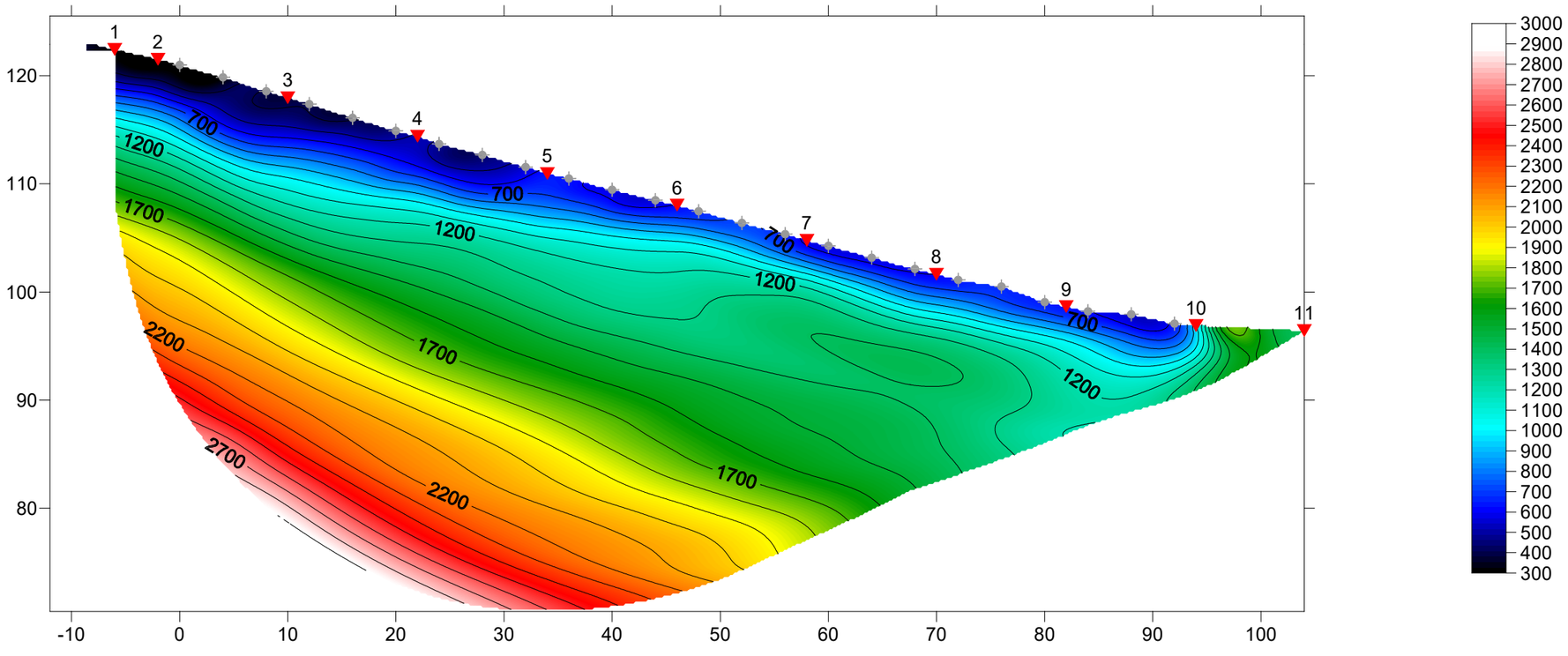
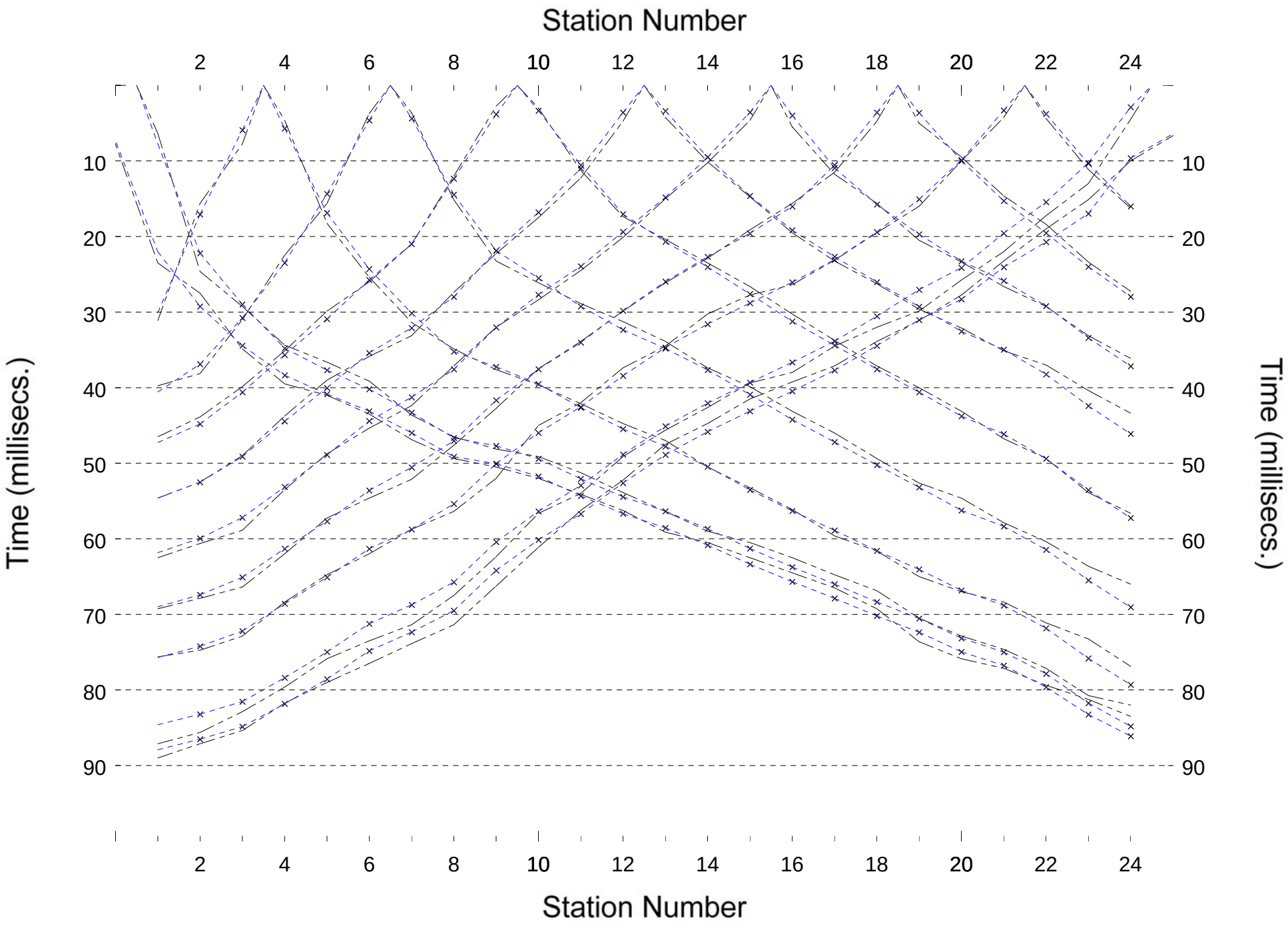
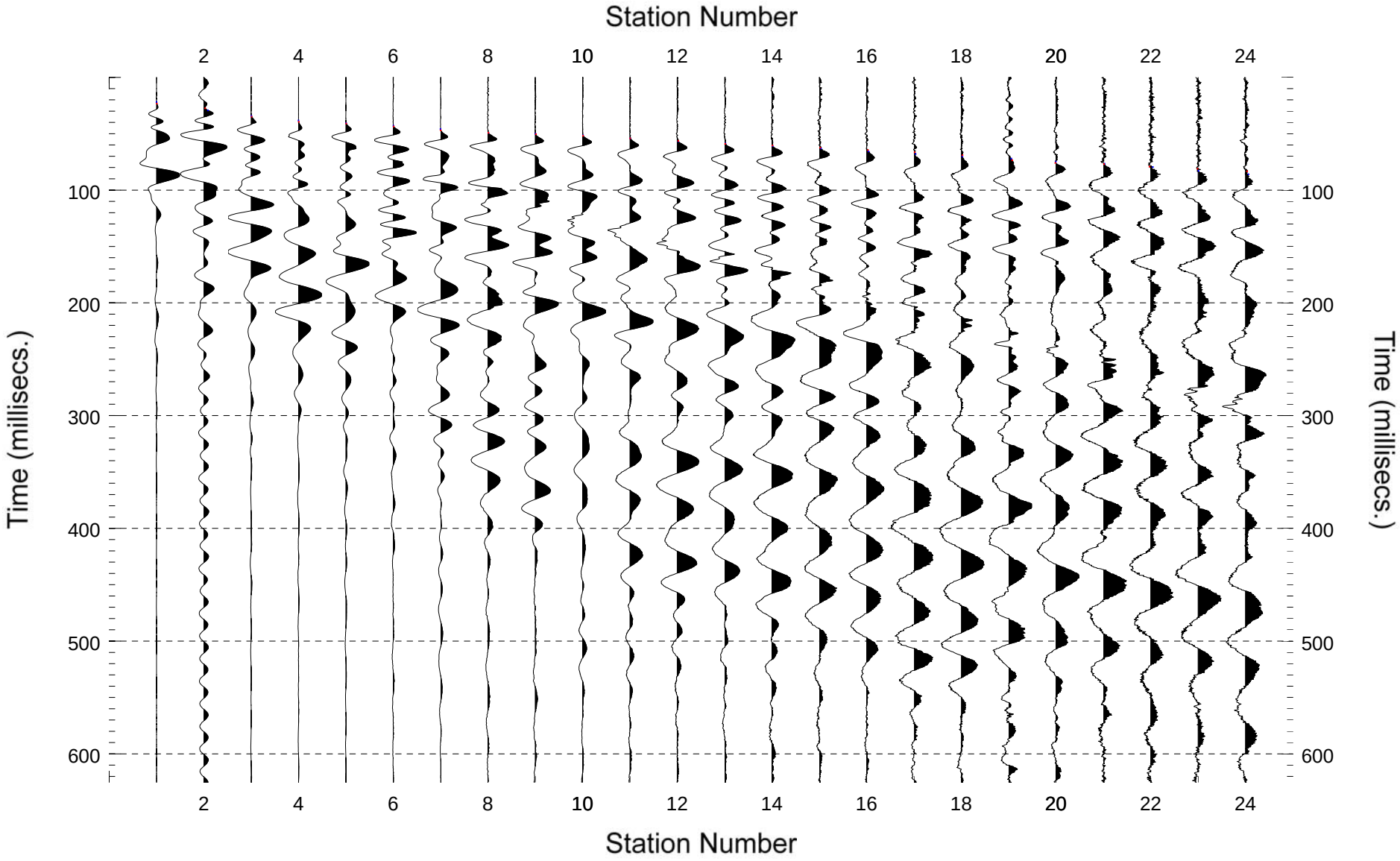
