

RISULTATI INDAGINE MASW - TIRRENIA, VIA DEI TIGLI

Dispersion curve: number of frequency-velocity points=11
 dataset: 4.sgy
 minimum offset (m): 4
 geophone spacing (m): 1.5
 sampling (ms): 0.131
 Dispersion curve: 4pick.cdp
 Number of individuals: 40
 Number of generations: 51

Rayleigh-wave dispersion analysis

Adopted search space (minimum Vs & thickness): 140 1 150 2 180 2 200
 Adopted search space (maximum Vs & thickness): 160 3 200 5 220 5 400
 Adopted Poisson values: 0.35 0.35 0.35 0.45

Rayleigh wave analysis

Optimizing Vs & Thickness - generation: 1; average & best misfits:	-8.9302	-5.4502
Optimizing Vs & Thickness - generation: 2; average & best misfits:	-8.8393	-5.4502
Optimizing Vs & Thickness - generation: 3; average & best misfits:	-8.562	-5.3756
Optimizing Vs & Thickness - generation: 4; average & best misfits:	-8.5925	-3.7952
Optimizing Vs & Thickness - generation: 5; average & best misfits:	-7.4049	-3.7952
Optimizing Vs & Thickness - generation: 6; average & best misfits:	-7.9057	-3.7952
Optimizing Vs & Thickness - generation: 7; average & best misfits:	-8.2021	-3.7357
Optimizing Vs & Thickness - generation: 8; average & best misfits:	-8.2128	-3.7357
Optimizing Vs & Thickness - generation: 9; average & best misfits:	-7.8604	-3.7357
Optimizing Vs & Thickness - generation: 10; average & best misfits:	-7.8132	-3.5553
Optimizing Vs & Thickness - generation: 11; average & best misfits:	-7.4239	-3.5553
Optimizing Vs & Thickness - generation: 12; average & best misfits:	-7.8556	-3.5553
Optimizing Vs & Thickness - generation: 13; average & best misfits:	-7.5505	-3.5553
Optimizing Vs & Thickness - generation: 14; average & best misfits:	-7.5283	-3.4855
Optimizing Vs & Thickness - generation: 15; average & best misfits:	-6.3214	-3.4376
Optimizing Vs & Thickness - generation: 16; average & best misfits:	-7.1393	-3.4376
Optimizing Vs & Thickness - generation: 17; average & best misfits:	-6.7133	-3.4376
Optimizing Vs & Thickness - generation: 18; average & best misfits:	-7.3187	-3.3999
Optimizing Vs & Thickness - generation: 19; average & best misfits:	-7.2484	-3.3999
Optimizing Vs & Thickness - generation: 20; average & best misfits:	-7.3919	-3.2414
Optimizing Vs & Thickness - generation: 21; average & best misfits:	-7.2104	-3.1488
Optimizing Vs & Thickness - generation: 22; average & best misfits:	-6.1368	-3.1488
Optimizing Vs & Thickness - generation: 23; average & best misfits:	-6.2934	-3.1488
Optimizing Vs & Thickness - generation: 24; average & best misfits:	-6.333	-3.1488
Optimizing Vs & Thickness - generation: 25; average & best misfits:	-7.7088	-3.1488
Optimizing Vs & Thickness - generation: 26; average & best misfits:	-7.4832	-3.1488
Optimizing Vs & Thickness - generation: 27; average & best misfits:	-6.7981	-3.1488
Optimizing Vs & Thickness - generation: 28; average & best misfits:	-7.3236	-3.1488
Optimizing Vs & Thickness - generation: 29; average & best misfits:	-6.8817	-3.13
Optimizing Vs & Thickness - generation: 30; average & best misfits:	-7.1388	-3.13
Optimizing Vs & Thickness - generation: 31; average & best misfits:	-7.4414	-3.13
Optimizing Vs & Thickness - generation: 32; average & best misfits:	-7.3339	-3.13
Optimizing Vs & Thickness - generation: 33; average & best misfits:	-7.5753	-3.13
Optimizing Vs & Thickness - generation: 34; average & best misfits:	-7.704	-3.13
Optimizing Vs & Thickness - generation: 35; average & best misfits:	-7.5244	-3.13
Optimizing Vs & Thickness - generation: 36; average & best misfits:	-6.9643	-3.13
Optimizing Vs & Thickness - generation: 37; average & best misfits:	-7.4102	-3.13
Optimizing Vs & Thickness - generation: 38; average & best misfits:	-7.2976	-3.13
Optimizing Vs & Thickness - generation: 39; average & best misfits:	-7.649	-3.13
Optimizing Vs & Thickness - generation: 40; average & best misfits:	-7.4196	-3.1297
Optimizing Vs & Thickness - generation: 41; average & best misfits:	-7.4159	-3.1256
Optimizing Vs & Thickness - generation: 42; average & best misfits:	-7.5876	-3.1256
Optimizing Vs & Thickness - generation: 43; average & best misfits:	-7.3233	-2.9671
Optimizing Vs & Thickness - generation: 44; average & best misfits:	-7.4035	-2.9605
Optimizing Vs & Thickness - generation: 45; average & best misfits:	-7.4222	-2.9605
Optimizing Vs & Thickness - generation: 46; average & best misfits:	-7.1673	-2.9605
Optimizing Vs & Thickness - generation: 47; average & best misfits:	-6.9001	-2.9605
Optimizing Vs & Thickness - generation: 48; average & best misfits:	-6.7587	-2.9605
Optimizing Vs & Thickness - generation: 49; average & best misfits:	-6.1511	-2.8787
Optimizing Vs & Thickness - generation: 50; average & best misfits:	-6.0189	-2.8738
Optimizing Vs & Thickness - generation: 51; average & best misfits:	-7.0125	-2.8738

