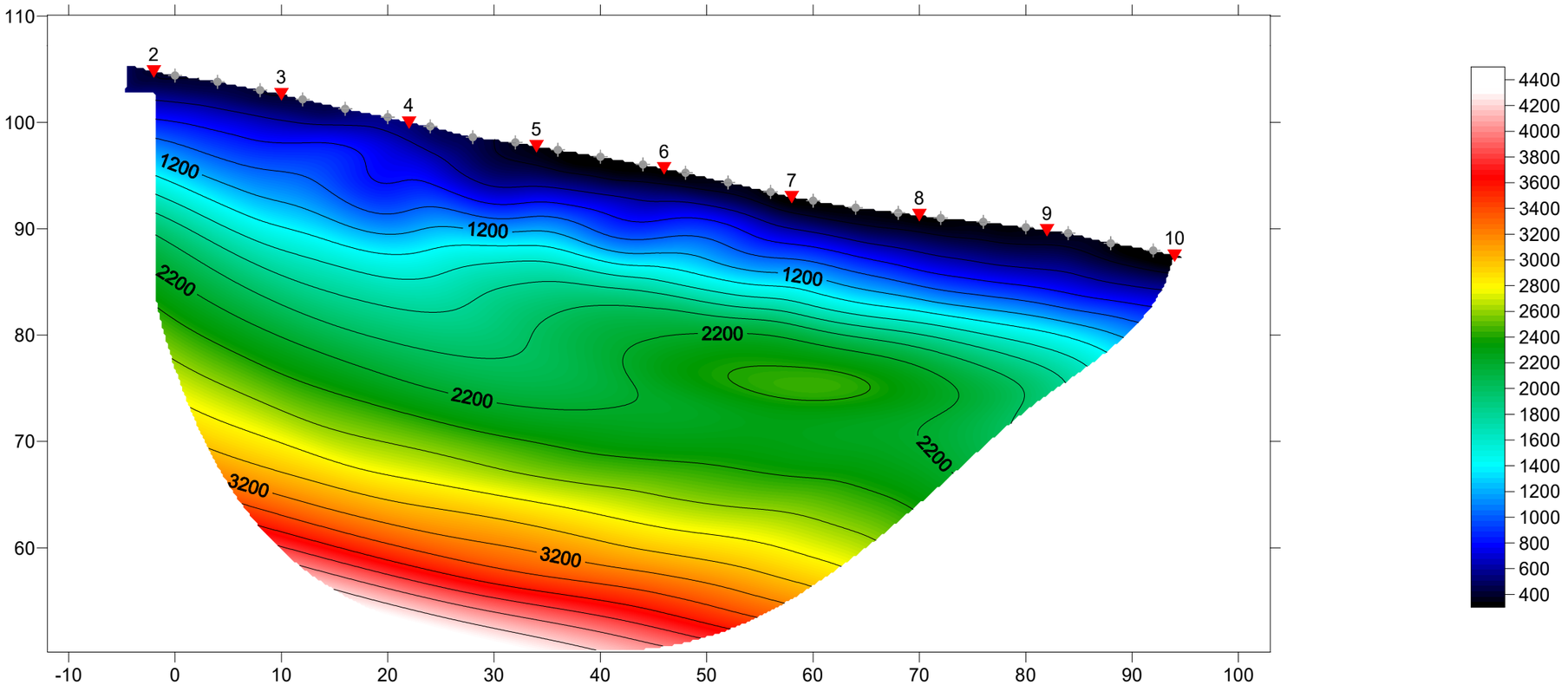
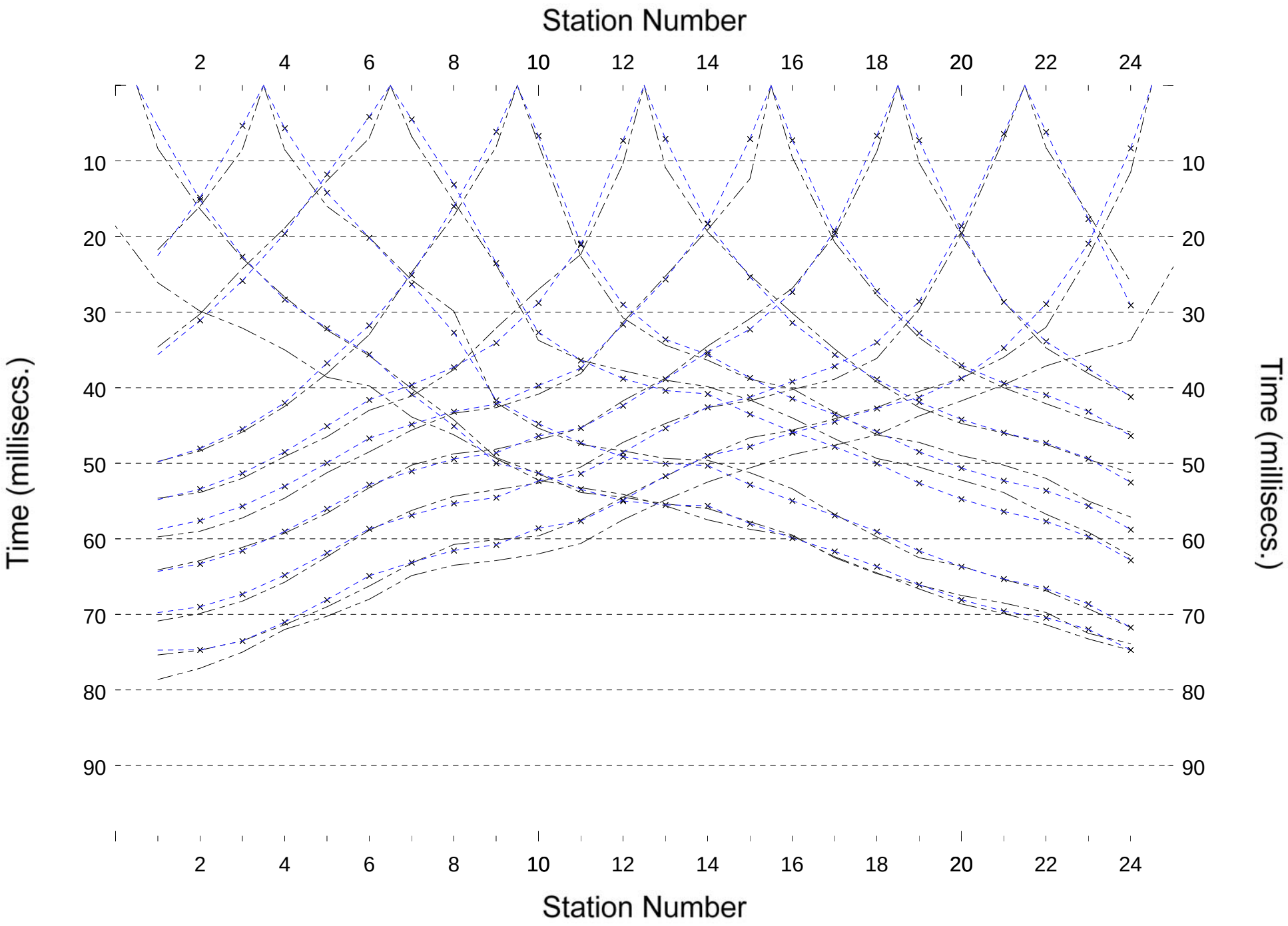
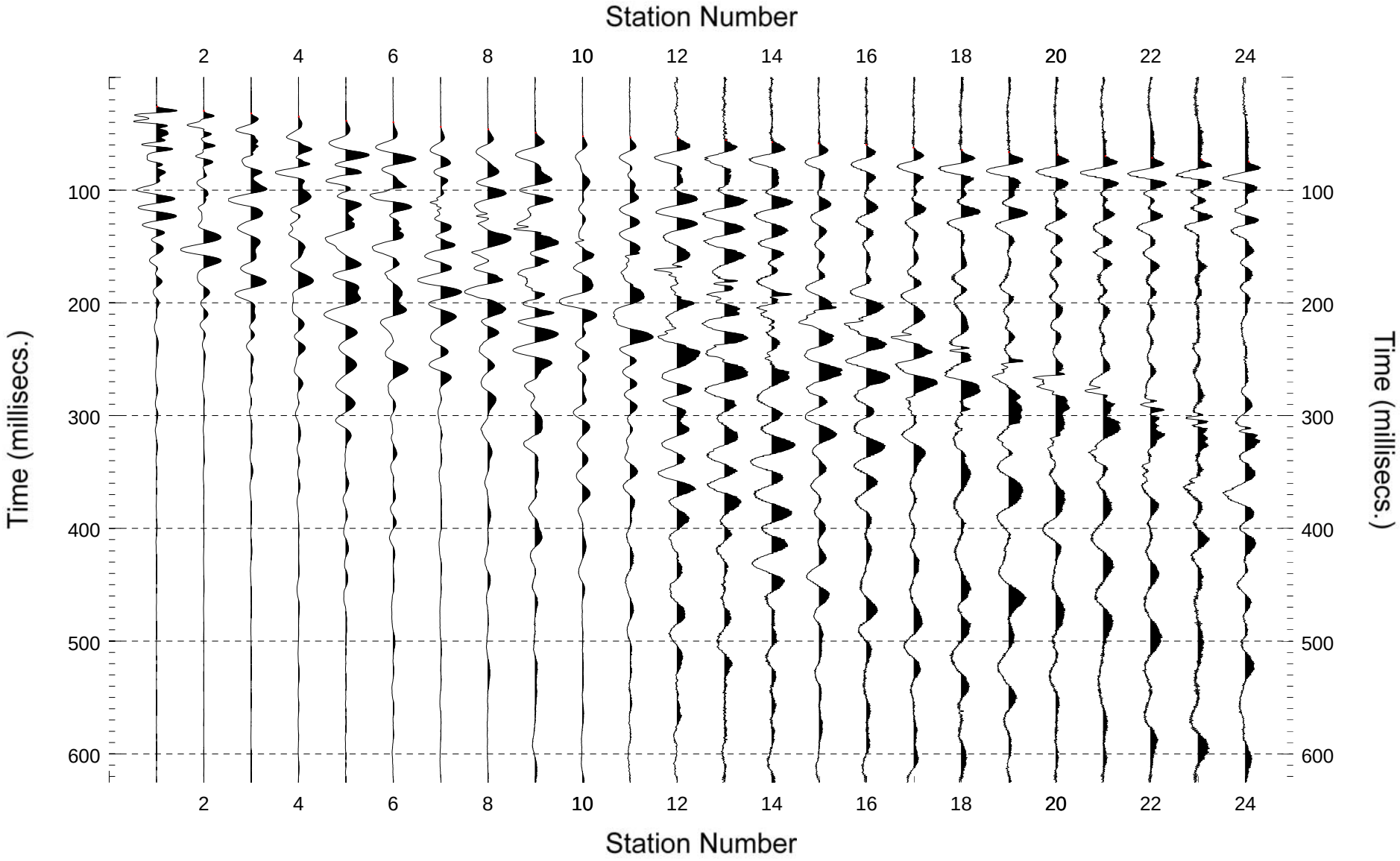
