MICROZONAZIONE SISMICA
Livello 2

Allegato 2 – Report delle indagini

Regione Emilia-Romagna
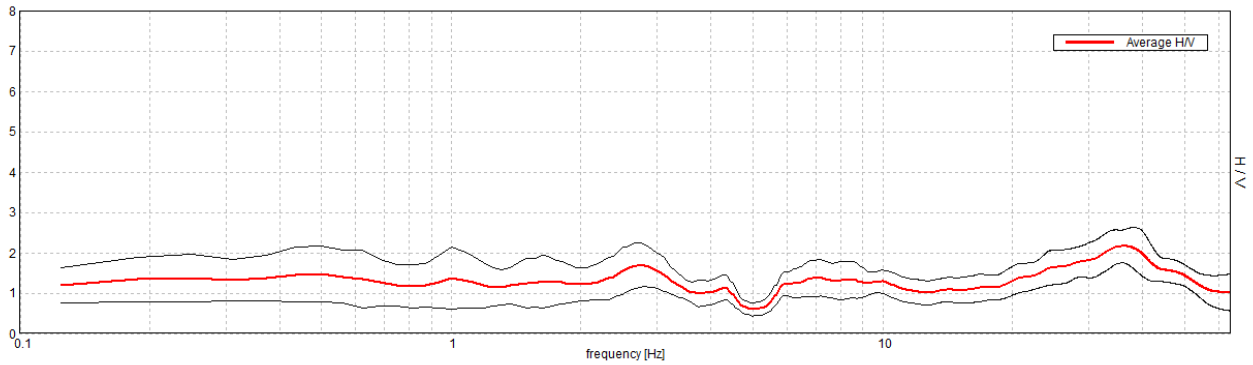
Comune di Monzuno

Regione	Soggetto realizzatore	Data
EMILIA-ROMAGNA	Raggruppamento temporaneo di professionisti Capogruppo: dott. geol. Samuel Sangiorgi Mandanti: dott. geol. Raffaele Brunaldi, dott. geol. Maurizio Zamboni, dott. geol. Antonio Milioto, ing. Marco Soglia	Luglio 2020

MONZUNO_MS, TR21 BRENTO LA VALLAZZA
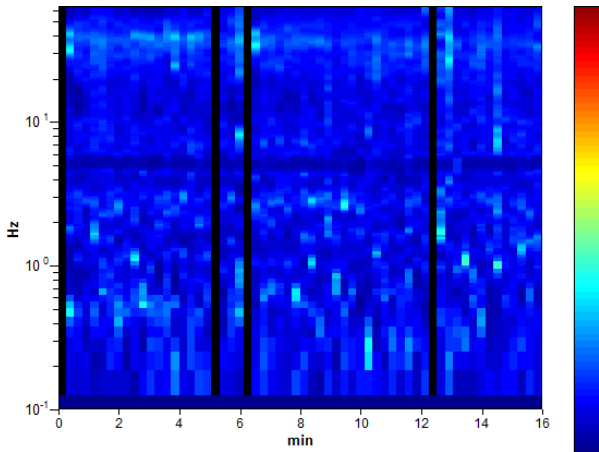
Instrument: TRZ-0108/01-10
Start recording: 17/11/18 13:22:11   End recording: 17/11/18 13:38:12
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 93% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
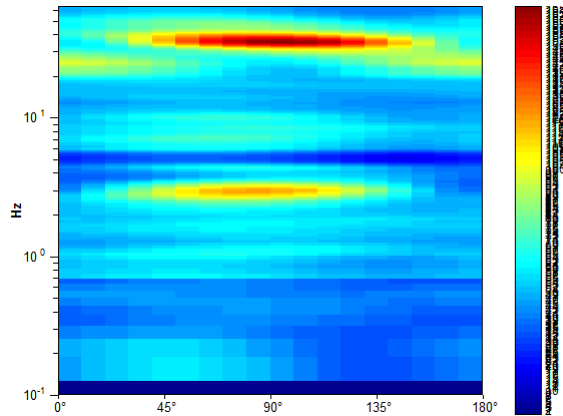
HORIZONTAL TO VERTICAL SPECTRAL RATIO

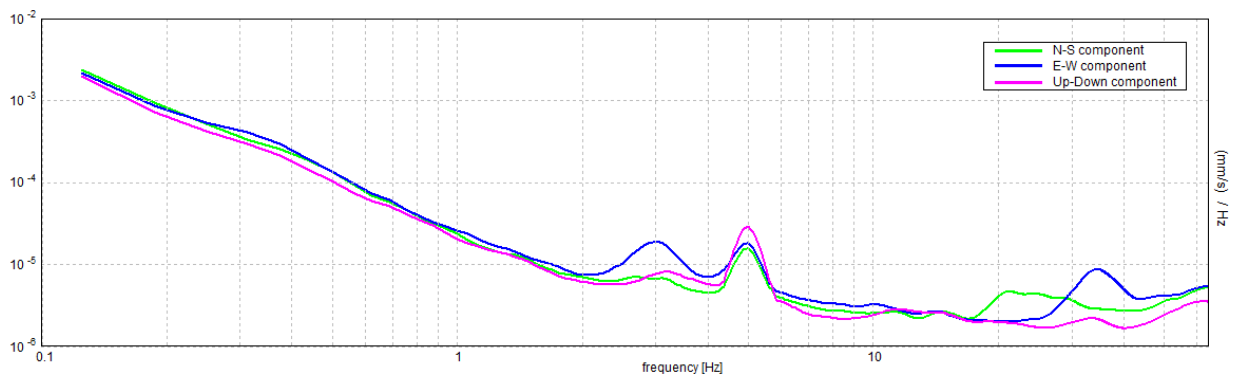Max. H/V at 2.75 ± 0.46 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 2.75 ± 0.46 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.75 > 0.63	**OK**	
$n_c(f_0) > 200$	2464.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 67 times	**OK**	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	4.625 Hz	**OK**	
$A_0 > 2$	1.69 > 2		**NO**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.08201| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	0.22554 < 0.1375		**NO**
$\sigma_A(f_0) < \theta(f_0)$	0.2672 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

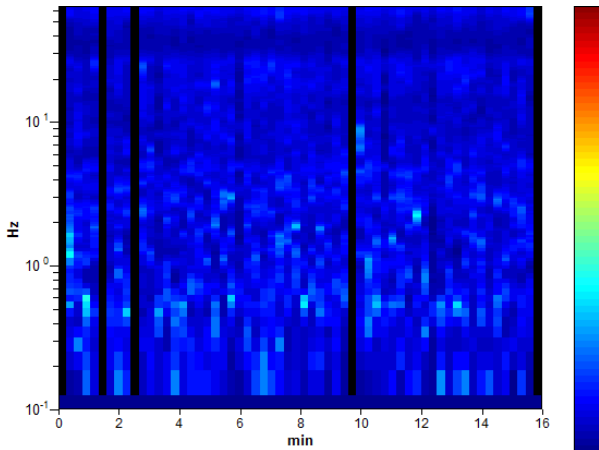| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR20 BRENTO

Instrument: TRZ-0108/01-10
Start recording: 17/11/18 13:01:49   End recording: 17/11/18 13:17:50
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 92% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
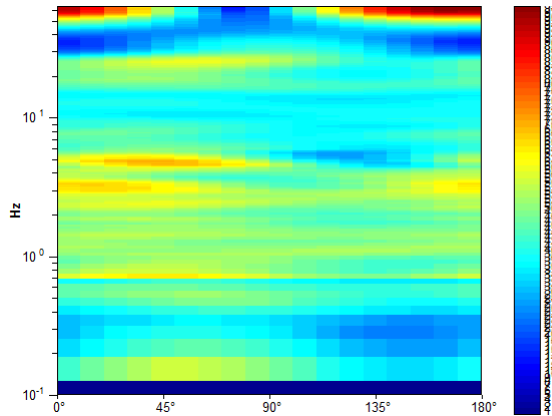
HORIZONTAL TO VERTICAL SPECTRAL RATIO

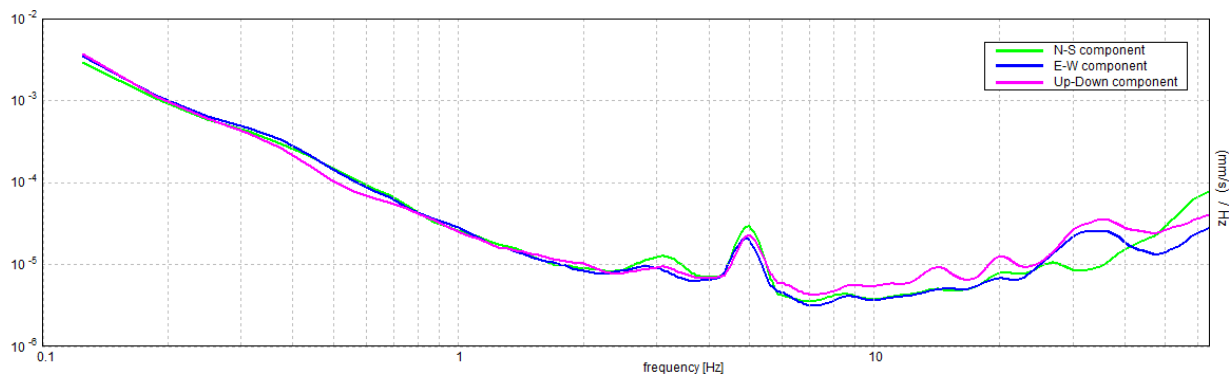Max. H/V at 0.5 ± 0.05 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<table>
<tr><td colspan="4" align="center">Max. H/V at 0.5 ± 0.05 Hz (in the range 0.1 - 20.0 Hz).</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">Criteria for a reliable H/V curve
[All 3 should be fulfilled]</td></tr>
<tr><td>$f_0 > 10 / L_w$</td><td>0.50 > 0.63</td><td></td><td>NO</td></tr>
<tr><td>$n_c(f_0) > 200$</td><td>440.0 > 200</td><td>OK</td><td></td></tr>
<tr><td>$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz</td><td>Exceeded 0 out of 13 times</td><td>OK</td><td></td></tr>
<tr><td colspan="4" align="center">Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]</td></tr>
<tr><td>Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$</td><td></td><td></td><td>NO</td></tr>
<tr><td>Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$</td><td></td><td></td><td>NO</td></tr>
<tr><td>$A_0 > 2$</td><td>1.63 > 2</td><td></td><td>NO</td></tr>
<tr><td>$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$</td><td>|0.04591| < 0.05</td><td>OK</td><td></td></tr>
<tr><td>$\sigma_f < \varepsilon(f_0)$</td><td>0.02295 < 0.075</td><td>OK</td><td></td></tr>
<tr><td>$\sigma_A(f_0) < \theta(f_0)$</td><td>0.3922 < 2.0</td><td>OK</td><td></td></tr>
</table>

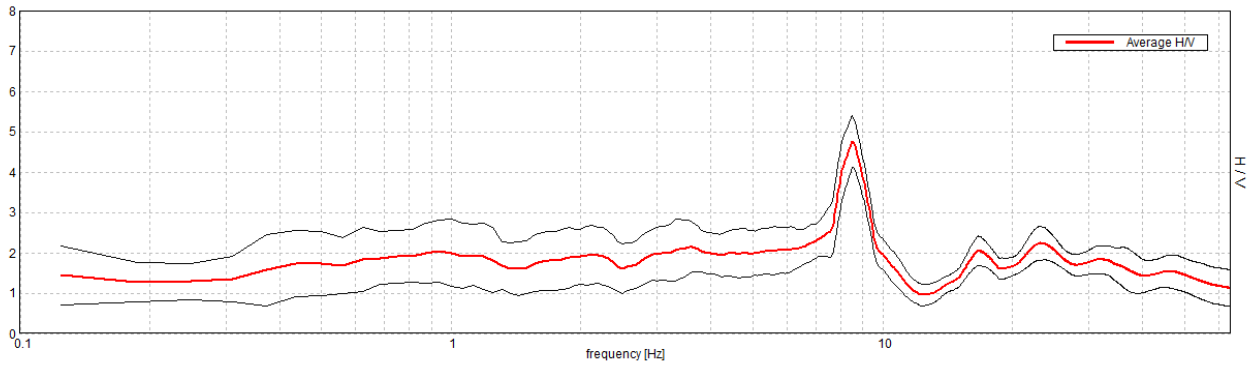|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

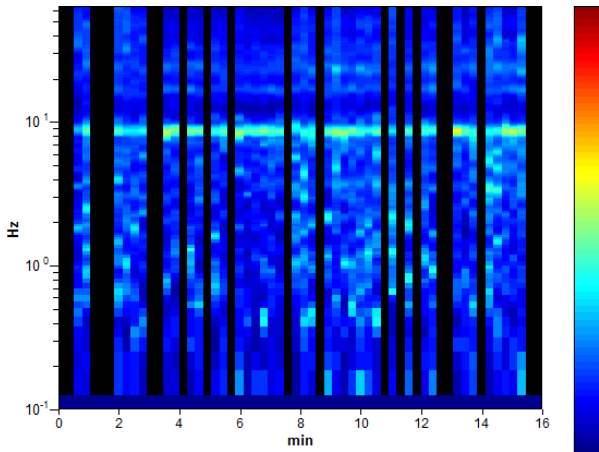| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25\, f_0$	$0.2\, f_0$	$0.15\, f_0$	$0.10\, f_0$	$0.05\, f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR41 BRENTO

Instrument: TRZ-0108/01-10
Start recording: 15/02/19 16:51:38   End recording: 15/02/19 17:07:38
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 67% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
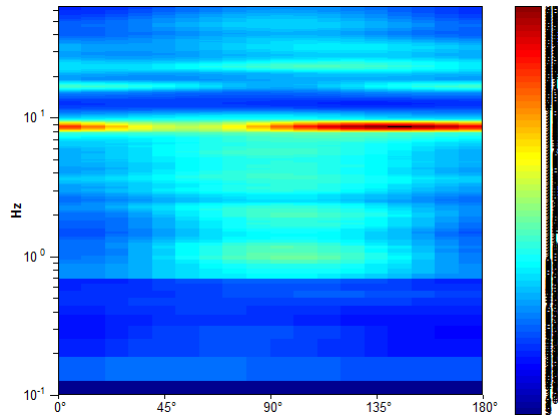
HORIZONTAL TO VERTICAL SPECTRAL RATIO

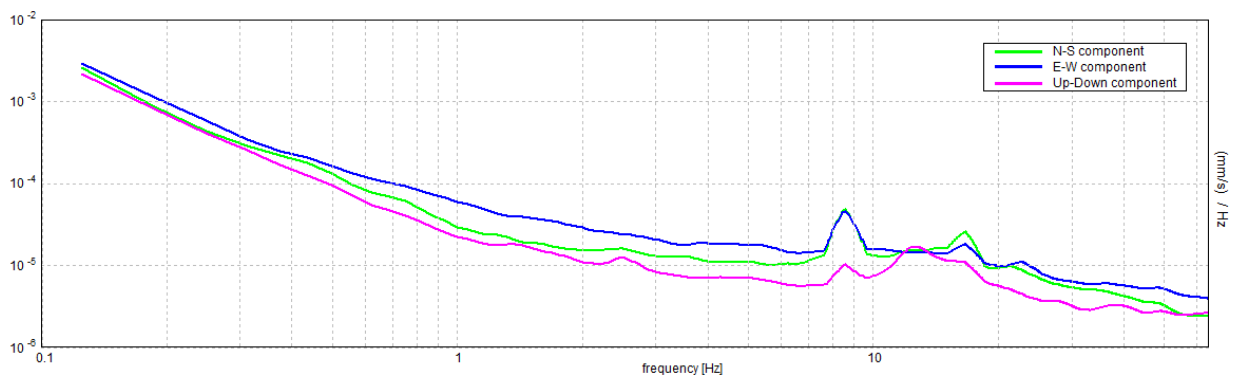Max. H/V at 8.5 ± 0.34 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 8.5 ± 0.34 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	8.50 > 0.63	**OK**	
$n_c(f_0) > 200$	5440.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 205 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	7.188 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	9.563 Hz	**OK**	
$A_0 > 2$	4.75 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01968| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.16725 < 0.425	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3131 < 1.58	**OK**	

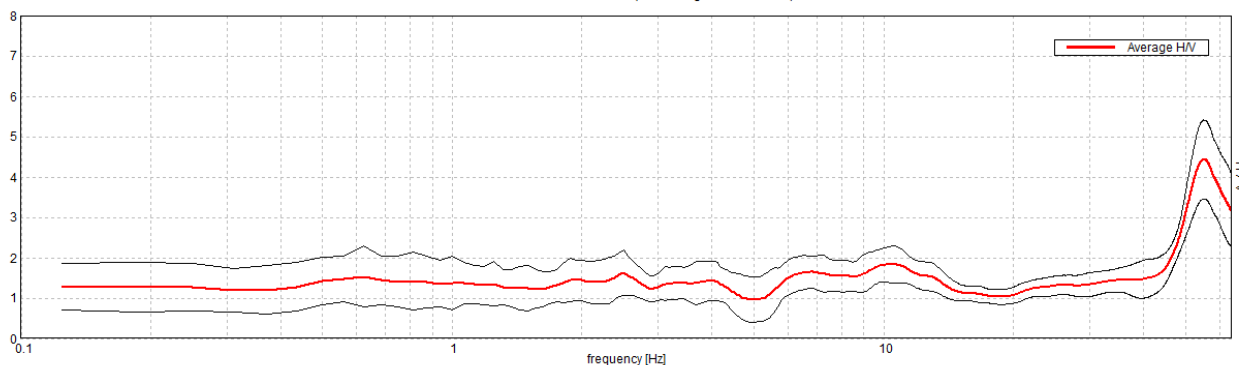|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

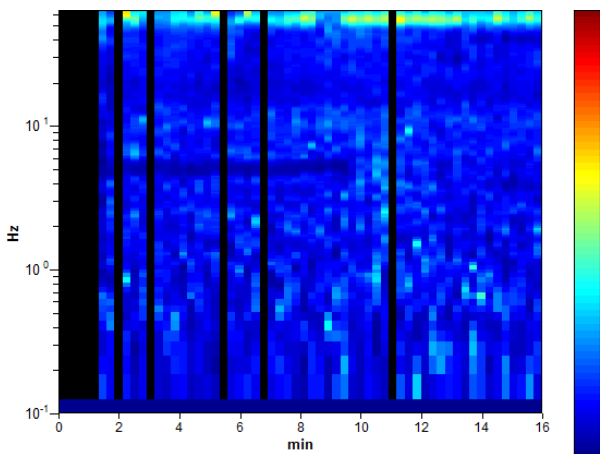## MONZUNO_MS, TR22 MONTE CASTELLAZZO

Instrument: TRZ-0108/01-10
Start recording: 17/11/18 13:49:44   End recording: 17/11/18 14:05:45
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

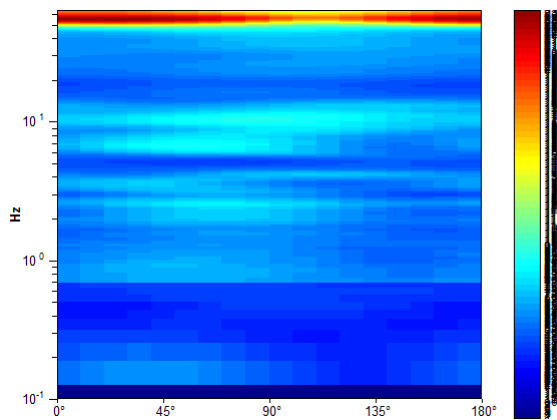### HORIZONTAL TO VERTICAL SPECTRAL RATIO

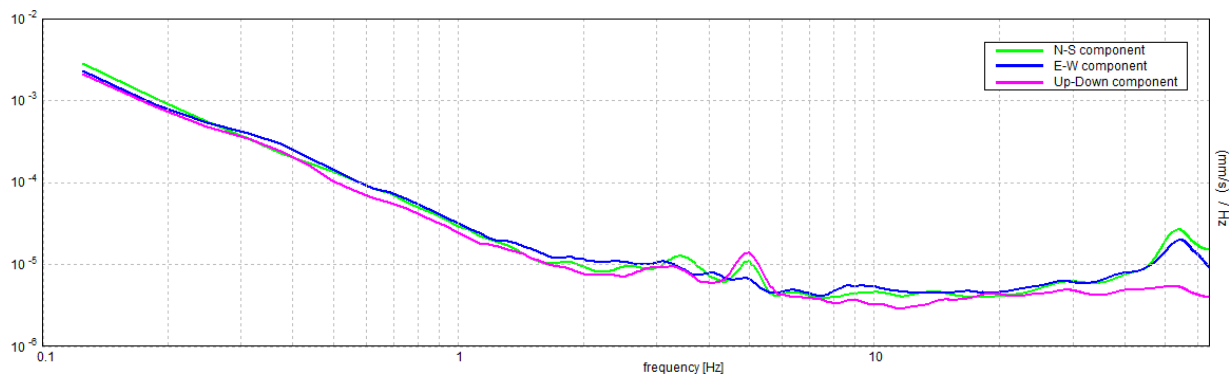Max. H/V at 10.63 ± 1.02 Hz. (In the range 0.1 - 20.0 Hz).
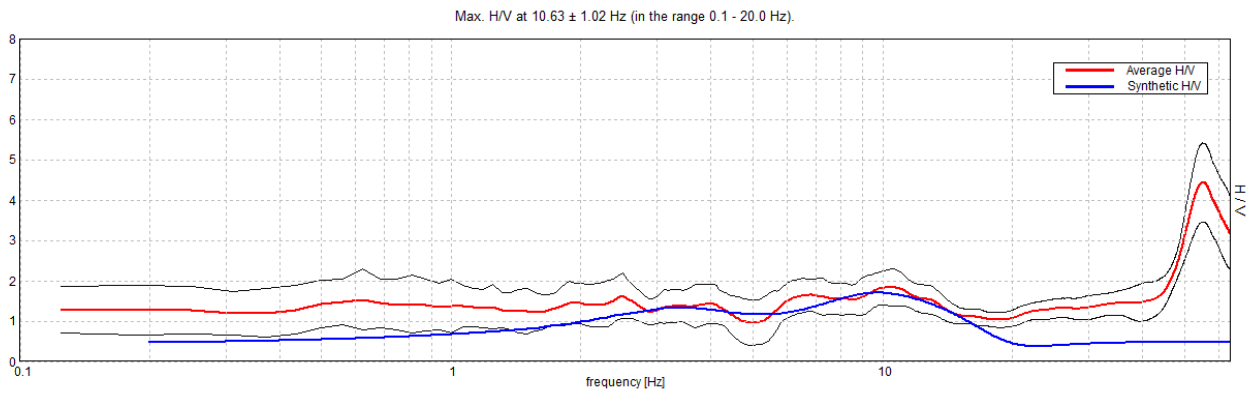

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 10.63 ± 1.02 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.30	4.30	225
14.30	10.00	430
44.30	30.00	570
inf.	inf.	760

Vs(0.0-30.0)=429m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 10.63 ± 1.02 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	$10.63 > 0.63$	**OK**	
$n_c(f_0) > 200$	$8500.0 > 200$	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 256 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	$1.83 > 2$		**NO**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$|0.04736| < 0.05$	**OK**	
$\sigma_f < \varepsilon(f_0)$	$0.5032 < 0.53125$	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	$0.2265 < 1.58$	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

