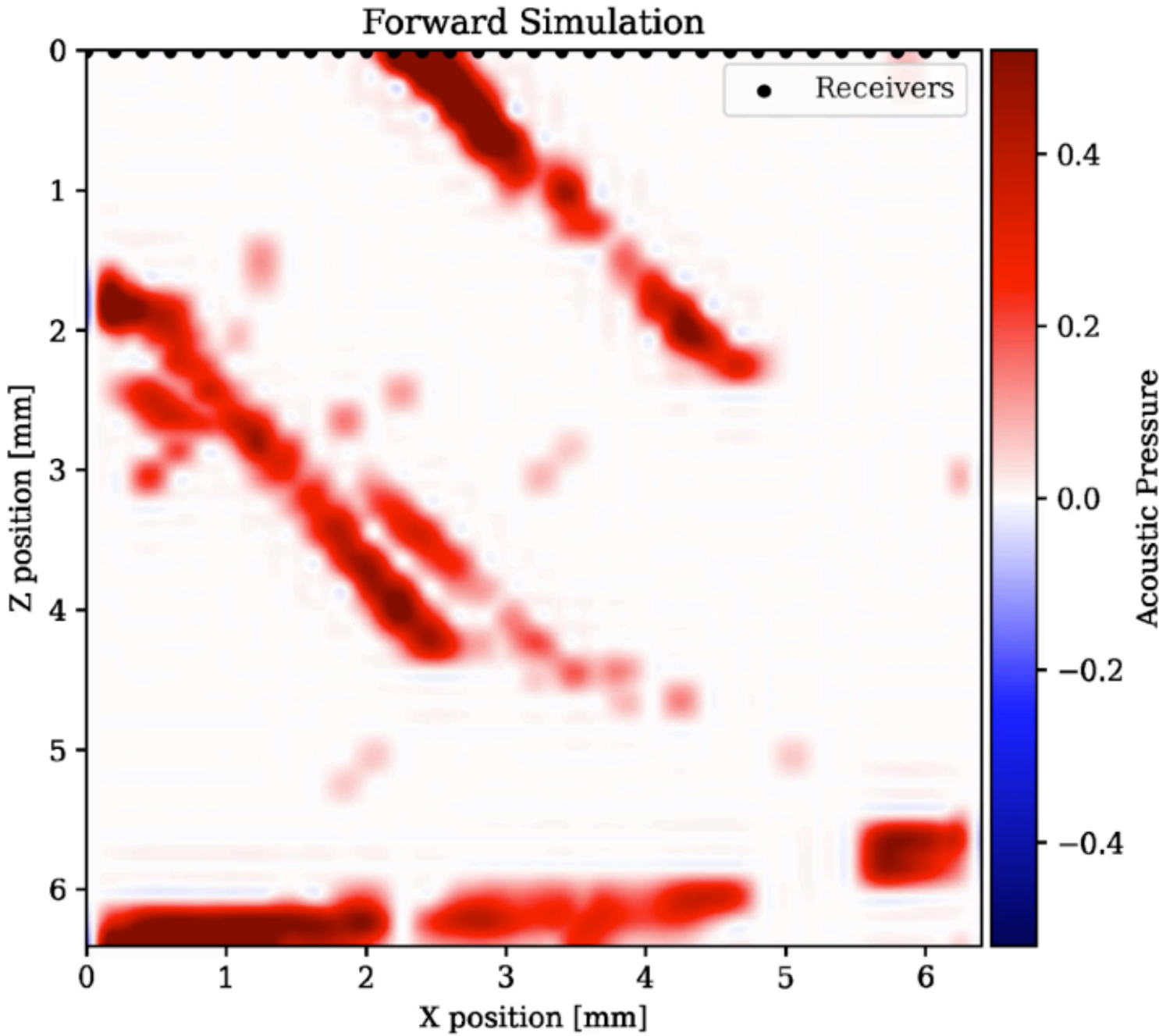
Huynh, Nam, et al. "Photoacoustic imaging using an 8-beam Fabry-Perot scanner." Photons Plus Ultrasound: Imaging and Sensing 2016. Vol. 9708. International Society for Optics and Photonics, 2016.


