

An Intriguing Property of Geophysics Inversion

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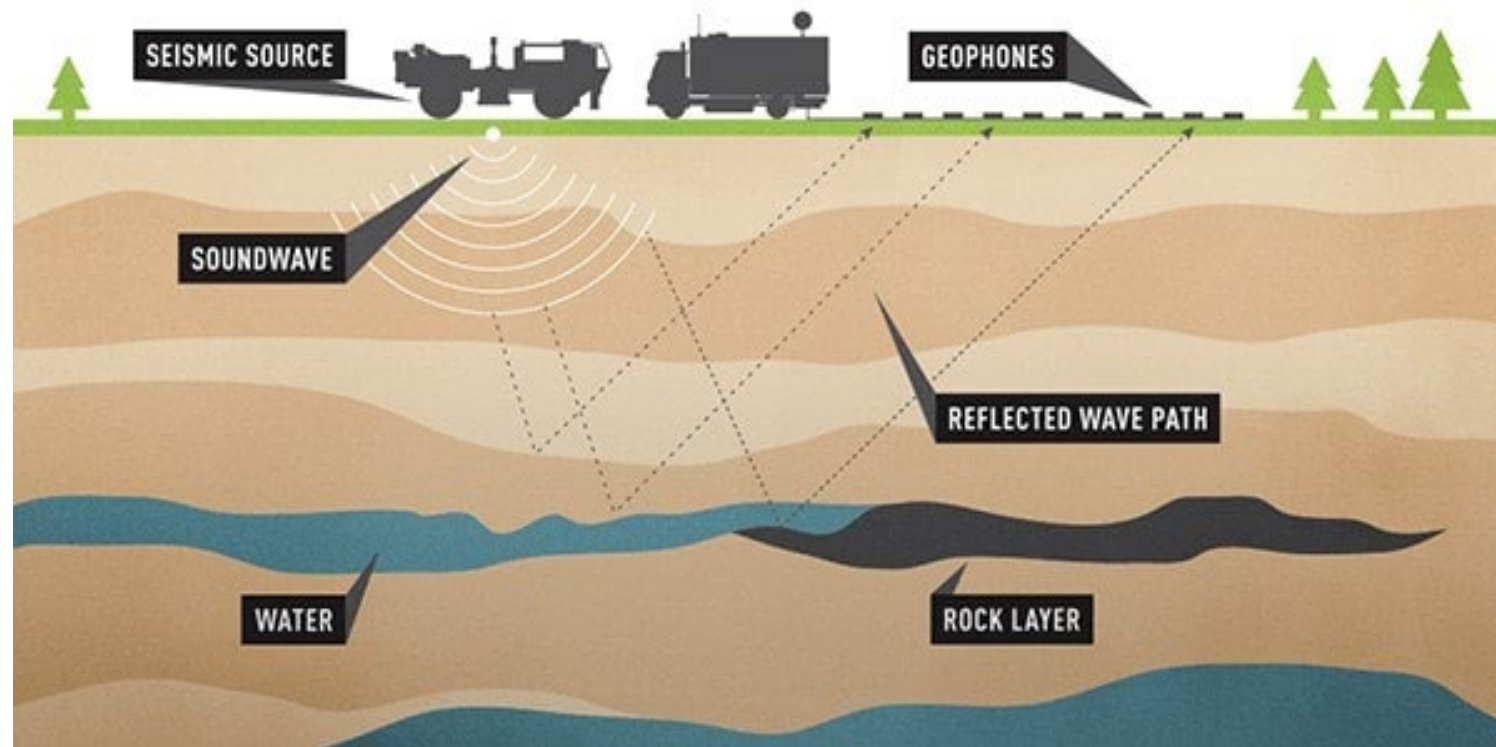
¹Los Alamos National Laboratory