Checking the new search space (for the finer search)

Now a finer search around the most promising search space area

Rayleigh wave analysis

Optimizing Vs & Thickness - generation: 1; average & best misfits:	-6.1969	-2.8738
Optimizing Vs & Thickness - generation: 2; average & best misfits:	-6.9913	-2.8738
Optimizing Vs & Thickness - generation: 3; average & best misfits:	-7.4937	-2.8738
Optimizing Vs & Thickness - generation: 4; average & best misfits:	-7.2417	-2.8722
Optimizing Vs & Thickness - generation: 5; average & best misfits:	-6.6881	-2.8722
Optimizing Vs & Thickness - generation: 6; average & best misfits:	-6.182	-2.8722
Optimizing Vs & Thickness - generation: 7; average & best misfits:	-6.4612	-2.8722
Optimizing Vs & Thickness - generation: 8; average & best misfits:	-6.7434	-2.8722
Optimizing Vs & Thickness - generation: 9; average & best misfits:	-6.5953	-2.8722

Optimizing Vs & Thickness - generation: 10; average & best misfits: -6.3172	-2.8396
Optimizing Vs & Thickness - generation: 11; average & best misfits: -6.4488	-2.8396
Optimizing Vs & Thickness - generation: 12; average & best misfits: -6.2137	-2.8396
Optimizing Vs & Thickness - generation: 13; average & best misfits: -6.1288	-2.6837
Optimizing Vs & Thickness - generation: 14; average & best misfits: -5.8567	-2.6837

Model after the Vs & Thickness optimization (fixed Poisson values):

Vs (m/s):	147	200	184	233
Poisson:	0.35	0.35	0.35	0.45
Thickness (m):	1.9	4.3	3.2	