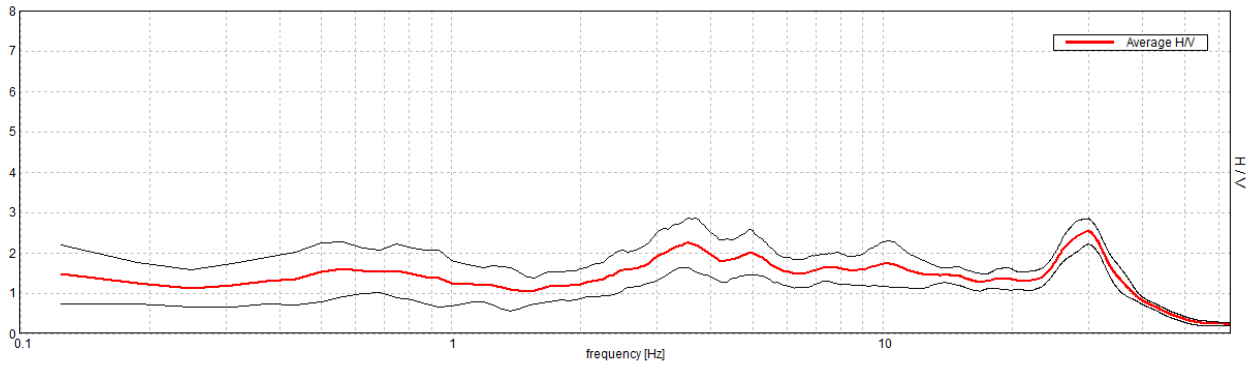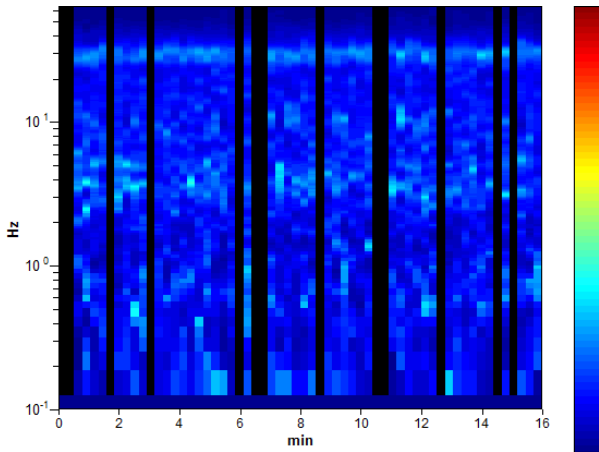| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR4 VADO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 11:41:13   End recording: 15/11/18 11:57:14
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00''.   Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
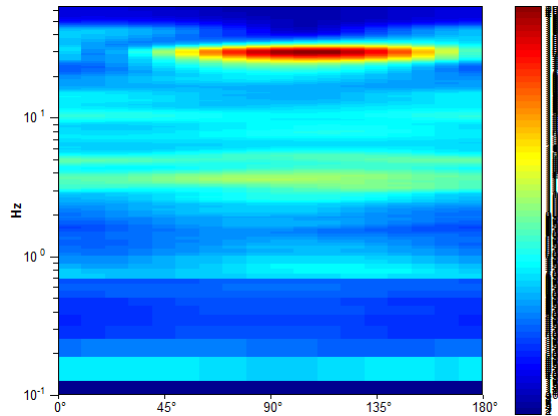Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

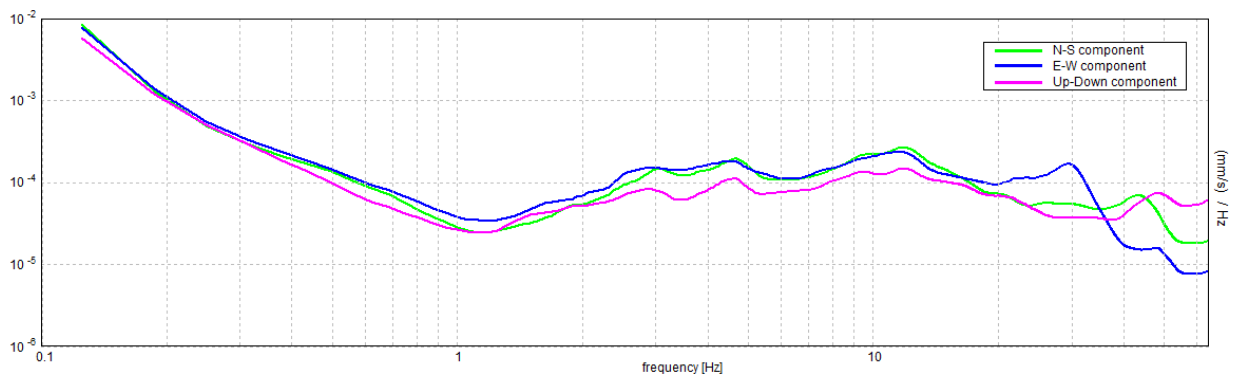Max. H/V at 3.56 ± 0.02 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 3.56 ± 0.02 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.56 > 0.63	**OK**	
$n_c(f_0) > 200$	2679.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 86 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.625 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	2.24 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00248| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.00882 < 0.17813	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3055 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR3 VADO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 11:17:03   End recording: 15/11/18 11:33:04
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
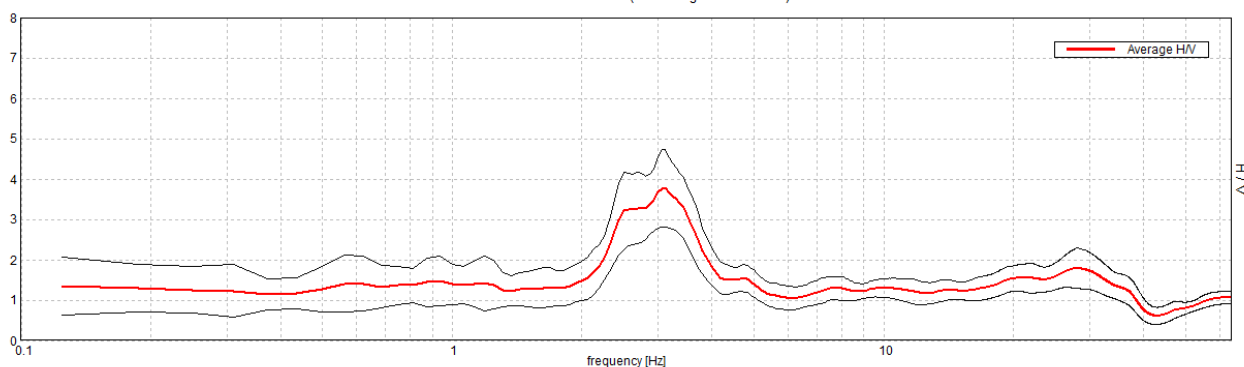Trace length: 0h16'00".   Analyzed 85% trace (manual window selection)
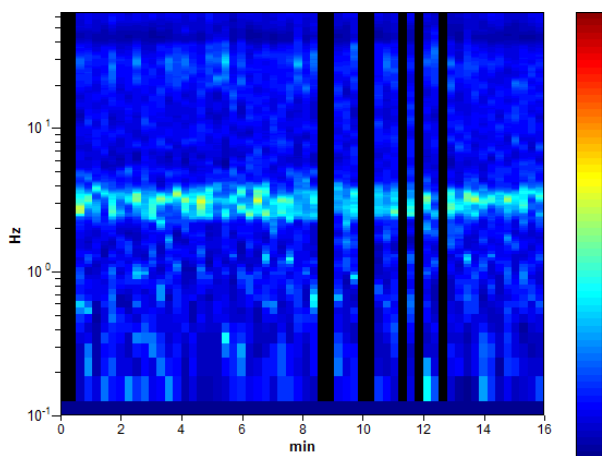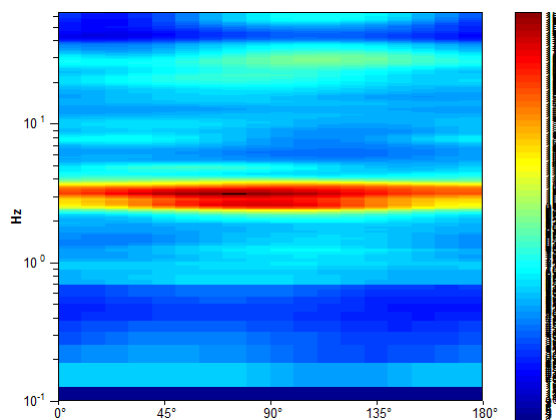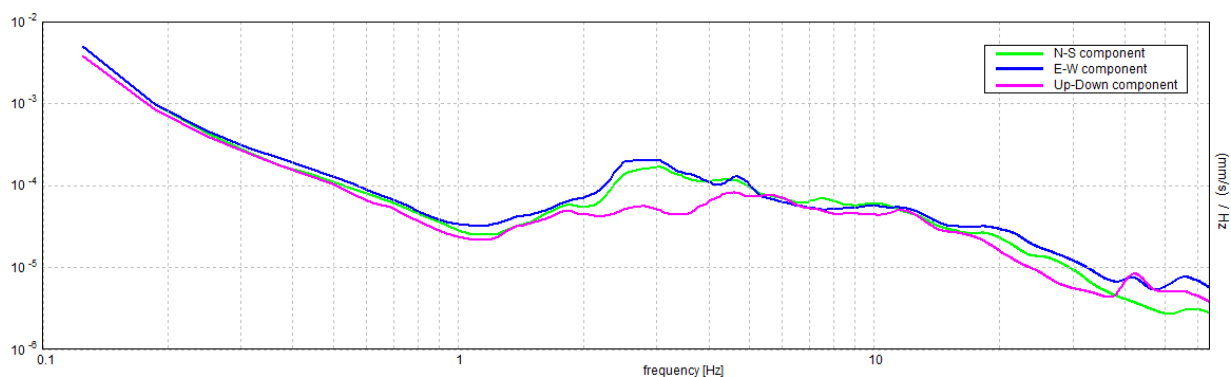Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.13 ± 0.04 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 3.13 ± 0.04 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
20.00	20.00	240
inf.	inf.	525

Vs(0.0-30.0)=293m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="border:1px solid black; text-align:center">

Max. H/V at 3.13 ± 0.04 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.13 > 0.63	**OK**
$n_c(f_0) > 200$	2550.0 > 200	**OK**
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 76 times	**OK**

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.188 Hz	**OK**
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	4.0 Hz	**OK**
$A_0 > 2$	3.78 > 2	**OK**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00593| < 0.05	**OK**
$\sigma_f < \varepsilon(f_0)$	0.01855 < 0.15625	**OK**
$\sigma_A(f_0) < \theta(f_0)$	0.4733 < 1.58	**OK**

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR1 VADO STAZIONE

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 10:14:12   End recording: 15/11/18 10:30:13
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 95% trace (manual window selection)
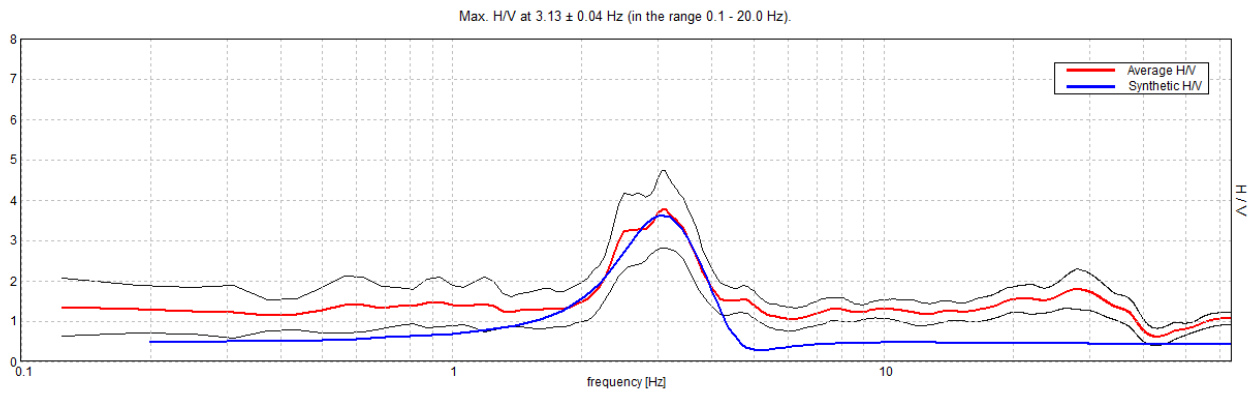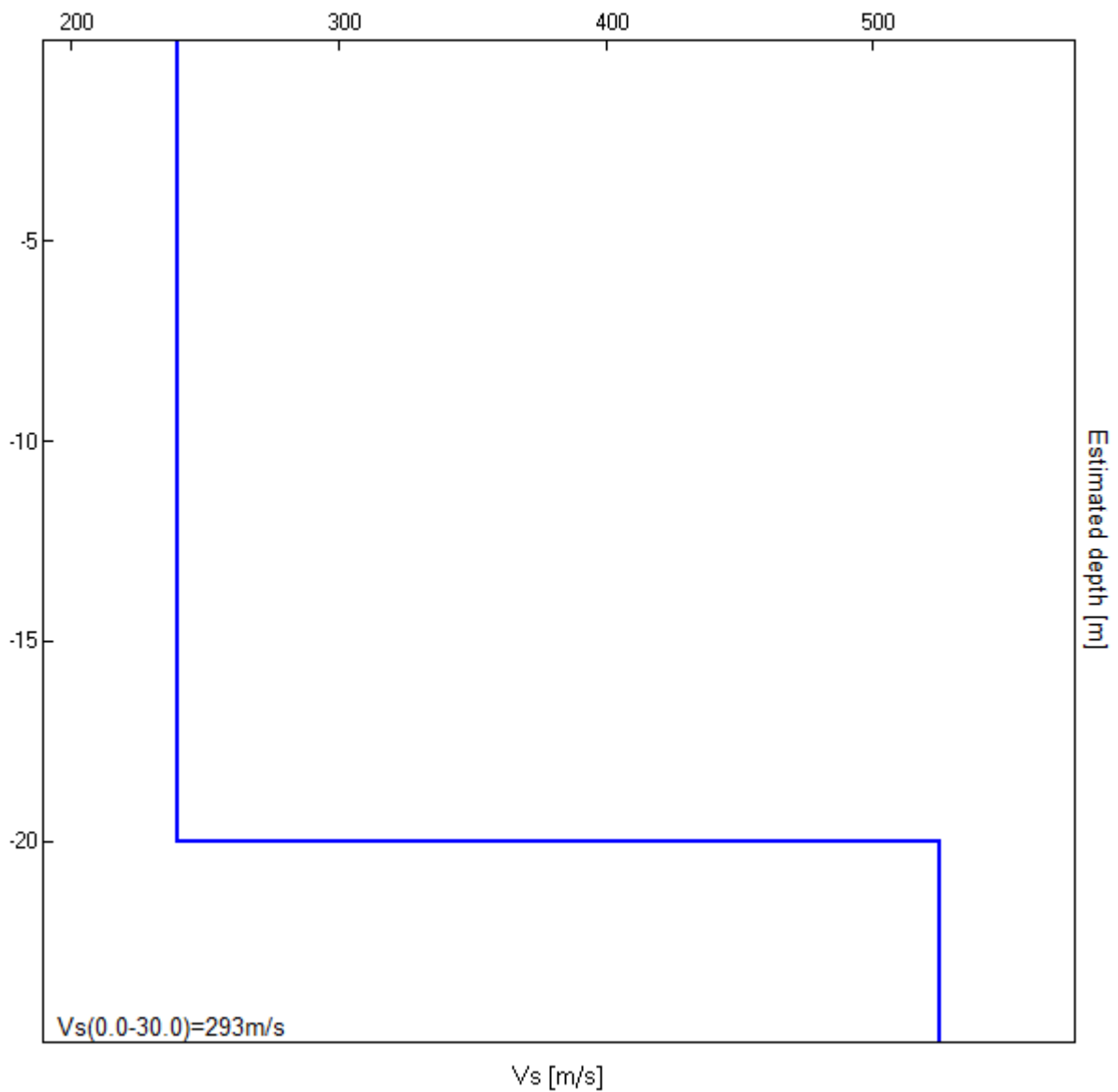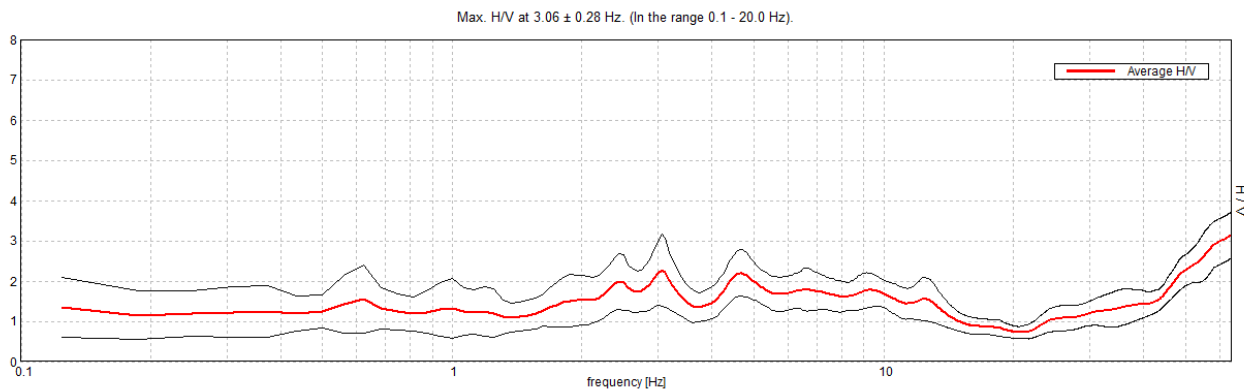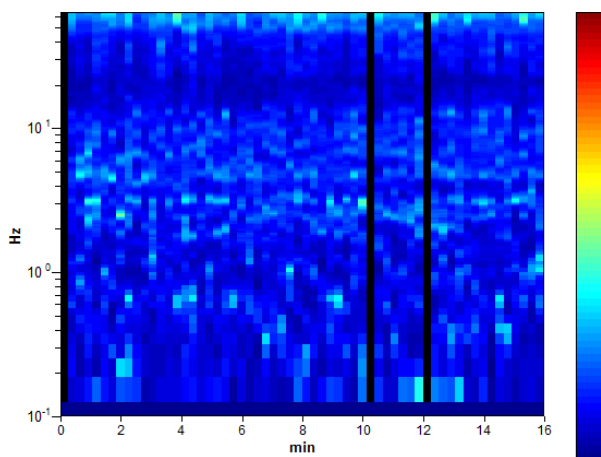Sampling rate: 128 Hz
Window size: 16 s
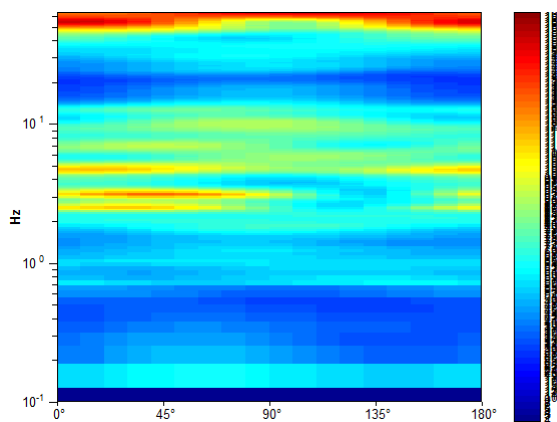Smoothing type: Triangular window
Smoothing: 10%
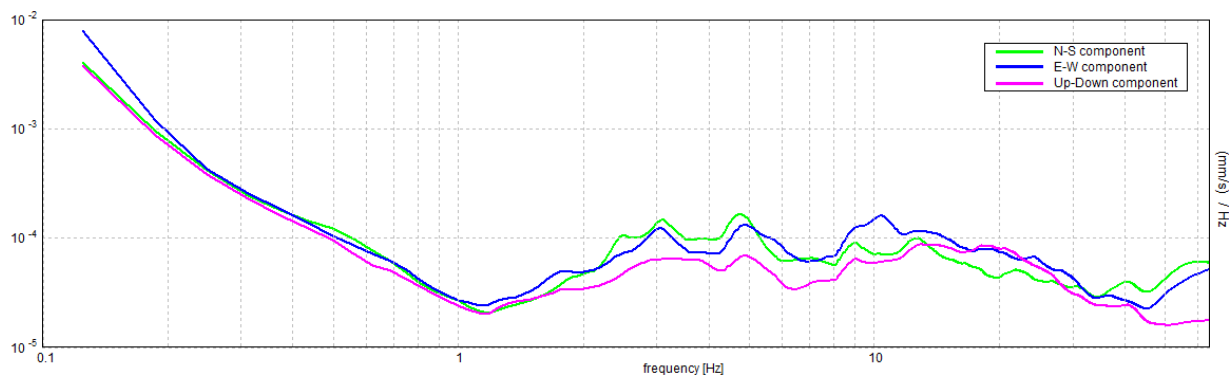
HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.06 ± 0.28 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 3.06 ± 0.28 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.06 > 0.63	OK
$n_c(f_0) > 200$	2793.0 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 74 times	OK

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.438 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.27 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04569| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.13993 < 0.15313	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.444 < 1.58	OK	

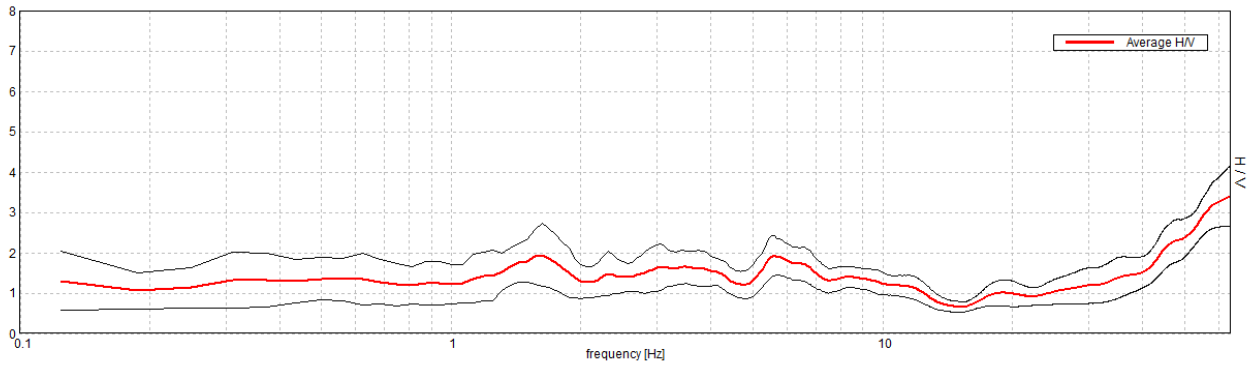|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

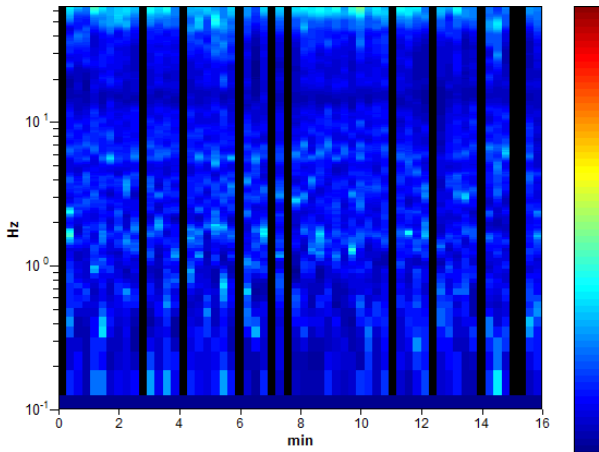| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR2 VADO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 10:41:29   End recording: 15/11/18 10:57:30
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 82% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
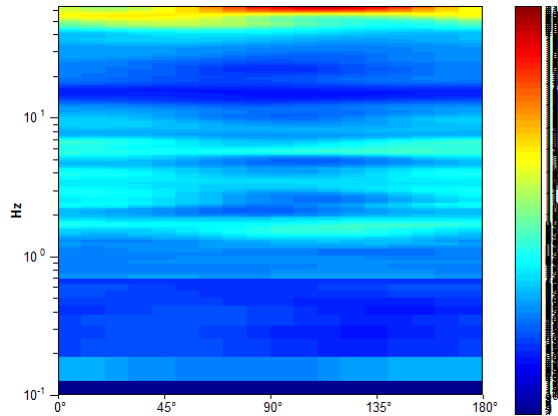
HORIZONTAL TO VERTICAL SPECTRAL RATIO