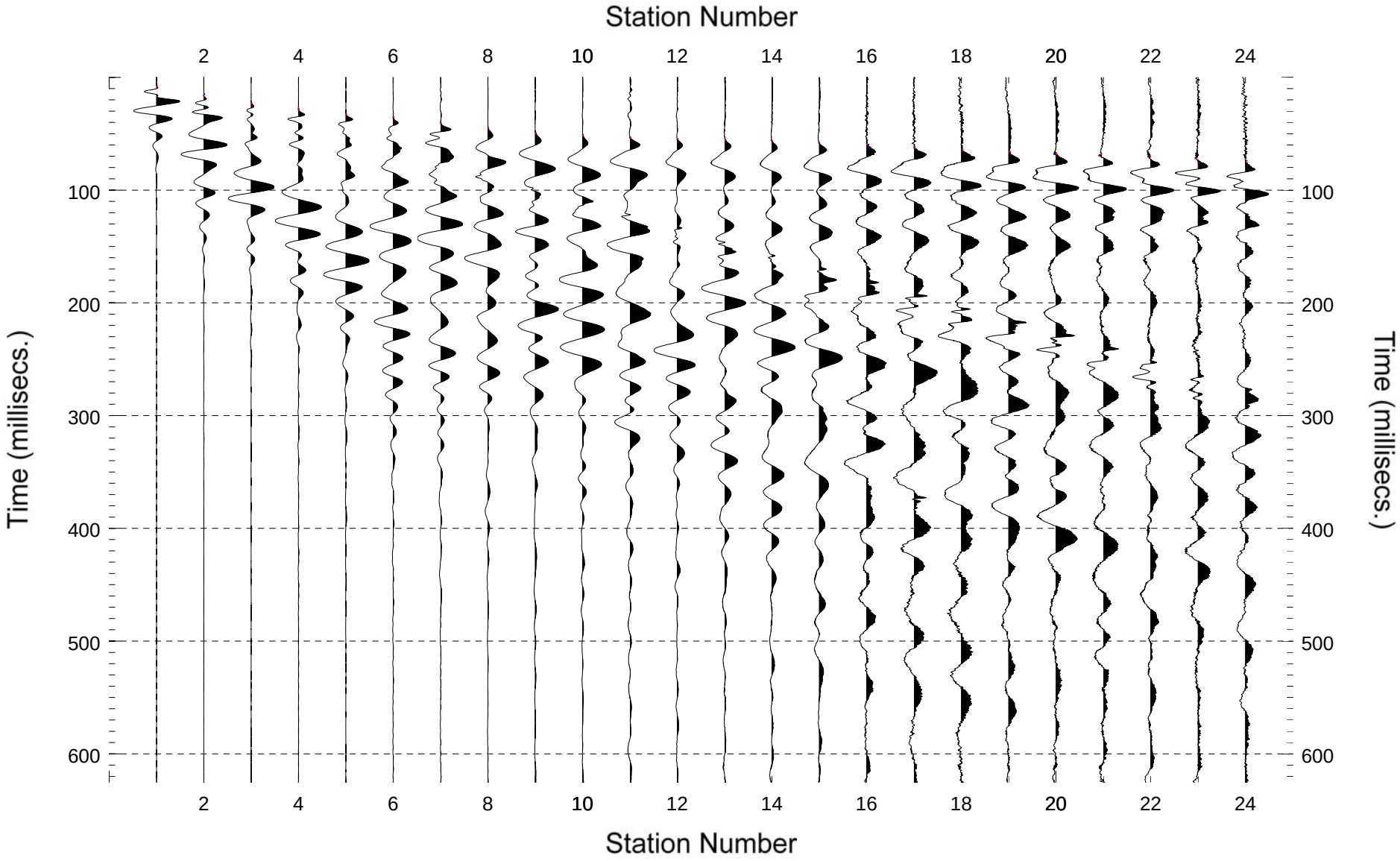
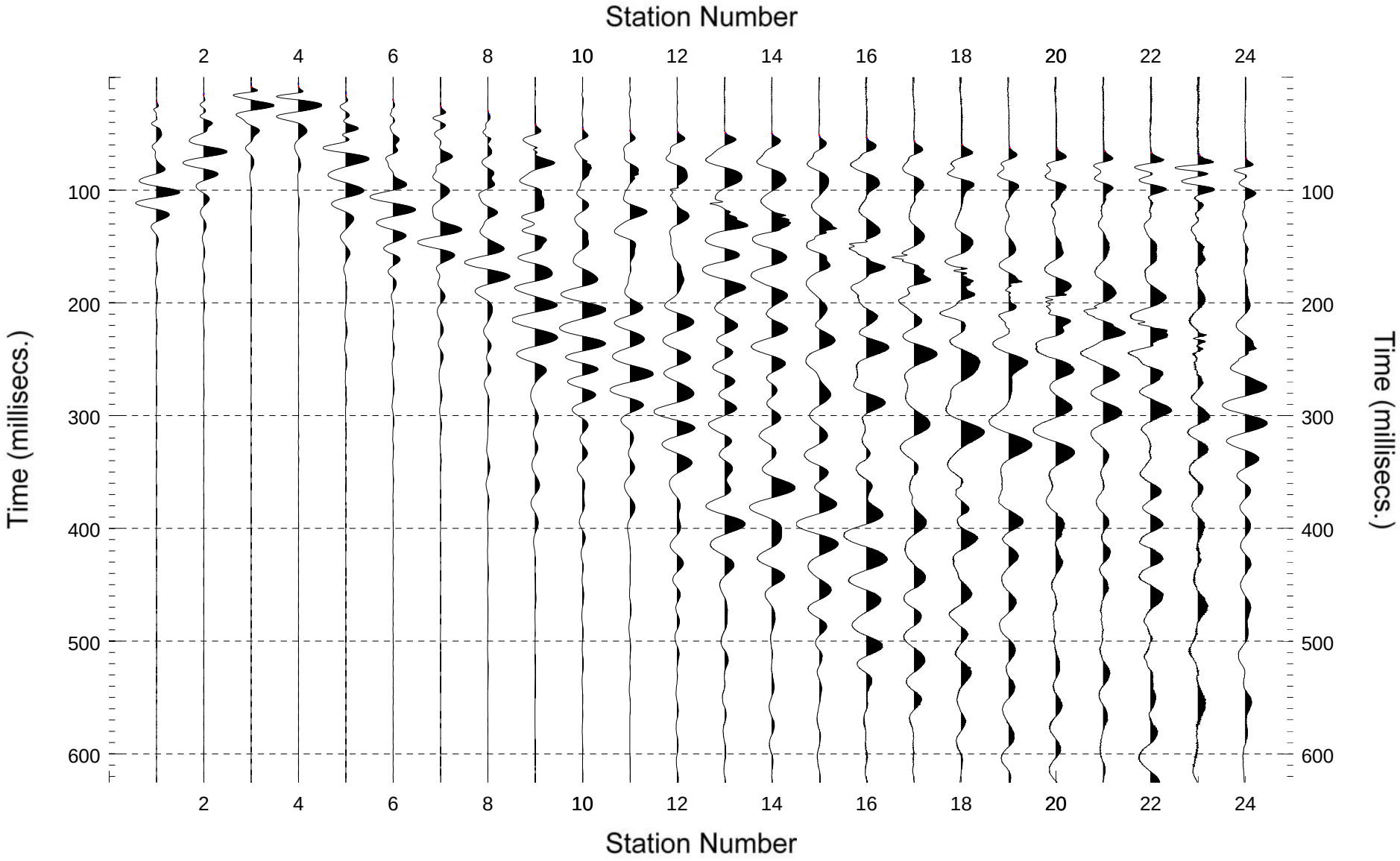
LN 0101 - BORGIANO