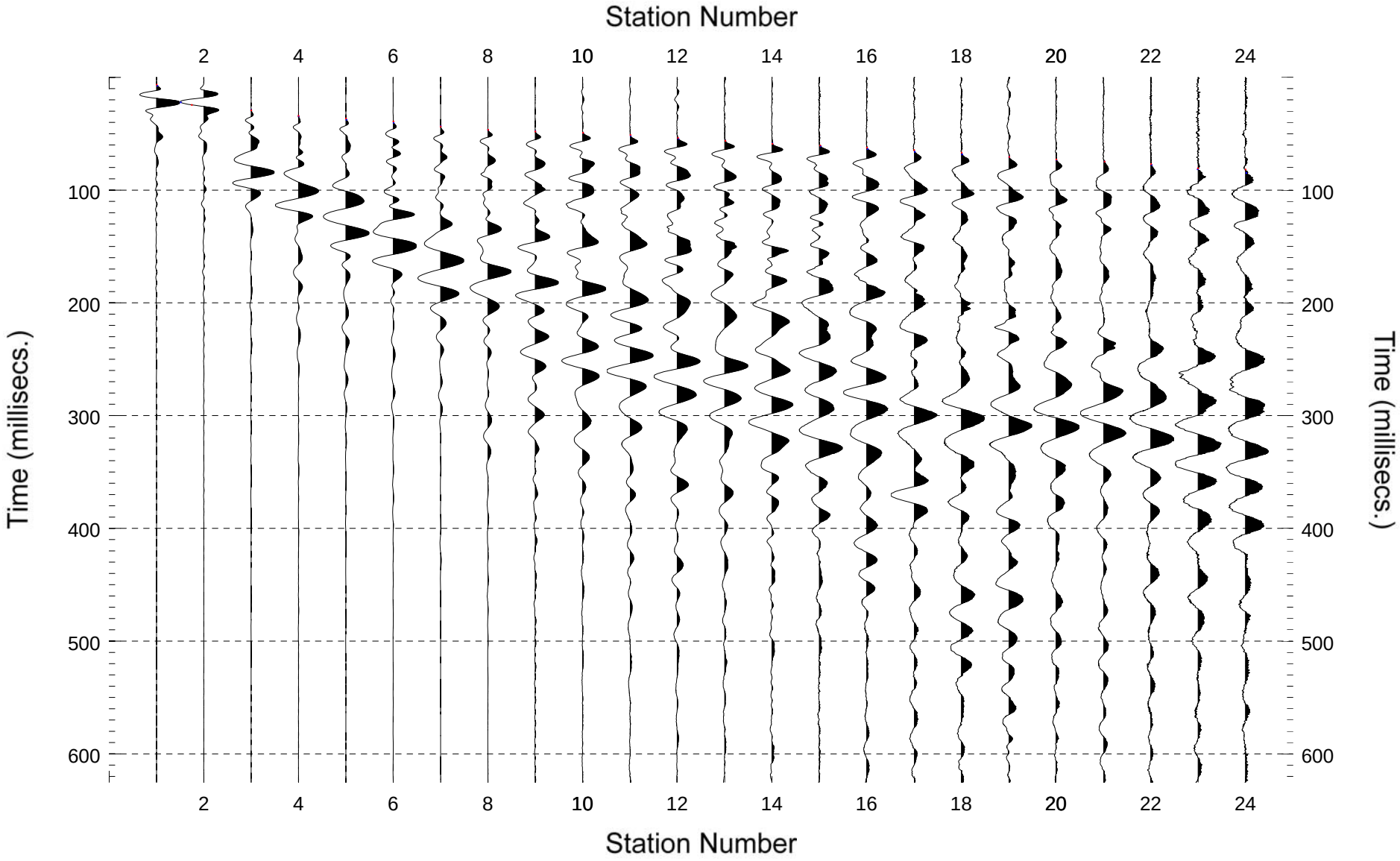
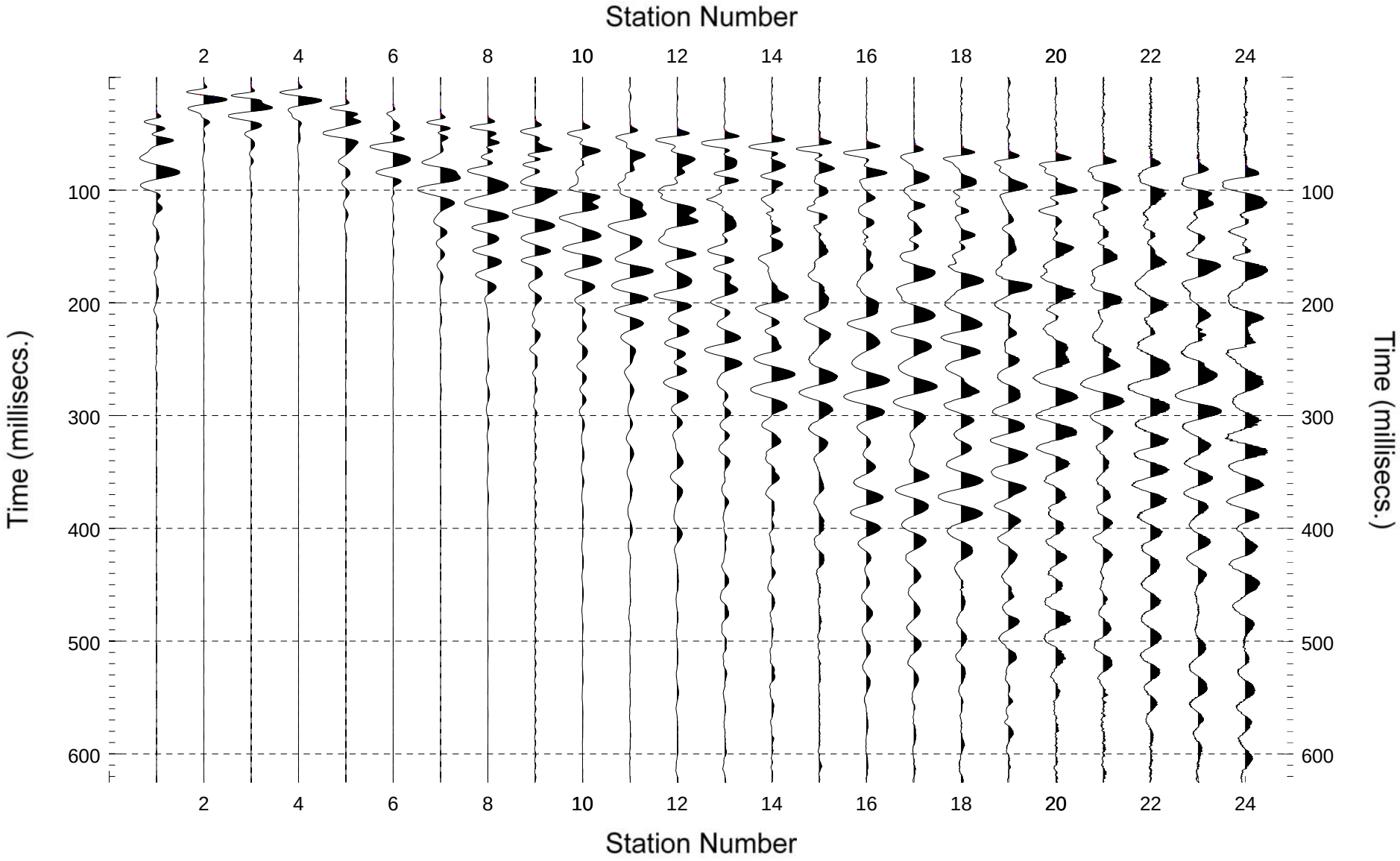
LN 0100 - BORGIANO