²Microsoft

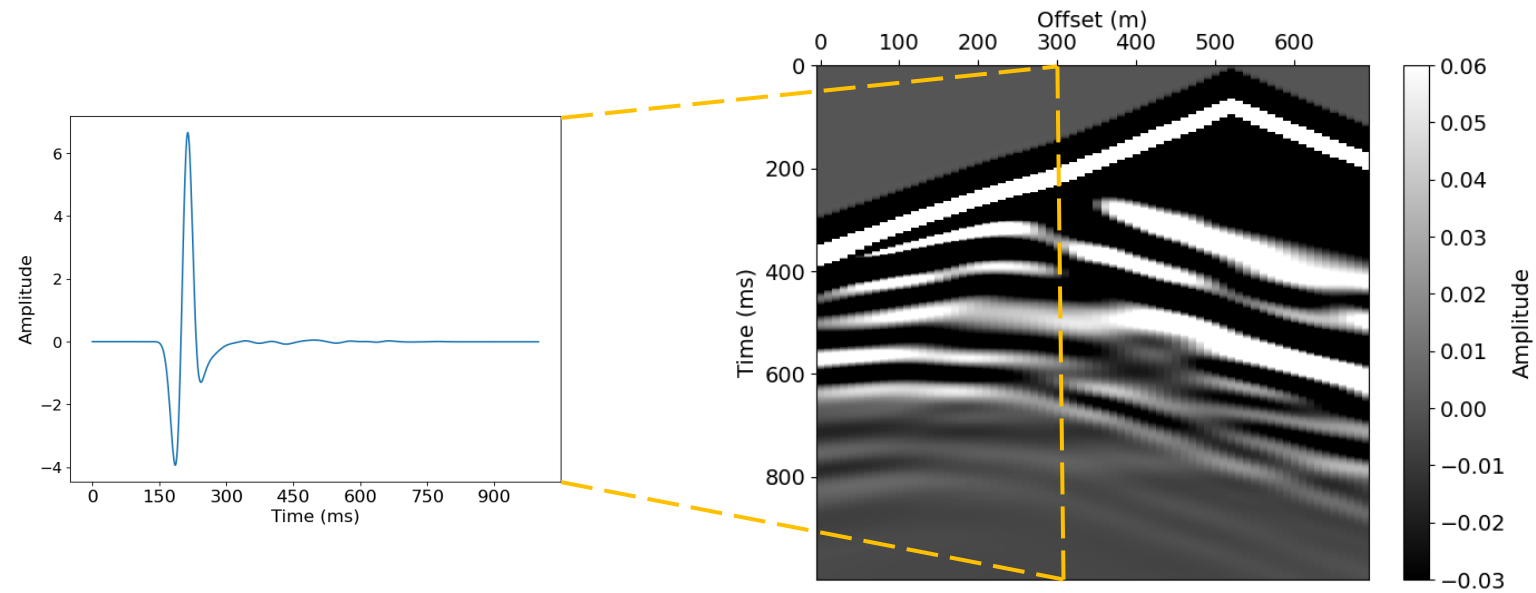
³The Pennsylvania State University

Geophysics Inversion

Geophysical properties (e.g., velocity) can be obtained via geophysical measurements (e.g., seismic).