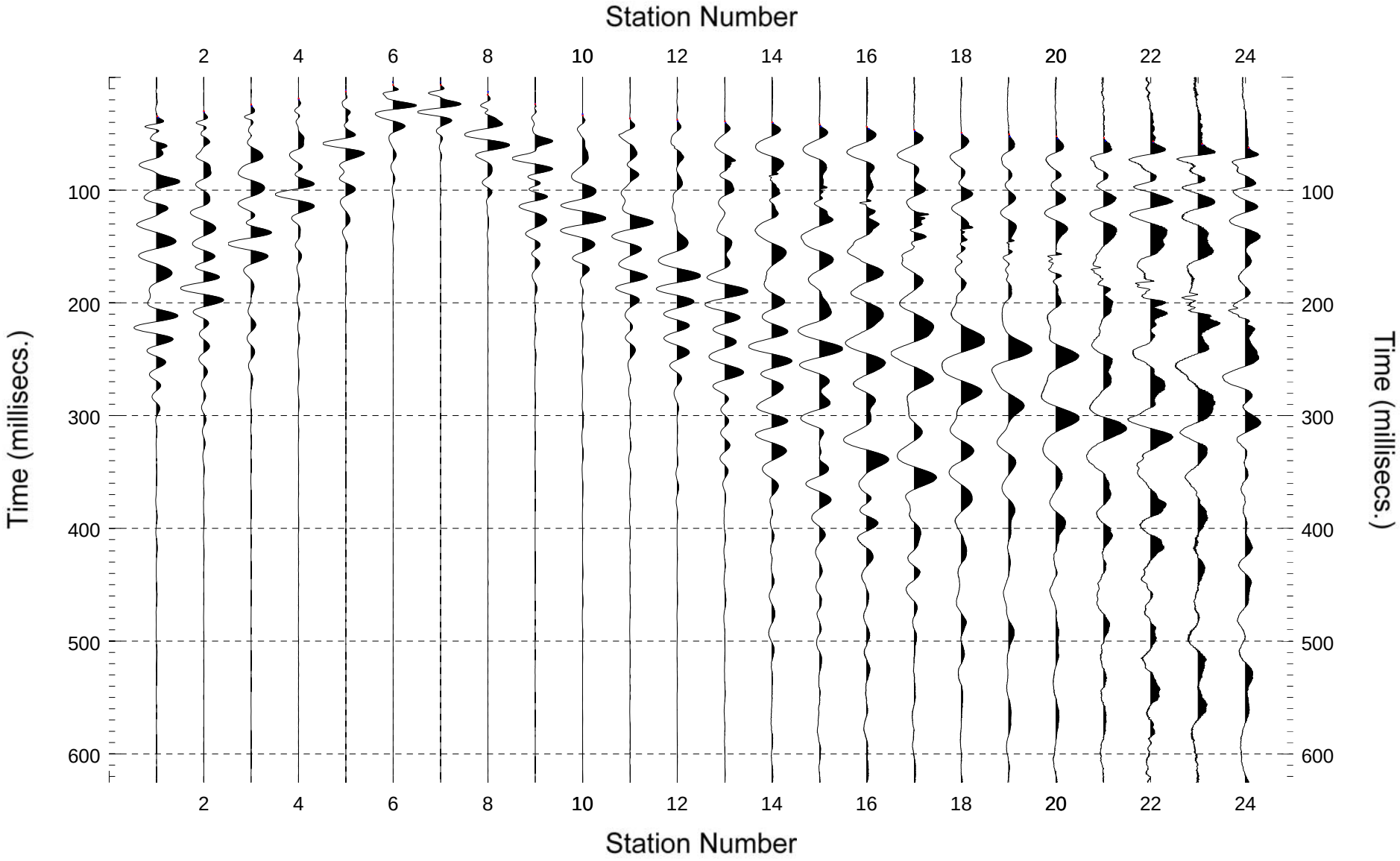


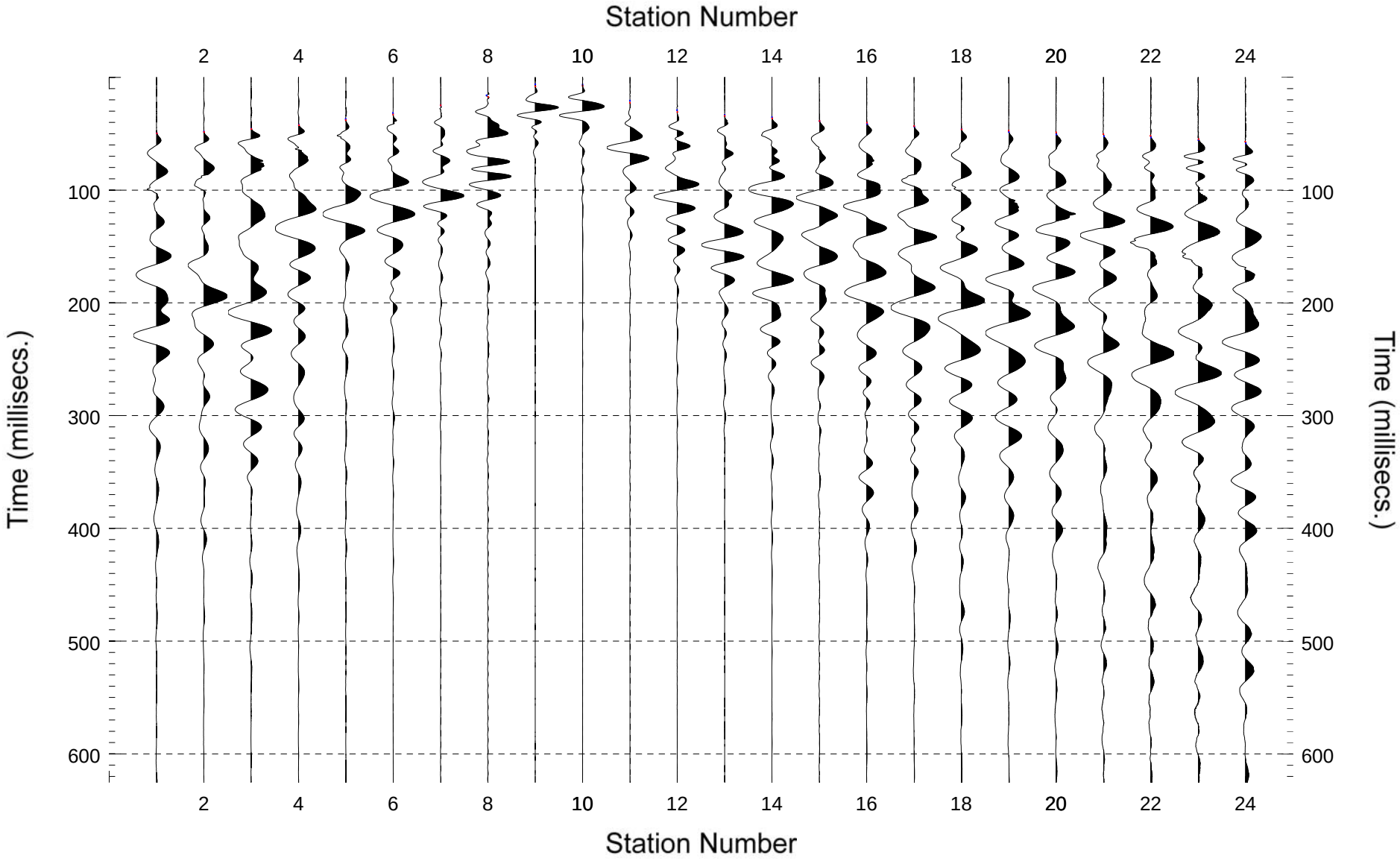

Station Number
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80
90
Time (millisecs.)
Time (millisecs.)
Station Number

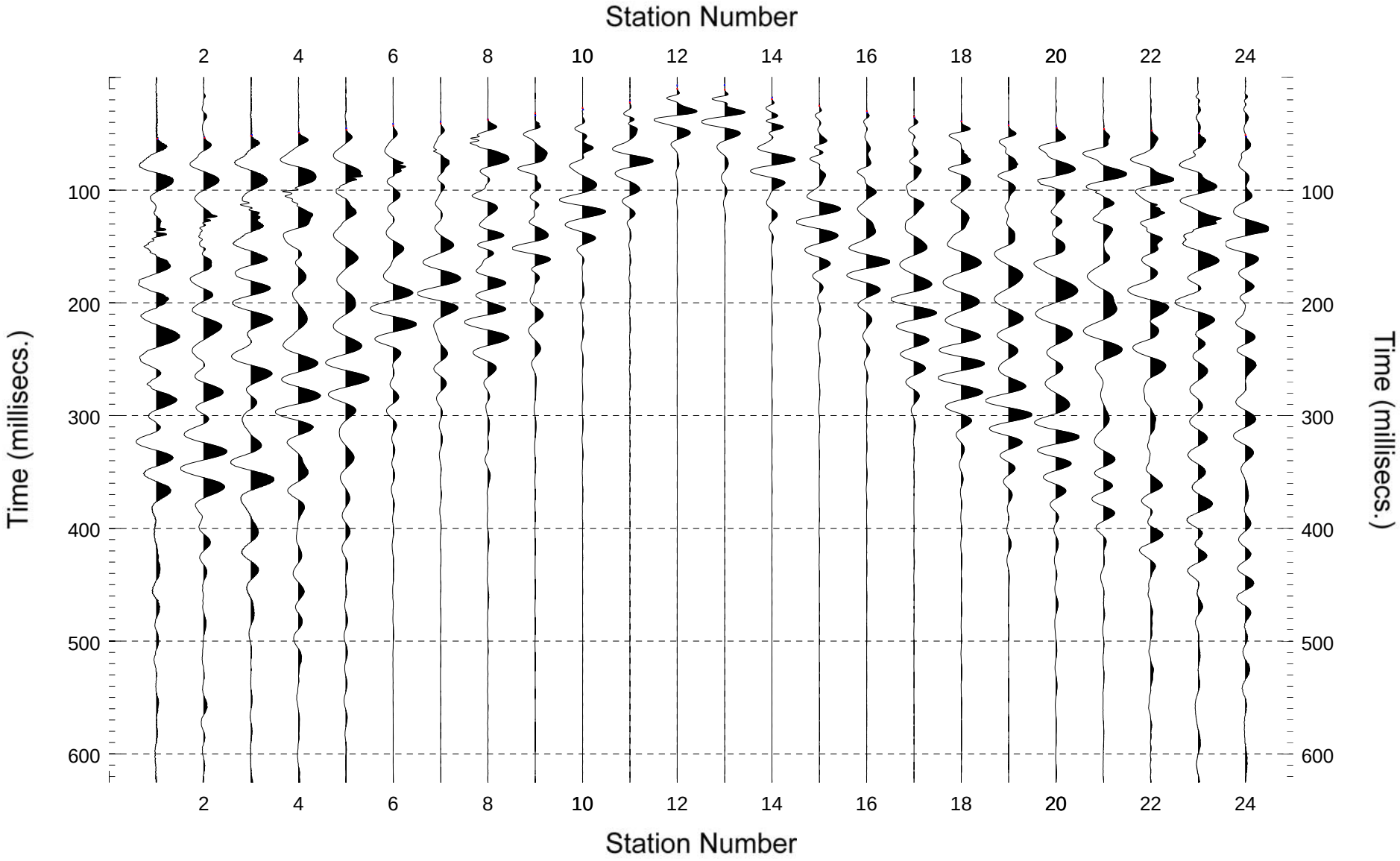

Station Number
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Time (millisecs.)
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Station Number
Time (millisecs.)