0
100
200
300
400
500
Time Step
0
20
40
60
Receiver no.
0.4
0.2
0.0
−0.2
−0.4
Acoustic Pressure


Z position [mm]
X position [mm]
Acoustic Pressure
0
1
2
3
4
5
6
0.4
0.2
0.0
−0.2
−0.4

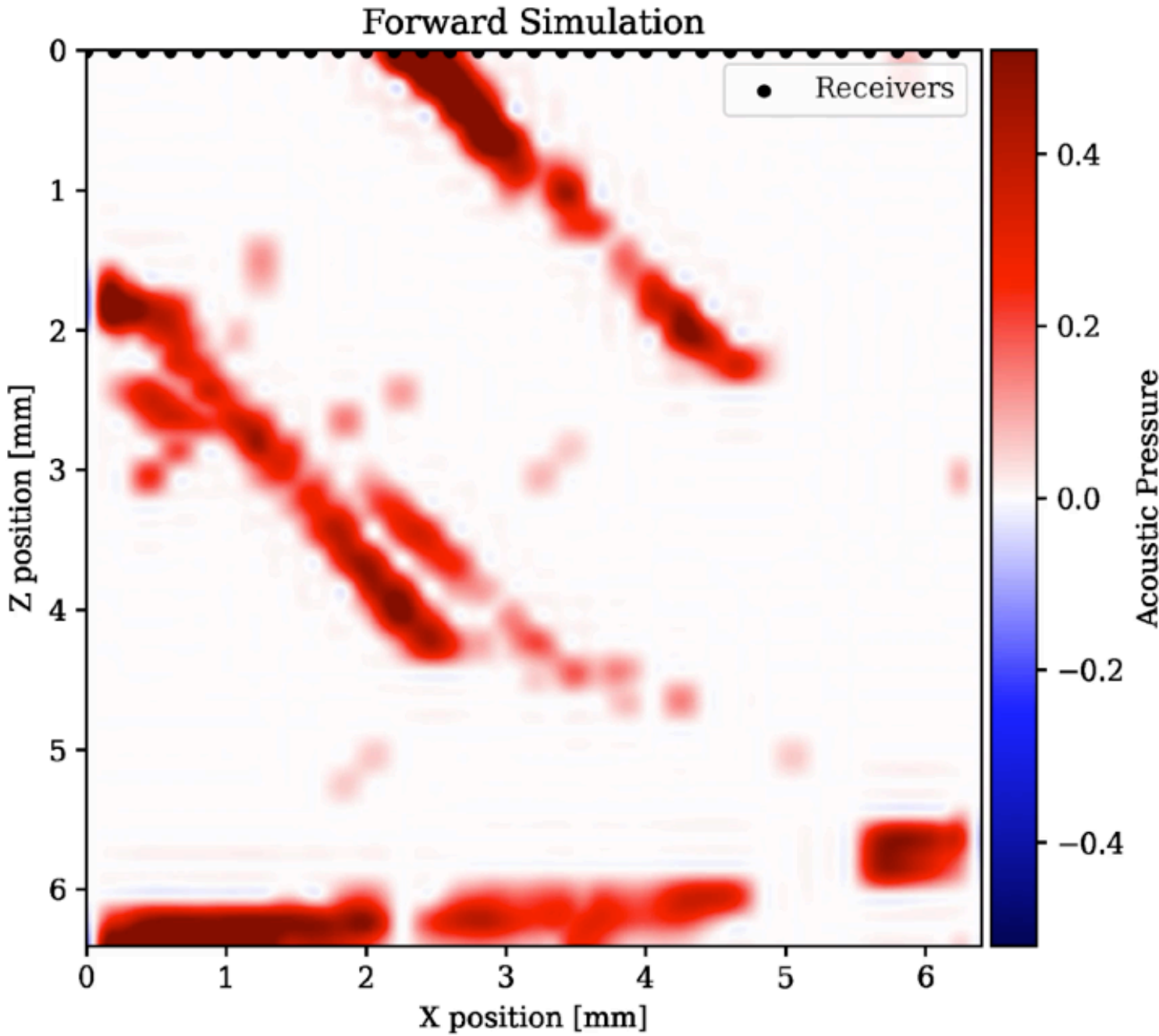

Forward Simulation
Receivers
Z position [mm]
X position [mm]
Acoustic Pressure
0
1
2
3
4
5
6
0.4
0.2
0.0
−0.2
−0.4