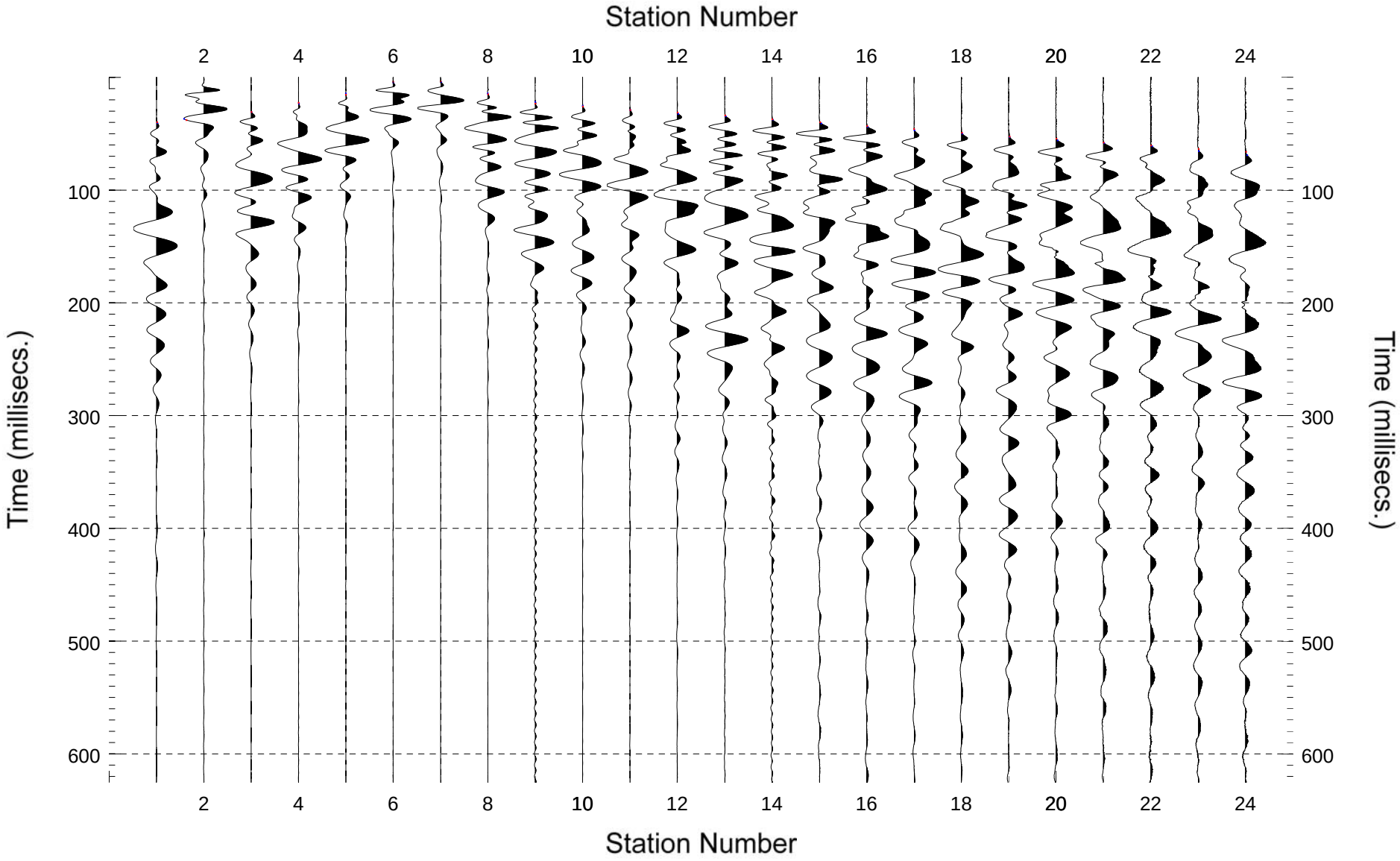


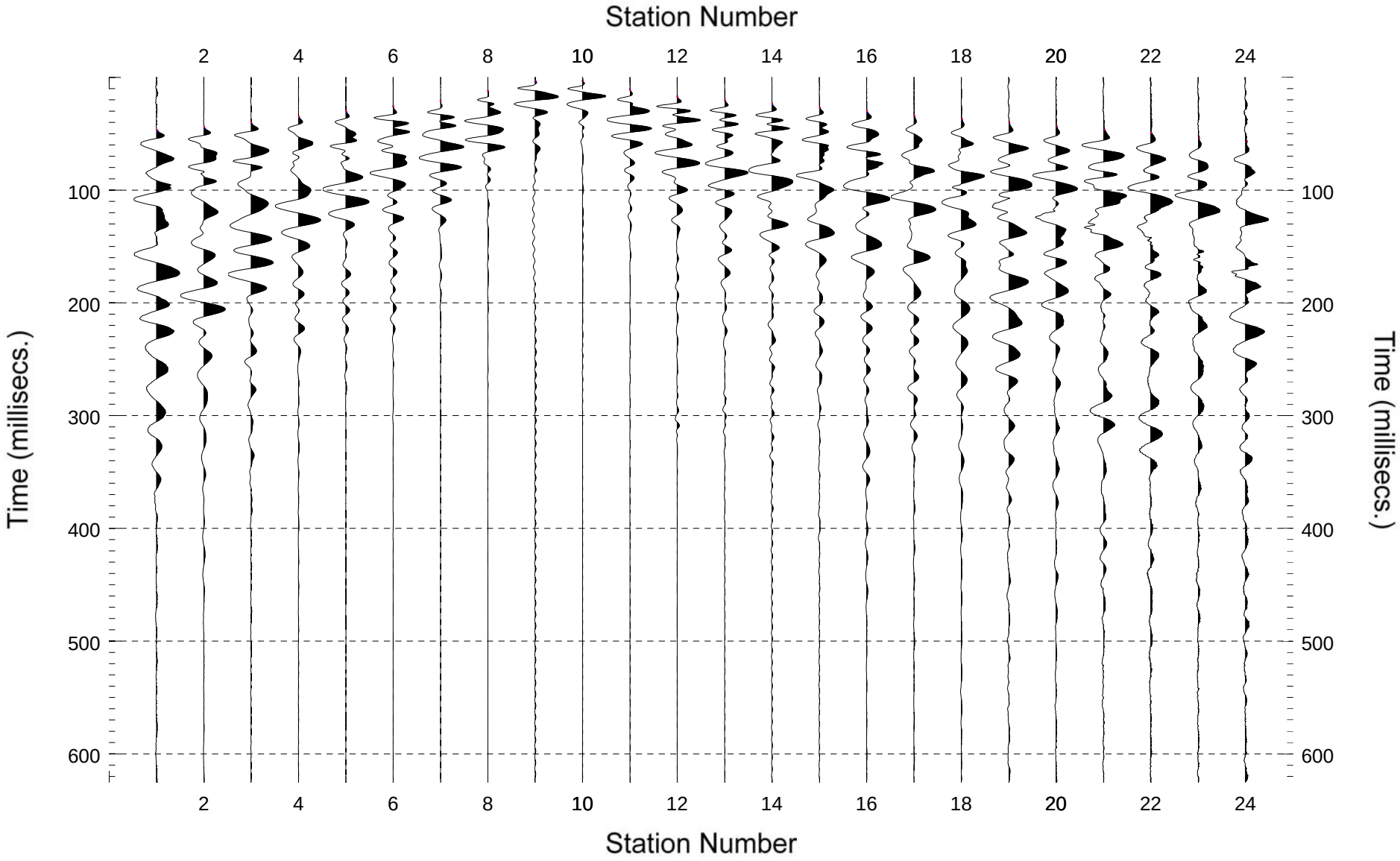

Station Number
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Time (millisecs.)
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Time (millisecs.)
Station Number

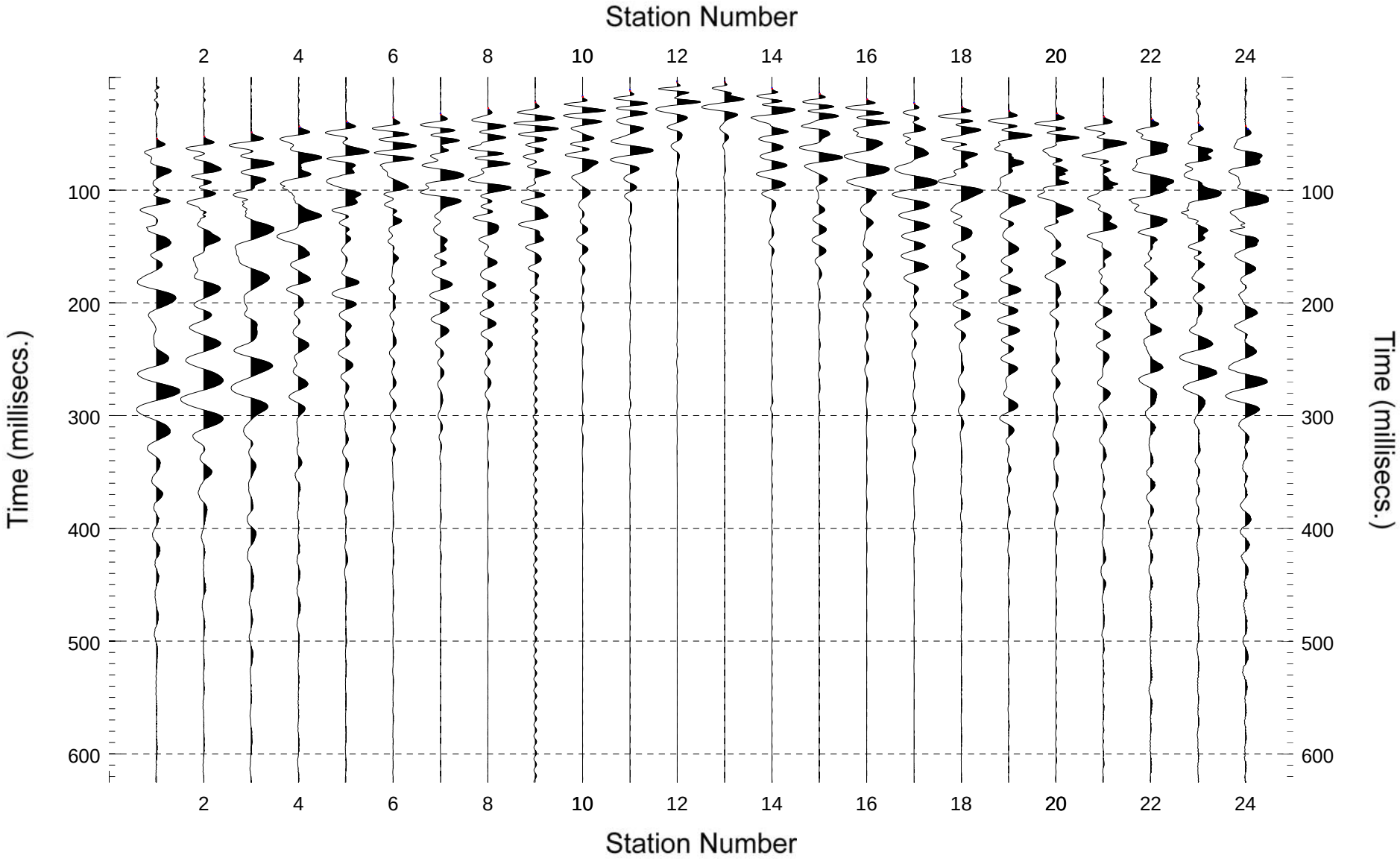

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Station Number
Time (millisecs.)