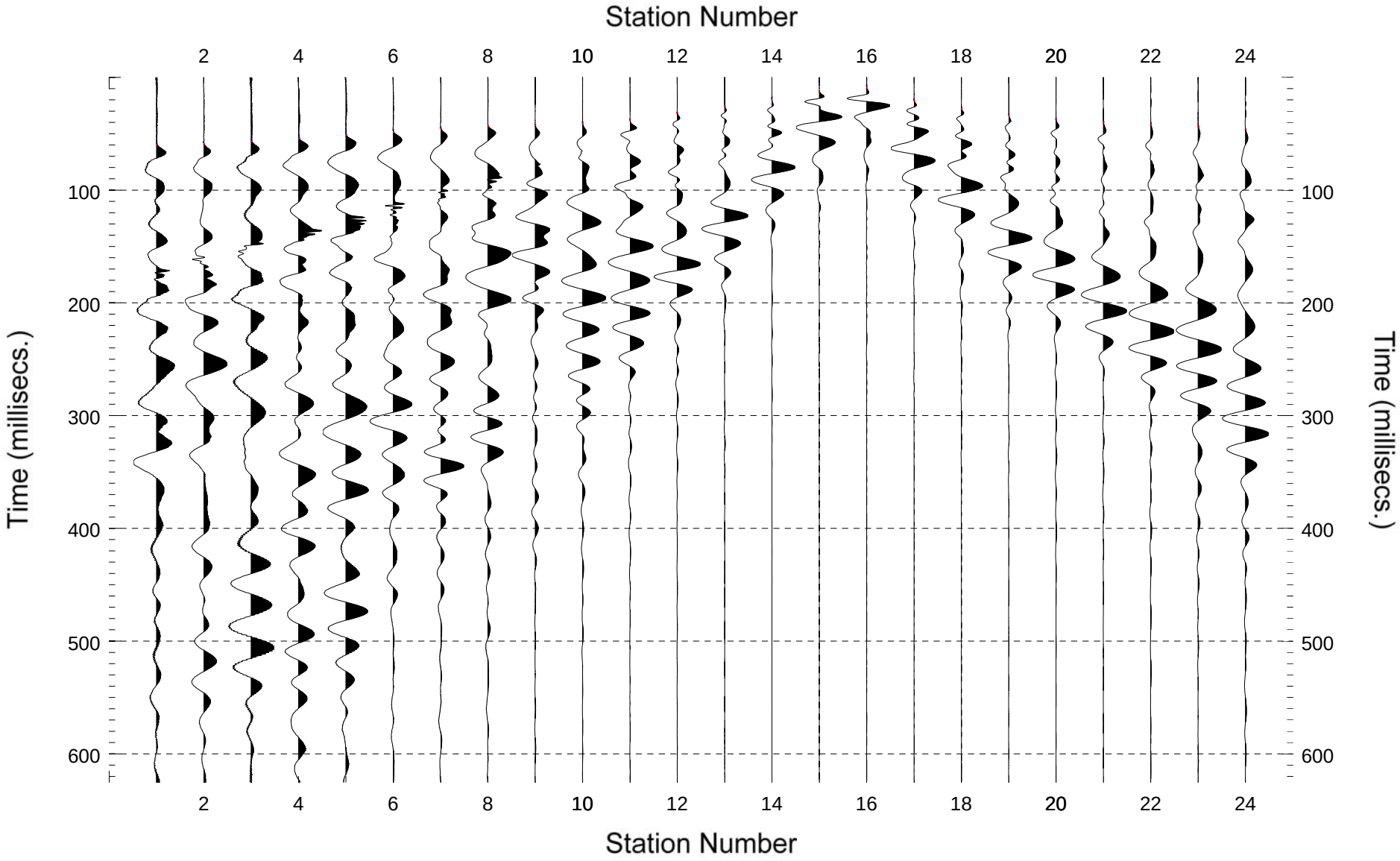

Station Number
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Time (millisecs.)
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Station Number
Time (millisecs.)

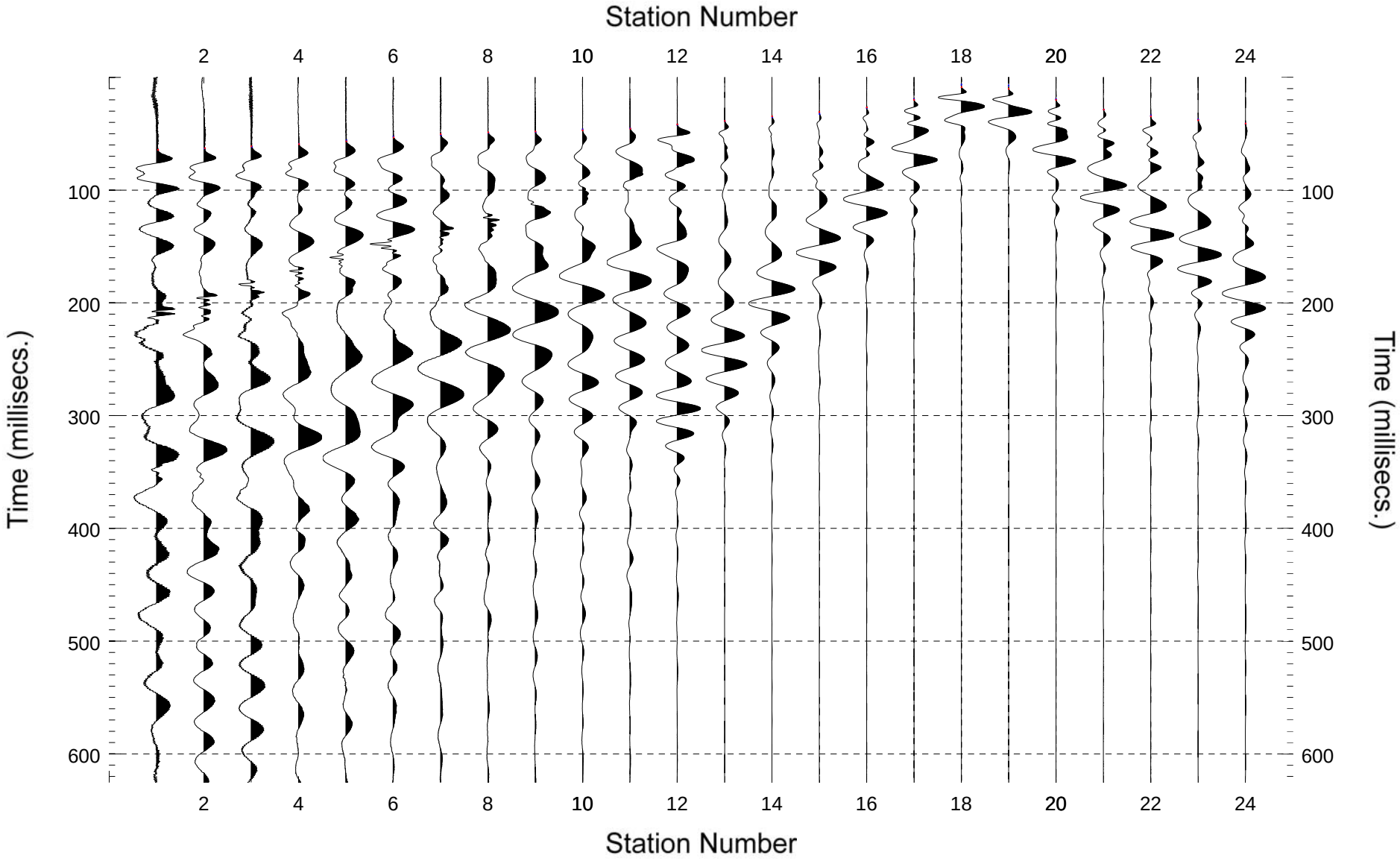

Station Number
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Time (millisecs.)
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Station Number
Time (millisecs.)

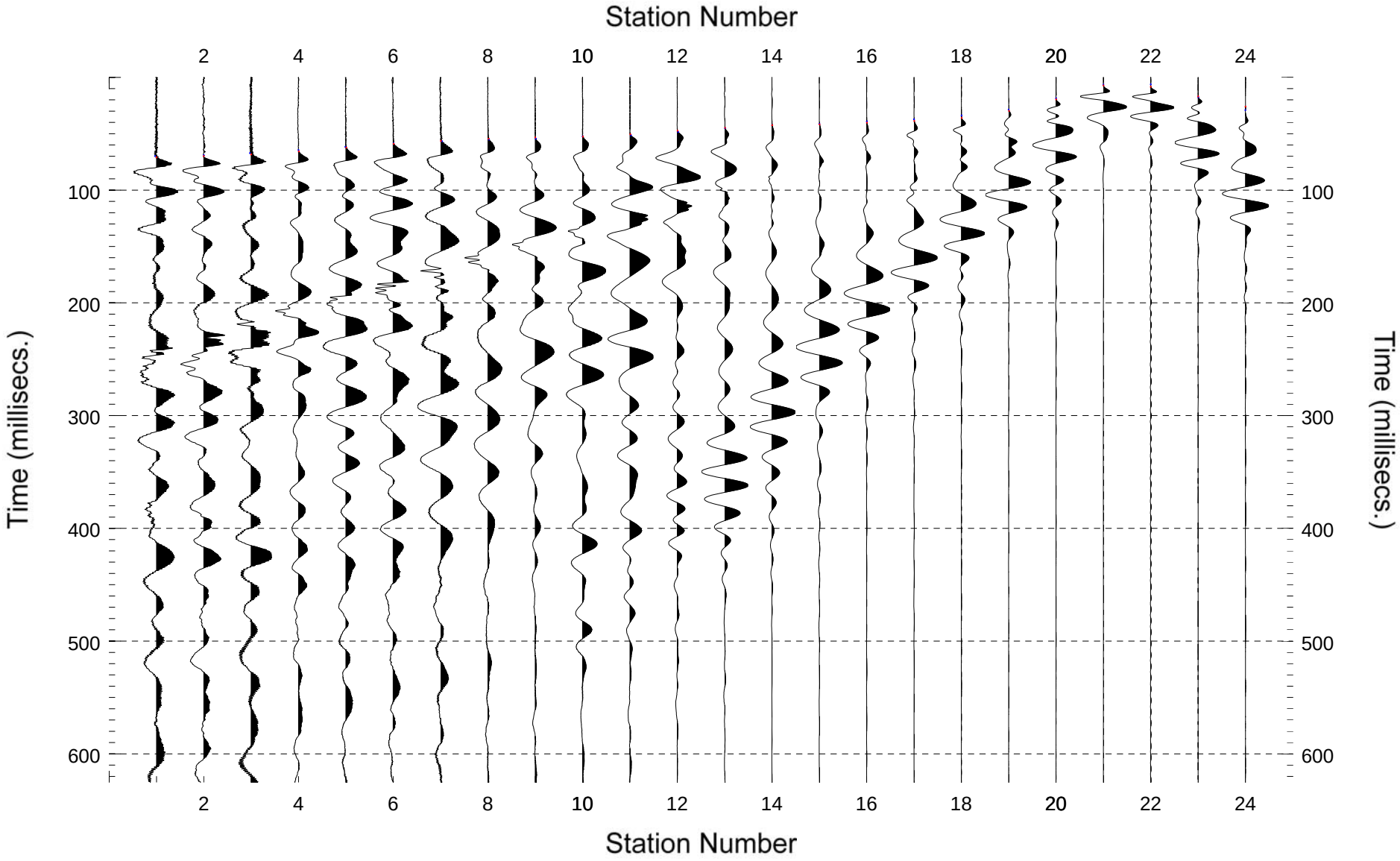

Station Number
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Time (millisecs.)
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Station Number
Time (millisecs.)