Rayleigh wave analysis

Optimizing Vp & Density - generation: 1; average & best misfits: -2.7176	-2.6432
Optimizing Vp & Density - generation: 2; average & best misfits: -2.6924	-2.6296
Optimizing Vp & Density - generation: 3; average & best misfits: -2.6824	-2.625
Optimizing Vp & Density - generation: 4; average & best misfits: -2.6784	-2.625
Optimizing Vp & Density - generation: 5; average & best misfits: -2.6728	-2.625
Optimizing Vp & Density - generation: 6; average & best misfits: -2.6694	-2.6244
Optimizing Vp & Density - generation: 7; average & best misfits: -2.6608	-2.6244
Optimizing Vp & Density - generation: 8; average & best misfits: -2.662	-2.6188
Optimizing Vp & Density - generation: 9; average & best misfits: -2.6621	-2.6188
Optimizing Vp & Density - generation: 10; average & best misfits: -2.6553	-2.6188
Optimizing Vp & Density - generation: 11; average & best misfits: -2.6617	-2.6188
Optimizing Vp & Density - generation: 12; average & best misfits: -2.6583	-2.6188
Optimizing Vp & Density - generation: 13; average & best misfits: -2.6521	-2.6188
Optimizing Vp & Density - generation: 14; average & best misfits: -2.6489	-2.6181

Number of models considered to calculate the average model: 70

RESULTS winMASW Pro
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Dataset: 4.sgy
Analyzed curve: 4pick.cdp

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MEAN MODEL

VS (m/s):	147	198	186	238
Standard deviations (m/s):	3	3	9	18
Thickness (m):	1.9	4.3	3.1	
Standard deviations (m):	0.2	0.6	0.8	

Approximate values for Vp, density & elastic moduli

Vp (m/s):	303	437	383	1158
Density (gr/cm3):	1.77	1.85	1.82	2.09
Vp/Vs ratio:	2.06	2.21	2.06	4.87
Poisson:	0.35	0.37	0.35	0.48
Young modulus (MPa):	103	199	170	350
Shear modulus (MPa):	38	73	63	118
Lamé (MPa):	86	209	141	2565
Bulk modulus (MPa):	111	257	183	2644

Fundamental mode

Mean model

f (Hz)	VR(m/s)
7.56158	199.7543
9.7307	188.4979
12.7675	179.5597
15.9127	175.3155
20.2509	171.5553
24.5892	167.3
29.1443	161.5582
34.1333	154.9423
38.1461	150.4459
45.6296	144.7441
57.8851	140.3621

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BEST MODEL

Vs (m/s):	146.5042	200	183.5654	233.2926
thickness (m):	1.8537	4.2818	3.2054	

Approximate values for Vp, density & elastic moduli

Vp (m/s):	303	455	361	1708
Density (gr/cm3):	1.77	1.86	1.81	2.18
Vp/Vs ratio:	2.06	2.27	1.96	7.33
Poisson:	0.35	0.38	0.32	0.49
Young modulus (MPa):	103	206	162	353
Shear modulus (MPa):	38	75	61	119
Lamé (MPa):	86	237	113	6134
Bulk modulus (MPa):	111	286	154	6213

dispersion curve (frequency - Rayleigh phase velocity)

Fundamental mode)

best model

F(Hz)	VR(m/s)
7.56158	197.506
9.7307	187.1235
12.7675	179.3238
15.9127	175.8037
20.2509	172.6101
24.5892	168.5653
29.1443	162.6491
34.1333	155.5764
38.1461	150.7409
45.6296	144.6541
57.8851	140.0374