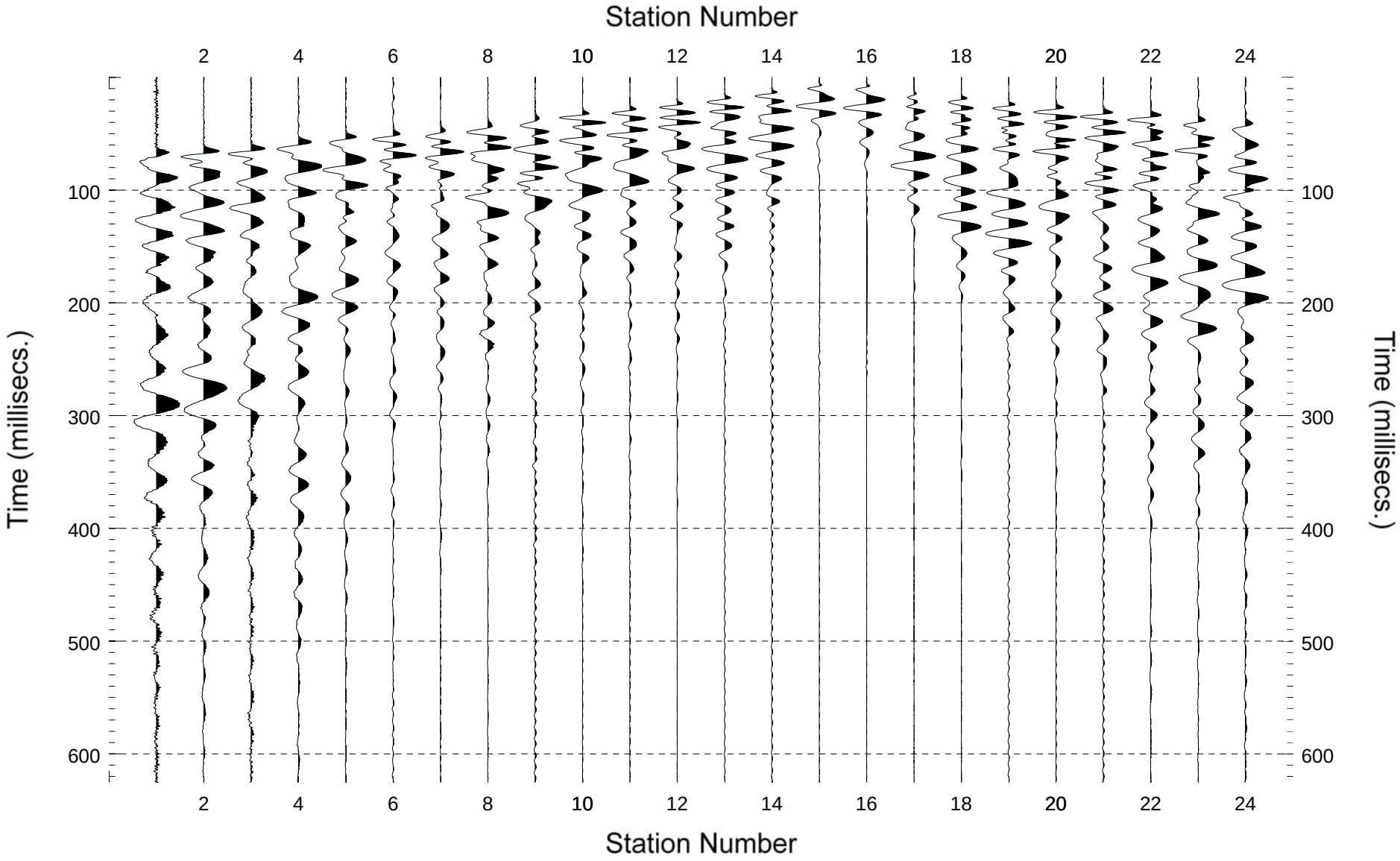

Station Number
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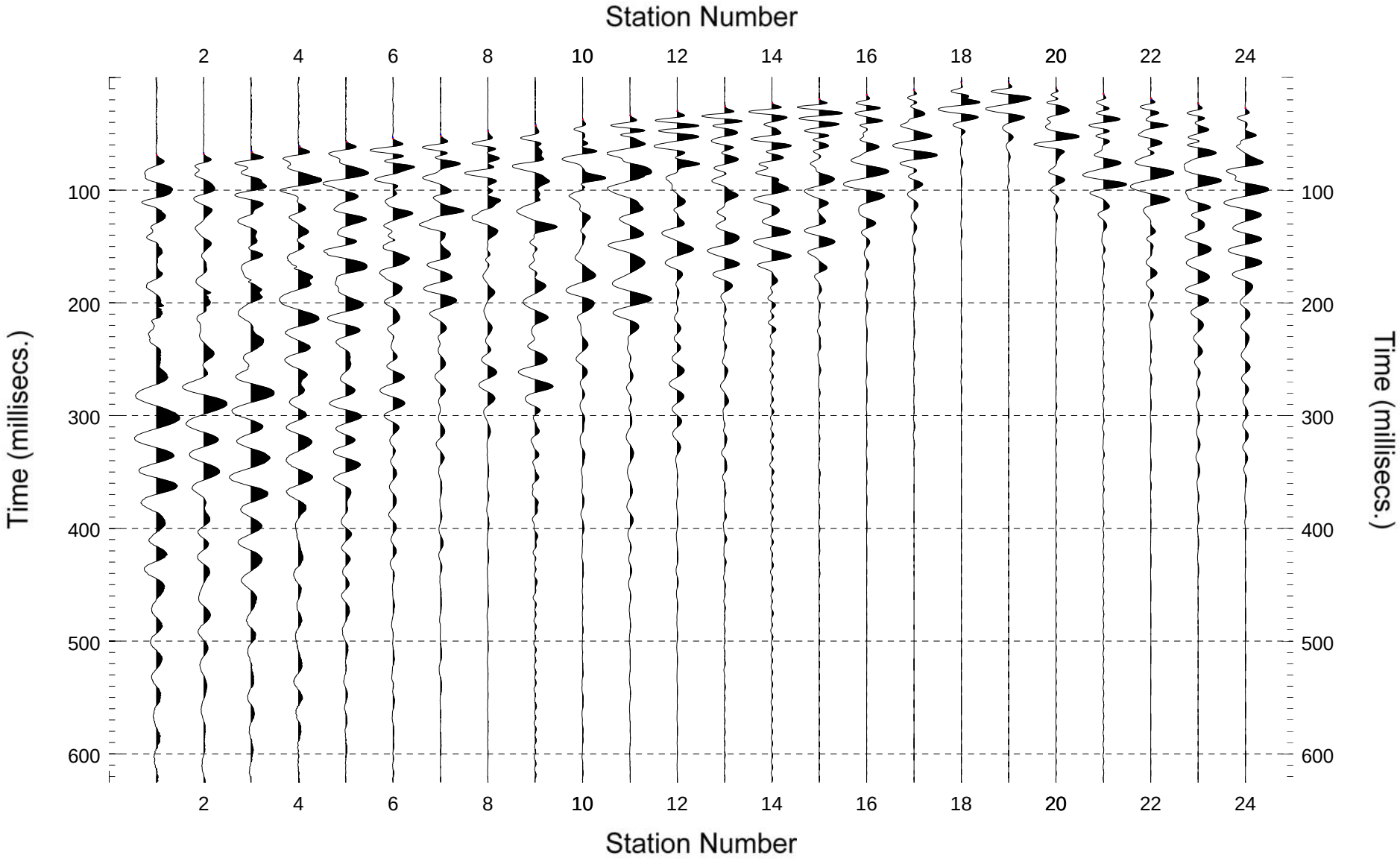

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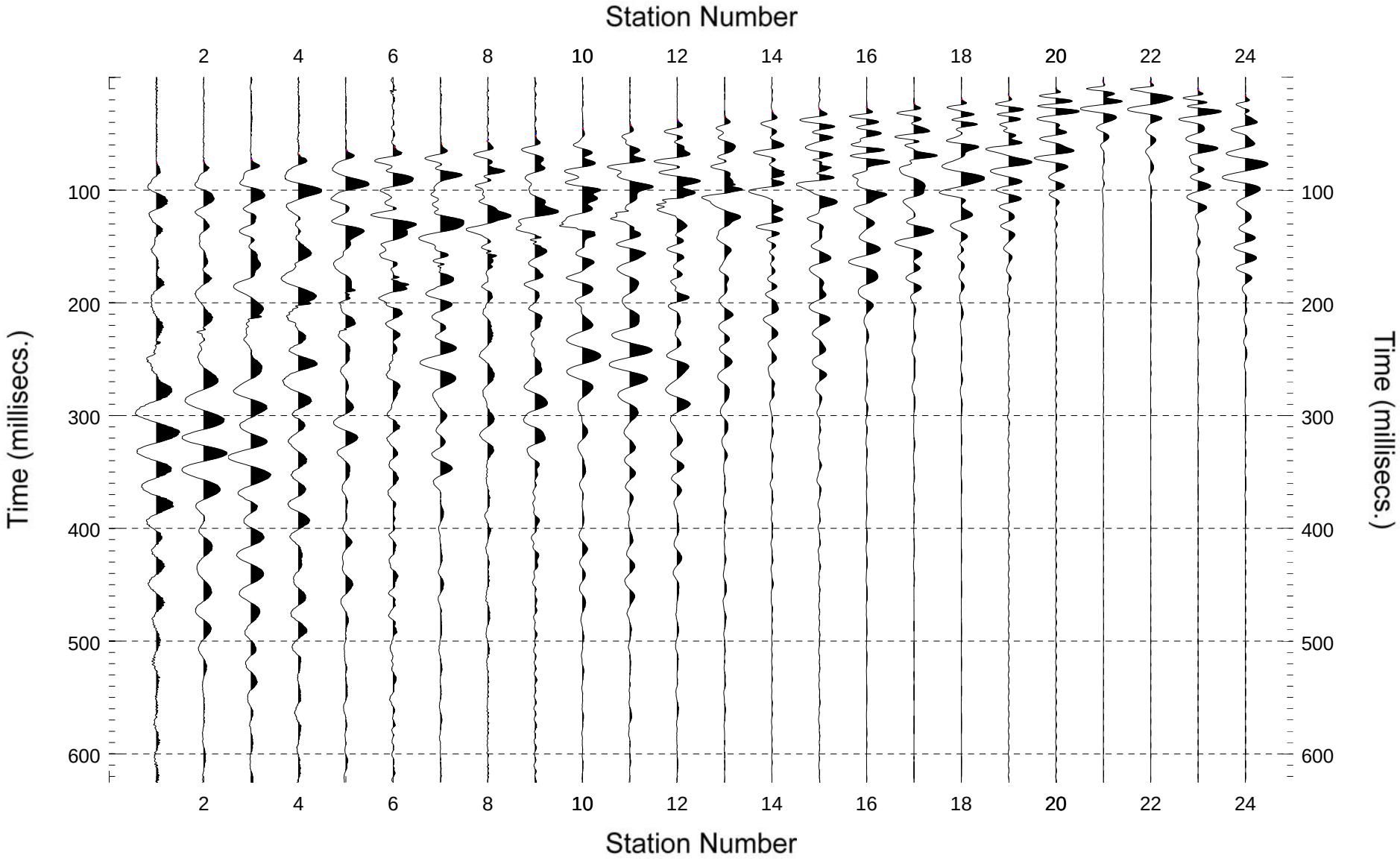

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Time (millisecs.)
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Station Number
Time (millisecs.)