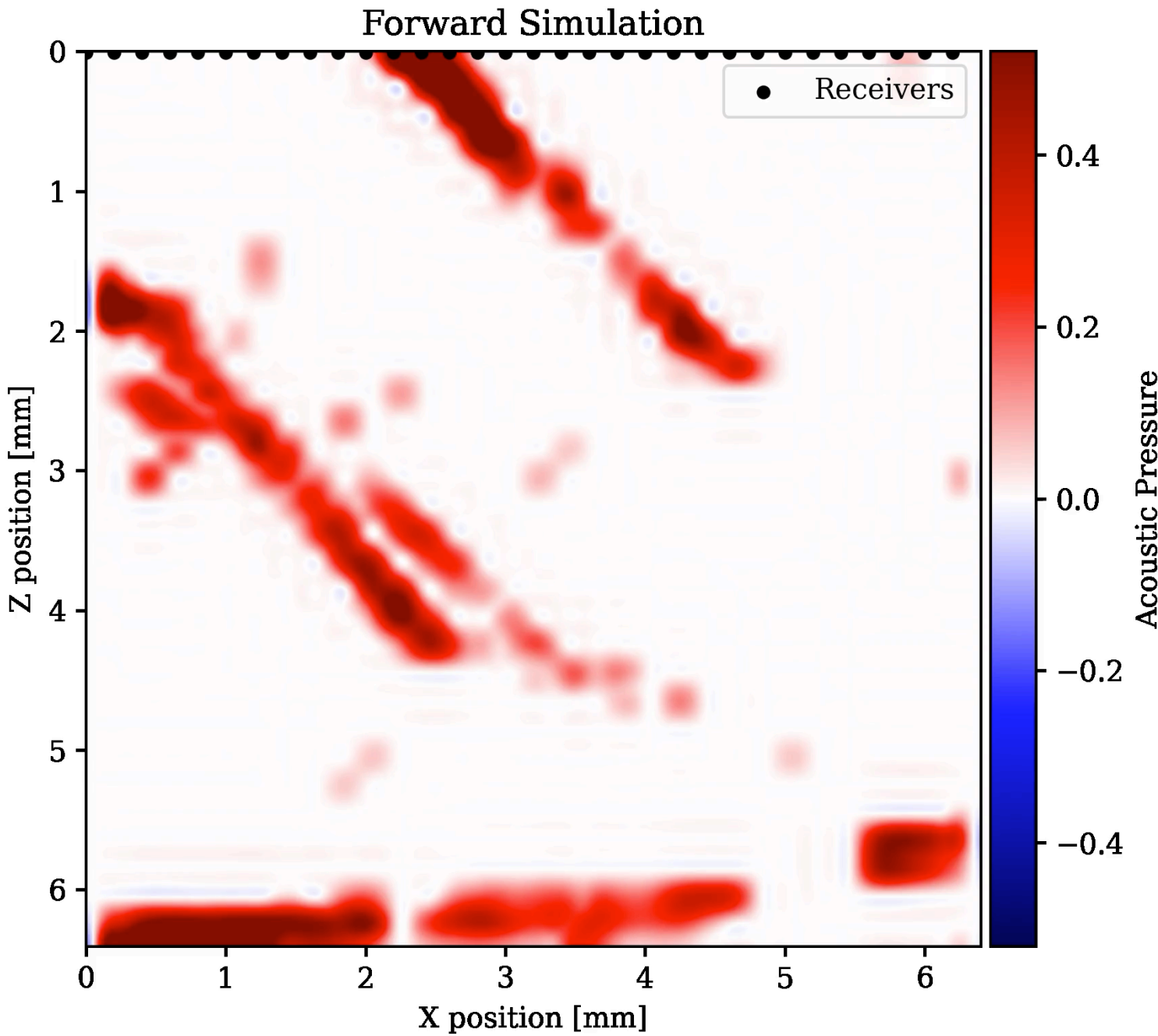
$$\mathbf{d} = A\mathbf{p}$$

A**p** = forward wave operator

**d** = data at receivers

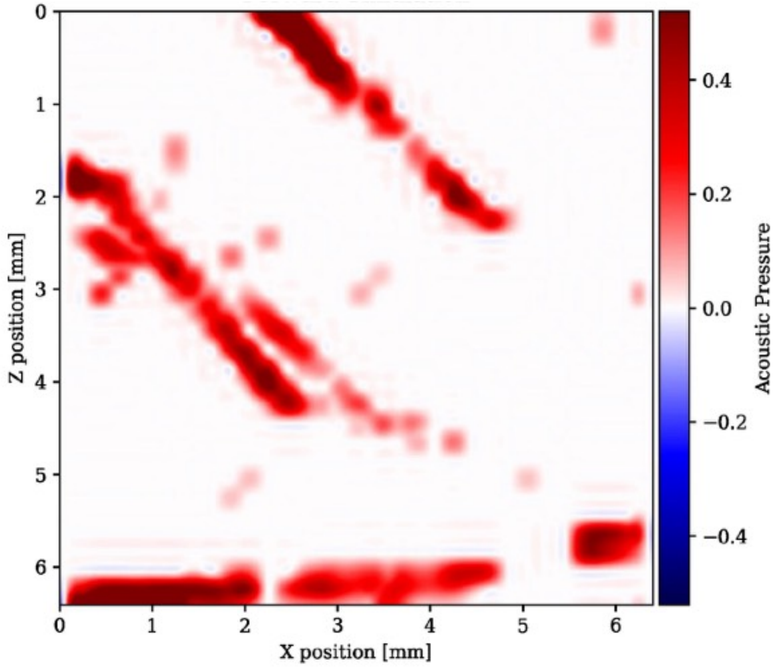
**p** = initial pressure condition


Forward Simulation
Receivers
Z position [mm]
X position [mm]
Acoustic Pressure
0
1
2
3
4
5
6
0.4