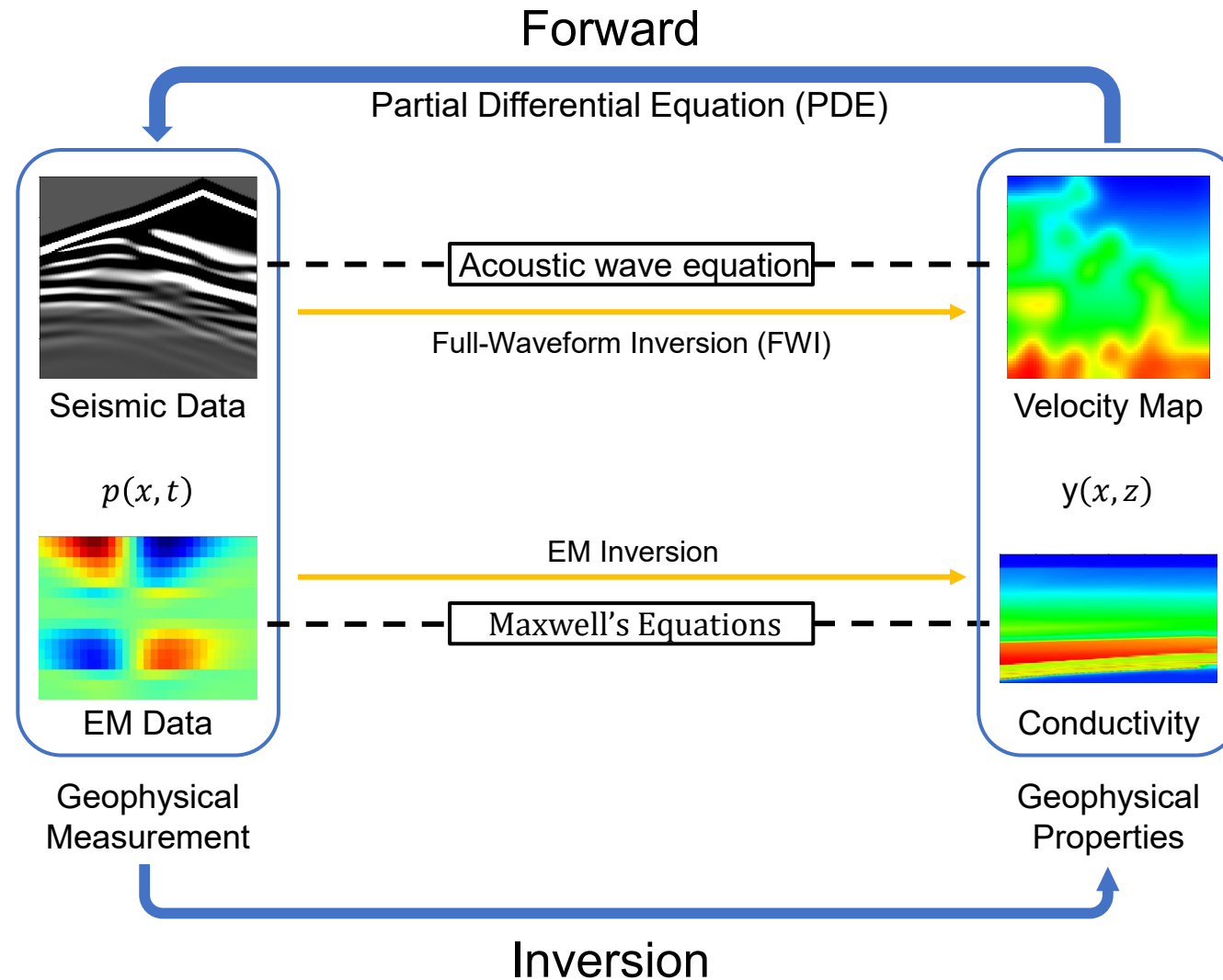


Full-Waveform Inversion (FWI)

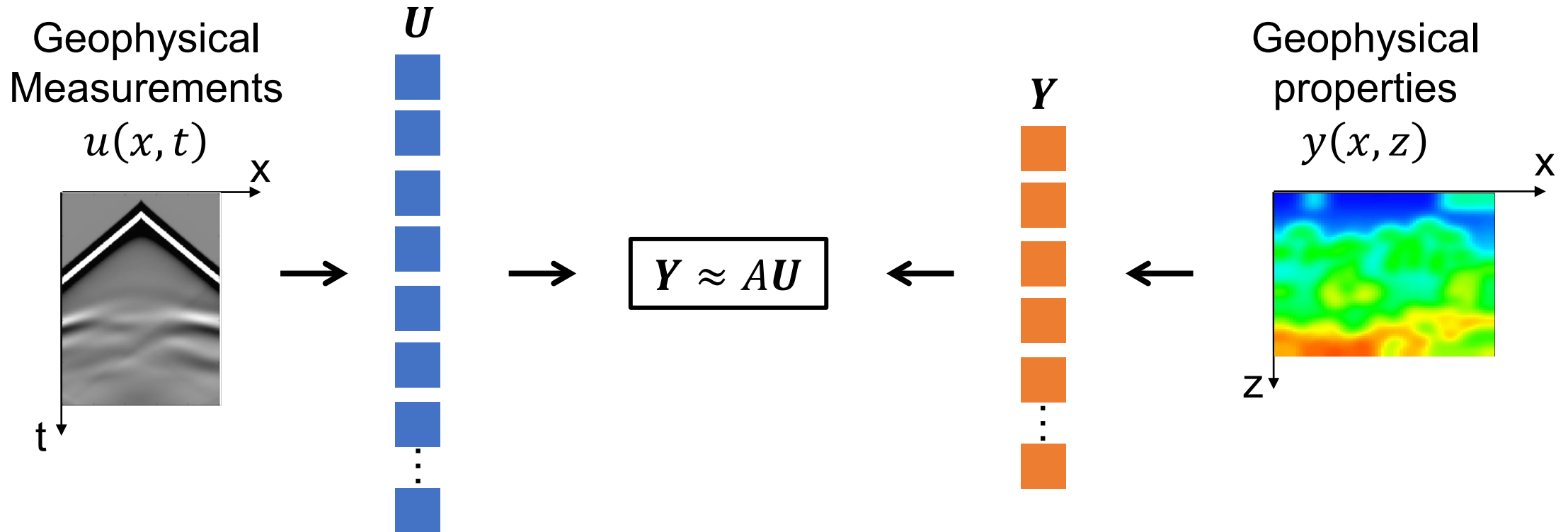


Seismic Data (p)