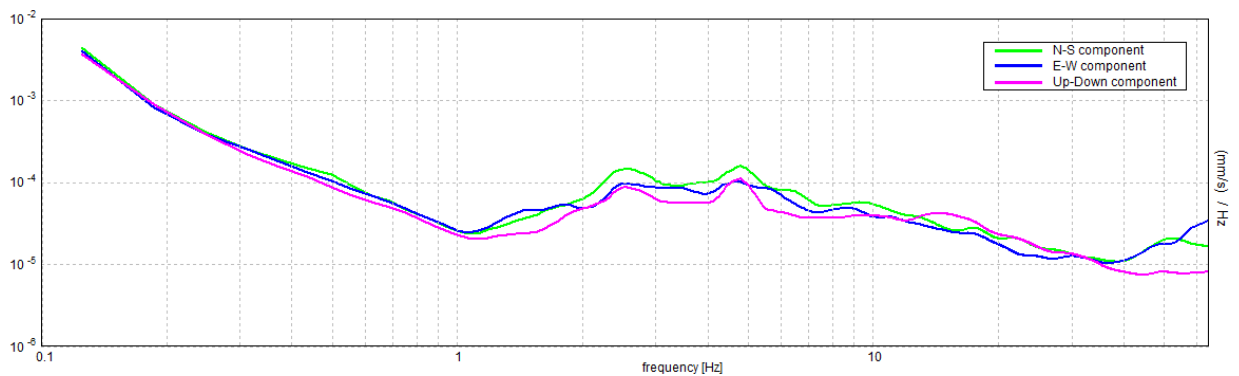Max. H/V at 1.63 ± 0.93 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="text-align: center;">

Max. H/V at 1.63 ± 0.93 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.63 > 0.63	**OK**	
$n_c(f_0) > 200$	1274.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 40 times	**OK**	

Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	1.94 > 2		**NO**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.28153| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	0.45749 < 0.1625		**NO**
$\sigma_A(f_0) < \theta(f_0)$	0.3816 < 1.78	**OK**	

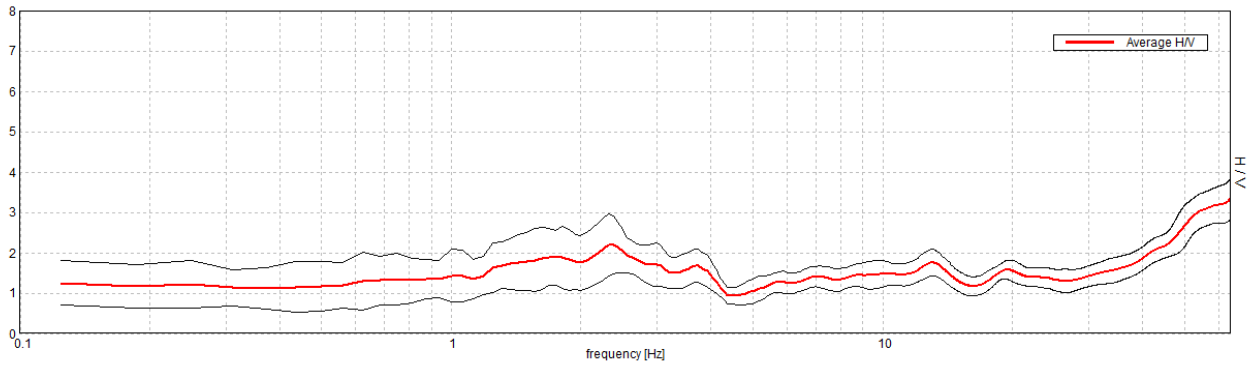|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w \, n_w \, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

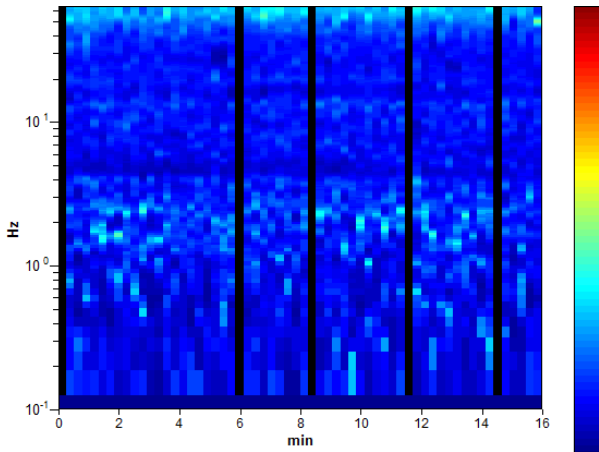| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR5 VADO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 12:08:26   End recording: 15/11/18 12:24:27
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 92% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
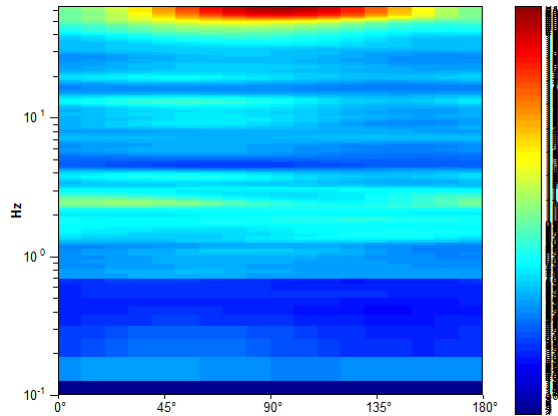
HORIZONTAL TO VERTICAL SPECTRAL RATIO

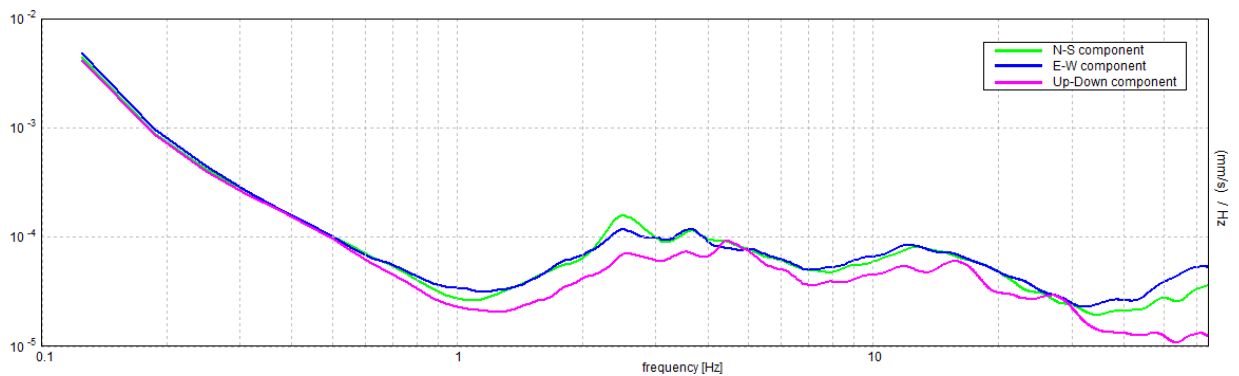Max. H/V at 2.38 ± 0.06 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 2.38 ± 0.06 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.00	5.00	300
15.00	10.00	500
35.00	20.00	600
75.00	40.00	700
inf.	inf.	950

Vs(0.0-30.0)=486m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 2.38 ± 0.06 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.38 > 0.63	OK	
$n_c(f_0) > 200$	2090.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 58 times	OK	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	4.313 Hz	OK	
$A_0 > 2$	2.20 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01266| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.03007 < 0.11875	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.3532 < 1.58	OK	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR6 VADO SERBATOIO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 12:33:12   End recording: 15/11/18 12:49:13
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

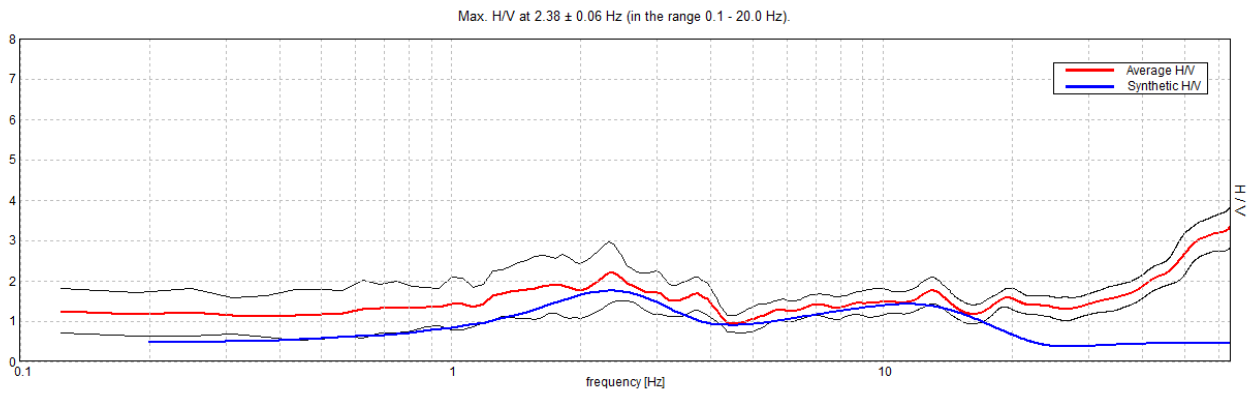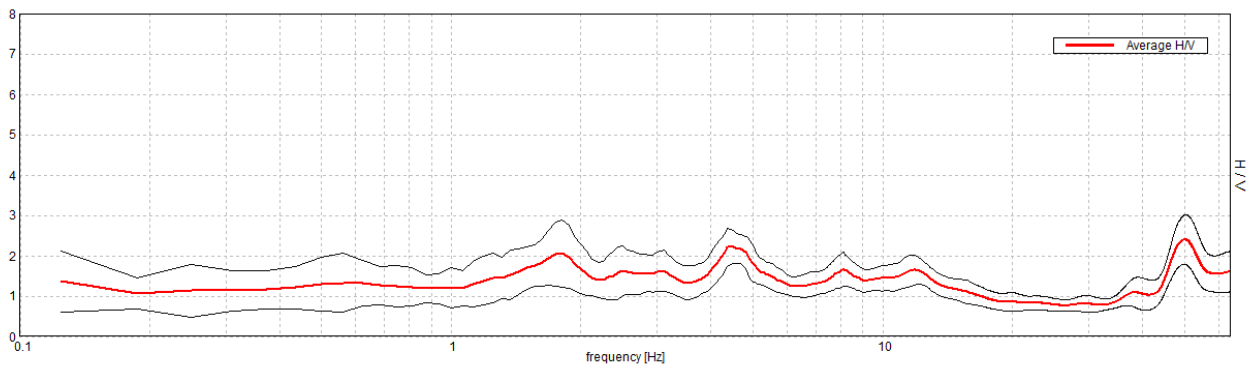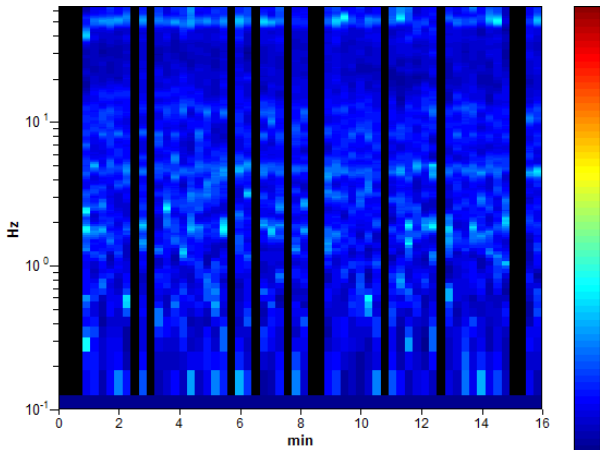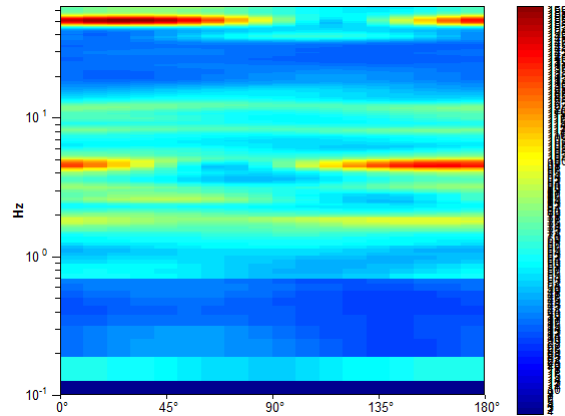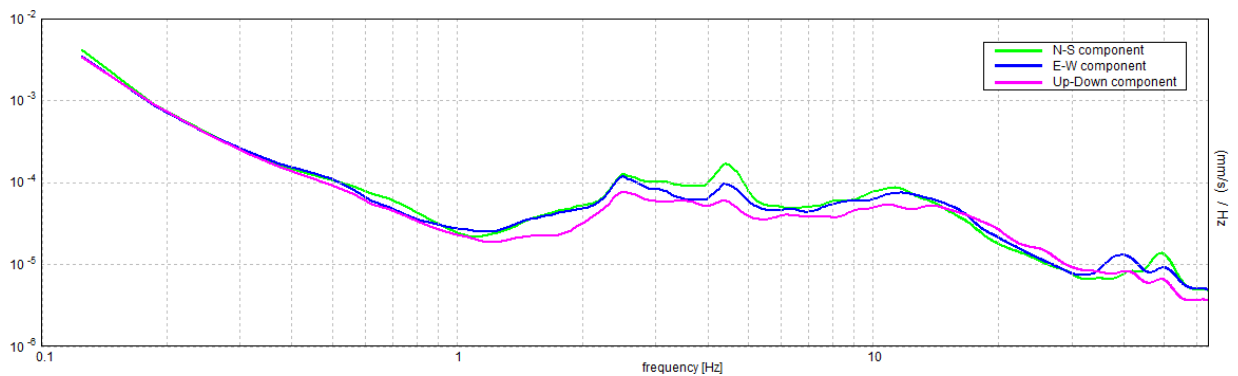Max. H/V at 4.44 ± 0.54 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY	DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 4.44 ± 0.54 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	4.44 > 0.63	**OK**	
$n_c(f_0) > 200$	3266.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 108 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$	$A_{H/V}(f^-) < A_0 / 2$		**NO**
Exists f^+ in $[f_0, 4f_0]$	$A_{H/V}(f^+) < A_0 / 2$	15.688 Hz	**OK**
$A_0 > 2$	2.22 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.05995| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	0.26602 < 0.22188		**NO**
$\sigma_A(f_0) < \theta(f_0)$	0.2148 < 1.58	**OK**	

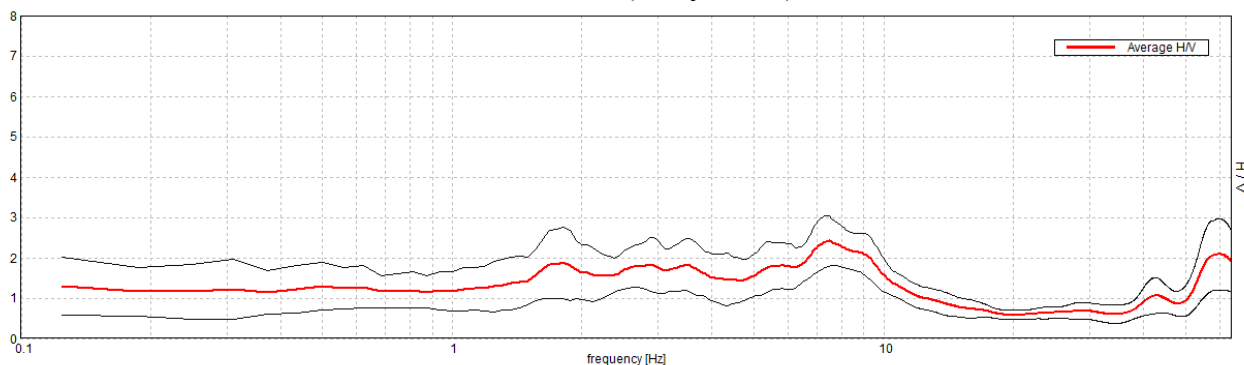|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

037044P139HVSR153

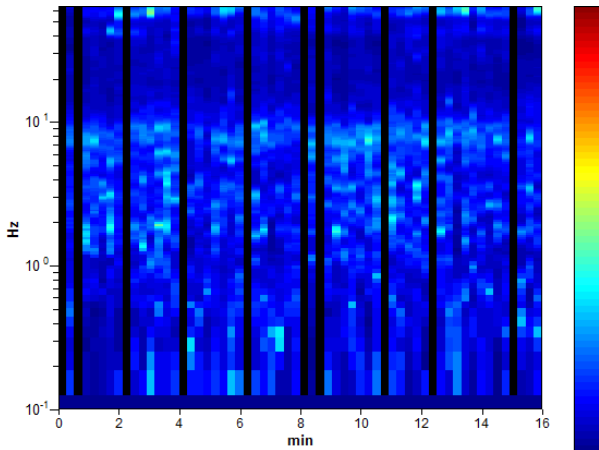## MONZUNO_MS, TR7 VADO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 12:56:39   End recording: 15/11/18 13:12:40
Channel labels: NORTH SOUTH;   EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
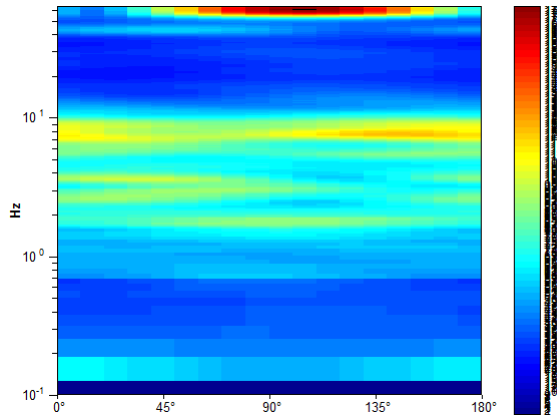
HORIZONTAL TO VERTICAL SPECTRAL RATIO

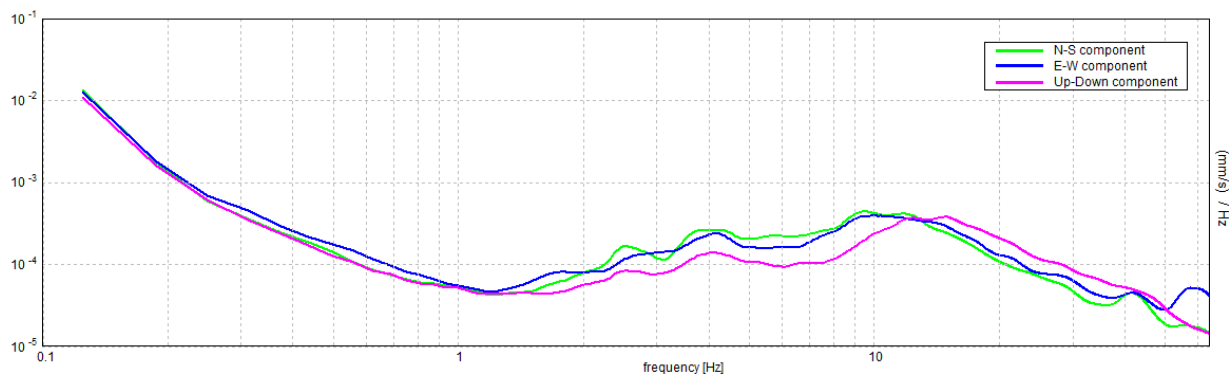Max. H/V at 7.44 ± 0.68 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<table>
<tr><td colspan="4" align="center">**Max. H/V at 7.44 ± 0.68 Hz (in the range 0.1 - 20.0 Hz).**</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">**Criteria for a reliable H/V curve**
[All 3 should be fulfilled]</td></tr>
<tr><td>$f_0 > 10 / L_w$</td><td>7.44 > 0.63</td><td>**OK**</td><td></td></tr>
<tr><td>$n_c(f_0) > 200$</td><td>5950.0 > 200</td><td>**OK**</td><td></td></tr>
<tr><td>$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz</td><td>Exceeded 0 out of 180 times</td><td>**OK**</td><td></td></tr>
<tr><td colspan="4" align="center">**Criteria for a clear H/V peak**
[At least 5 out of 6 should be fulfilled]</td></tr>
<tr><td>Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$</td><td></td><td></td><td>**NO**</td></tr>
<tr><td>Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$</td><td>11.25 Hz</td><td>**OK**</td><td></td></tr>
<tr><td>$A_0 > 2$</td><td>2.41 > 2</td><td>**OK**</td><td></td></tr>
<tr><td>$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$</td><td>|0.04505| < 0.05</td><td>**OK**</td><td></td></tr>
<tr><td>$\sigma_f < \varepsilon(f_0)$</td><td>0.33504 < 0.37188</td><td>**OK**</td><td></td></tr>
<tr><td>$\sigma_A(f_0) < \theta(f_0)$</td><td>0.3111 < 1.58</td><td>**OK**</td><td></td></tr>
</table>

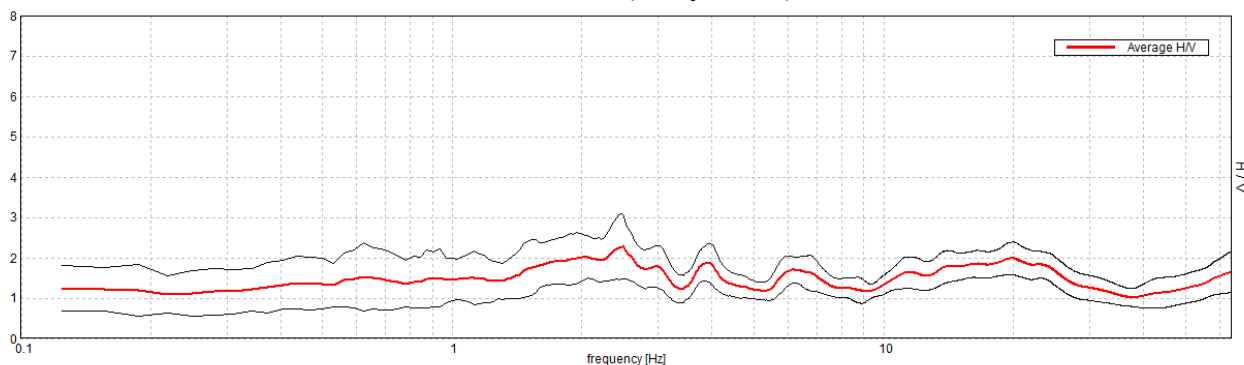|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

037044P140HVSR154

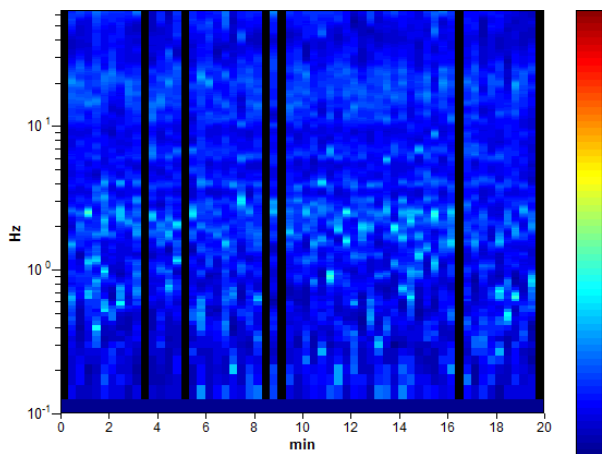## MONZUNO_MS, TR40 VADO CAMPO SPORTIVO

Instrument: TRZ-0108/01-10
Start recording: 15/02/19 15:33:50   End recording: 15/02/19 15:53:51
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h20'00".   Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
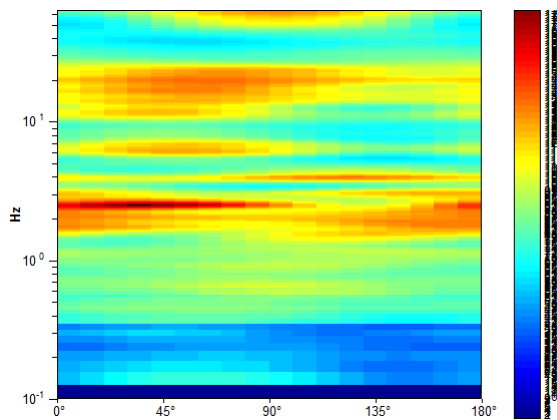Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