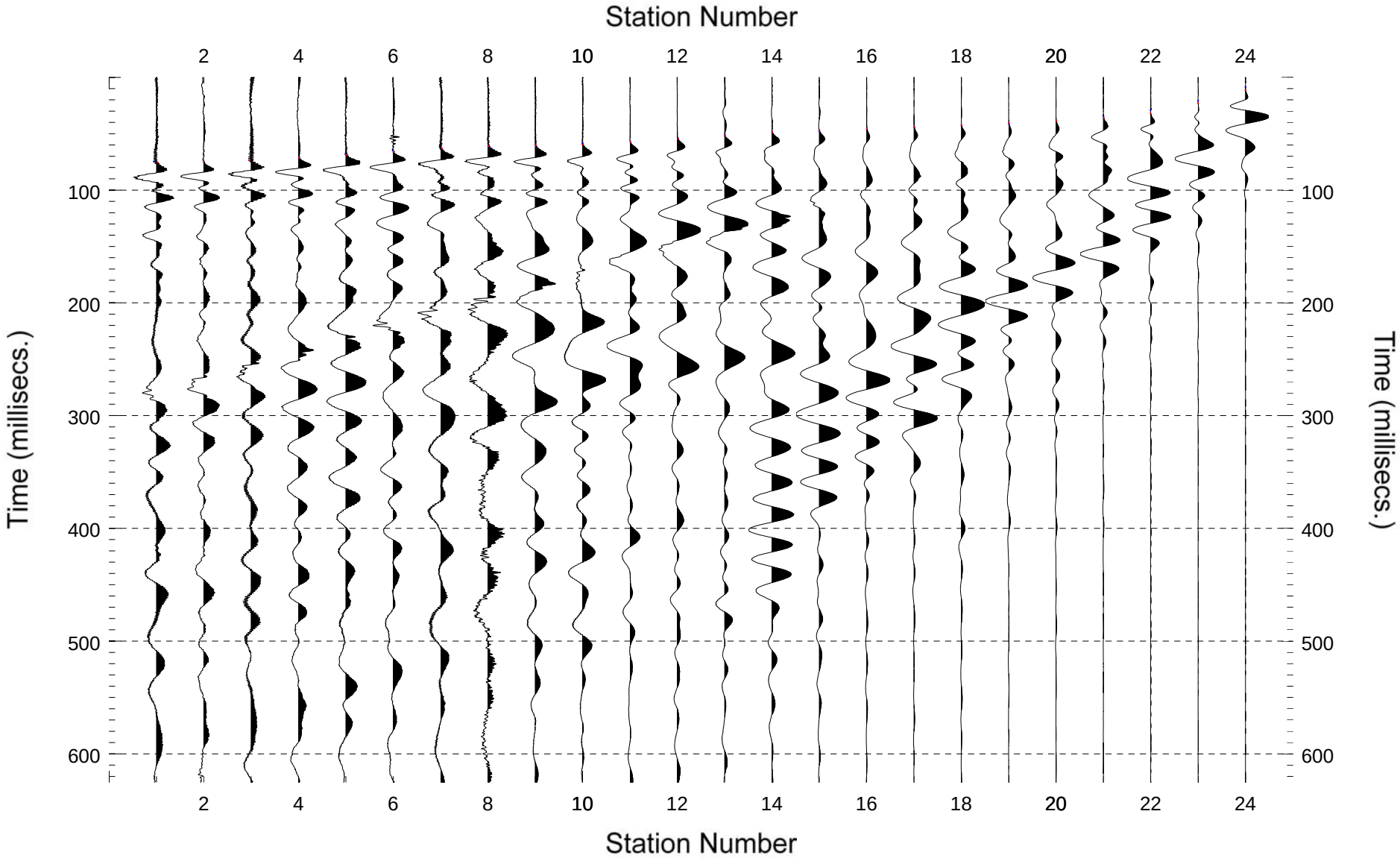

Station Number
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Time (millisecs.)
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Station Number
Time (millisecs.)

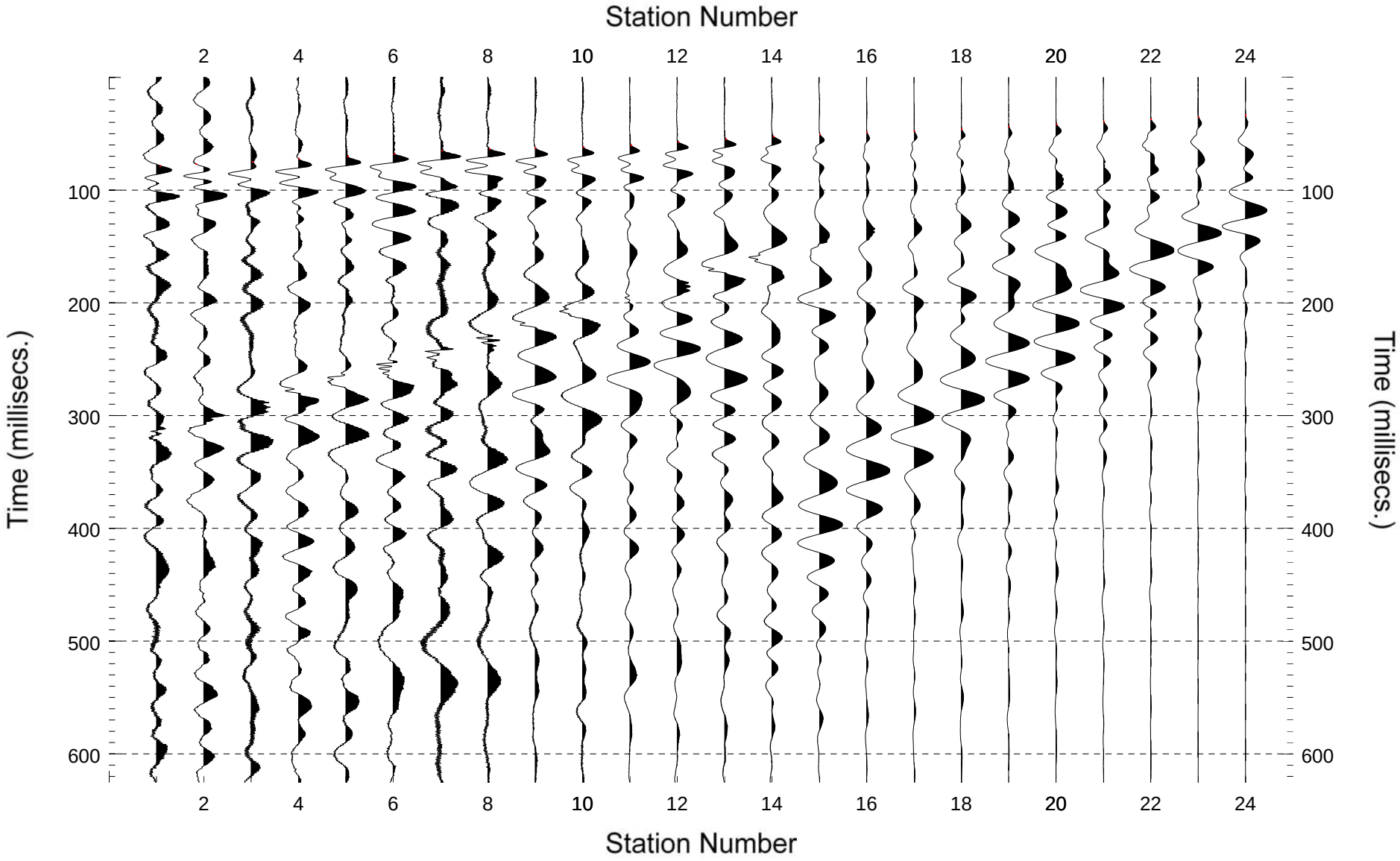

Station Number
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Station Number
Time (millisecs.)


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


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


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


Station Number
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Time (millisecs.)
100
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Station Number
Time (millisecs.)


Station Number
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Time (millisecs.)
100
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500
600
Station Number
Time (millisecs.)