Inversion quality: very good

VS5 (mean model): 175 m/s

VS5 (best model): 176 m/s

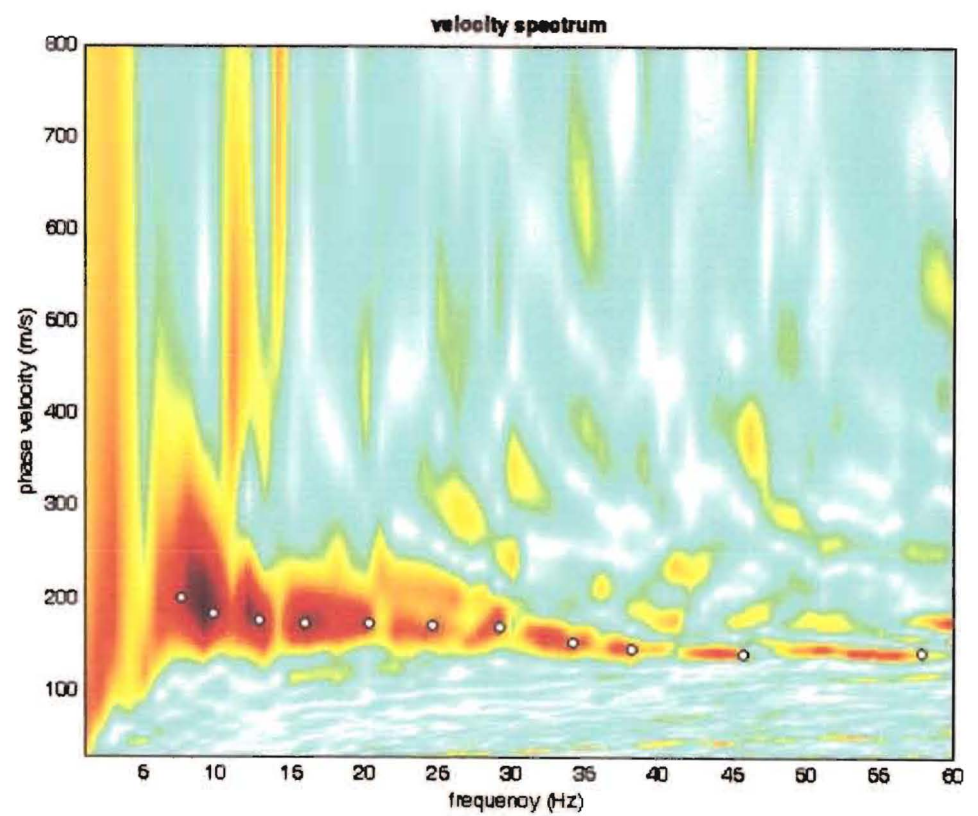
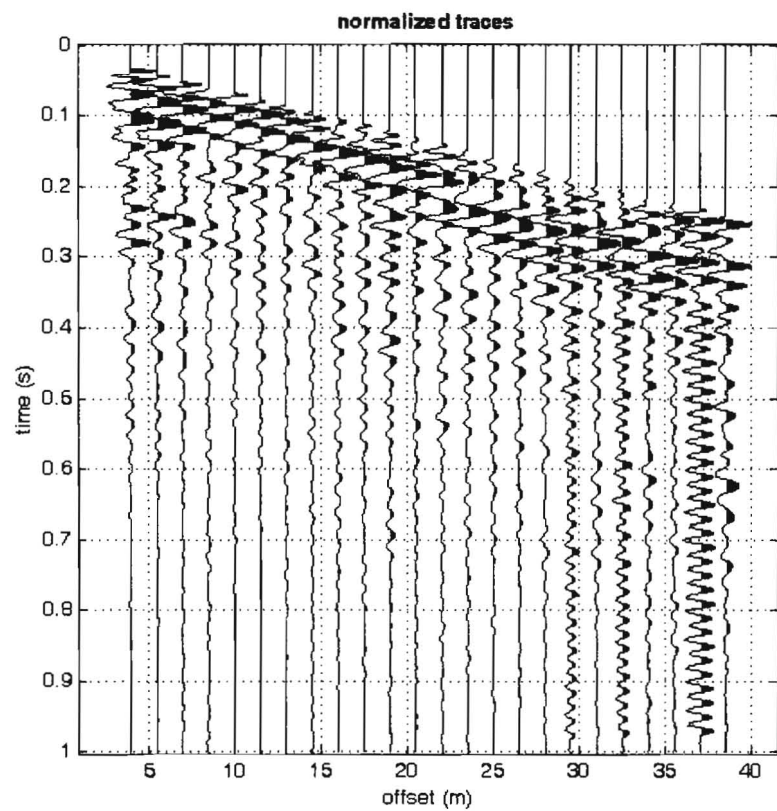
VS20 (mean model): 208 m/s

VS20 (best model): 206 m/s

VS30 (mean model): 217 m/s

VS30 (best model): 214 m/s

winMASW 4.2 Pro
Surface Wave Analysis
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