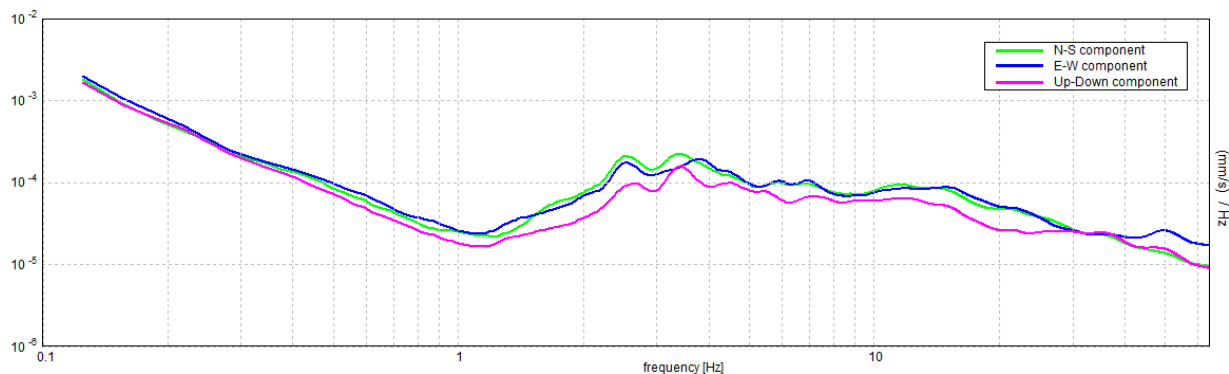Max. H/V at 2.47 ± 0.67 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 2.47 ± 0.67 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.47 > 0.50	**OK**	
$n_c(f_0) > 200$	2616.9 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 120 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	2.28 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.13378| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	0.33026 < 0.12344		**NO**
$\sigma_A(f_0) < \theta(f_0)$	0.3954 < 1.58	**OK**	

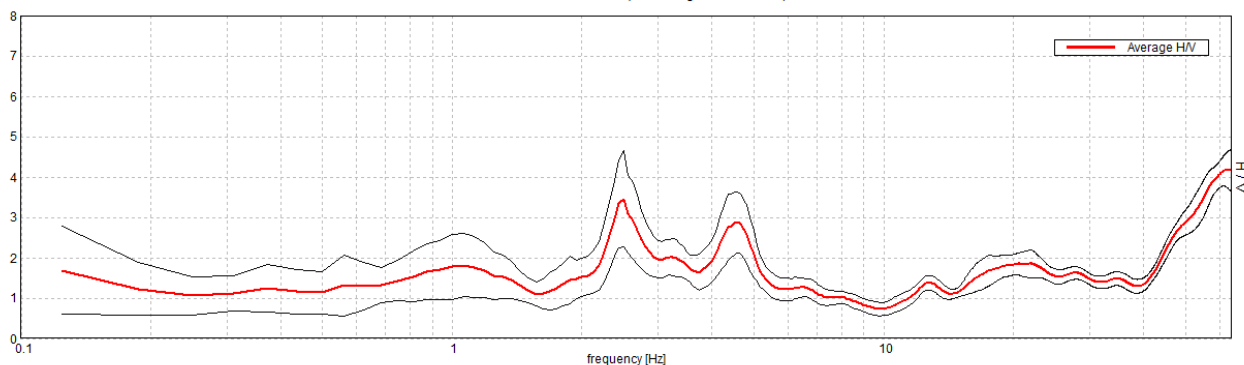|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w \, n_w \, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

037044P141HVSR155
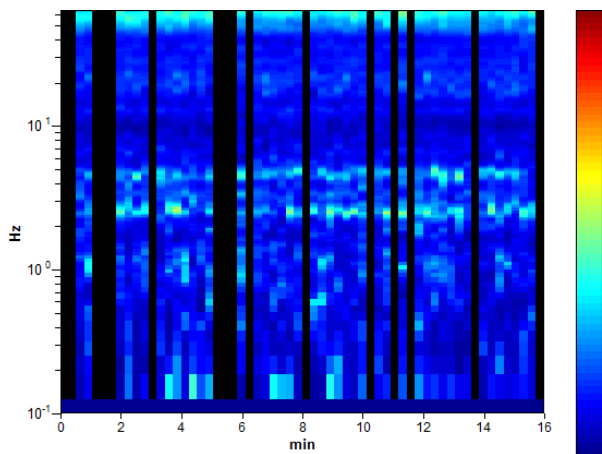
MONZUNO_MS, TR8 VADO CRETA

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 13:47:45   End recording: 15/11/18 14:03:46
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
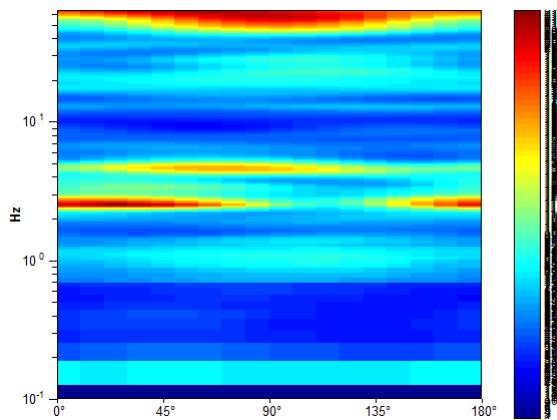Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

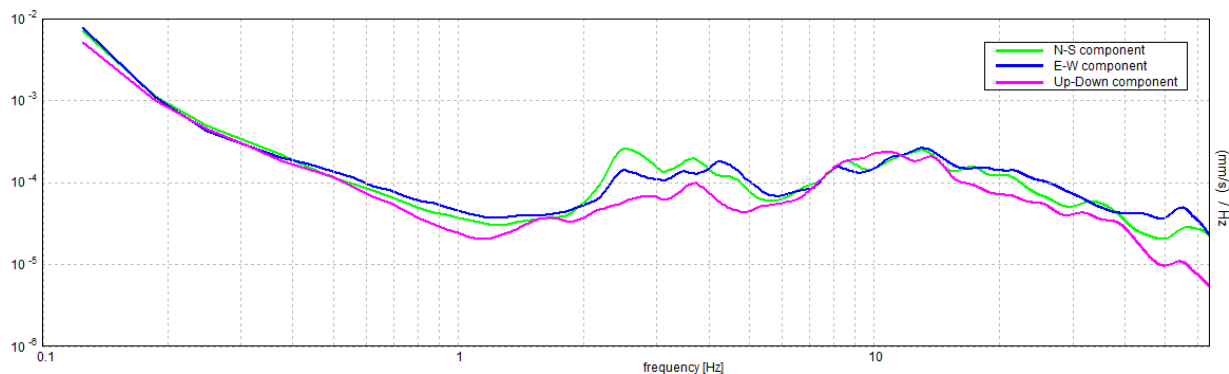Max. H/V at 2.5 ± 0.07 Hz. (In the range 0.1 - 20.0 Hz).
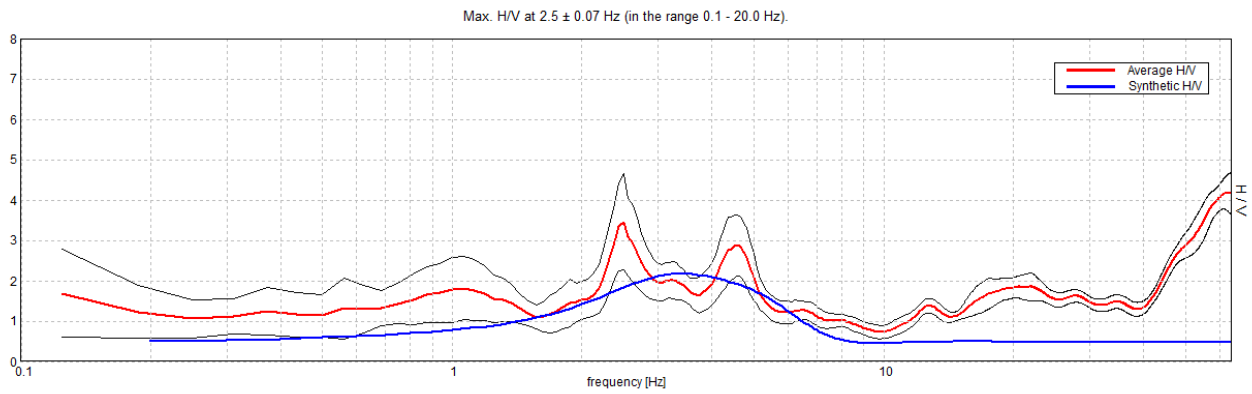

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 2.5 ± 0.07 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.00	4.00	220
11.50	7.50	250
26.50	15.00	440
51.50	25.00	550
inf.	inf.	690

Vs(0.0-30.0)=338m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 2.5 ± 0.07 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.50 > 0.63	**OK**	
$n_c(f_0) > 200$	1760.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 61 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	2.125 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	3.625 Hz	**OK**	
$A_0 > 2$	3.46 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01374| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.03436 < 0.125	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.5839 < 1.58	**OK**	

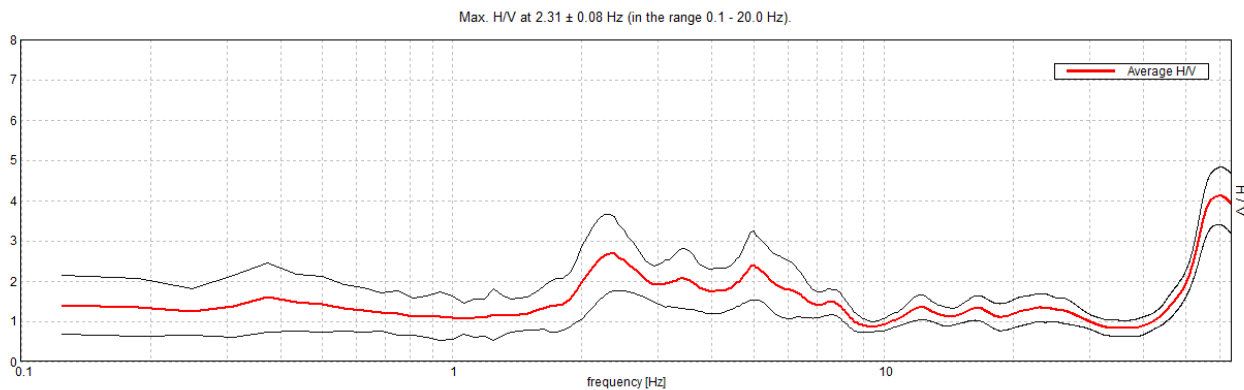|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w \, n_w \, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

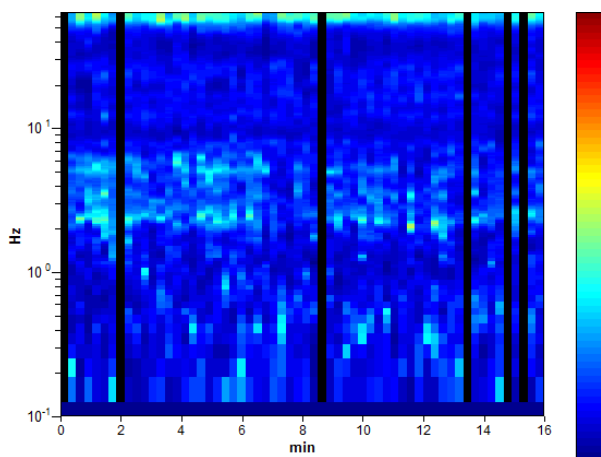| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR14 VADO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 18:11:12   End recording: 15/11/18 18:27:13
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 90% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
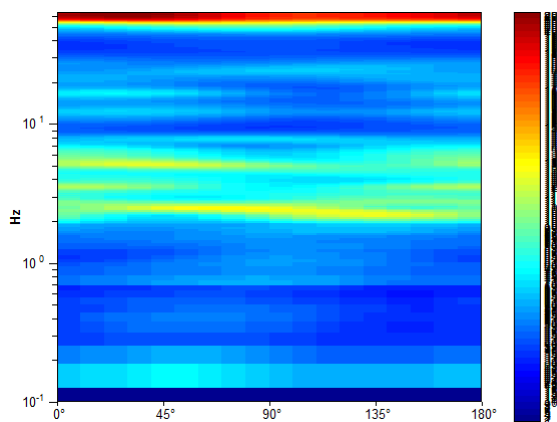Smoothing type: Triangular window
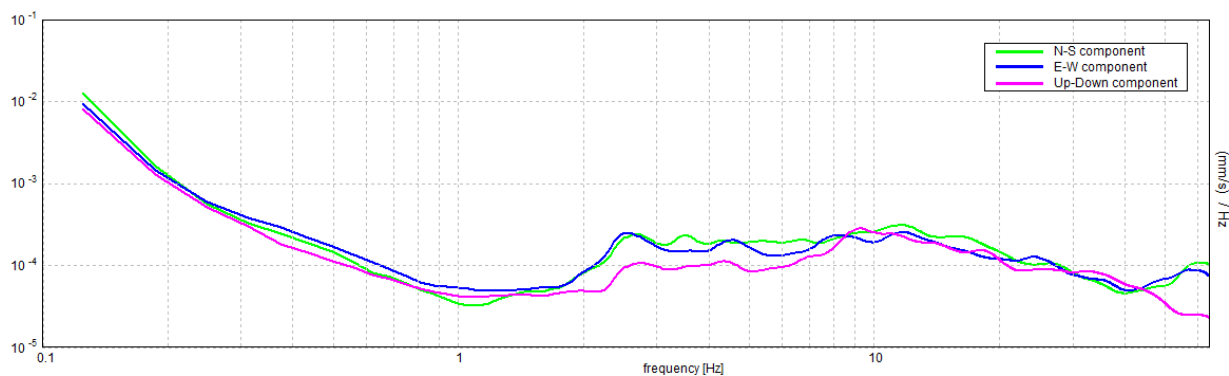Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 2.31 ± 0.08 Hz (in the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 2.31 ± 0.08 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.31 > 0.63	**OK**	
$n_c(f_0) > 200$	1998.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 56 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	1.625 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	8.063 Hz	**OK**	
$A_0 > 2$	2.69 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01722| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.03983 < 0.11563	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.4778 < 1.58	**OK**	

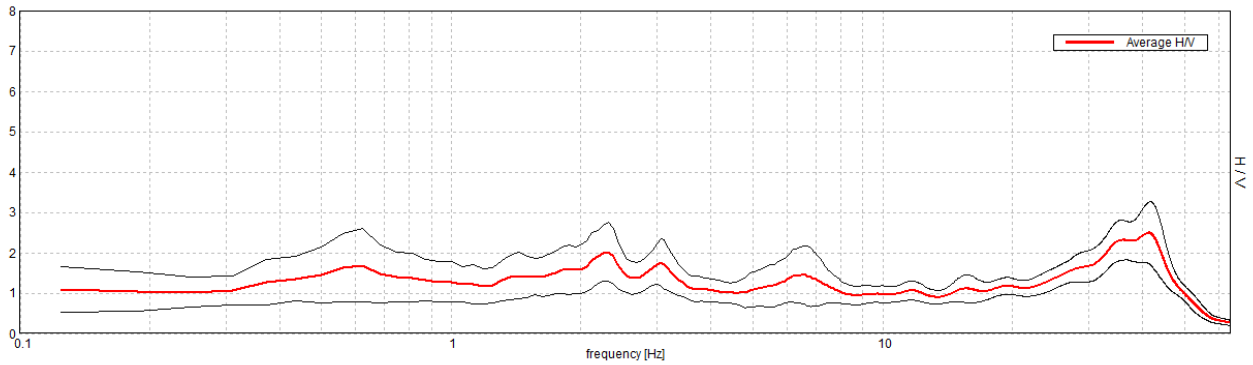|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

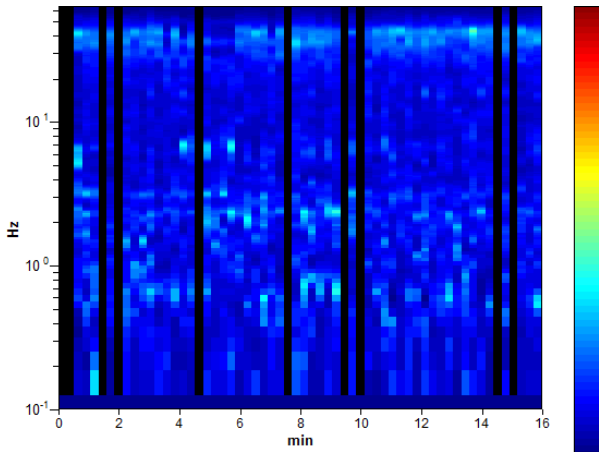## MONZUNO_MS, TR15 MONZUNO CÀ DI CUCCO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 19:07:48   End recording: 15/11/18 19:23:49
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
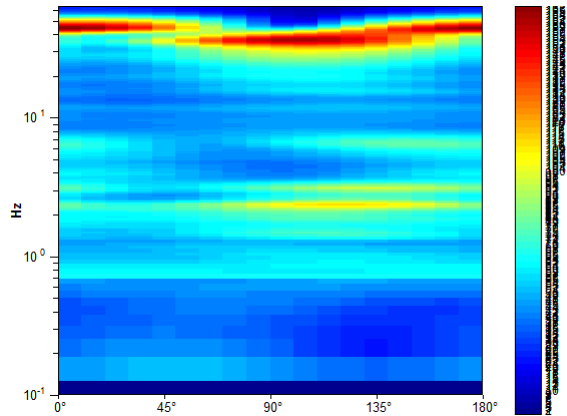Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO
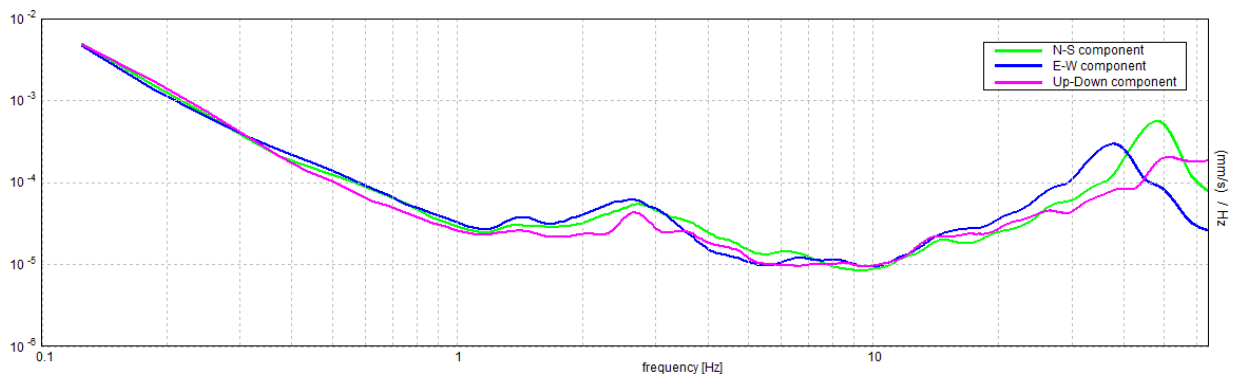
Max. H/V at 2.31 ± 0.23 Hz. (In the range 0.1 - 20.0 Hz).
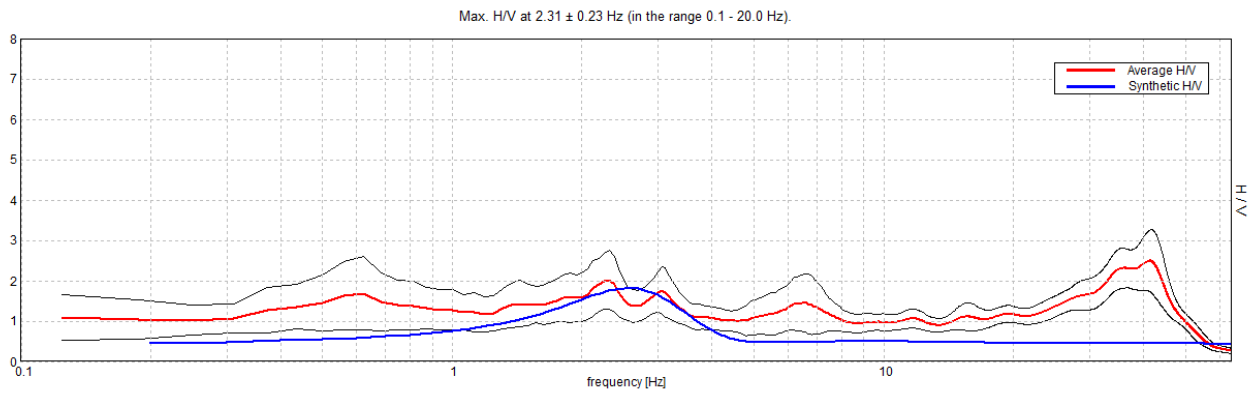

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 2.31 ± 0.23 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
10.00	10.00	450
30.00	20.00	500
55.00	25.00	600
inf.	inf.	850

Vs(0.0-30.0)=482m/s

Vs(0.0-30.0)=482m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 2.31 ± 0.23 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.31 > 0.63	**OK**	
$n_c(f_0) > 200$	1850.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 56 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	4.375 Hz	**OK**	
$A_0 > 2$	2.02 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04883| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.11292 < 0.11563	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3601 < 1.58	**OK**	

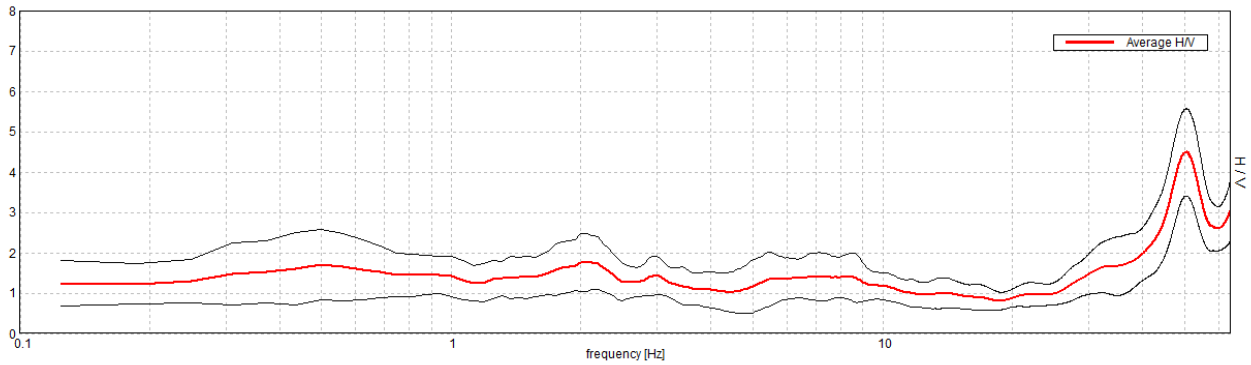|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w \, n_w \, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

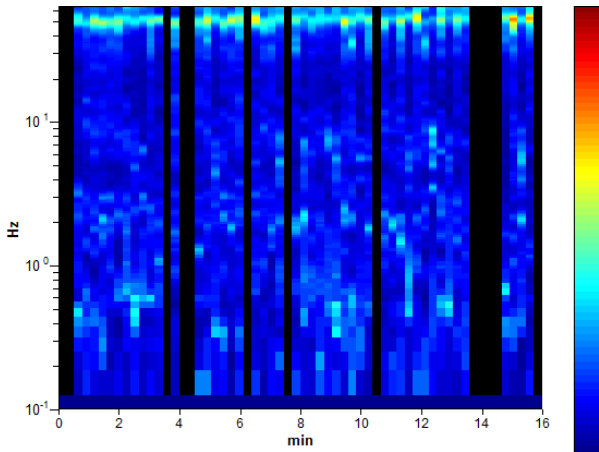| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 \, f_0$	$0.2 \, f_0$	$0.15 \, f_0$	$0.10 \, f_0$	$0.05 \, f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR16 SELVE