Geophysics Inversion

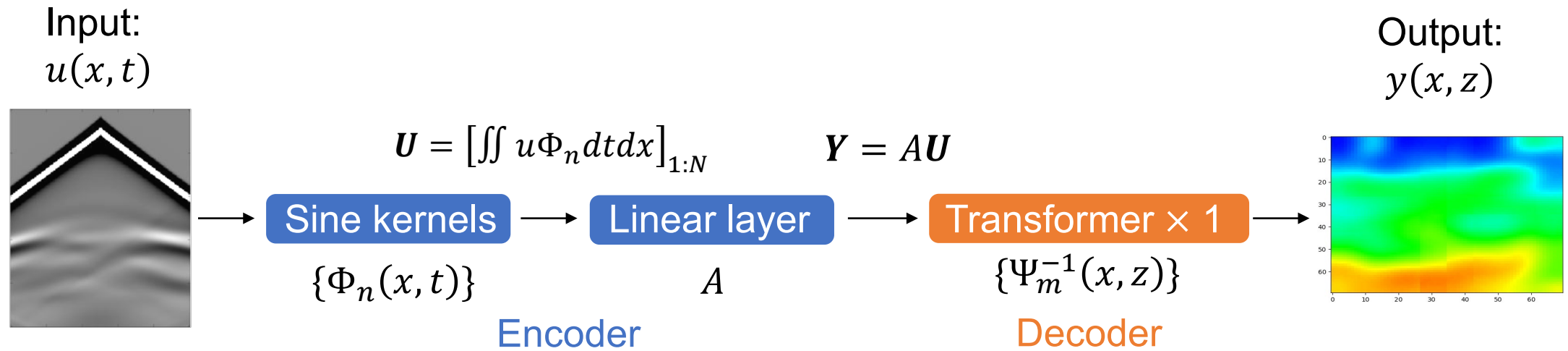


Foundation



$$U_n = \iint u(x, t) \Phi_n(x, t) dt dx \quad Y_m = \iint y(x, z) \Psi_m(x, z) dx dz$$

Methodology



Results

Dataset	Model	MAE↓	MSE↓	SSIM↑	#Parameters	FLOPs
Kimberlina Leakage	InversionNet (Wu & Lin, 2019)	9.43	1086.99	0.9868	15.81M	563.52M
	VelocityGAN Zhang et al. (2019)	9.73	1026.27	0.9863	16.99M	1.31G
	InvLINT (Ours)	8.13	1534.60	0.9812	1.49M (9.4%)	44.30M (7.9%)
Marmousi	InversionNet (Wu & Lin, 2019)	149.67	45936.23	0.7889	24.41M	189.58M
	VelocityGAN Zhang et al. (2019)	124.62	30644.31	0.8642	25.59M	259.49M
	InvLINT (Ours)	136.67	36003.43	0.7972	1.45M (5.9%)	9.31M (4.9%)
Salt	InversionNet (Wu & Lin, 2019)	25.98	8669.98	0.9764	13.74M	32.37M
	VelocityGAN Zhang et al. (2019)	332.62	145669.11	0.7760	14.92M	65.98M
	InvLINT (Ours)	24.60	8840.79	0.9742	1.62M (11.8%)	5.98M (18.5%)
Kimberlina-Reservoir	InversionNet (Wu & Lin, 2019)	0.01330	0.000855	0.9175	0.30M	1.20G
	VelocityGAN Zhang et al. (2019)	0.01313	0.000688	0.8611	1.48M	3.95G
	InvLINT (Ours)	0.00703	0.000537	0.9370	0.16M (53.3%)	96.10M (8.0%)

Results

Ground
Truth

InversionNet
(Wu & Lin, 2019)