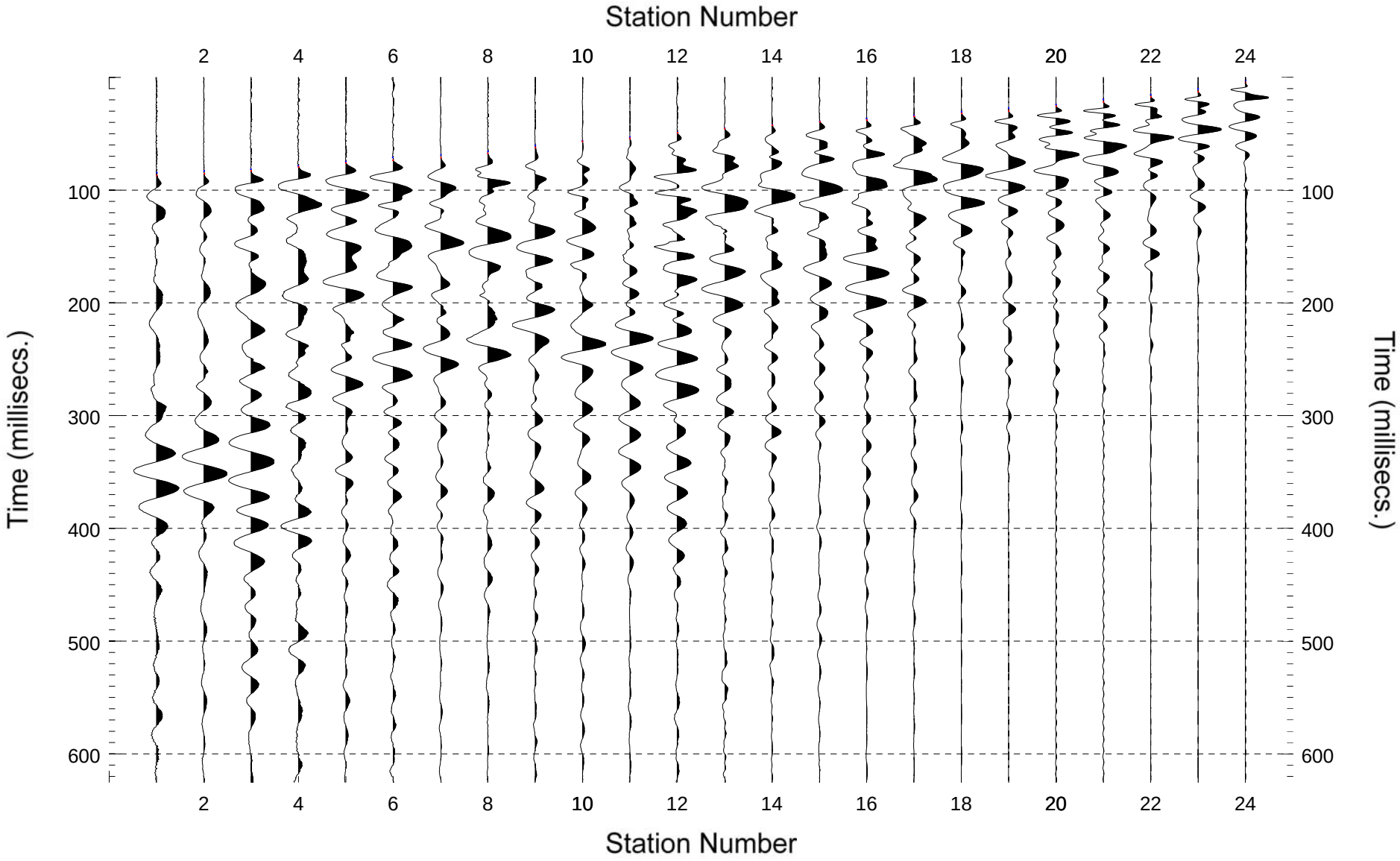

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Time (millisecs.)
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Station Number
Time (millisecs.)

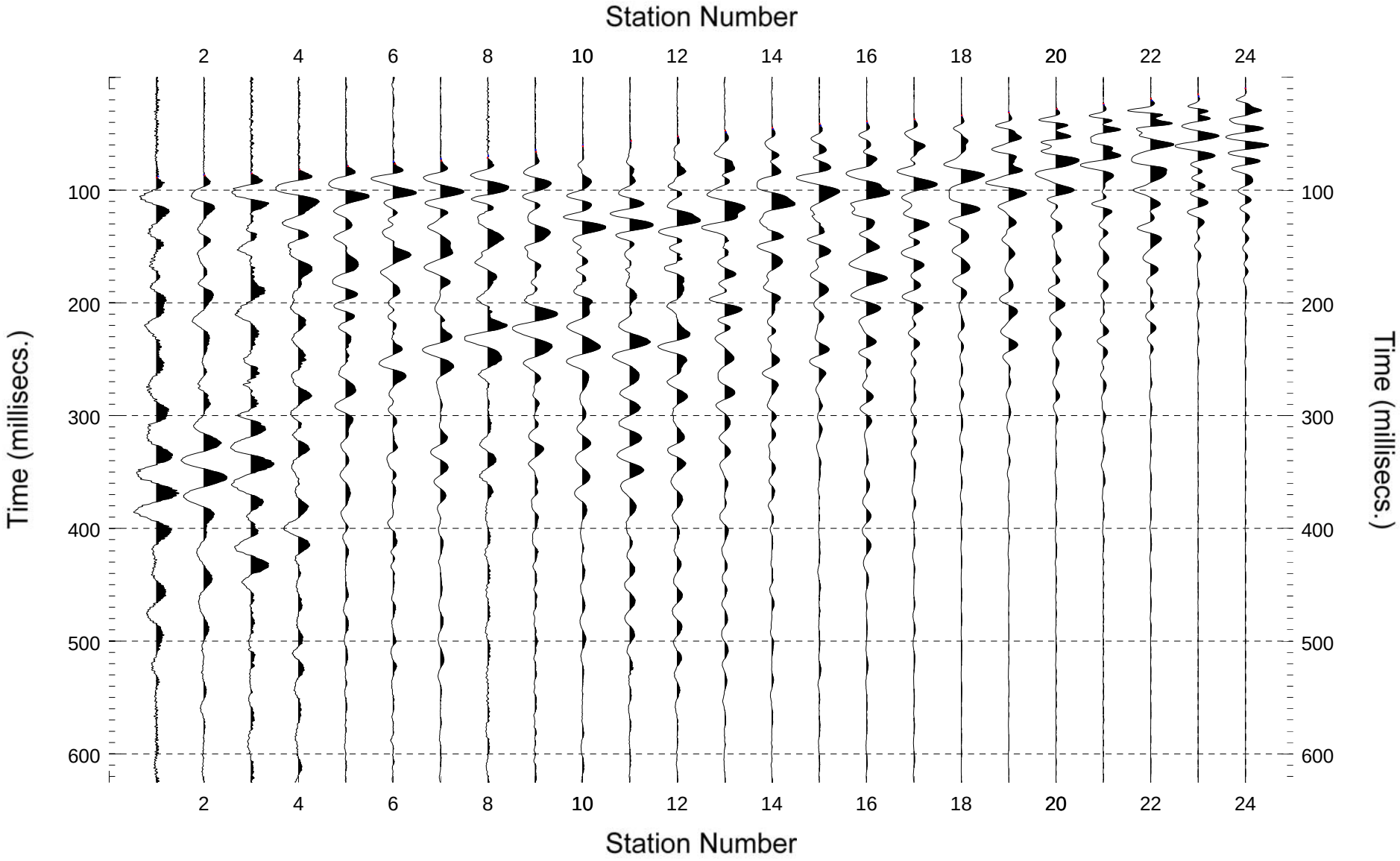

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Station Number
Time (millisecs.)


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Time (millisecs.)
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Station Number
Time (millisecs.)


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Time (millisecs.)


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Time (millisecs.)
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Station Number
Time (millisecs.)


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Time (millisecs.)
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Station Number
Time (millisecs.)


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Time (millisecs.)
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Station Number
Time (millisecs.)

LN0100 MASW

Analyzing Phase velocities

==o== SECTION#1
dataset: 2m 05ser1.sgy
minimum offset (m): 2
geophone spacing (m): 4
sampling (ms): 0.125
Dispersion curve: BORGIANO LN1 05.cdp
Number of individuals: 80
Number of generations: 81

Rayleigh-wave dispersion analysis

Analyzing Phase Velocities

Adopted search space (minimum Vs & thickness): 191.4 1.32 257.4 3.3 283.8 3.63 495 4.95 594
Adopted search space (maximum Vs & thickness): 406 2.8 546 7 602 7.7 1050 10.5 1260
Adopted Poisson values: 0.3502 0.34959 0.34995 0.29995 0.3499

Output folder: ..\IO\output_disp

==o== SECTION#2

Rayleigh wave analysis
Optimizing Vs & Thickness - generation: 1; average & best misfits: -91.5114 -1.90956
Optimizing Vs & Thickness - generation: 2; average & best misfits: -75.4326 -1.90956
Optimizing Vs & Thickness - generation: 3; average & best misfits: -64.6712 -1.90956
Optimizing Vs & Thickness - generation: 4; average & best misfits: -62.2054 -1.90956
Optimizing Vs & Thickness - generation: 5; average & best misfits: -53.0562 -1.90956
Optimizing Vs & Thickness - generation: 6; average & best misfits: -47.7192 -1.90956
Optimizing Vs & Thickness - generation: 7; average & best misfits: -54.4677 -1.90956
Optimizing Vs & Thickness - generation: 8; average & best misfits: -46.432 -1.90956
Optimizing Vs & Thickness - generation: 9; average & best misfits: -46.5031 -1.90956
Optimizing Vs & Thickness - generation: 10; average & best misfits: -47.105 -1.90956
Optimizing Vs & Thickness - generation: 11; average & best misfits: -41.142 -1.90956
Optimizing Vs & Thickness - generation: 12; average & best misfits: -48.6043 -1.90956
Optimizing Vs & Thickness - generation: 13; average & best misfits: -35.0889 -1.90956
Optimizing Vs & Thickness - generation: 14; average & best misfits: -39.8001 -1.90956
Optimizing Vs & Thickness - generation: 15; average & best misfits: -40.4809 -1.90956
Optimizing Vs & Thickness - generation: 16; average & best misfits: -41.6663 -1.90956
Optimizing Vs & Thickness - generation: 17; average & best misfits: -40.7825 -1.90956