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 19:33:12   End recording: 15/11/18 19:49:12
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
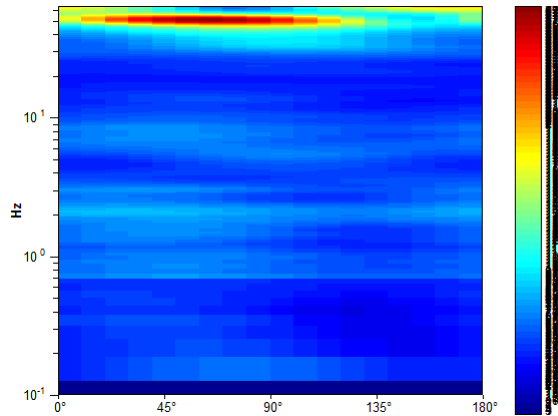
HORIZONTAL TO VERTICAL SPECTRAL RATIO

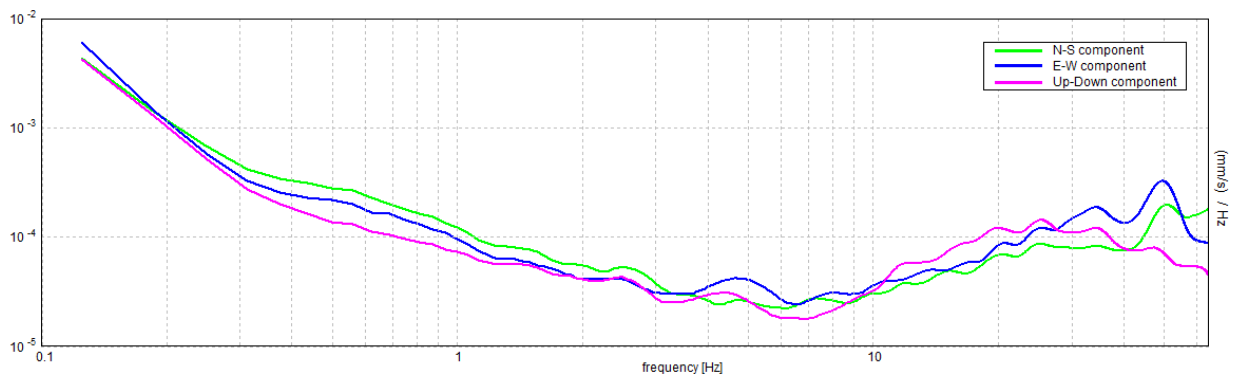Max. H/V at 2.06 ± 0.26 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<div style="border:1px solid black; padding:10px; text-align:center">

Max. H/V at 2.06 ± 0.26 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.06 > 0.63	**OK**	
$n_c(f_0) > 200$	1551.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 50 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	1.76 > 2		**NO**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.06194| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	0.12776 < 0.10313		**NO**
$\sigma_A(f_0) < \theta(f_0)$	0.3504 < 1.58	**OK**	

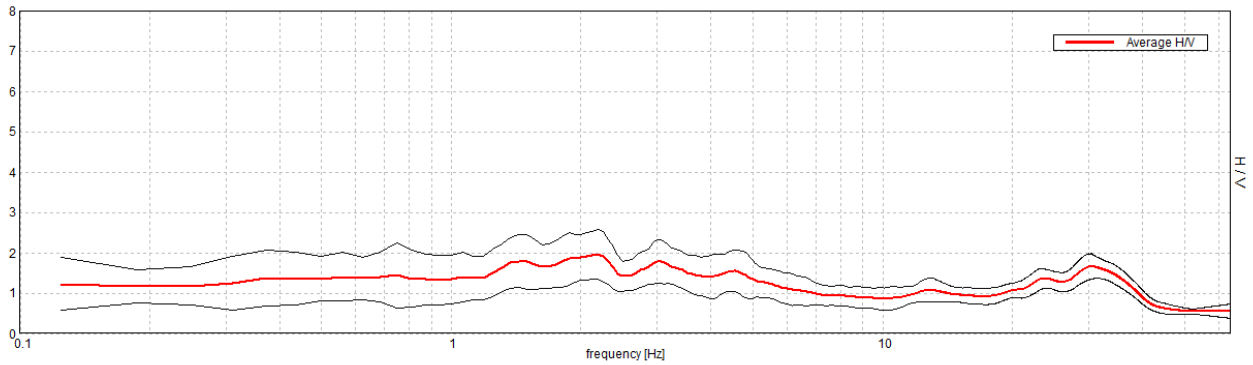|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

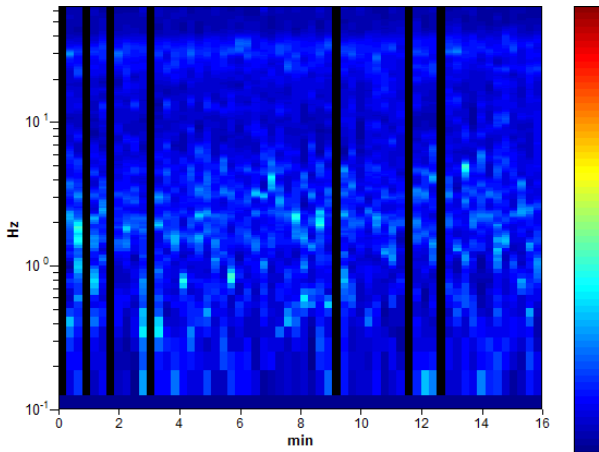## MONZUNO_MS, TR17 SELVE

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 19:58:17   End recording: 15/11/18 20:14:18
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
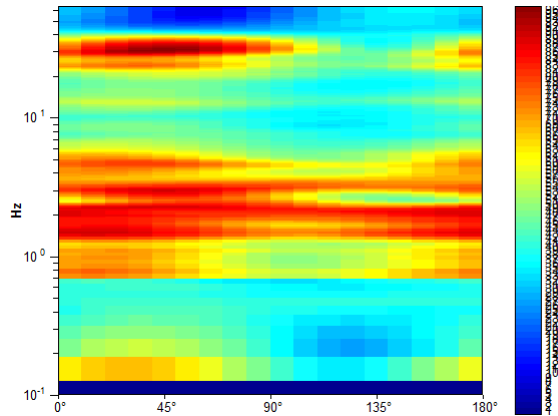Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

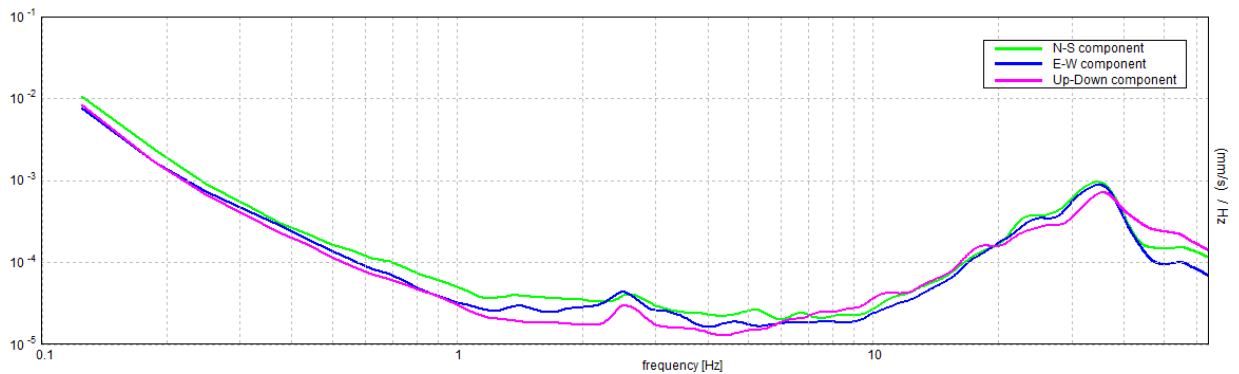Max. H/V at 2.19 ± 0.13 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 2.19 ± 0.13 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.19 > 0.63	**OK**	
$n_c(f_0) > 200$	1855.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 54 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	7.063 Hz	**OK**	
$A_0 > 2$	1.96 > 2		**NO**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03023| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.06613 < 0.10938	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3056 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25\, f_0$	$0.2\, f_0$	$0.15\, f_0$	$0.10\, f_0$	$0.05\, f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR18 SELVE CÀ DI NADALINO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 20:26:47   End recording: 15/11/18 20:42:48
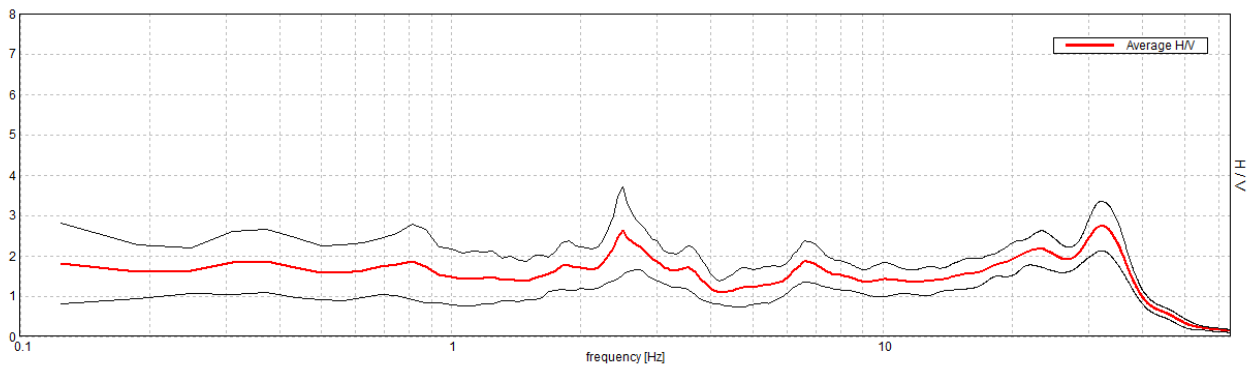Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
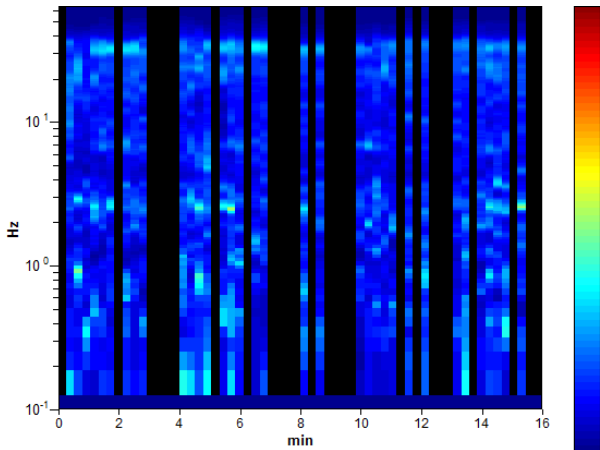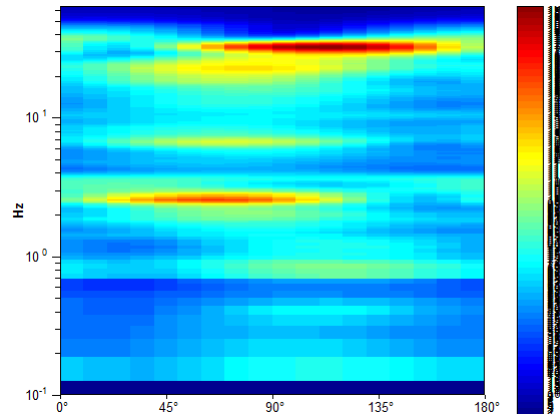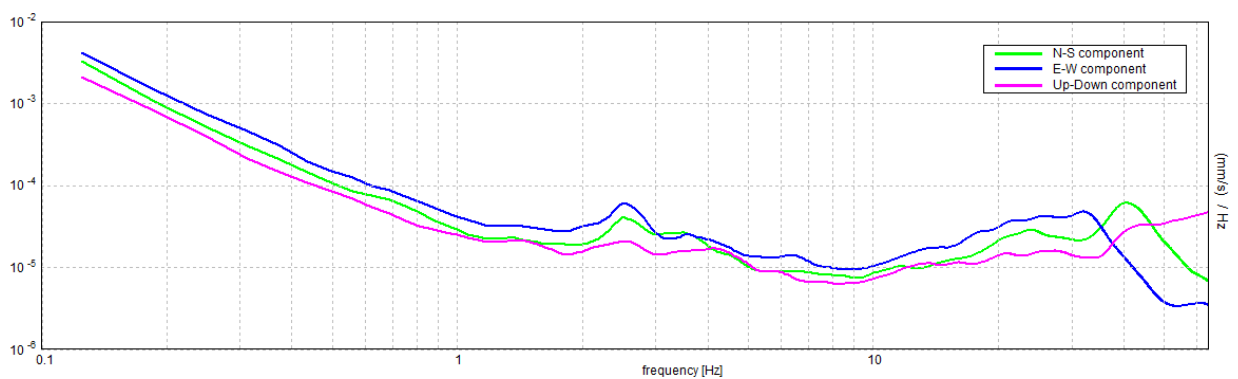Trace length: 0h16'00".   Analyzed 57% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 2.5 ± 0.18 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 2.5 ± 0.18 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.50 > 0.63	**OK**	
$n_c(f_0) > 200$	1360.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 61 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	3.938 Hz	**OK**	
$A_0 > 2$	2.62 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03438| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.08595 < 0.125	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.529 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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MONZUNO_MS, TR19 TRE FASCI

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 20:51:42   End recording: 15/11/18 21:07:43
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 93% trace (manual window selection)
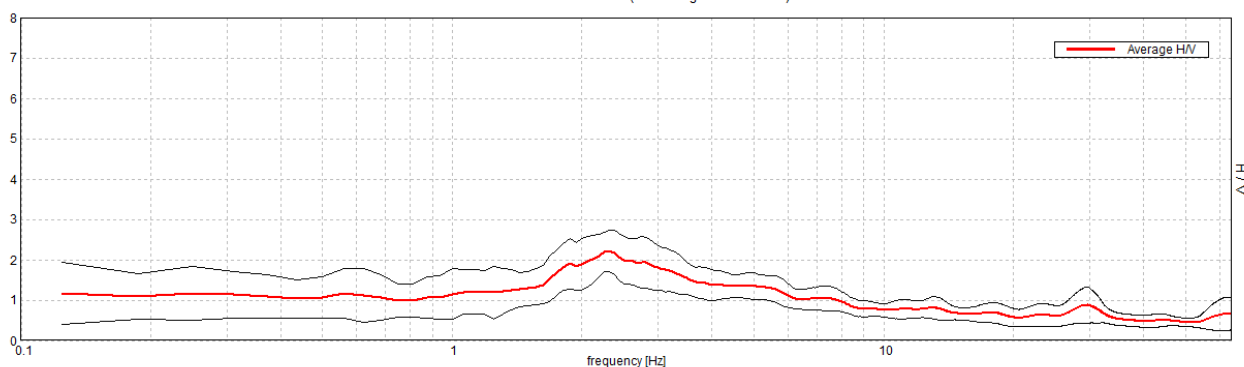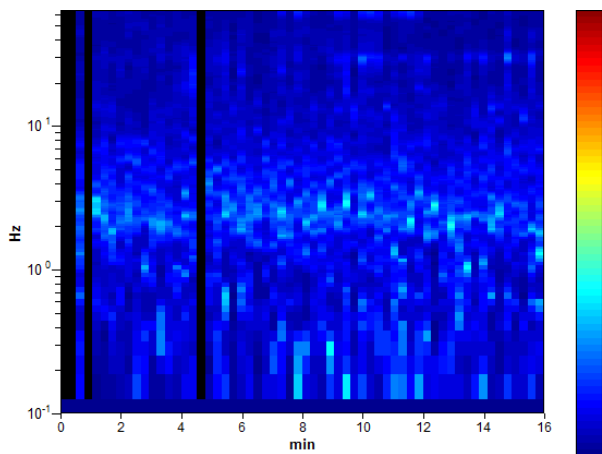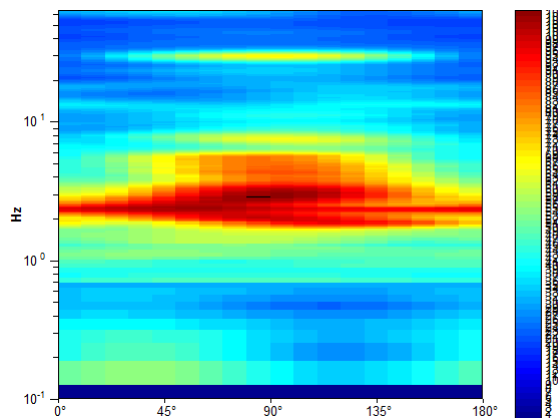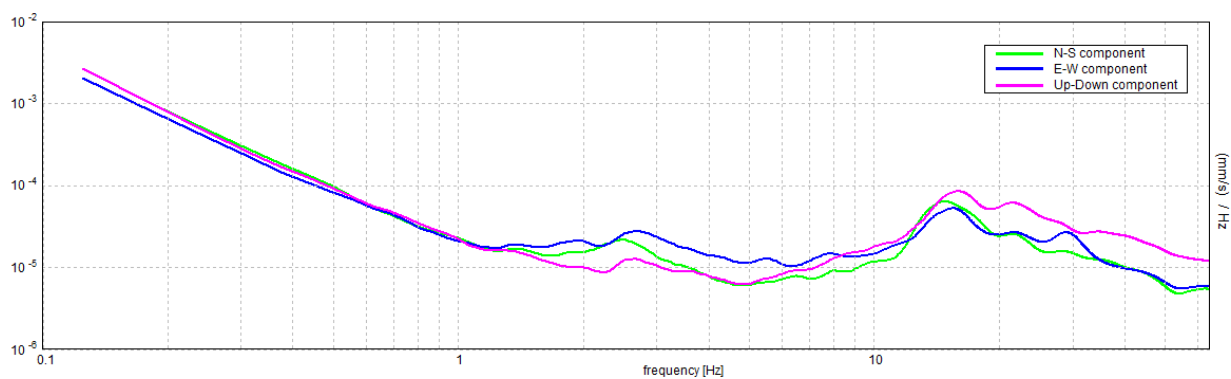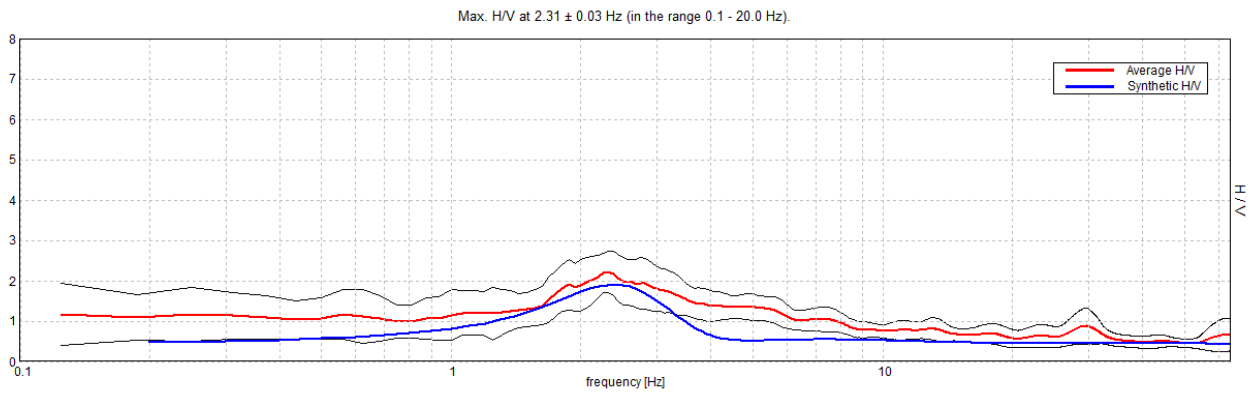Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

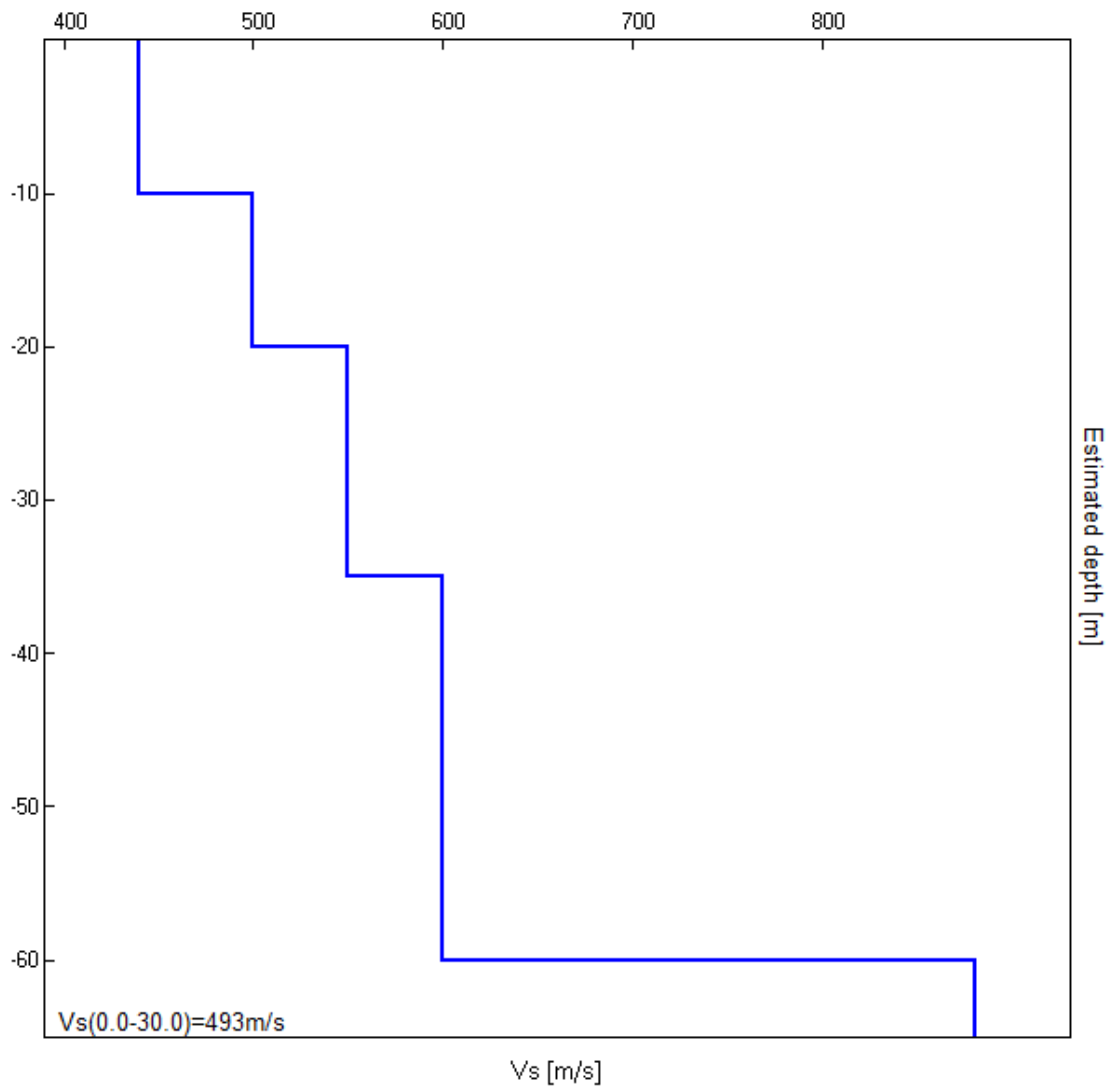Max. H/V at 2.31 ± 0.03 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 2.31 ± 0.03 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
10.00	10.00	440
20.00	10.00	500
35.00	15.00	550
60.00	25.00	600
inf.	inf.	880

Vs(0.0-30.0)=493m/s

Vs(0.0-30.0)=493m/s

Vs [m/s]

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 2.31 ± 0.03 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve			
[All 3 should be fulfilled]			
$f_0 > 10 / L_w$	2.31 > 0.63	**OK**	
$n_c(f_0) > 200$	2072.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 56 times	**OK**	

Criteria for a clear H/V peak			
[At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	0.938 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	6.063 Hz	**OK**	
$A_0 > 2$	2.23 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$\mid 0.00581 \mid < 0.05$	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.01344 < 0.11563	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.2518 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