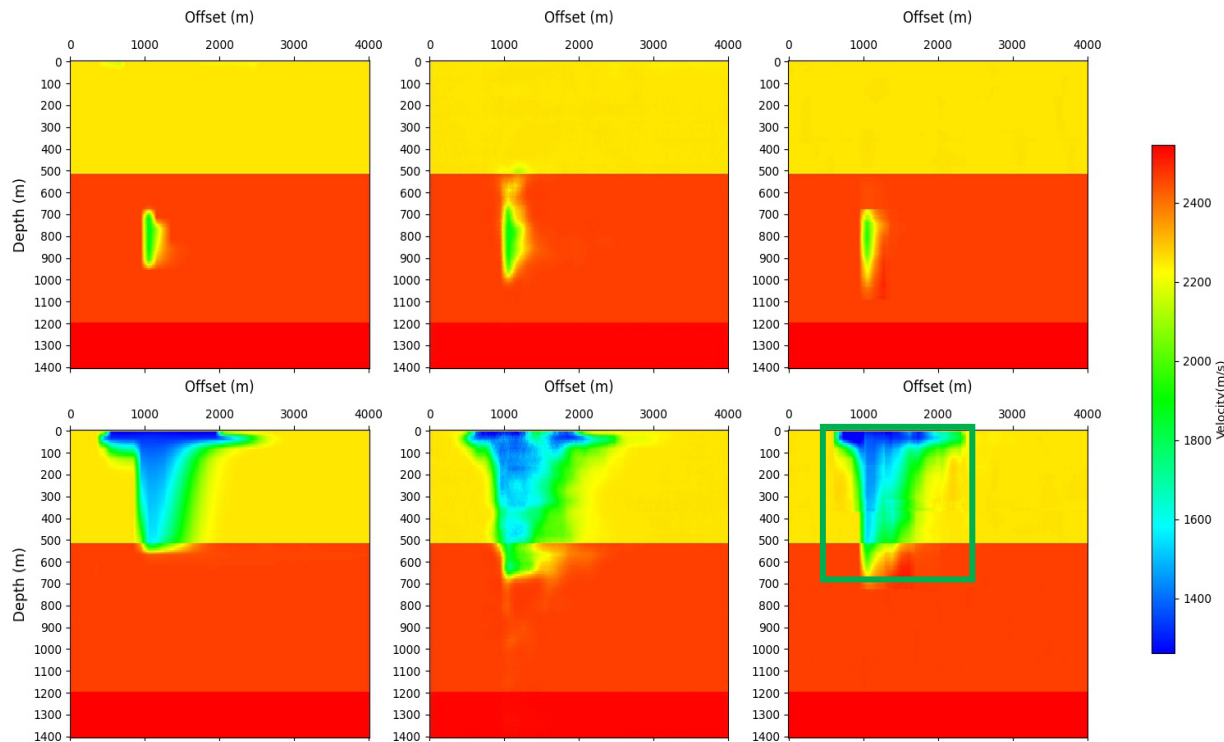
InvLINT
(Ours)