Optimizing Vs & Thickness - generation: 18; average & best misfits: -39.5219
-1.90956
Optimizing Vs & Thickness - generation: 19; average & best misfits: -38.048
-1.90956
Optimizing Vs & Thickness - generation: 20; average & best misfits: -32.73
-1.90956
Optimizing Vs & Thickness - generation: 21; average & best misfits: -32.4847
-1.90956
Optimizing Vs & Thickness - generation: 22; average & best misfits: -35.7856
-1.90956
Optimizing Vs & Thickness - generation: 23; average & best misfits: -33.8534
-1.90956
Optimizing Vs & Thickness - generation: 24; average & best misfits: -42.1319
-1.90956
Optimizing Vs & Thickness - generation: 25; average & best misfits: -36.6943
-1.90956
Optimizing Vs & Thickness - generation: 26; average & best misfits: -34.8646
-1.90956
Optimizing Vs & Thickness - generation: 27; average & best misfits: -34.3987
-1.90956
Optimizing Vs & Thickness - generation: 28; average & best misfits: -30.7632
-1.90956
Optimizing Vs & Thickness - generation: 29; average & best misfits: -32.0935
-1.90956
Optimizing Vs & Thickness - generation: 30; average & best misfits: -31.7425
-1.90956
Optimizing Vs & Thickness - generation: 31; average & best misfits: -31.2655
-1.90956
Optimizing Vs & Thickness - generation: 32; average & best misfits: -30.9184
-1.90956
Optimizing Vs & Thickness - generation: 33; average & best misfits: -28.9758
-1.90956
Optimizing Vs & Thickness - generation: 34; average & best misfits: -26.9262
-1.90956
Optimizing Vs & Thickness - generation: 35; average & best misfits: -33.3878
-1.90956
Optimizing Vs & Thickness - generation: 36; average & best misfits: -31.385
-1.90956
Optimizing Vs & Thickness - generation: 37; average & best misfits: -27.3448
-1.90956
Optimizing Vs & Thickness - generation: 38; average & best misfits: -24.5077
-1.90956
Optimizing Vs & Thickness - generation: 39; average & best misfits: -23.8864
-1.90956
Optimizing Vs & Thickness - generation: 40; average & best misfits: -24.7968
-1.90956
Optimizing Vs & Thickness - generation: 41; average & best misfits: -25.5107
-1.90956
Optimizing Vs & Thickness - generation: 42; average & best misfits: -28.1246
-1.90956
Optimizing Vs & Thickness - generation: 43; average & best misfits: -27.3393
-1.90956
Optimizing Vs & Thickness - generation: 44; average & best misfits: -24.1684
-1.77722
Optimizing Vs & Thickness - generation: 45; average & best misfits: -23.5976
-1.77722
Optimizing Vs & Thickness - generation: 46; average & best misfits: -20.3684
-1.77722
Optimizing Vs & Thickness - generation: 47; average & best misfits: -20.6327
-1.77722
Optimizing Vs & Thickness - generation: 48; average & best misfits: -20.5102
-1.77722
Optimizing Vs & Thickness - generation: 49; average & best misfits: -19.5612
-1.77722
Optimizing Vs & Thickness - generation: 50; average & best misfits: -20.1381
-1.77722
Optimizing Vs & Thickness - generation: 51; average & best misfits: -21.2668
-1.77722

Optimizing Vs & Thickness - generation: 52; average & best misfits: -21.4086
-1.77722
Optimizing Vs & Thickness - generation: 53; average & best misfits: -19.8975
-1.77722
Optimizing Vs & Thickness - generation: 54; average & best misfits: -18.4788
-1.77722
Optimizing Vs & Thickness - generation: 55; average & best misfits: -19.2942
-1.77722
Optimizing Vs & Thickness - generation: 56; average & best misfits: -17.9401
-1.77722
Optimizing Vs & Thickness - generation: 57; average & best misfits: -16.9123
-1.77722
Optimizing Vs & Thickness - generation: 58; average & best misfits: -20.582
-1.77722
Optimizing Vs & Thickness - generation: 59; average & best misfits: -21.0659
-1.77722
Optimizing Vs & Thickness - generation: 60; average & best misfits: -21.2495
-1.77722
Optimizing Vs & Thickness - generation: 61; average & best misfits: -24.708
-1.77722
Optimizing Vs & Thickness - generation: 62; average & best misfits: -25.0297
-1.77234
Optimizing Vs & Thickness - generation: 63; average & best misfits: -26.6519
-1.77234
Optimizing Vs & Thickness - generation: 64; average & best misfits: -25.2661
-1.77234
Optimizing Vs & Thickness - generation: 65; average & best misfits: -25.2492
-1.77234
Optimizing Vs & Thickness - generation: 66; average & best misfits: -19.7475
-1.77234
Optimizing Vs & Thickness - generation: 67; average & best misfits: -18.6052
-1.77195
Optimizing Vs & Thickness - generation: 68; average & best misfits: -16.7685
-1.77195
Optimizing Vs & Thickness - generation: 69; average & best misfits: -14.0409
-1.77195
Optimizing Vs & Thickness - generation: 70; average & best misfits: -13.0995
-1.77195
Optimizing Vs & Thickness - generation: 71; average & best misfits: -16.0609
-1.76038
Optimizing Vs & Thickness - generation: 72; average & best misfits: -21.7177
-1.76038
Optimizing Vs & Thickness - generation: 73; average & best misfits: -22.6095
-1.76038
Optimizing Vs & Thickness - generation: 74; average & best misfits: -22.0113
-1.76038
Optimizing Vs & Thickness - generation: 75; average & best misfits: -21.6675
-1.72842
Optimizing Vs & Thickness - generation: 76; average & best misfits: -20.3889
-1.72842
Optimizing Vs & Thickness - generation: 77; average & best misfits: -21.9674
-1.72842
Optimizing Vs & Thickness - generation: 78; average & best misfits: -18.1673
-1.72842
Optimizing Vs & Thickness - generation: 79; average & best misfits: -16.5204
-1.72842
Optimizing Vs & Thickness - generation: 80; average & best misfits: -16.0585
-1.72842
Optimizing Vs & Thickness - generation: 81; average & best misfits: -13.3116
-1.72842

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: -94.8487
-1.72842

Optimizing Vs & Thickness - generation: 2; average & best misfits: -79.248
-1.72842
Optimizing Vs & Thickness - generation: 3; average & best misfits: -72.1069
-1.72842
Optimizing Vs & Thickness - generation: 4; average & best misfits: -80.3201
-1.72842
Optimizing Vs & Thickness - generation: 5; average & best misfits: -69.7862
-1.72842
Optimizing Vs & Thickness - generation: 6; average & best misfits: -69.5814
-1.72842
Optimizing Vs & Thickness - generation: 7; average & best misfits: -67.6088
-1.72842
Optimizing Vs & Thickness - generation: 8; average & best misfits: -65.041
-1.72842
Optimizing Vs & Thickness - generation: 9; average & best misfits: -57.5215
-1.72842
Optimizing Vs & Thickness - generation: 10; average & best misfits: -55.5216
-1.72842
Optimizing Vs & Thickness - generation: 11; average & best misfits: -56.862
-1.72842
Optimizing Vs & Thickness - generation: 12; average & best misfits: -55.3914
-1.72842
Optimizing Vs & Thickness - generation: 13; average & best misfits: -50.8908
-1.72842
Optimizing Vs & Thickness - generation: 14; average & best misfits: -48.4037
-1.72842
Optimizing Vs & Thickness - generation: 15; average & best misfits: -46.8298
-1.72842
Optimizing Vs & Thickness - generation: 16; average & best misfits: -43.9542
-1.72842
Optimizing Vs & Thickness - generation: 17; average & best misfits: -43.4243
-1.72842
Optimizing Vs & Thickness - generation: 18; average & best misfits: -41.7213
-1.72842
Optimizing Vs & Thickness - generation: 19; average & best misfits: -47.708
-1.72842
Optimizing Vs & Thickness - generation: 20; average & best misfits: -44.3178
-1.72842
Optimizing Vs & Thickness - generation: 21; average & best misfits: -44.1142
-1.72842

Model after the Vs & Thickness optimization (fixed Poisson values):
Vs (m/s): 292 390 430 750 900
Thickness (m): 2 5 5.5 7.5

Poisson: 0.35 0.35 0.35 0.3 0.35
Number of models considered to calculate the average model: 20

##
RESULTS
##

Dataset: 2m 05ser1.sgy
Analyzed curve: BORGIANO LN1 05.cdp

==o== SECTION#3

Analyzing Phase Velocities

Analyzing Rayleigh-Wave Dispersion

==
MEAN MODEL

Vs (m/s): 296 390 430 750 900
Standard deviations (m/s): 3 0 0 0 0

Thickness (m): 2.0 5.0 5.5 7.5
Standard deviations (m): 0.1 0.0 0.2 0.0

Approximate values for Vp, density, Poisson & Shear modulus
Vp (m/s): 616 811 895 1403 1873
Density (gr/cm3): 1.94 2.00 2.03 2.14 2.21
Vp/Vs ratio: 2.08 2.08 2.08 1.87 2.08
Poisson: 0.35 0.35 0.35 0.30 0.35
Shear modulus (MPa): 170 305 375 1202 1787

Fundamental mode
Mean model

frequency (Hz)	VR(m/s)
9.64803	692.9033
10.6375	670.9781
11.5651	642.7781
12.5546	599.9111
13.4822	551.4581
14.4717	503.917