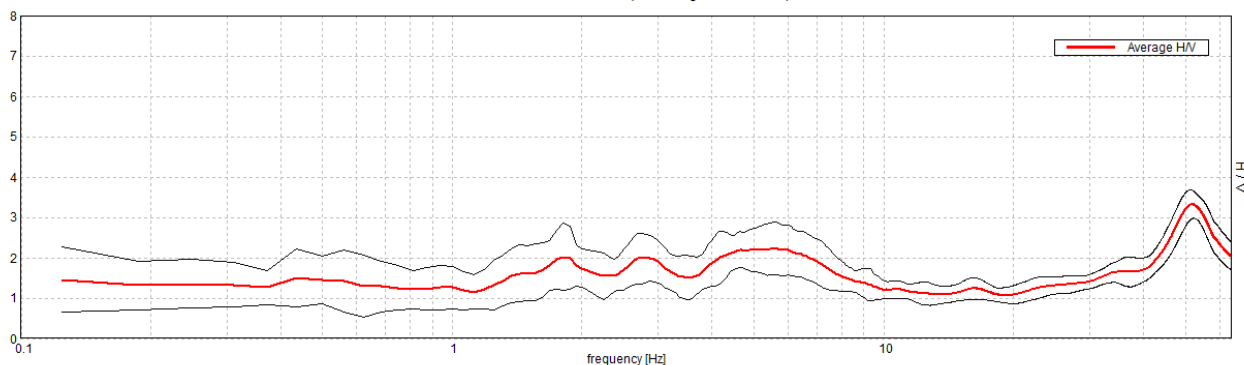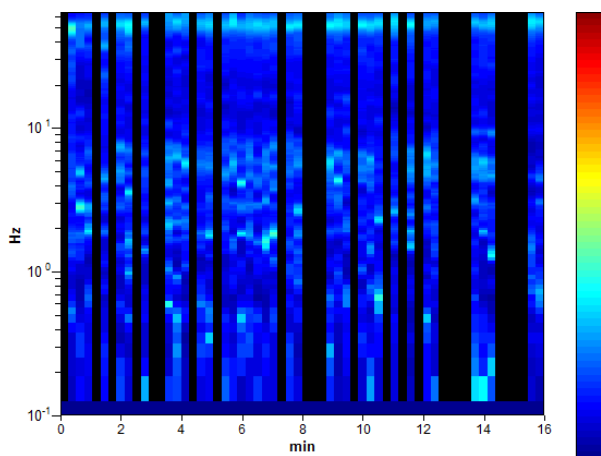| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR13 MONZUNO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 17:31:25   End recording: 15/11/18 17:47:25
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 60% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
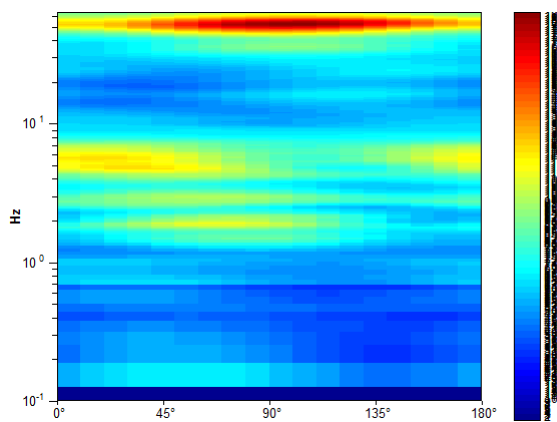
HORIZONTAL TO VERTICAL SPECTRAL RATIO

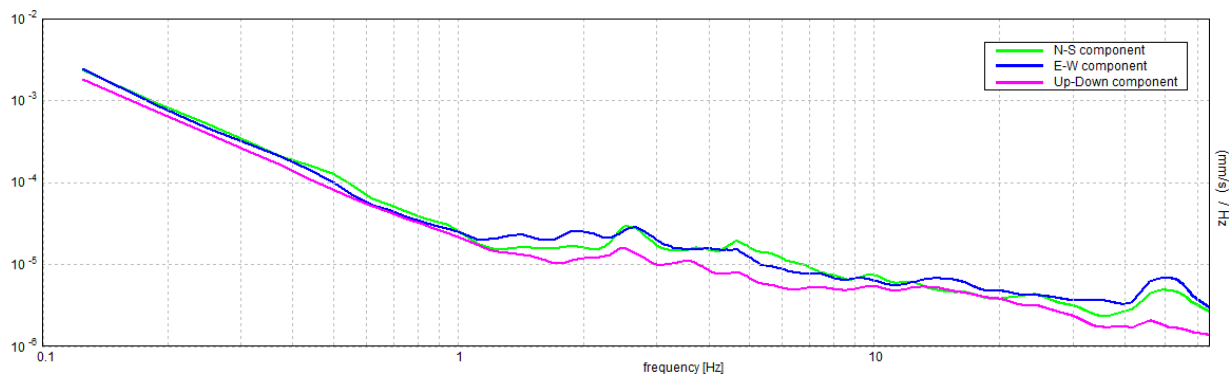Max. H/V at 5.63 ± 0.67 Hz. (In the range 0.1 - 20.0 Hz).
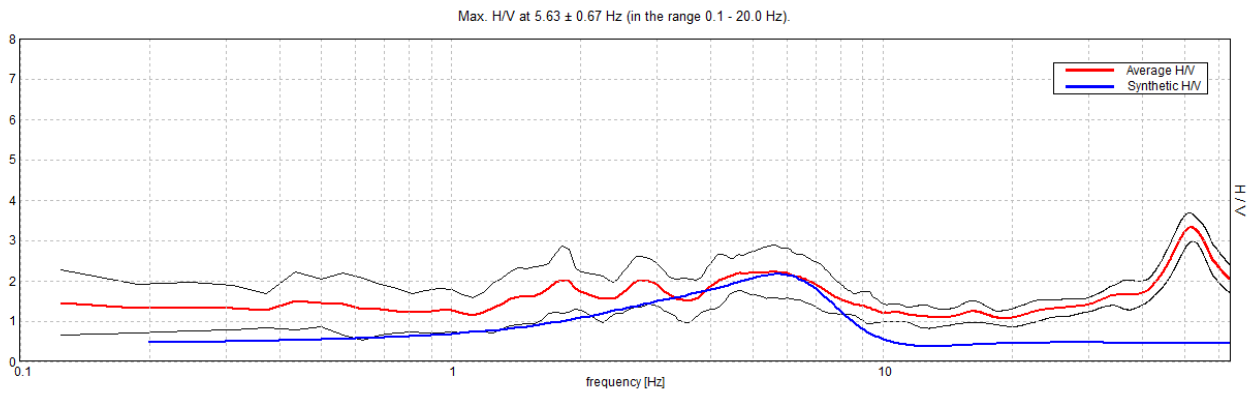

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 5.63 ± 0.67 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
9.50	9.50	290
23.00	13.50	500
63.00	40.00	670
inf.	inf.	790

Vs(0.0-30.0)=427m/s

Vs(0.0-30.0)=427m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 5.63 ± 0.67 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	5.63 > 0.63	**OK**	
$n_c(f_0) > 200$	3240.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 136 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	12.5 Hz	**OK**	
$A_0 > 2$	2.23 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.05752| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	0.32354 < 0.28125		**NO**
$\sigma_A(f_0) < \theta(f_0)$	0.3199 < 1.58	**OK**	

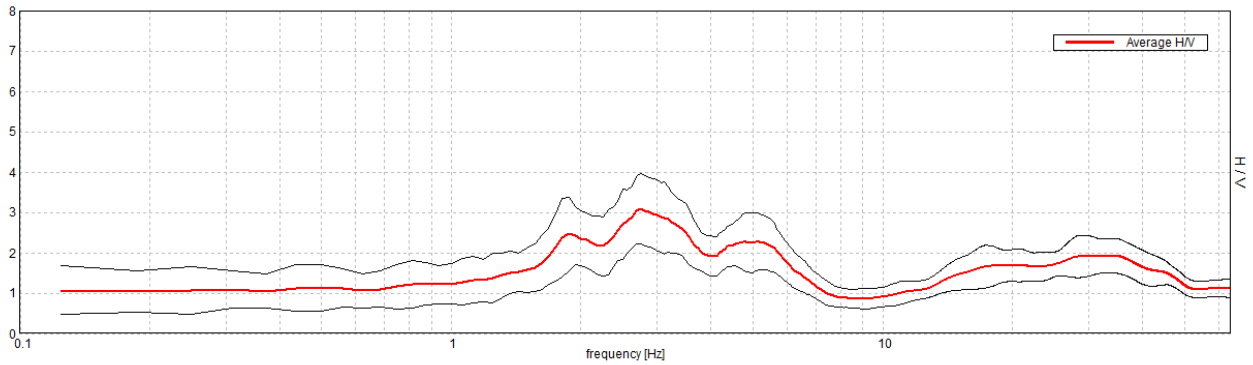|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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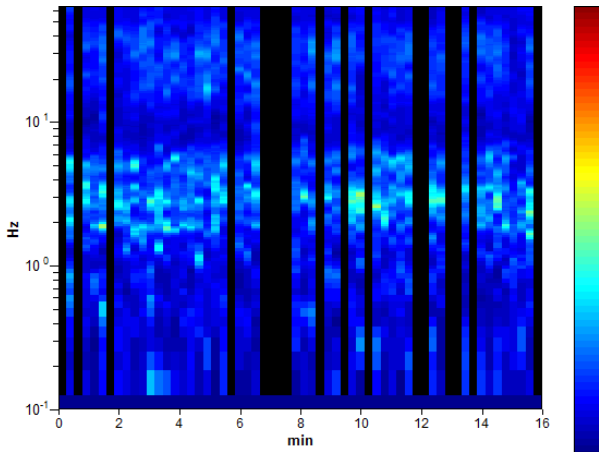## MONZUNO_MS, TR36 EX-BOCCIOFILA

Instrument: TRZ-0108/01-10
Start recording: 11/12/18 11:50:01   End recording: 11/12/18 12:06:02
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00''.   Analyzed 72% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

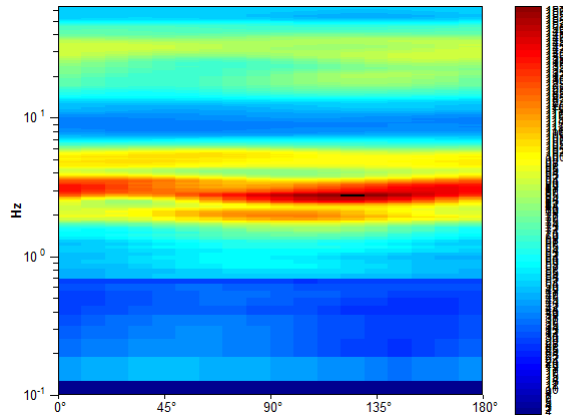### HORIZONTAL TO VERTICAL SPECTRAL RATIO

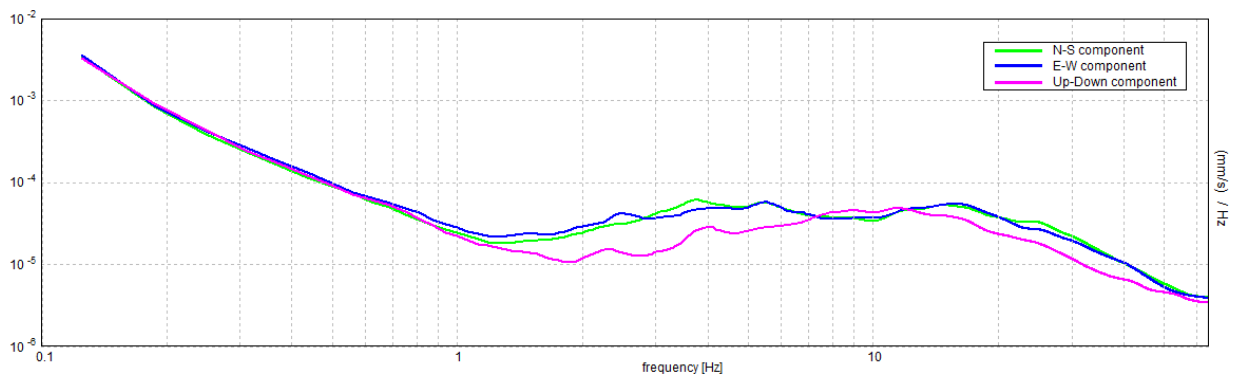Max. H/V at 2.75 ± 0.12 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 2.75 ± 0.12 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.75 > 0.63	OK	
$n_c(f_0) > 200$	1892.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 67 times	OK	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	1.438 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	6.313 Hz	OK	
$A_0 > 2$	3.09 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02152| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.05918 < 0.1375	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.4259 < 1.58	OK	

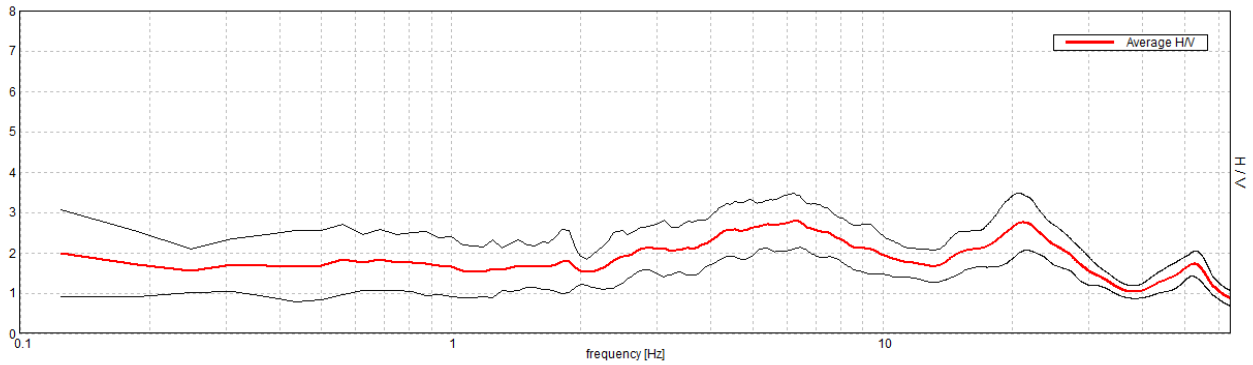|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

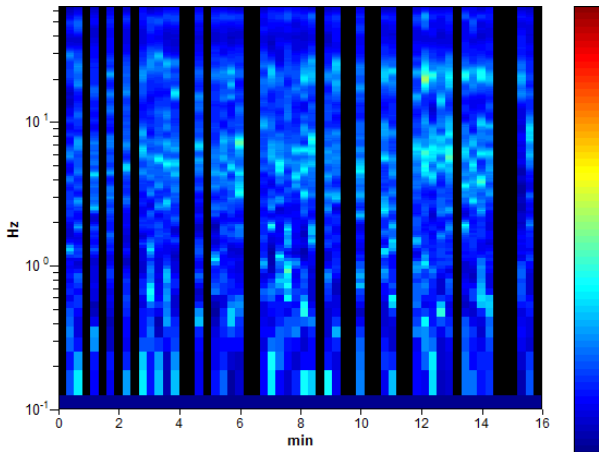| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR11 MONZUNO

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 16:41:42   End recording: 15/11/18 16:57:43
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 63% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
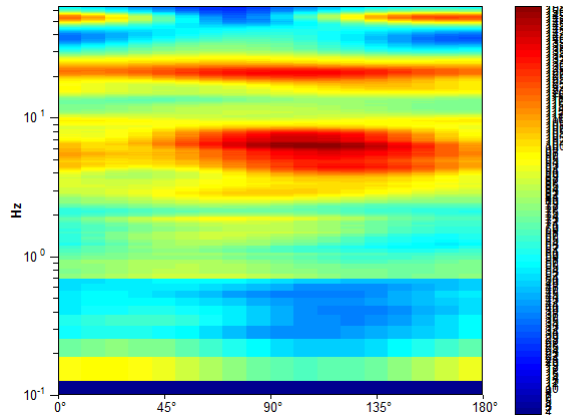Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

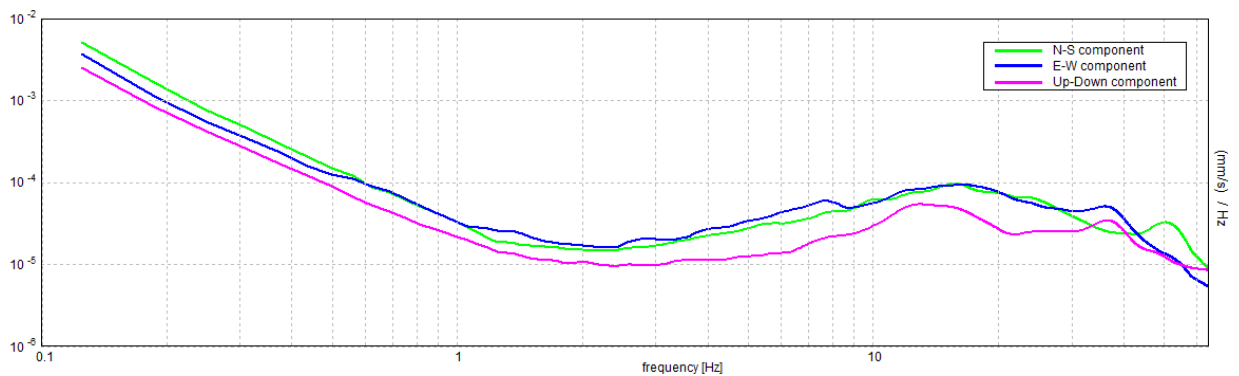Max. H/V at 6.25 ± 0.57 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 6.25 ± 0.57 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	6.25 > 0.63	**OK**	
$n_c(f_0) > 200$	3800.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 151 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	2.78 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.04442| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.27761 < 0.3125	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3352 < 1.58	**OK**	

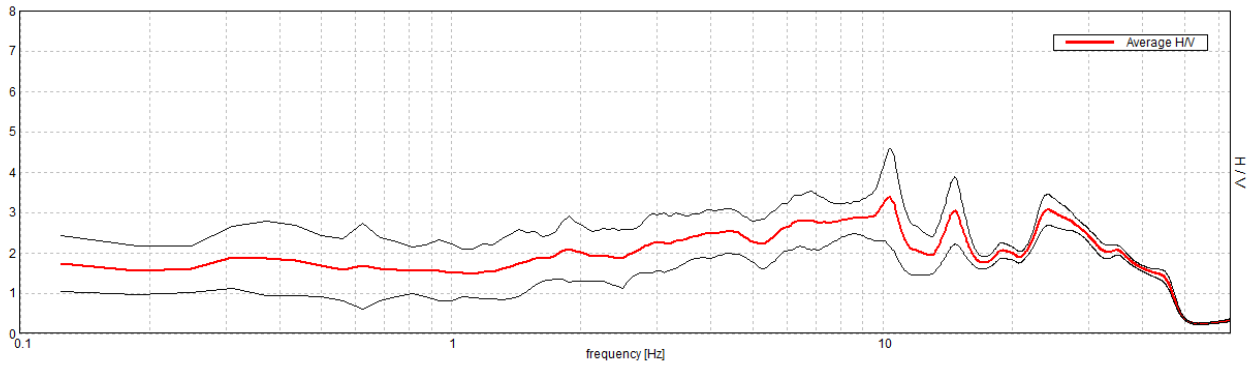|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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MONZUNO_MS, TR12 MONZUNO
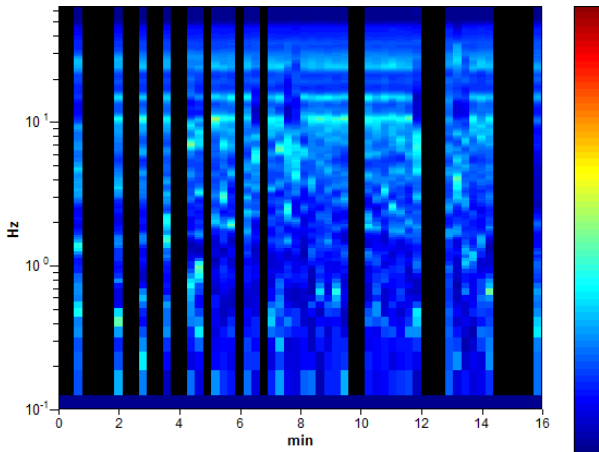
Instrument: TRZ-0108/01-10
Start recording: 15/11/18 17:04:09   End recording: 15/11/18 17:20:10
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 58% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

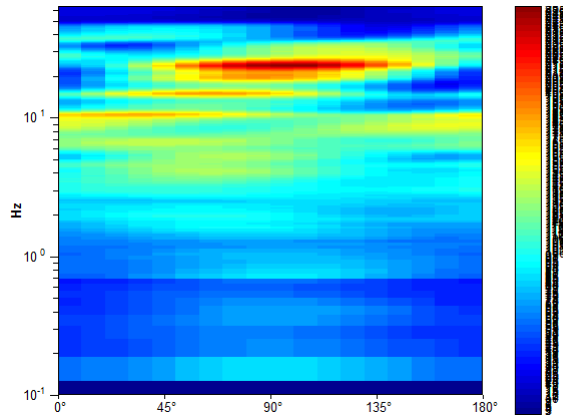### HORIZONTAL TO VERTICAL SPECTRAL RATIO

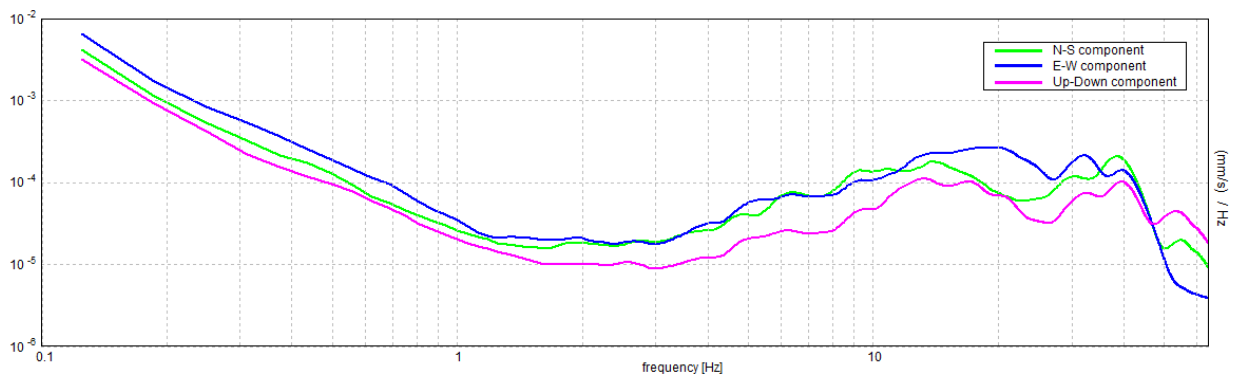Max. H/V at 10.38 ± 0.79 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 10.38 ± 0.79 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	10.38 > 0.63	**OK**	
$n_c(f_0) > 200$	5810.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 250 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	38.813 Hz	**OK**	
$A_0 > 2$	3.37 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03705| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.38443 < 0.51875	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.5814 < 1.58	**OK**	

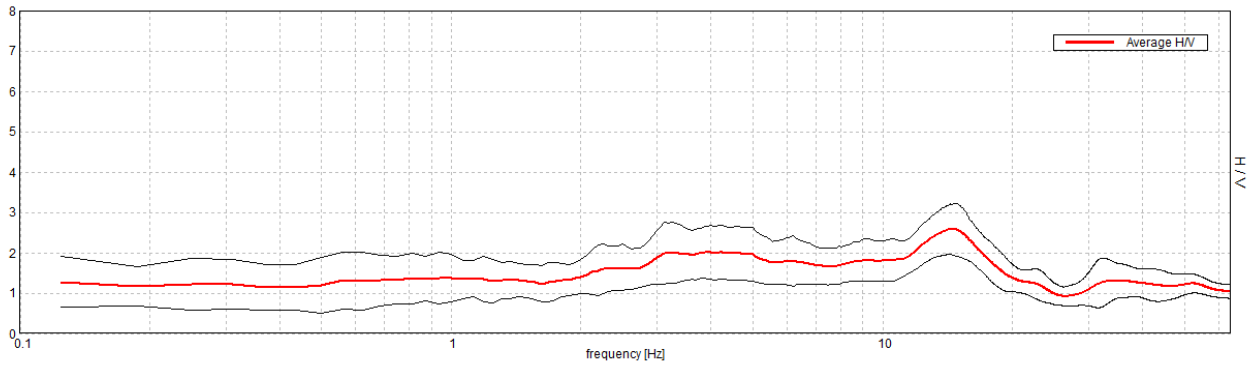|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