0.2
0.0
−0.2
−0.4

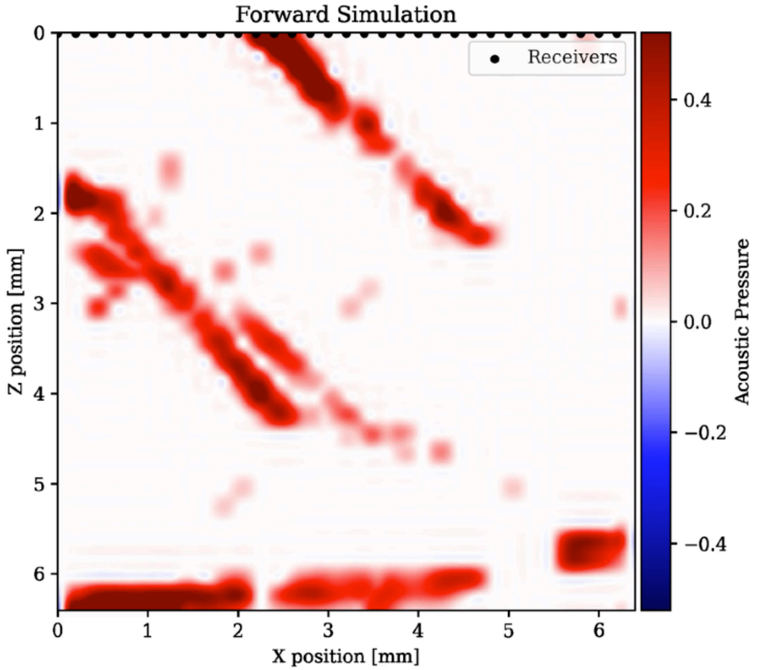

Forward Simulation
Receivers
Z position [mm]
X position [mm]
Acoustic Pressure
0
1
2
3
4
5
6
0.4
0.2
0.0
−0.2
−0.4

# Forward Problem

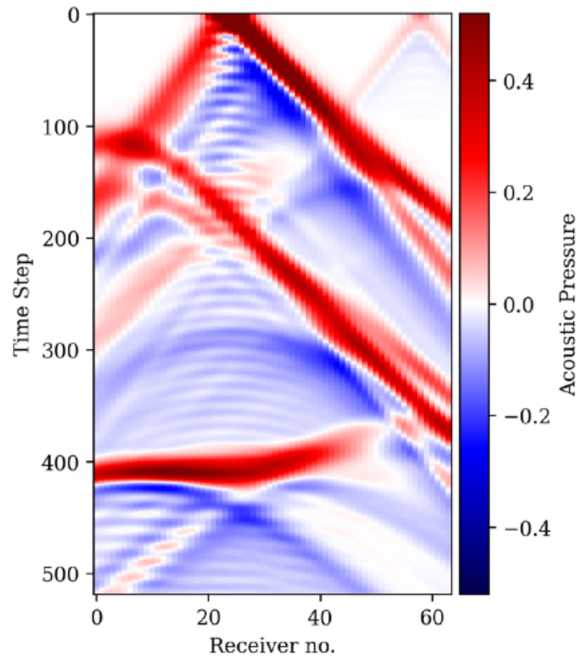
Can be expressed as linear operator $\mathbf{d} = A\mathbf{p}$