==o== SECTION#4

==========
BEST MODEL

Vs (m/s): 292 390 430 750 900
thickness (m): 1.9736 5 5.5 7.536

Approximate values for Vp, density, Poisson & Shear modulus
Vp (m/s): 608 811 895 1403 1873
Density (gr/cm3): 1.93 2.00 2.03 2.14 2.21
Vp/Vs ratio: 2.08 2.08 2.08 1.87 2.08
Poisson: 0.35 0.35 0.35 0.30 0.35
Shear modulus (MPa): 165 305 375 1202 1787

dispersion curve (frequency - Rayleigh phase velocity)

Fundamental mode
best model

F(Hz)	VR(m/s)
9.64803	692.8709
10.6375	670.9727
11.5651	642.9011
12.5546	600.3106
13.4822	552.0346
14.4717	504.4361

==o== SECTION#5

Maximum penetration depth according to the "Steady State Rayleigh Method": 29 m

Inversion quality: very good

Vs5 (mean model): 346 472 m/s
Vs5 (best model): 344 472 m/s

Vs20 (mean model): 472 472 m/s
Vs20 (best model): 472 472 m/s

Vs30 (mean model): 561 472 m/s

Vs30 (best model): 561 472 m/s

==o== SECTION#6

For Italian Users:
Decreto 17 gennaio 2018 in aggiornamento alle Norme Tecniche per le Costruzioni e pubblicato sul Supplemento ordinario n° 8 alla Gazzetta Ufficiale del 20/02/2018:
A - Ammassi rocciosi affioranti o terreni molto rigidi caratterizzati da valori di velocità delle onde di taglio superiori a 800 m/s, eventualmente comprendenti in superficie terreni di caratteristiche meccaniche più scadenti con spessore massimo pari a 3 m.
B - Rocce tenere e depositi di terreni a grana grossa molto addensati o terreni a grana fina molto consistenti, caratterizzati da un miglioramento delle proprietà meccaniche con la profondità e da valori di velocità equivalente compresi tra 360 m/s e 800 m/s.
C - Depositi di terreni a grana grossa mediamente addensati o terreni a grana fina mediamente consistenti con profondità del substrato superiori a 30 m, caratterizzati da un miglioramento delle proprietà meccaniche con la profondità e da valori di velocità equivalente compresi tra 180 m/s e 360 m/s.
D - Depositi di terreni a grana grossa scarsamente addensati o di terreni a grana fina scarsamente consistenti, con profondità del substrato superiori a 30 m, caratterizzati da un miglioramento delle proprietà meccaniche con la profondità e da valori di velocità equivalente compresi tra 100 e 180 m/s.
E - Terreni con caratteristiche e valori di velocità equivalente riconducibili a quelle definite per le categorie C o D, con profondità del substrato non superiore a 30 m.

Per qualsiasi condizione di sottosuolo non classificabile nelle categorie precedenti, è necessario predisporre specifiche analisi di risposta locale per la definizione delle azioni sismiche.

Results saved in the folder "..\IO\output_disp".

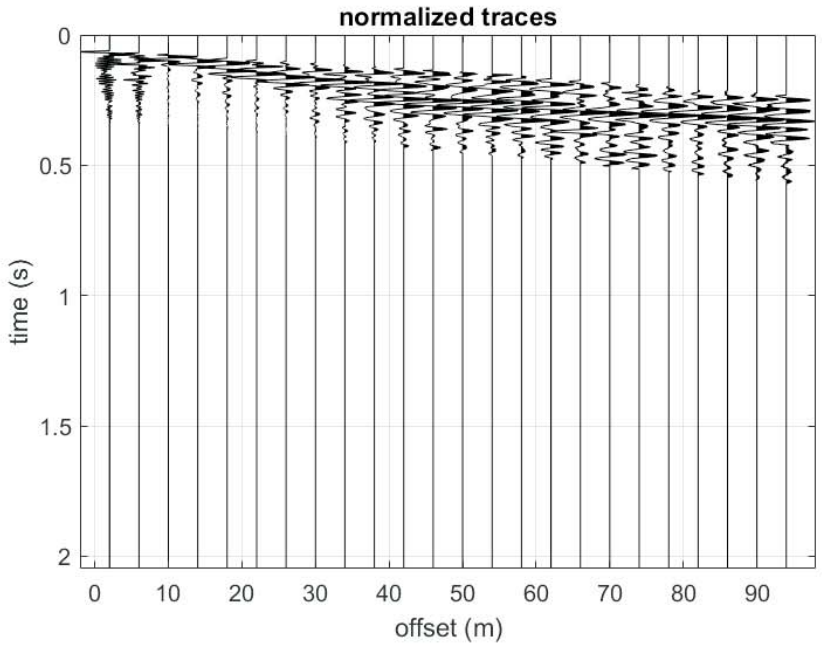
==========

winMASW - Surface Waves & Beyond

www.winmasw.com
Number of models used to define the mean model: 20
Vs5 for the best model: 344 472
Vs30 for the best model: 561 472

#1: uploading & processing (MASW analyses)

dataset: 2m 05ser1.sgy
sampling: 0.125 ms
minimum offset: 2 m
geophone spacing: 4 m



resampling: 0.5 | resample | accept

data selection: activate | select | 60 | cancel | save

filtering & spectra: filter | cancel | spectrum | spectrogram

refraction: refraction | 100 | upload | save | clear refraction

other tools & setting: 2.04787 time length to visualize (s) | done | cut | flip traces | zero padding

#2: velocity spectrum, modelling & picking (MASW/ReMi/ESAC analyses)

MASW: compute velocity spectrum: **phase velocity** | f-k | group velocity

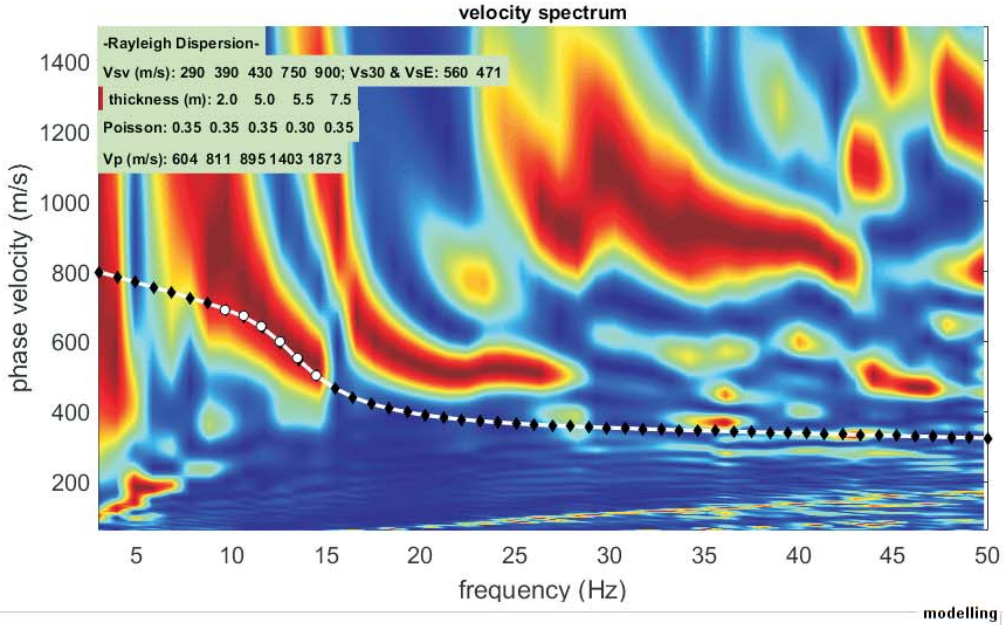
handling the spectra: save | upload | merge

explore spectrum | mode separation

visualize curves: input curve | ?

picking: ? | show f-k | fundamental | to select the last point of the considered mode click the right button | save picking | ? | BORGIANO LN1 05.cdp | cancel picking

inversion: inversion | Joint DC-HV inv.



modelling

	Vs (m/s)	Poisson	thickness (m)
	290	0.35	2
	390	0.35	5
	430	0.35	5.5
	750	0.3	7.5
	900	0.35	0
	0	0.35	0
	0	0.3	0
	0	0.2	

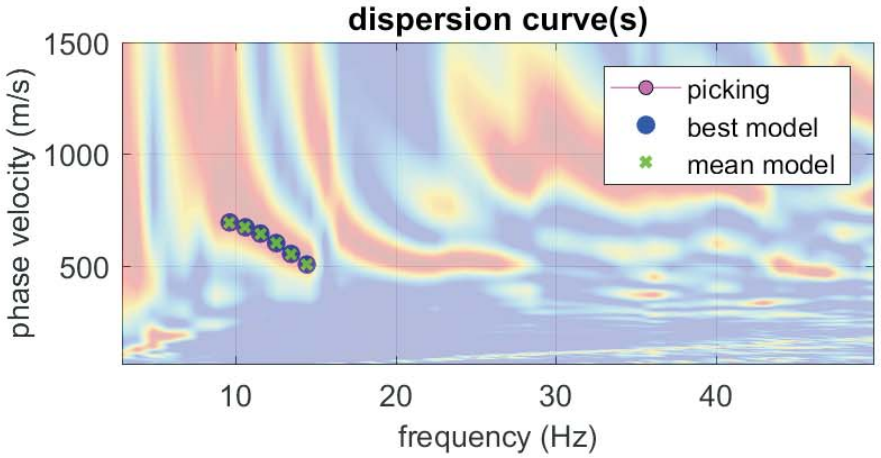
? | about Poisson

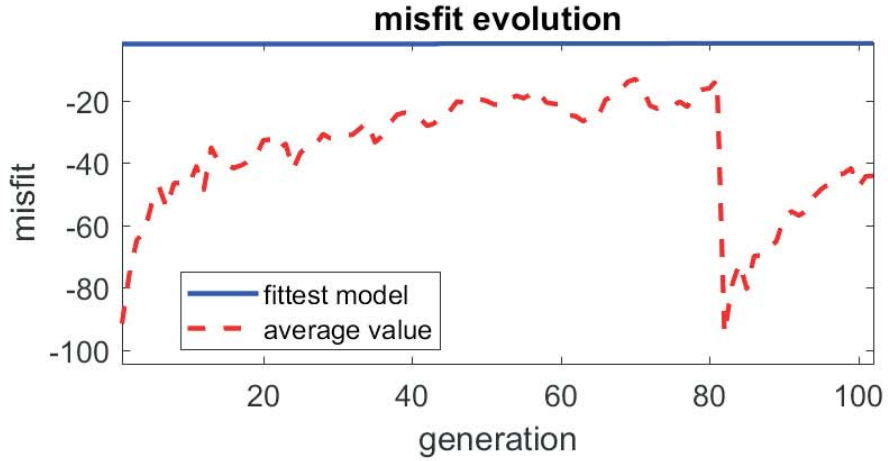
general setting: Rayleigh | 1 | phase vel | 0 Reference depth | Refraction | H/V body waves | 0 H/V modes (SW ellipticity)