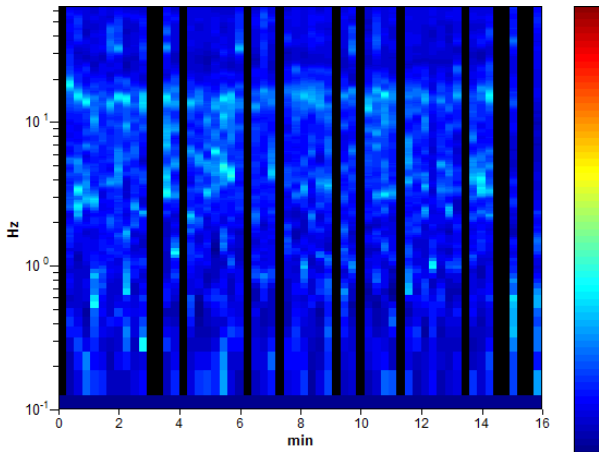037044P152HVSR166

MONZUNO_MS, TR23 MONZUNO

Instrument: TRZ-0108/01-10
Start recording: 17/11/18 14:30:44   End recording: 17/11/18 14:46:45
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

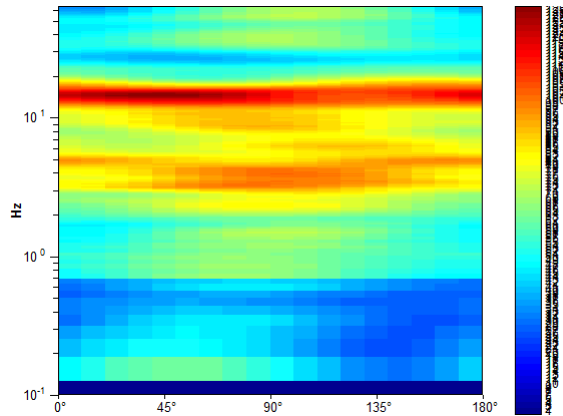## HORIZONTAL TO VERTICAL SPECTRAL RATIO

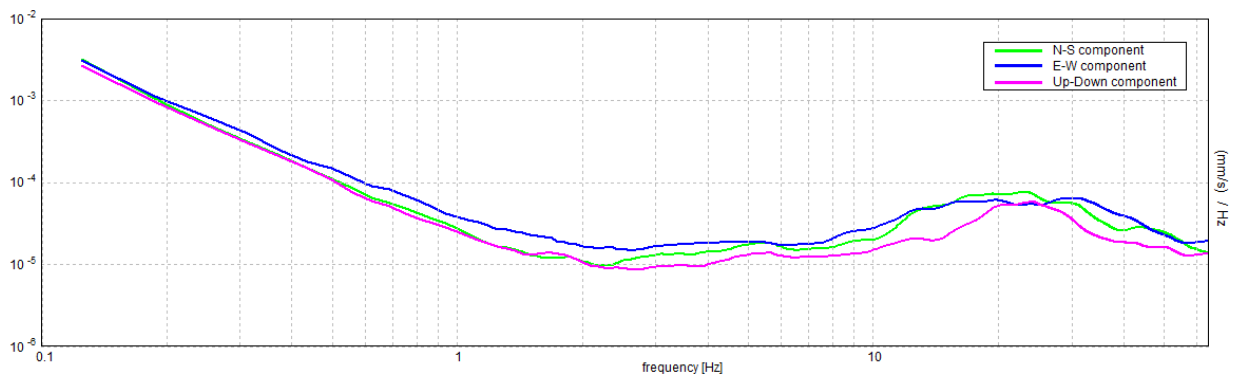Max. H/V at 14.38 ± 0.56 Hz. (In the range 0.1 - 20.0 Hz).
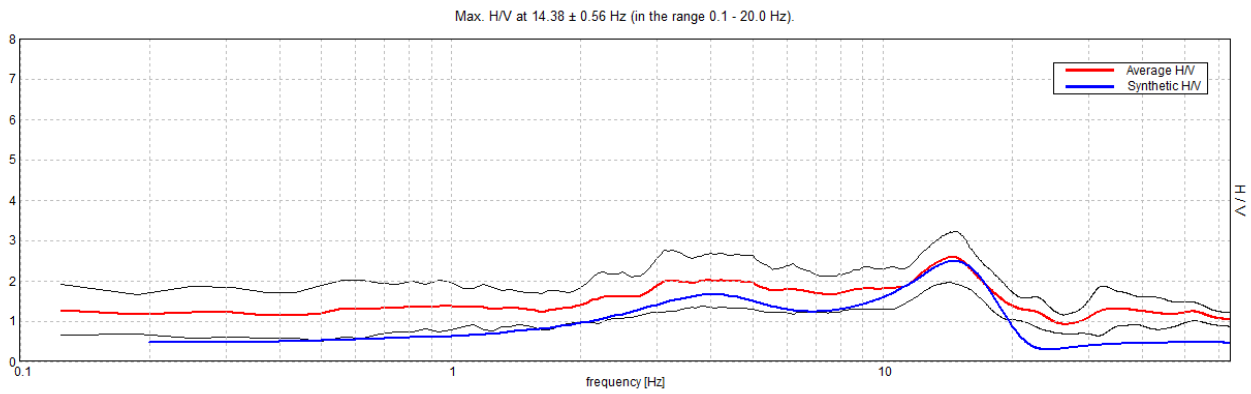

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 14.38 ± 0.56 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.20	4.20	235
19.20	15.00	500
44.20	25.00	660
inf.	inf.	850

Vs(0.0-30.0)=467m/s

Vs(0.0-30.0)=467m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 14.38 ± 0.56 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	14.38 > 0.63	**OK**	
$n_c(f_0) > 200$	10580.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 346 times	**OK**	

Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	20.938 Hz	**OK**	
$A_0 > 2$	2.58 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01914| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.27507 < 0.71875	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3079 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w \, n_w \, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR10 MONZUNO VIA VERGA

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 14:43:45   End recording: 15/11/18 14:59:46
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 65% trace (manual window selection)
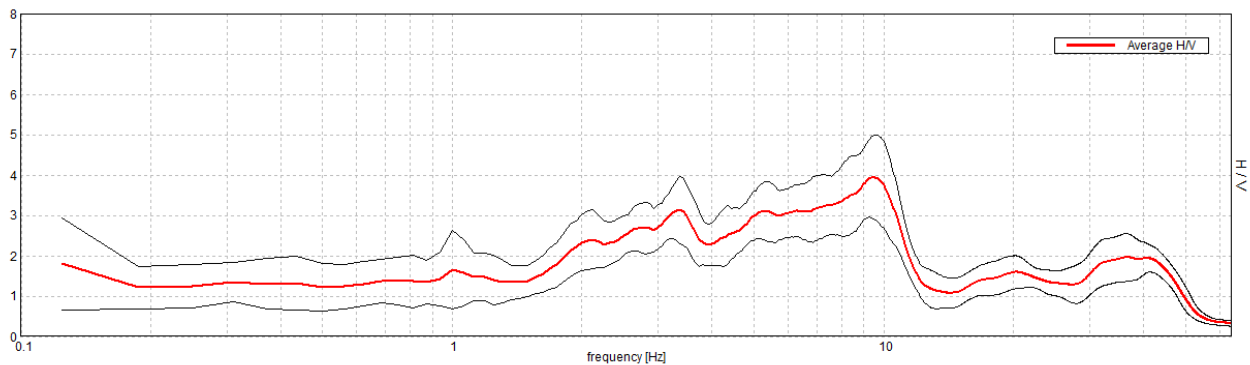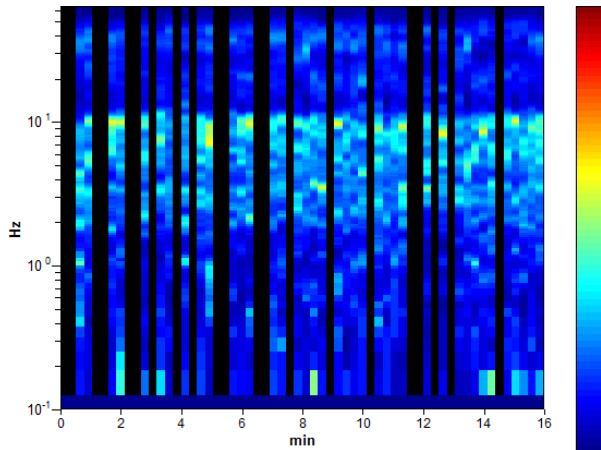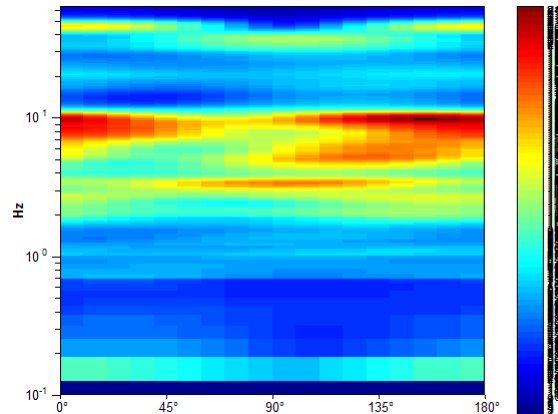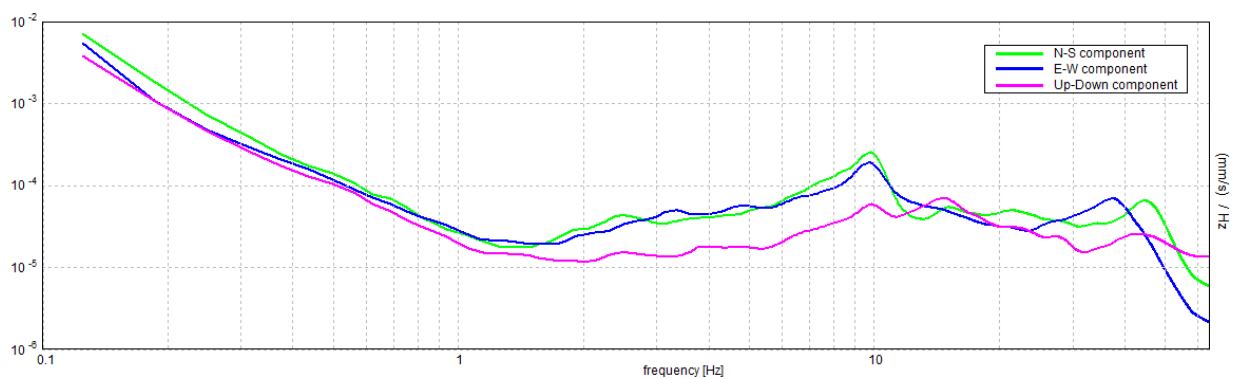Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 9.38 ± 0.43 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 9.38 ± 0.43 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	9.38 > 0.63	**OK**	
$n_c(f_0) > 200$	5850.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 226 times	**OK**	

Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	11.5 Hz	**OK**	
$A_0 > 2$	3.94 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0222| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.20817 < 0.46875	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.4939 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

TROMINO® *Grilla*
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MONZUNO_MS, TR37 MONZUNO CAMPO SPORTIVO

Instrument: TRZ-0108/01-10
Start recording: 11/12/18 13:36:32   End recording: 11/12/18 13:52:33
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00''.   Analyzed 78% trace (manual window selection)
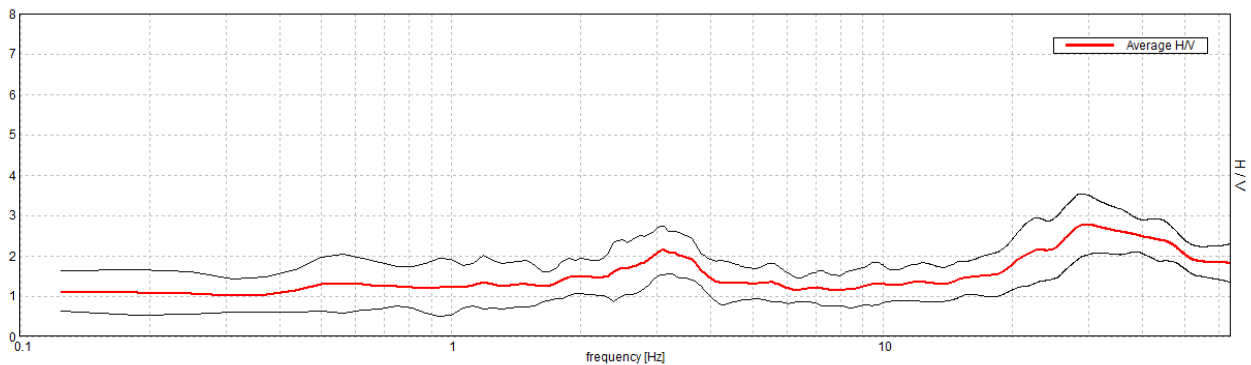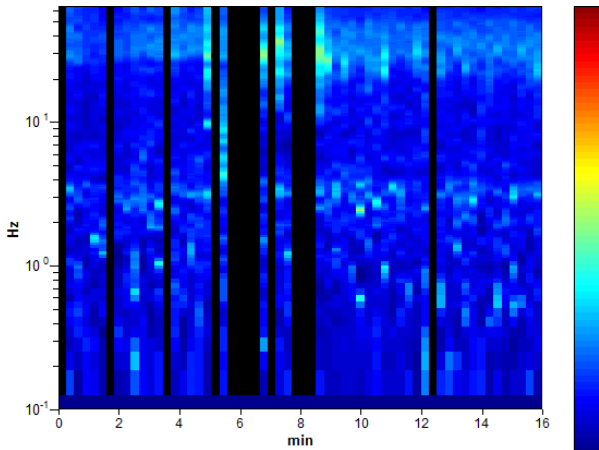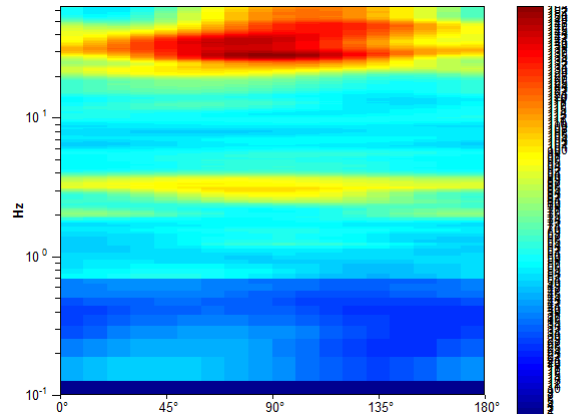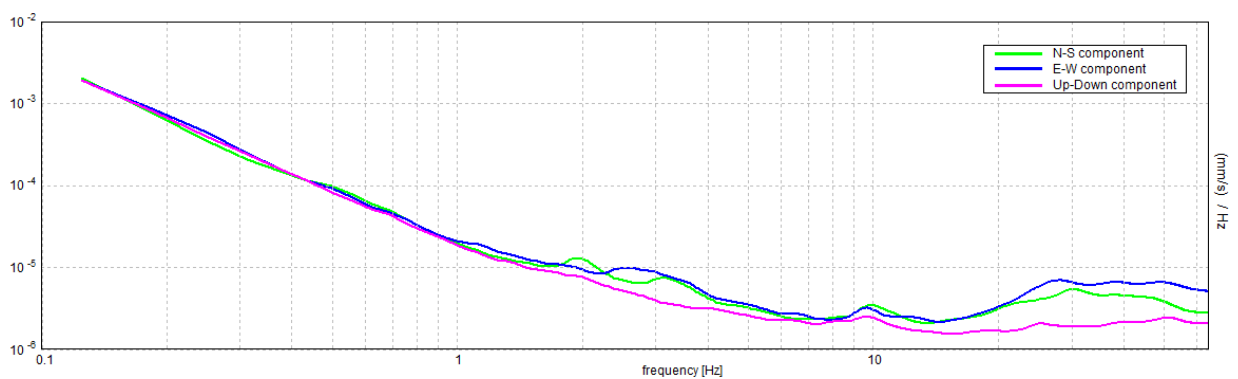Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 3.13 ± 0.05 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 3.13 ± 0.05 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.13 > 0.63	**OK**	
$n_c(f_0) > 200$	2350.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 76 times	**OK**	

Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	2.13 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00793| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.02477 < 0.15625	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.2945 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

TROMINO® Grilla
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MONZUNO_MS, TR24 SERRA TRASASSO

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 09:37:44   End recording: 19/11/18 09:53:45
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 80% trace (manual window selection)
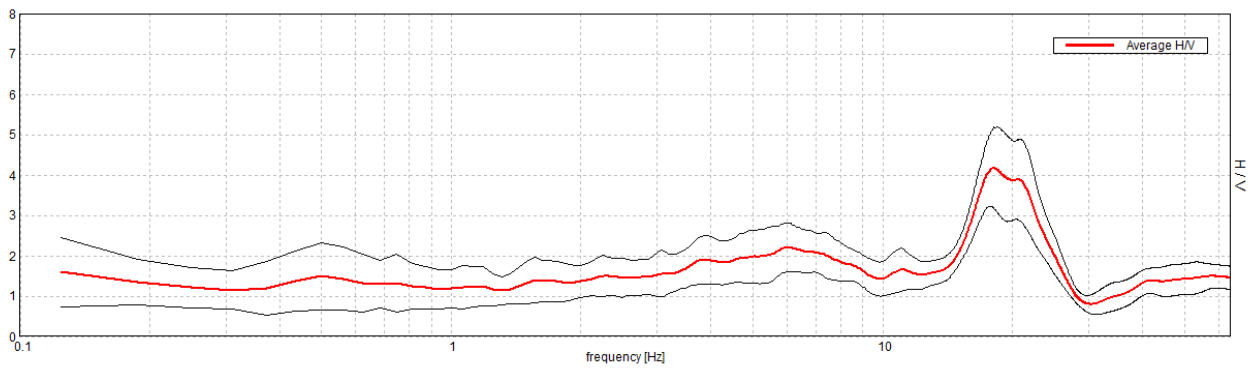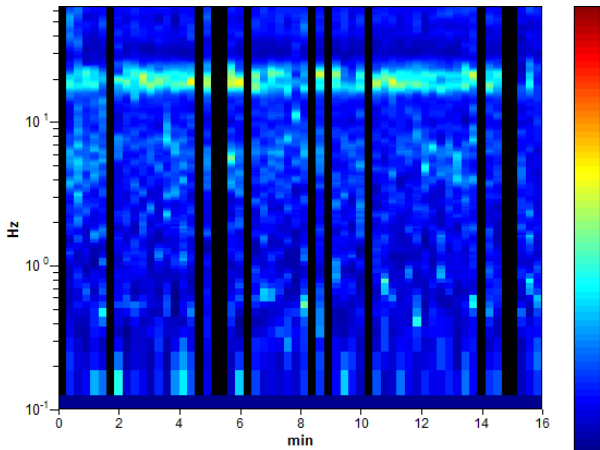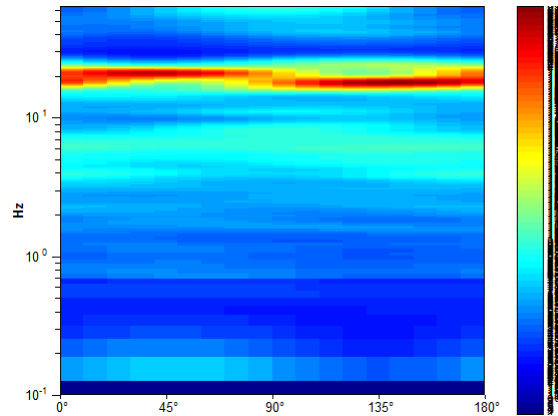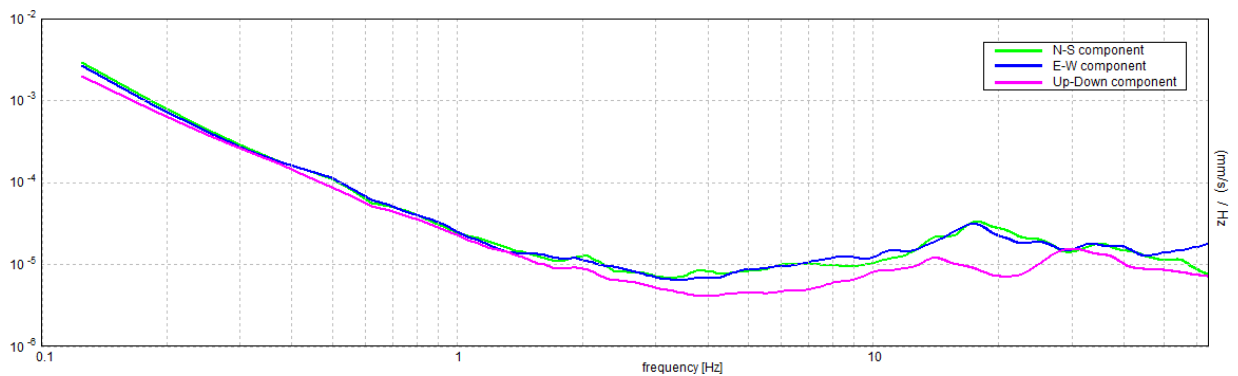Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 18.13 ± 0.09 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 18.13 ± 0.09 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	18.13 > 0.63	**OK**	
$n_c(f_0) > 200$	13920.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 436 times	**OK**	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	15.0 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	24.875 Hz	**OK**	
$A_0 > 2$	4.18 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00235| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.04251 < 0.90625	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.4934 < 1.58	**OK**	

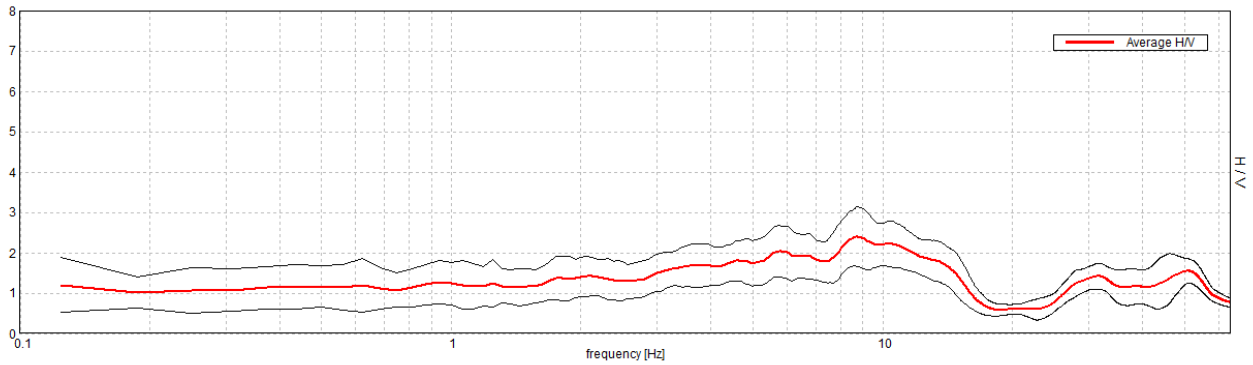|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

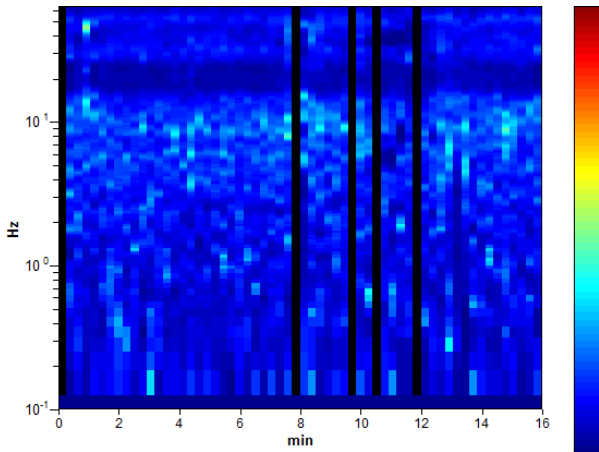| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25\,f_0$	$0.2\,f_0$	$0.15\,f_0$	$0.10\,f_0$	$0.05\,f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR26 TRASASSO