Ground
Truth

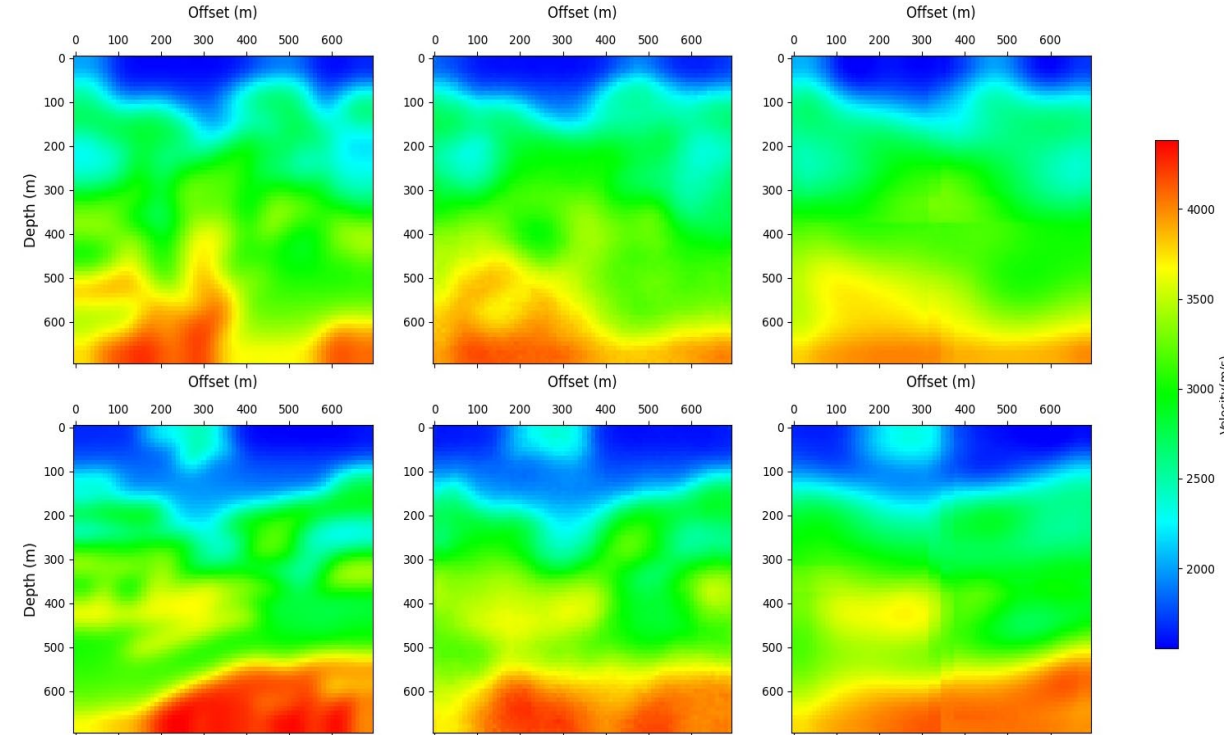
InversionNet
(Wu & Lin, 2019)

InvLINT
(Ours)

Kimberlina-Leakage



Marmousi



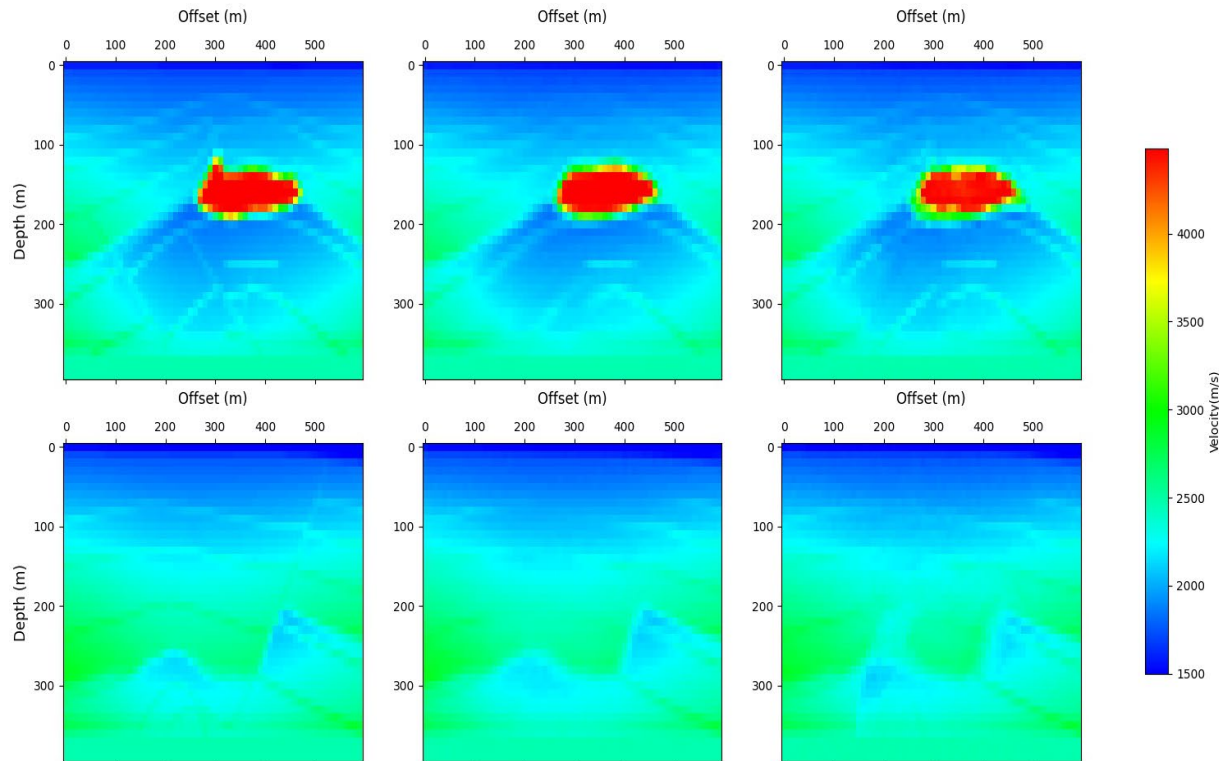
Results

Ground
Truth

InversionNet
(Wu & Lin, 2019)