LN 0101 MASW

Analyzing Phase velocities

==o== SECTION#1
dataset: LN3 CLEAN.sgy
minimum offset (m): 2
geophone spacing (m): 4
sampling (ms): 0.25
Dispersion curve: BORGIANO LN3 05.cdp
Number of individuals: 80
Number of generations: 81

Rayleigh-wave dispersion analysis

Analyzing Phase Velocities

Adopted search space (minimum Vs & thickness): 138.6 2.508 178.2 1.32 151.8 1.98 231 11.88 396 7.92 594
Adopted search space (maximum Vs & thickness): 294 5.32 378 2.8 322 4.2 490 25.2 840 16.8 1260
Adopted Poisson values: 0.39982 0.39987 0.39984 0.35022 0.35 0.3499

Output folder: ..\IO\output_disp

==o== SECTION#2

Rayleigh wave analysis
Optimizing Vs & Thickness - generation: 1; average & best misfits: -79.262 -14.3525
Optimizing Vs & Thickness - generation: 2; average & best misfits: -58.7483 -9.51908
Optimizing Vs & Thickness - generation: 3; average & best misfits: -60.3979 -9.19084
Optimizing Vs & Thickness - generation: 4; average & best misfits: -52.7159 -9.19084
Optimizing Vs & Thickness - generation: 5; average & best misfits: -54.3166 -9.19084
Optimizing Vs & Thickness - generation: 6; average & best misfits: -44.8491 -9.19084
Optimizing Vs & Thickness - generation: 7; average & best misfits: -44.0777 -9.19084
Optimizing Vs & Thickness - generation: 8; average & best misfits: -45.9854 -9.19084
Optimizing Vs & Thickness - generation: 9; average & best misfits: -52.1348 -9.19084
Optimizing Vs & Thickness - generation: 10; average & best misfits: -46.902 -9.19084
Optimizing Vs & Thickness - generation: 11; average & best misfits: -48.2389 -9.19084
Optimizing Vs & Thickness - generation: 12; average & best misfits: -44.027 -9.19084
Optimizing Vs & Thickness - generation: 13; average & best misfits: -39.2342 -9.19084
Optimizing Vs & Thickness - generation: 14; average & best misfits: -42.1004 -9.19084
Optimizing Vs & Thickness - generation: 15; average & best misfits: -40.5243 -9.19084
Optimizing Vs & Thickness - generation: 16; average & best misfits: -38.4937 -9.18765
Optimizing Vs & Thickness - generation: 17; average & best misfits: -39.7092

-8.92012
Optimizing Vs & Thickness - generation: 18; average & best misfits: -39.7609
-8.92012
Optimizing Vs & Thickness - generation: 19; average & best misfits: -41.5778
-8.92012
Optimizing Vs & Thickness - generation: 20; average & best misfits: -41.5473
-8.92012
Optimizing Vs & Thickness - generation: 21; average & best misfits: -36.1766
  -8.863
Optimizing Vs & Thickness - generation: 22; average & best misfits: -31.769
 -8.863
Optimizing Vs & Thickness - generation: 23; average & best misfits: -31.5572
-7.79993
Optimizing Vs & Thickness - generation: 24; average & best misfits: -32.1352
-7.79993
Optimizing Vs & Thickness - generation: 25; average & best misfits: -32.4369
-7.79993
Optimizing Vs & Thickness - generation: 26; average & best misfits: -29.8919
-7.79993
Optimizing Vs & Thickness - generation: 27; average & best misfits: -30.6317
-7.79993
Optimizing Vs & Thickness - generation: 28; average & best misfits: -31.5314
-7.79993
Optimizing Vs & Thickness - generation: 29; average & best misfits: -31.7264
-7.79993
Optimizing Vs & Thickness - generation: 30; average & best misfits: -28.7905
-7.79993
Optimizing Vs & Thickness - generation: 31; average & best misfits: -27.697
-7.79993
Optimizing Vs & Thickness - generation: 32; average & best misfits: -27.5628
-7.50216
Optimizing Vs & Thickness - generation: 33; average & best misfits: -25.8441
-7.50216
Optimizing Vs & Thickness - generation: 34; average & best misfits: -25.2414
-7.32491
Optimizing Vs & Thickness - generation: 35; average & best misfits: -25.6059
-7.32491
Optimizing Vs & Thickness - generation: 36; average & best misfits: -23.9728
-7.32491
Optimizing Vs & Thickness - generation: 37; average & best misfits: -24.5235
-6.85639
Optimizing Vs & Thickness - generation: 38; average & best misfits: -24.3708
-6.85639
Optimizing Vs & Thickness - generation: 39; average & best misfits: -24.0608
-6.85639
Optimizing Vs & Thickness - generation: 40; average & best misfits: -21.7356
-6.85639
Optimizing Vs & Thickness - generation: 41; average & best misfits: -25.0923
-6.85639
Optimizing Vs & Thickness - generation: 42; average & best misfits: -23.8676
-6.85639
Optimizing Vs & Thickness - generation: 43; average & best misfits: -29.0651
 -6.8074
Optimizing Vs & Thickness - generation: 44; average & best misfits: -23.4044
 -6.8074
Optimizing Vs & Thickness - generation: 45; average & best misfits: -25.1561
 -6.8074
Optimizing Vs & Thickness - generation: 46; average & best misfits: -23.7646
 -6.8074
Optimizing Vs & Thickness - generation: 47; average & best misfits: -22.9924
 -6.8074
Optimizing Vs & Thickness - generation: 48; average & best misfits: -22.3609
-5.67784
Optimizing Vs & Thickness - generation: 49; average & best misfits: -22.7659
-5.67784
Optimizing Vs & Thickness - generation: 50; average & best misfits: -22.081
-5.67784
Optimizing Vs & Thickness - generation: 51; average & best misfits: -22.0012

-5.67784
Optimizing Vs & Thickness - generation: 52; average & best misfits: -21.4753
-5.67784
Optimizing Vs & Thickness - generation: 53; average & best misfits: -20.5011
-5.67784
Optimizing Vs & Thickness - generation: 54; average & best misfits: -19.4354
-5.67784
Optimizing Vs & Thickness - generation: 55; average & best misfits: -20.7491
-5.67784
Optimizing Vs & Thickness - generation: 56; average & best misfits: -20.1426
-5.67784
Optimizing Vs & Thickness - generation: 57; average & best misfits: -19.6508
-5.67784
Optimizing Vs & Thickness - generation: 58; average & best misfits: -20.7808
-5.67784
Optimizing Vs & Thickness - generation: 59; average & best misfits: -23.0709
-5.67784
Optimizing Vs & Thickness - generation: 60; average & best misfits: -21.0323
-5.67784
Optimizing Vs & Thickness - generation: 61; average & best misfits: -22.2871
-5.67784
Optimizing Vs & Thickness - generation: 62; average & best misfits: -22.9223
-5.67784
Optimizing Vs & Thickness - generation: 63; average & best misfits: -24.9762
-5.67784
Optimizing Vs & Thickness - generation: 64; average & best misfits: -22.4943
-5.10959
Optimizing Vs & Thickness - generation: 65; average & best misfits: -23.9573
-5.10959
Optimizing Vs & Thickness - generation: 66; average & best misfits: -23.6866
-5.10959
Optimizing Vs & Thickness - generation: 67; average & best misfits: -24.2523
-5.10959
Optimizing Vs & Thickness - generation: 68; average & best misfits: -23.8291
-5.10959
Optimizing Vs & Thickness - generation: 69; average & best misfits: -20.8425
-5.10959
Optimizing Vs & Thickness - generation: 70; average & best misfits: -18.2685
-5.10959
Optimizing Vs & Thickness - generation: 71; average & best misfits: -18.4715
-5.10959
Optimizing Vs & Thickness - generation: 72; average & best misfits: -19.571
-5.10959
Optimizing Vs & Thickness - generation: 73; average & best misfits: -21.302
-5.10959
Optimizing Vs & Thickness - generation: 74; average & best misfits: -21.2522
-5.10959
Optimizing Vs & Thickness - generation: 75; average & best misfits: -22.5506
-5.10959
Optimizing Vs & Thickness - generation: 76; average & best misfits: -22.6635
-5.10959
Optimizing Vs & Thickness - generation: 77; average & best misfits: -24.5838
-5.10959
Optimizing Vs & Thickness - generation: 78; average & best misfits: -23.6309
-5.10959
Optimizing Vs & Thickness - generation: 79; average & best misfits: -23.2111
-5.10959
Optimizing Vs & Thickness - generation: 80; average & best misfits: -23.4458
-5.10959
Optimizing Vs & Thickness - generation: 81; average & best misfits: -23.1144
-5.10959

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: -82.6784

-5.10959
Optimizing Vs & Thickness - generation: 2; average & best misfits: -63.2062
-5.10959
Optimizing Vs & Thickness - generation: 3; average & best misfits: -52.1897
-5.10959
Optimizing Vs & Thickness - generation: 4; average & best misfits: -47.1016
-5.10959
Optimizing Vs & Thickness - generation: 5; average & best misfits: -50.1863
-5.10959
Optimizing Vs & Thickness - generation: 6; average & best misfits: -44.6817
-5.10959
Optimizing Vs & Thickness - generation: 7; average & best misfits: -51.465
-5.10959
Optimizing Vs & Thickness - generation: 8; average & best misfits: -49.5953
-5.10959
Optimizing Vs & Thickness - generation: 9; average & best misfits: -53.1037
-5.10959
Optimizing Vs & Thickness - generation: 10; average & best misfits: -47.8823
-5.10959
Optimizing Vs & Thickness - generation: 11; average & best misfits: -43.2697
-5.10959
Optimizing Vs & Thickness - generation: 12; average & best misfits: -46.1095
-5.10959
Optimizing Vs & Thickness - generation: 13; average & best misfits: -42.4196
 -5.0511
Optimizing Vs & Thickness - generation: 14; average & best misfits: -43.0371
 -5.0511
Optimizing Vs & Thickness - generation: 15; average & best misfits: -37.4819
 -5.0511
Optimizing Vs & Thickness - generation: 16; average & best misfits: -31.796
-5.0511
Optimizing Vs & Thickness - generation: 17; average & best misfits: -30.3454
 -5.0511
Optimizing Vs & Thickness - generation: 18; average & best misfits: -34.9254
 -5.0511
Optimizing Vs & Thickness - generation: 19; average & best misfits: -36.1652
 -5.0511
Optimizing Vs & Thickness - generation: 20; average & best misfits: -34.8039
 -5.0511
Optimizing Vs & Thickness - generation: 21; average & best misfits: -34.3344
 -5.0511

Model after the Vs & Thickness optimization (fixed Poisson values):
Vs (m/s): 223 230 288 350 590 864
Thickness (m): 4.1   2.1   3.4   18   8.7

Poisson: 0.4   0.4   0.4   0.35   0.35   0.35
Number of models considered to calculate the average model: 23