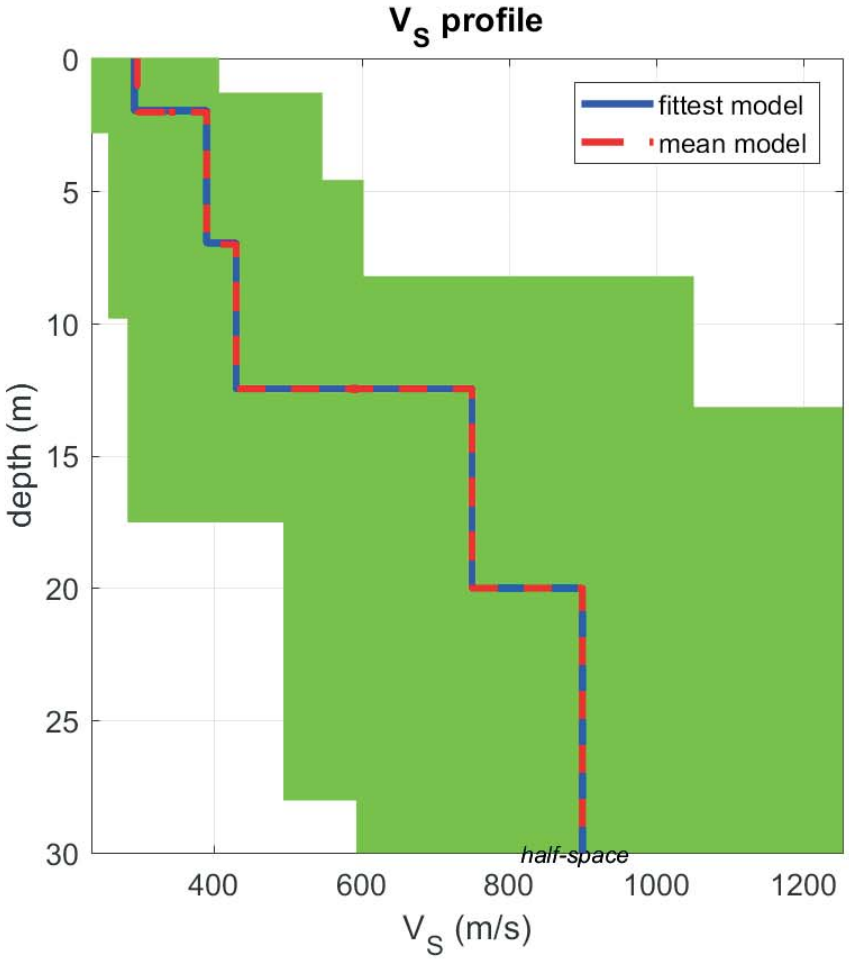
compute | upload mod. | save model | refresh | report

synthetics: ZVF | shows DC | synthetics

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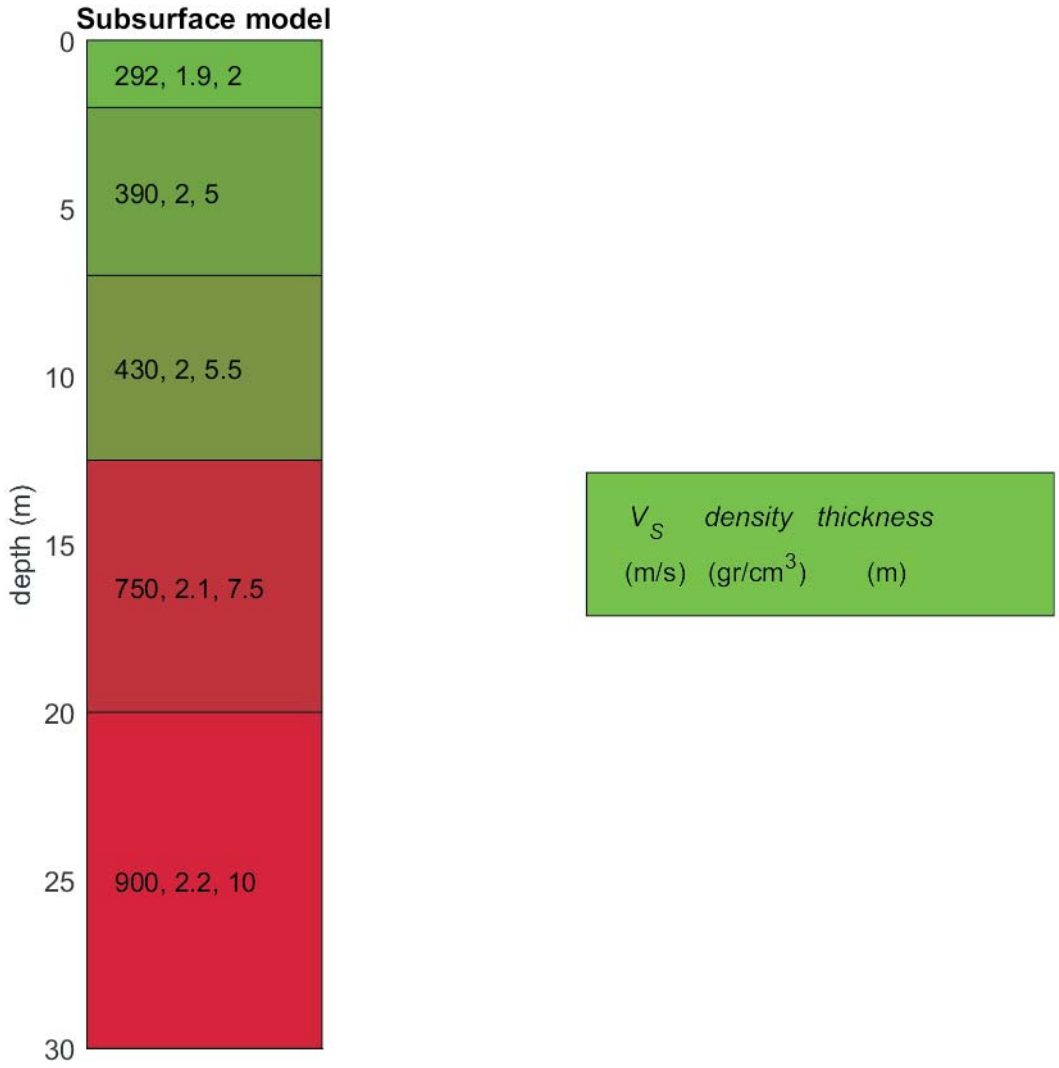


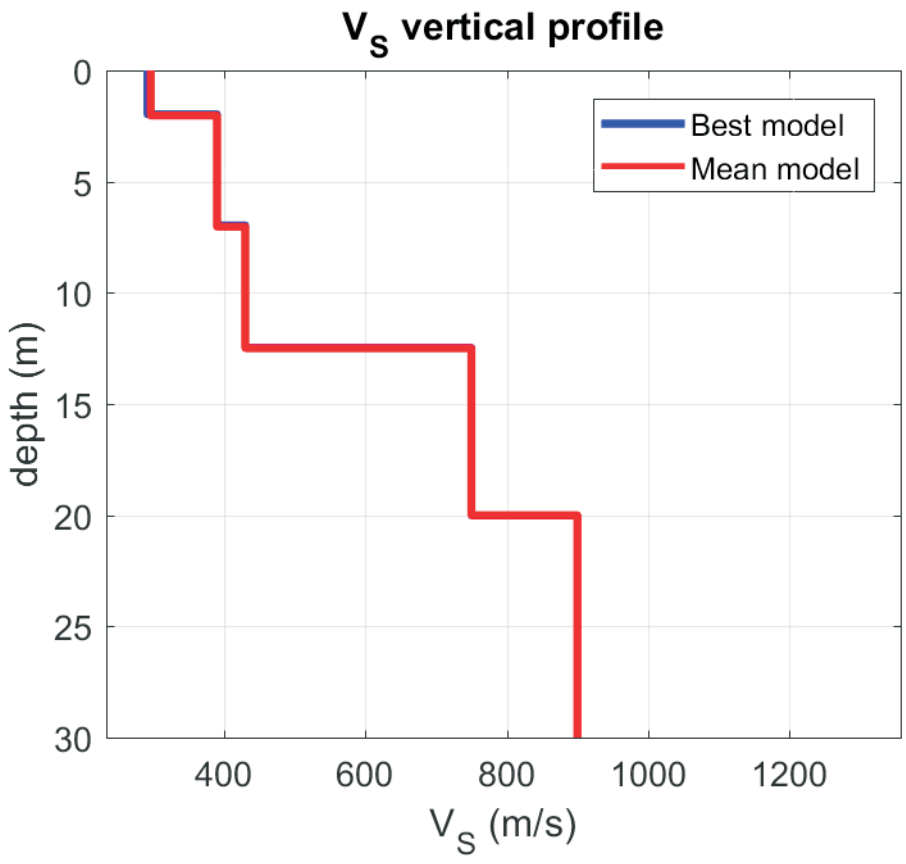




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dataset: 2m 05ser1.sgy
dispersion curve: BORGIANO LN1 05.cdp
Vs30 & VsE (best model): 561 472 m/s
Vs30 & VsE (mean model): 561 472 m/s


Subsurface model
depth (m)
0
5
10
15
20
25
30
292, 1.9, 2
390, 2, 5
430, 2, 5.5
750, 2.1, 7.5
900, 2.2, 10
V_S density thickness
(m/s) (gr/cm^3) (m)


V_S vertical profile
Best model
Mean model
depth (m)
0
5
10
15
20
25
30
400
600
800
1000
1200
V_S (m/s)