**p** = initial pressure condition




A**p** = forward wave operator




**d** = data at receivers



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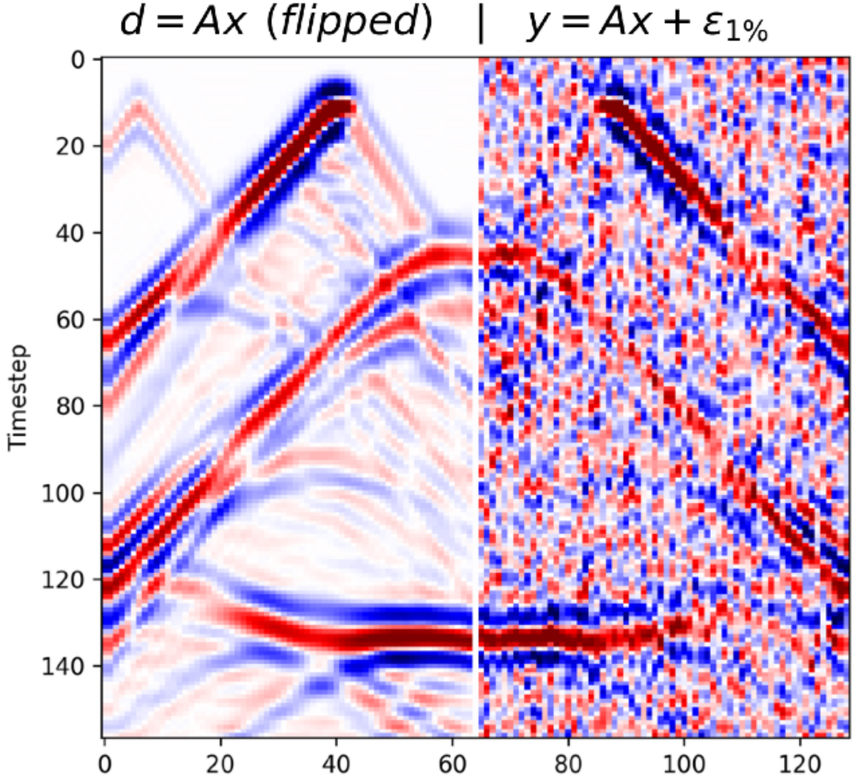
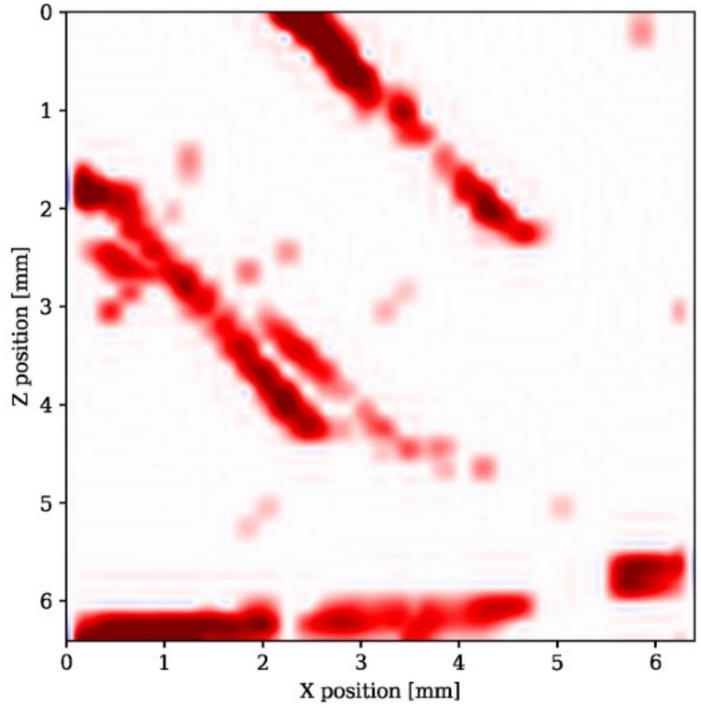
# Inverse Problem

Given acoustic data at receivers calculate acoustic pressure at $T = 0$




Invert data that is noisy, sparse & from limited view receiver geometry




$$\underset{\mathbf{x}}{\operatorname{argmin}} \ \frac{1}{2}\|A\mathbf{x} - \mathbf{d}\|_2^2 + \log R(\mathbf{x})$$