##
RESULTS
##

Dataset: LN3 CLEAN.sgy
Analyzed curve: BORGIANO LN3 05.cdp

==o== SECTION#3

Analyzing Phase Velocities

Analyzing Rayleigh-Wave Dispersion

==
MEAN MODEL

Vs (m/s):   220 243 281 350 585 863

LN 0101 MASW

Standard deviations (m/s): 9 16 12 0 13 4

Thickness (m): 4.0 2.1 3.4 18.0 8.6
Standard deviations (m): 0.2 0.1 0.2 0.0 0.2

Approximate values for Vp, density, Poisson & Shear modulus
Vp (m/s): 538 595 688 729 1218 1796
Density (gr/cm3): 1.90 1.93 1.96 1.98 2.10 2.20
Vp/Vs ratio: 2.45 2.45 2.45 2.08 2.08 2.08
Poisson: 0.40 0.40 0.40 0.35 0.35 0.35
Shear modulus (MPa): 92 114 155 242 719 1636

Fundamental mode
Mean model

frequency (Hz)	VR(m/s)
3.83487	640.1166
4.7625	576.8085
5.07171	513.9812
10.3901	288.2193
11.6888	276.5848
12.7401	267.6045

==o== SECTION#4

==========

BEST MODEL

Vs (m/s): 223 230 288 350 590 864
thickness (m): 4.05044 2.0832 3.44371 18 8.66138

Approximate values for Vp, density, Poisson & Shear modulus
Vp (m/s): 546 563 705 729 1228 1798
Density (gr/cm3): 1.91 1.91 1.97 1.98 2.10 2.20
Vp/Vs ratio: 2.45 2.45 2.45 2.08 2.08 2.08
Poisson: 0.40 0.40 0.40 0.35 0.35 0.35
Shear modulus (MPa): 95 101 163 242 732 1640

dispersion curve (frequency - Rayleigh phase velocity)

Fundamental mode
best model

F(Hz)	VR(m/s)
3.83487	640.5337
4.7625	576.8022
5.07171	513.4164
10.3901	287.8784
11.6888	275.6292
12.7401	266.0389

==o== SECTION#5

Maximum penetration depth according to the "Steady State Rayleigh Method": 66 m

Inversion quality: very good

Vs5 (mean model): 224 224 m/s
Vs5 (best model): 224 224 m/s

Vs20 (mean model): 290 290 m/s
Vs20 (best model): 290 290 m/s

Vs30 (mean model): 317 317 m/s
Vs30 (best model): 317 317 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".

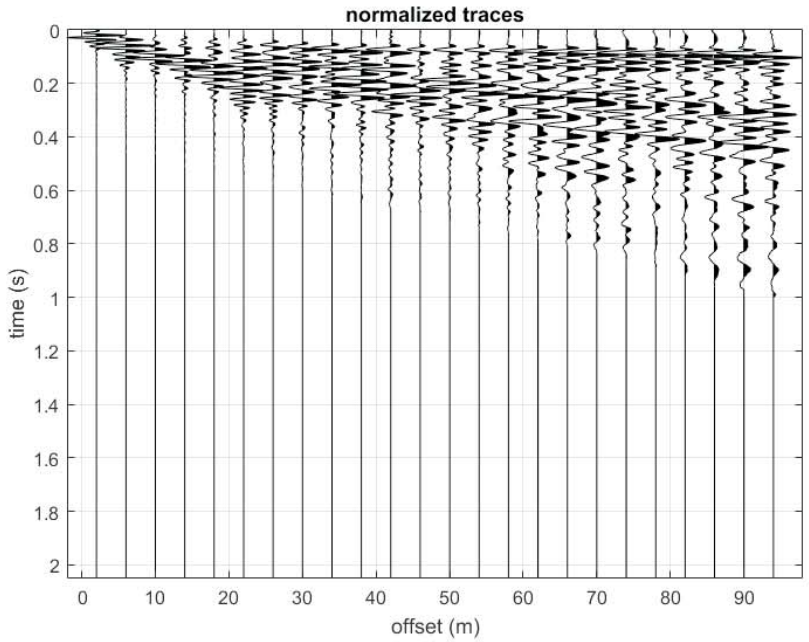
==========

winMASW - Surface Waves & Beyond

www.winmasw.com
Number of models used to define the mean model: 23
Vs5 for the best model: 224 224
Vs30 for the best model: 317 317

#1: uploading & processing (MASW analyses)

dataset: LN3 CLEAN.sgy
sampling: 0.25 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
2.04775
time length to visualize (s)
done
cut
flip traces
zero padding

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

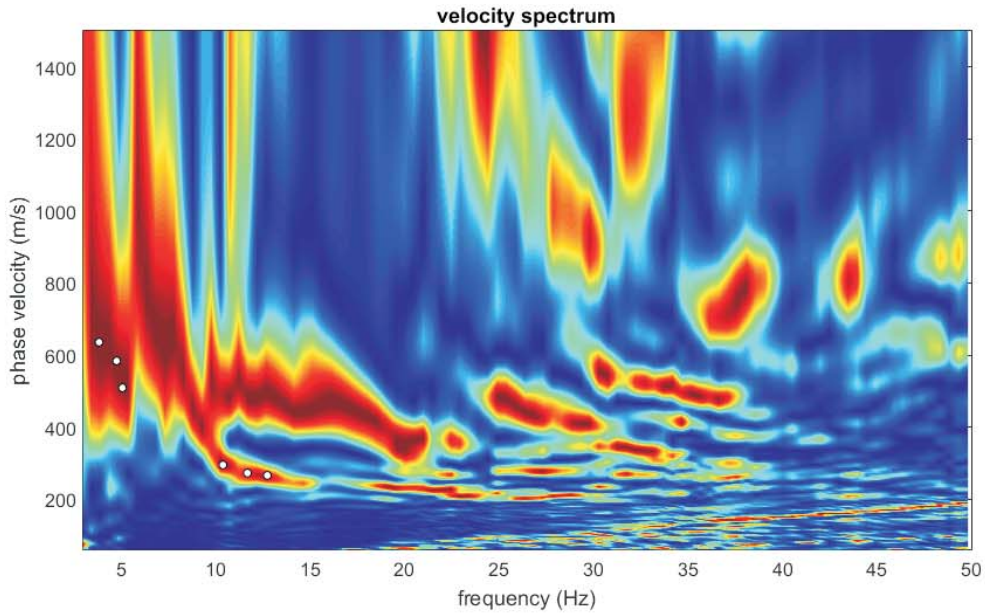
MASW: compute velocity spectrum
phase velocity
f-k
group velocity

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 LN3 05.cdp
cancel picking



inversion
inversion
Joint DC-HV inv.

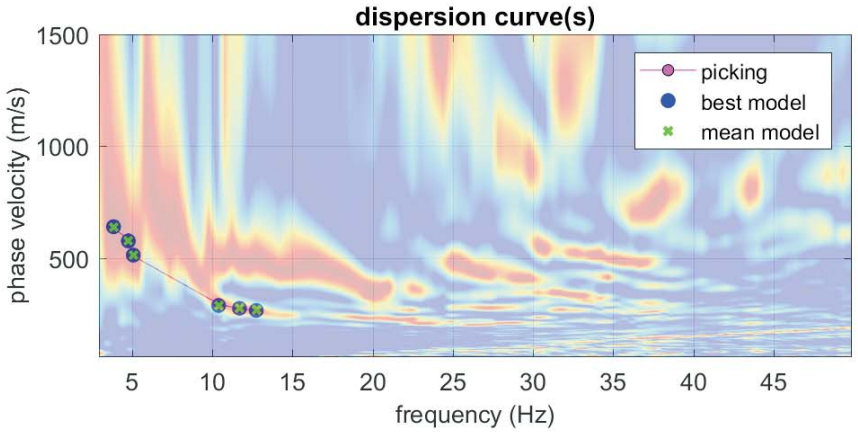
modelling
?
about Poisson
general setting
Rayleigh
1
phase vel
0
Reference depth
Refraction
HV body waves
0
HV modes (SW ellipticity)

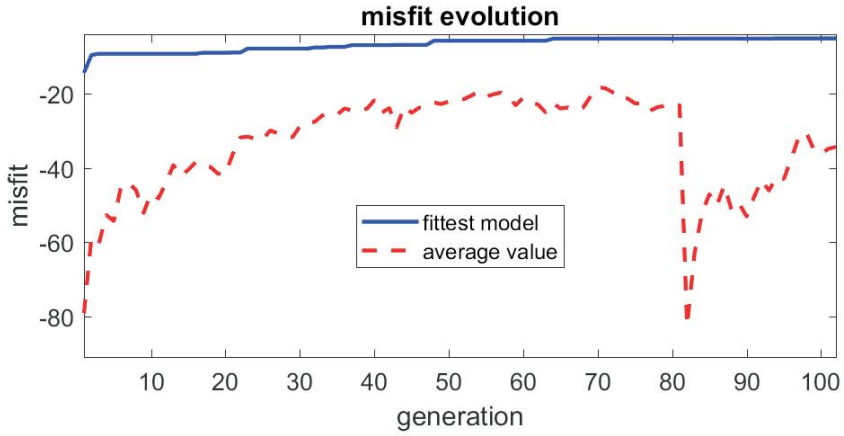
Vs (m/s)	Poisson	thickness (m)
210	0.4	3.8
270	0.4	2
230	0.4	3
350	0.35	18
600	0.35	12
900	0.35	0
0	0.3	0
0	0.2	