InvLINT
(Ours)

Salt

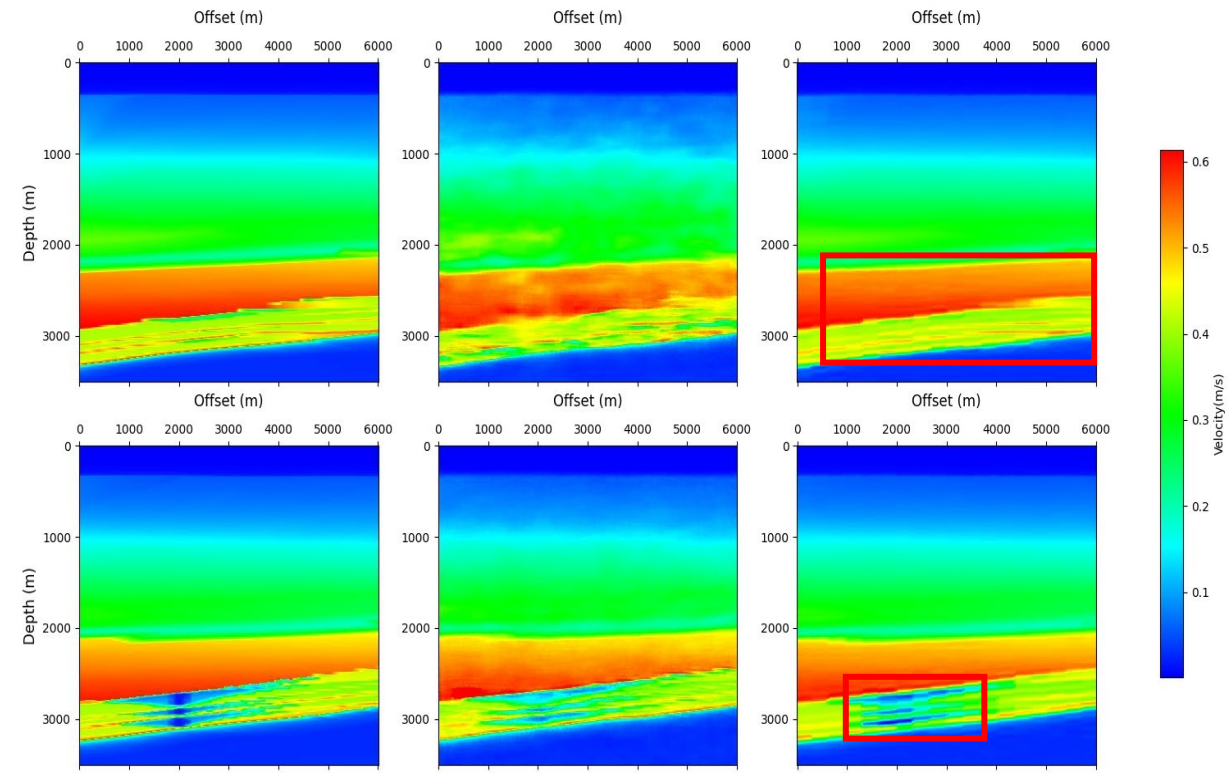


Ground
Truth

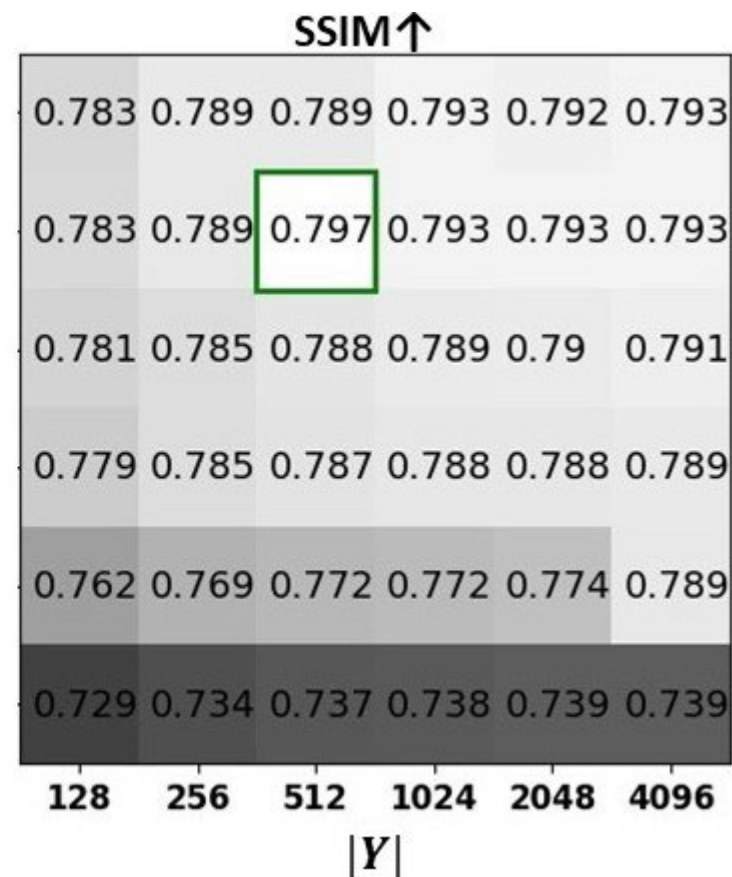
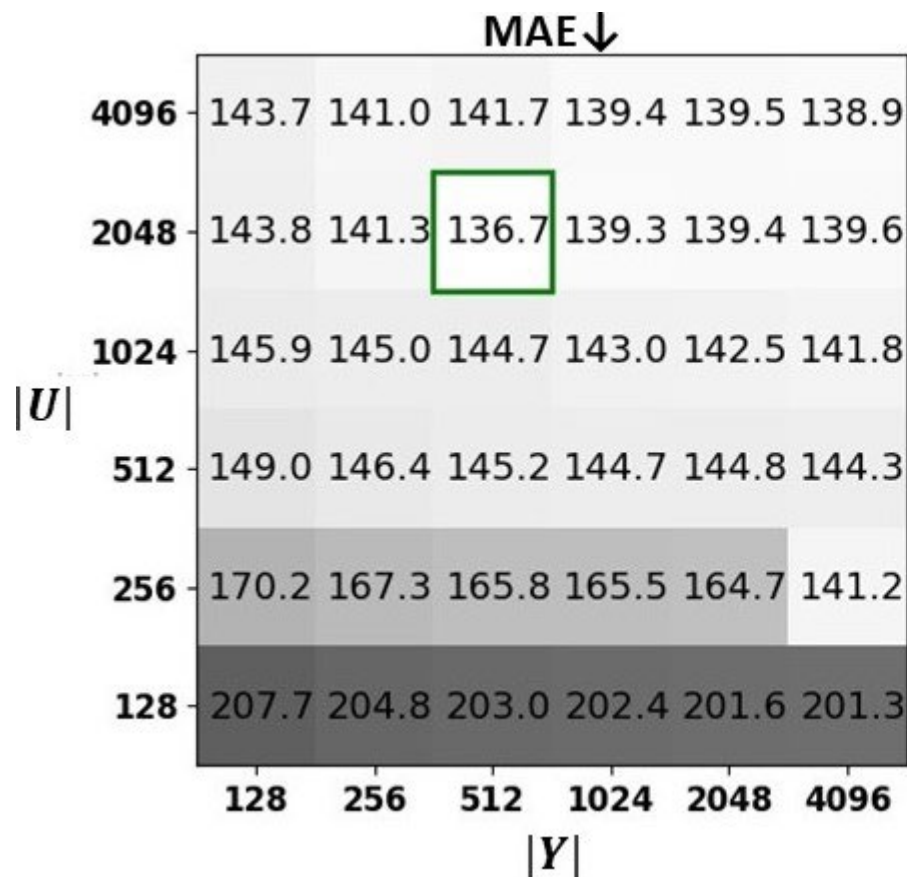
InversionNet
(Wu & Lin, 2019)

InvLINT
(Ours)

Kimberlina-Reservoir



Ablations (Embedding Dimensions on Marmousi)



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Thank you for listening!