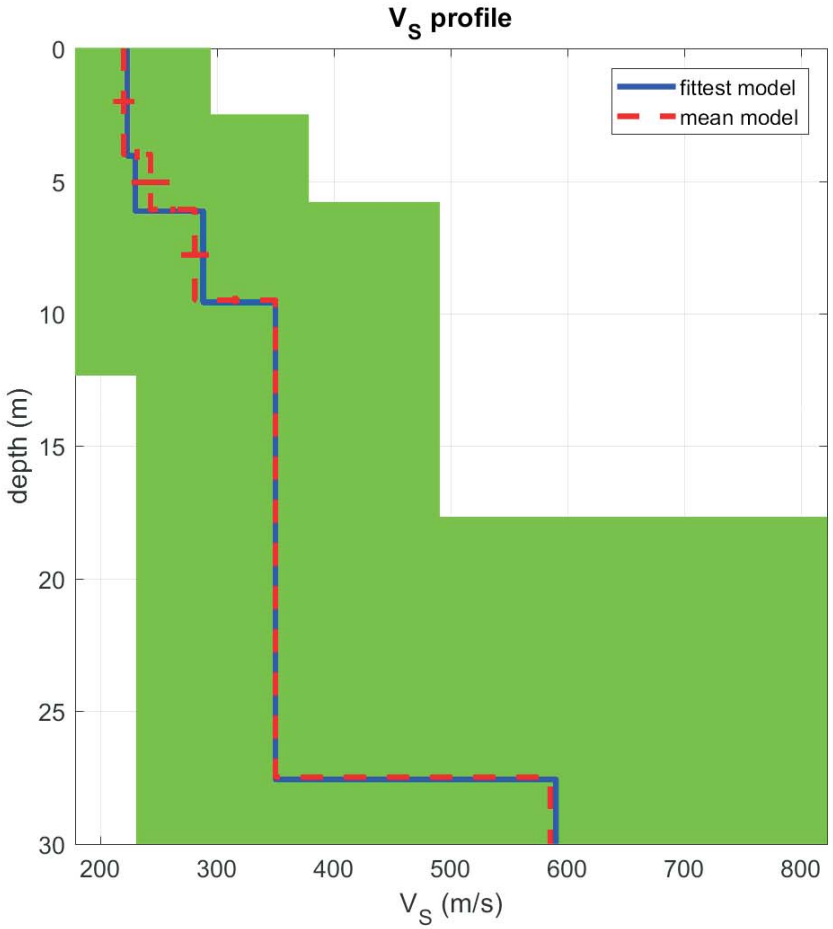
compute
upload mod.
save model
refresh
report

synthetics
ZVF
shows DC
synthetics

www.winmasw.com







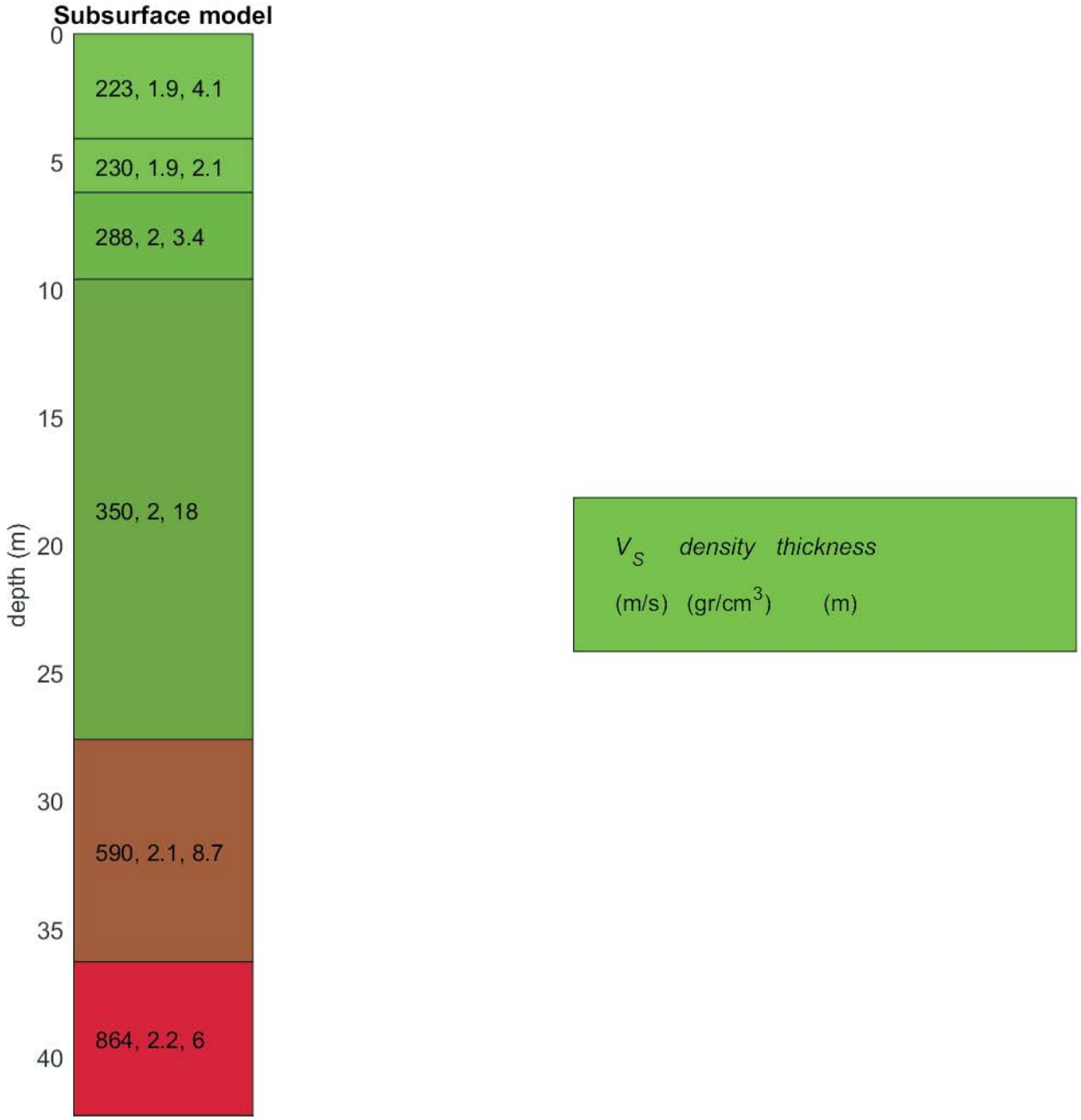
www.winmasw.com

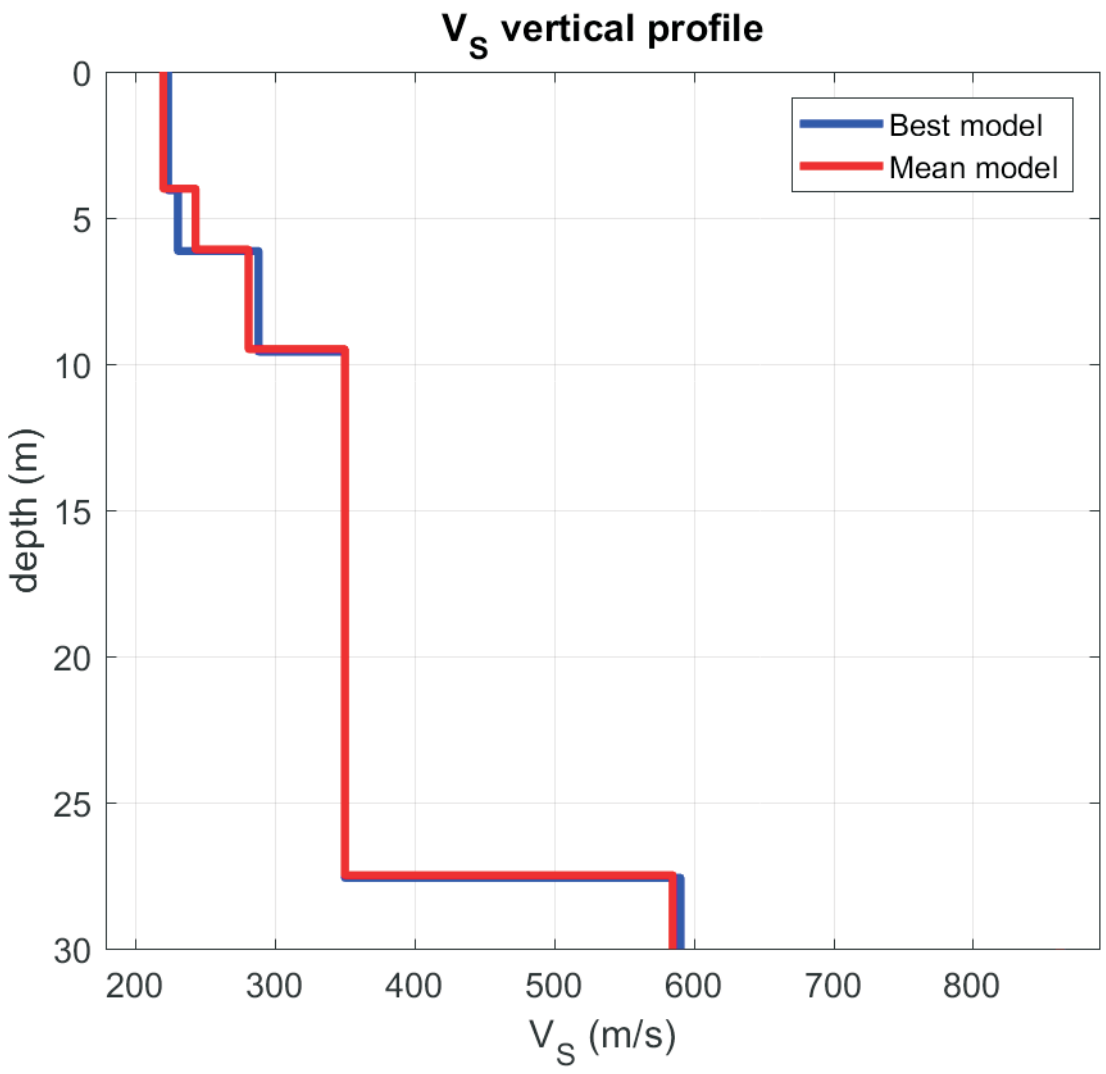
dataset: LN3 CLEAN.sgy

dispersion curve: BORGIANO LN3 05.cdp

Vs30 & VsE (best model): 317 317 m/s

Vs30 & VsE (mean model): 317 317 m/s


Subsurface model
0
5
10
15
20
25
30
35
40
depth (m)
223, 1.9, 4.1
230, 1.9, 2.1
288, 2, 3.4
350, 2, 18
590, 2.1, 8.7
864, 2.2, 6
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
200
300
400
500
600
700
800
V_S (m/s)