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 10:31:27   End recording: 19/11/18 10:47:28
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00''.   Analyzed 92% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
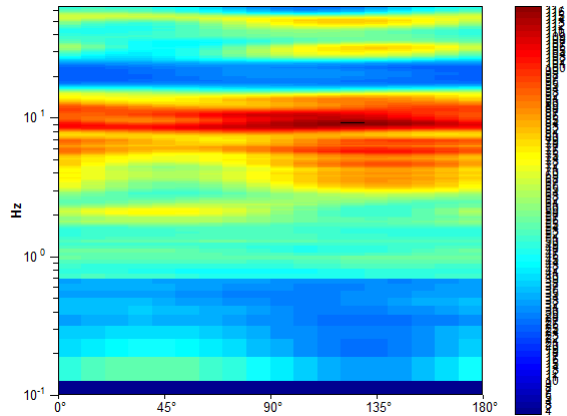Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

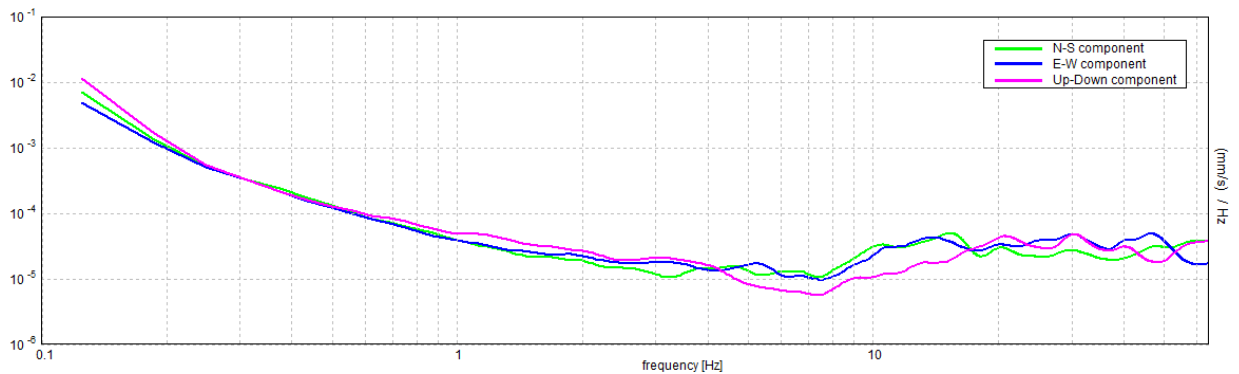Max. H/V at 8.75 ± 0.46 Hz. (In the range 0.1 - 20.0 Hz).
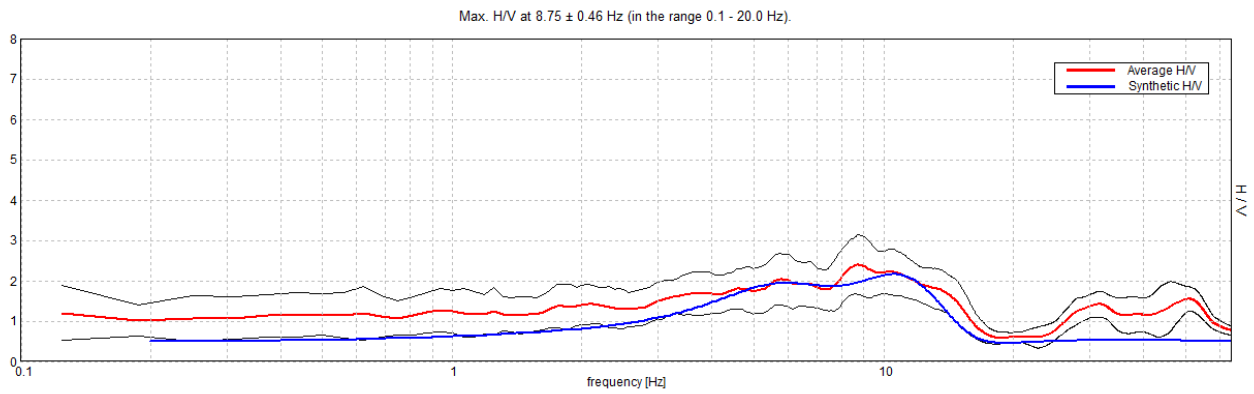

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 8.75 ± 0.46 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
1.00	1.00	210
5.00	4.00	225
9.00	4.00	450
19.00	10.00	530
30.00	11.00	620
inf.	inf.	820

Vs(0.0-30.0)=441m/s

Vs(0.0-30.0)=441m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 8.75 ± 0.46 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	8.75 > 0.63	**OK**	
$n_c(f_0) > 200$	7700.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 211 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	15.5 Hz	**OK**	
$A_0 > 2$	2.40 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02573| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.2251 < 0.4375	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3707 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w \, n_w \, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR25 CÀ NASCETTI

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 10:07:40   End recording: 19/11/18 10:23:41
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
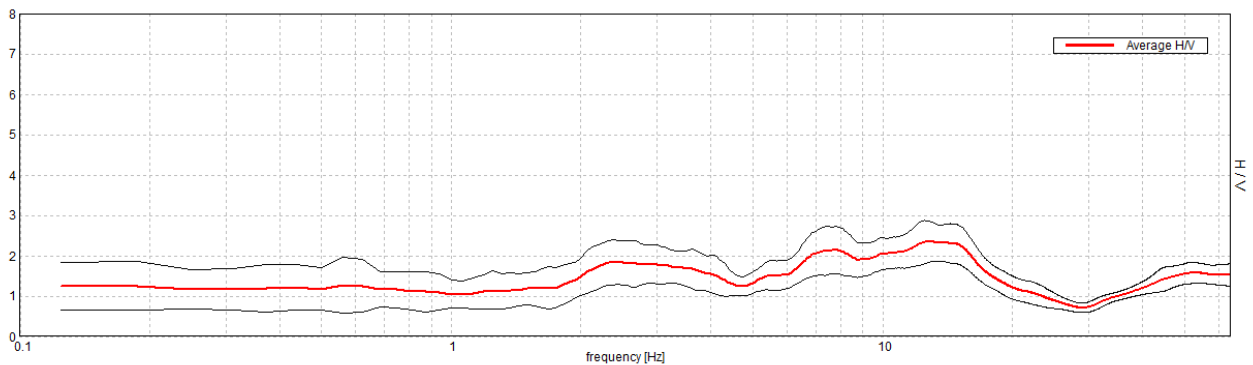Trace length: 0h16'00''.   Analyzed 90% trace (manual window selection)
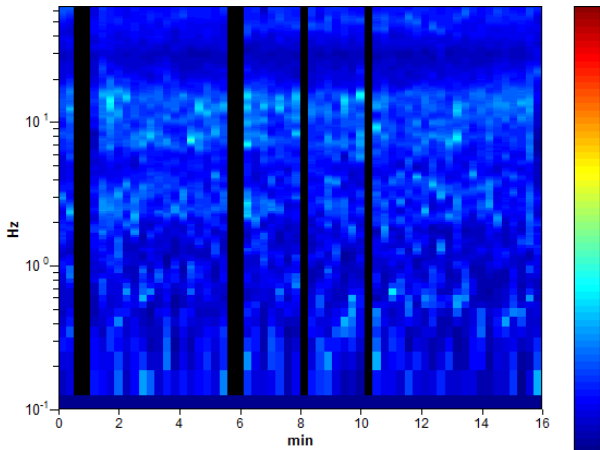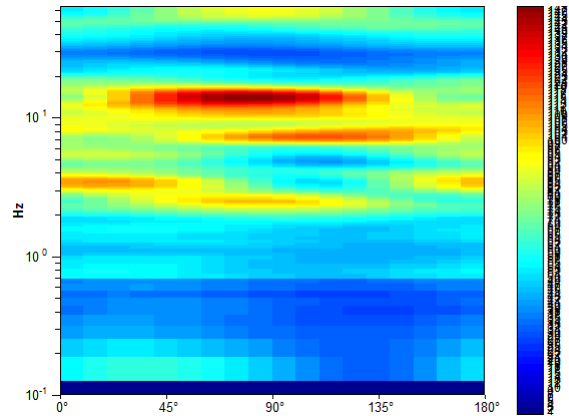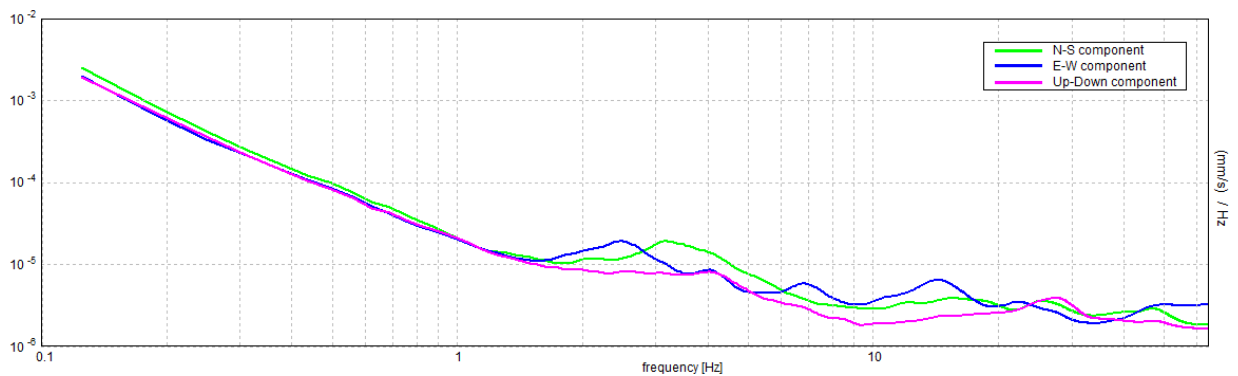Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 12.75 ± 0.49 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 12.75 ± 0.49 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
3.70	3.70	205
15.70	12.00	440
inf.	inf.	595

Vs(0.0-30.0)=433m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 12.75 ± 0.49 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	12.75 > 0.63	**OK**	
$n_c(f_0) > 200$	11016.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 307 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	20.438 Hz	**OK**	
$A_0 > 2$	2.35 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01893| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.2413 < 0.6375	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.2547 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR28 VALLE

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 11:30:18   End recording: 19/11/18 11:46:19
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00".   Analyzed 90% trace (manual window selection)
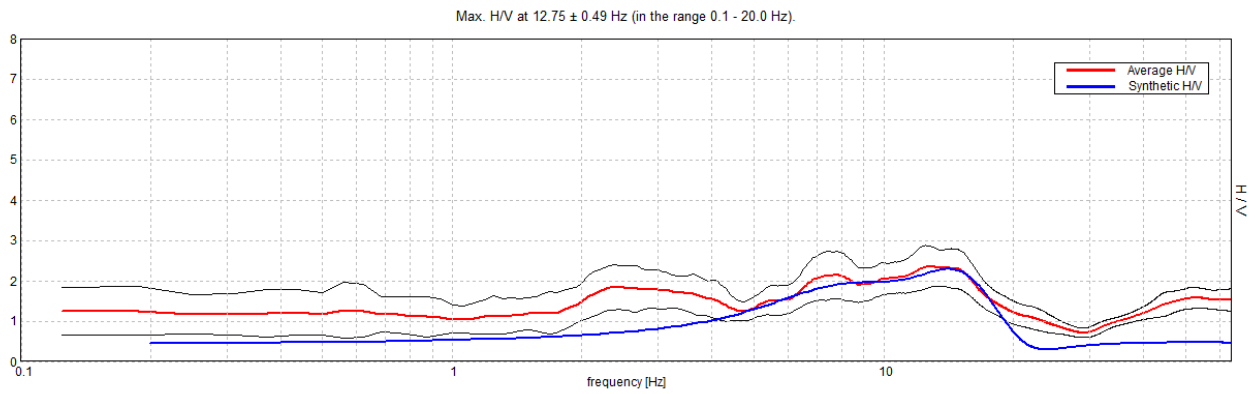Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO
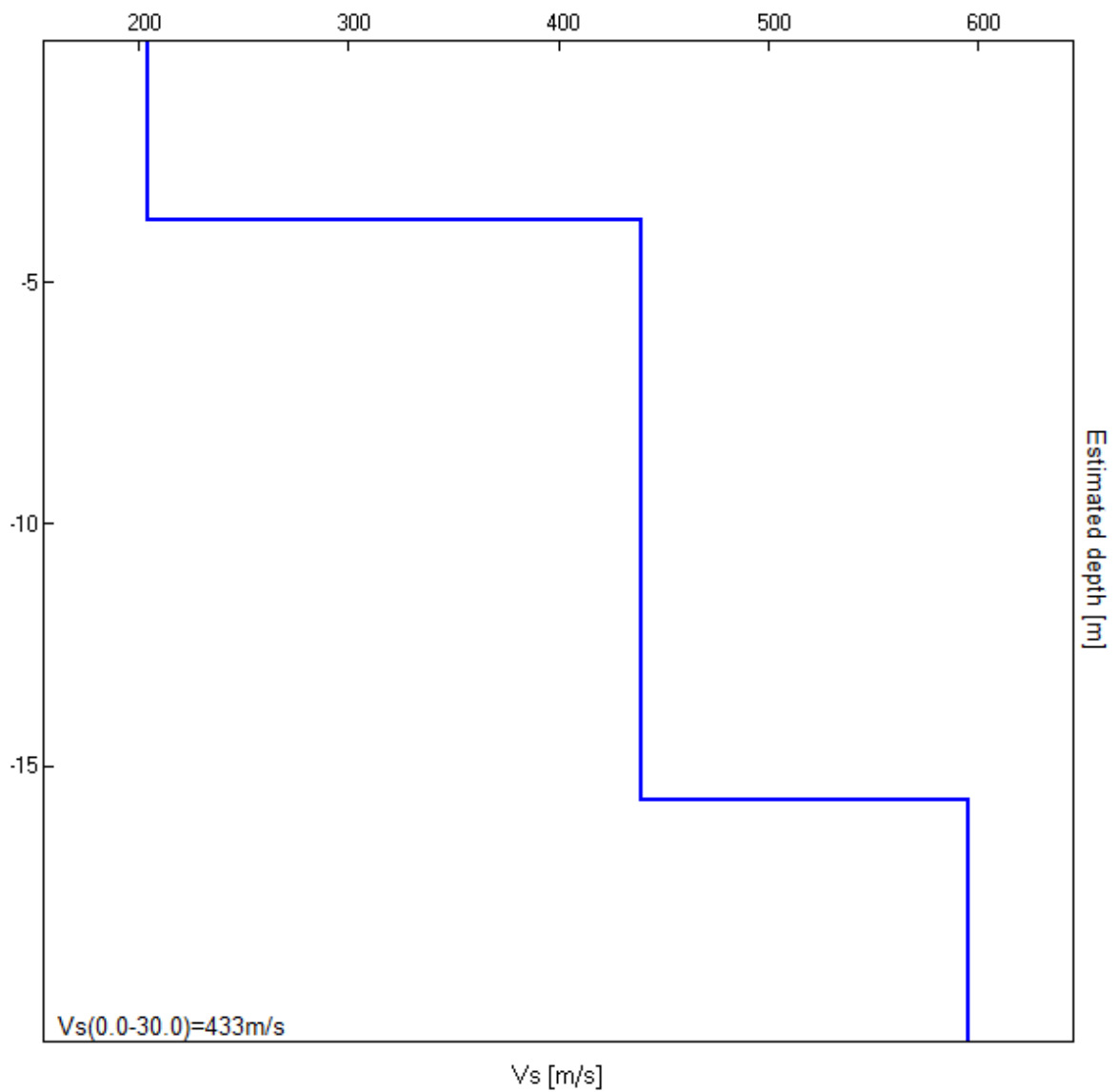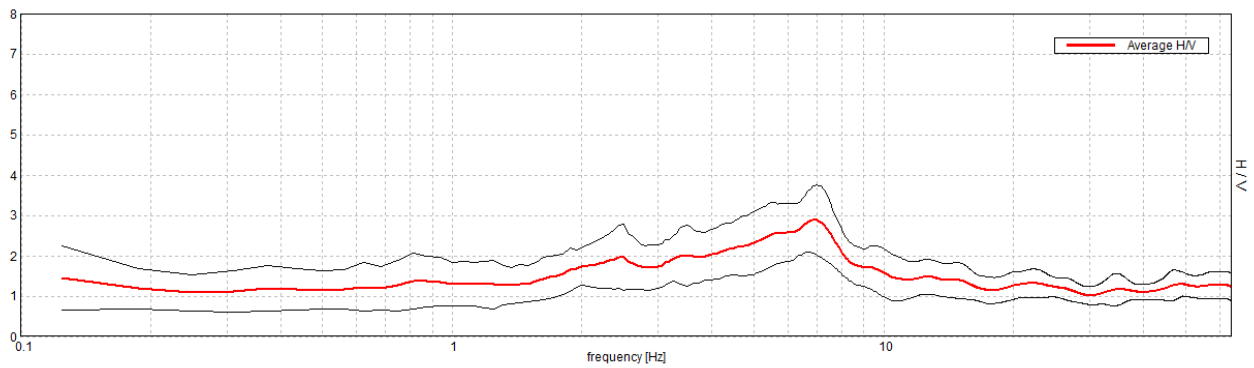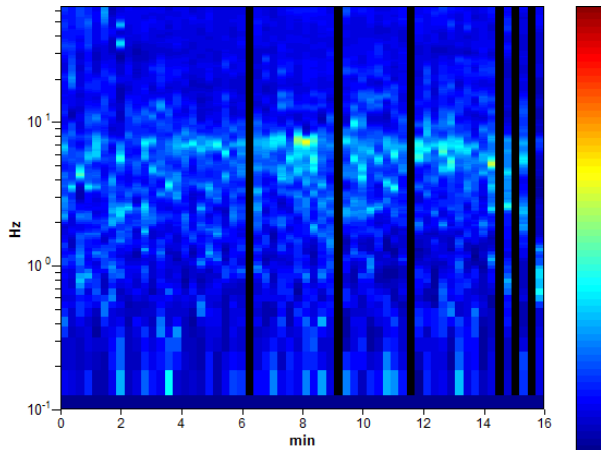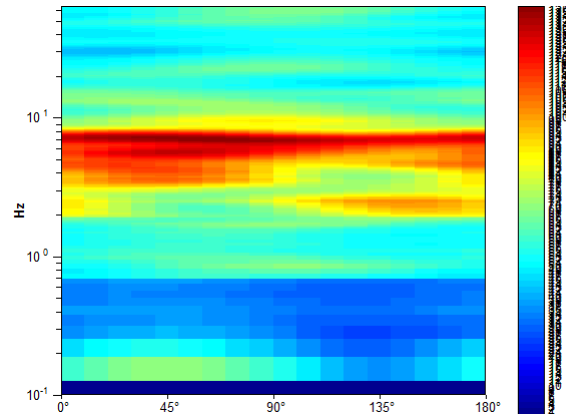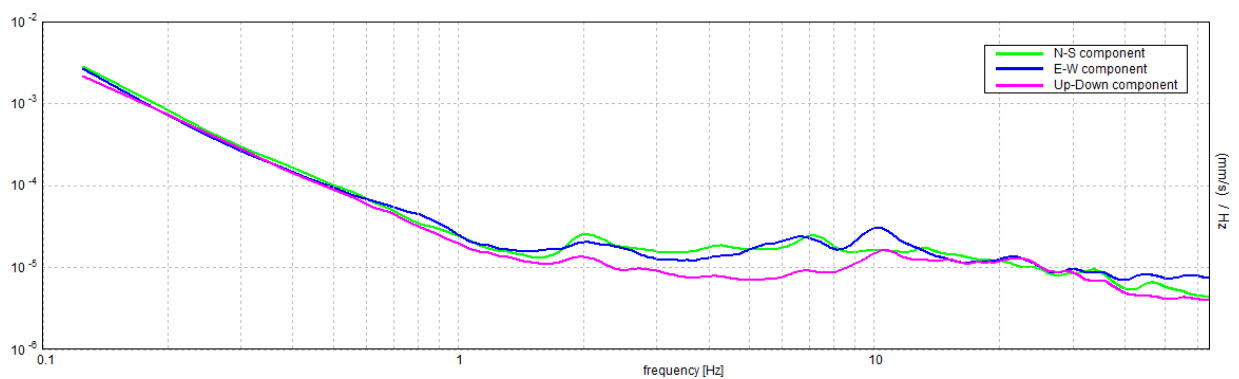
Max. H/V at 6.88 ± 0.32 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 6.88 ± 0.32 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
7.00	7.00	190
27.00	20.00	435
inf.	inf.	580

Vs(0.0-30.0)=341m/s

Vs(0.0-30.0)=341m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<table>
<tr><td colspan="4" align="center">**Max. H/V at 6.88 ± 0.32 Hz (in the range 0.1 - 20.0 Hz).**</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">**Criteria for a reliable H/V curve**
[All 3 should be fulfilled]</td></tr>
<tr><td align="center">$f_0 > 10 / L_w$</td><td align="center">6.88 > 0.63</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$n_c(f_0) > 200$</td><td align="center">5940.0 > 200</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz</td><td align="center">Exceeded 0 out of 166 times</td><td align="center">**OK**</td><td></td></tr>
<tr><td colspan="4" align="center">**Criteria for a clear H/V peak**
[At least 5 out of 6 should be fulfilled]</td></tr>
<tr><td align="center">Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$</td><td></td><td></td><td align="center">**NO**</td></tr>
<tr><td align="center">Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$</td><td align="center">10.625 Hz</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$A_0 > 2$</td><td align="center">2.89 > 2</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$</td><td align="center">|0.0229| < 0.05</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$\sigma_f < \varepsilon(f_0)$</td><td align="center">0.15745 < 0.34375</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$\sigma_A(f_0) < \theta(f_0)$</td><td align="center">0.4158 < 1.58</td><td align="center">**OK**</td><td></td></tr>
</table>

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

037044P159HVSR173

MONZUNO_MS, TR27 GABBIANO

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 11:02:31   End recording: 19/11/18 11:18:32
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 77% trace (manual window selection)
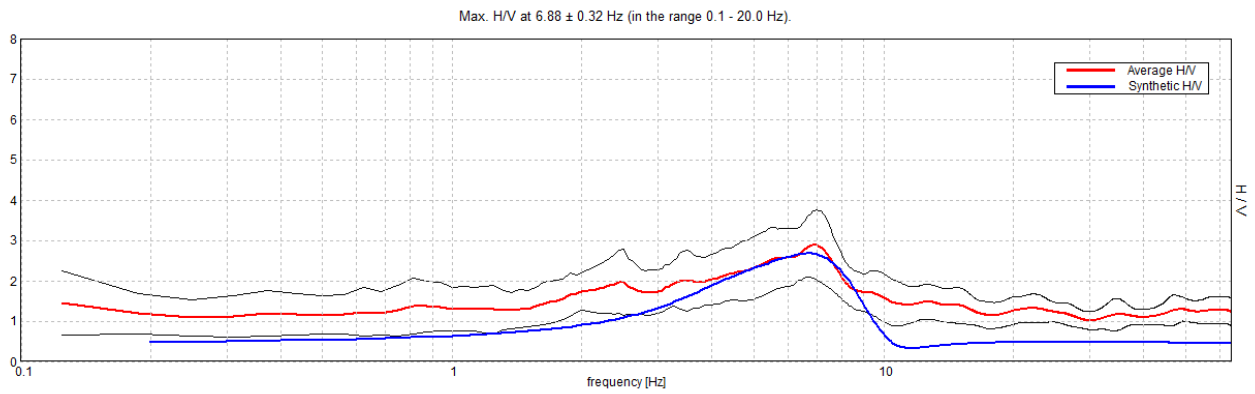Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO
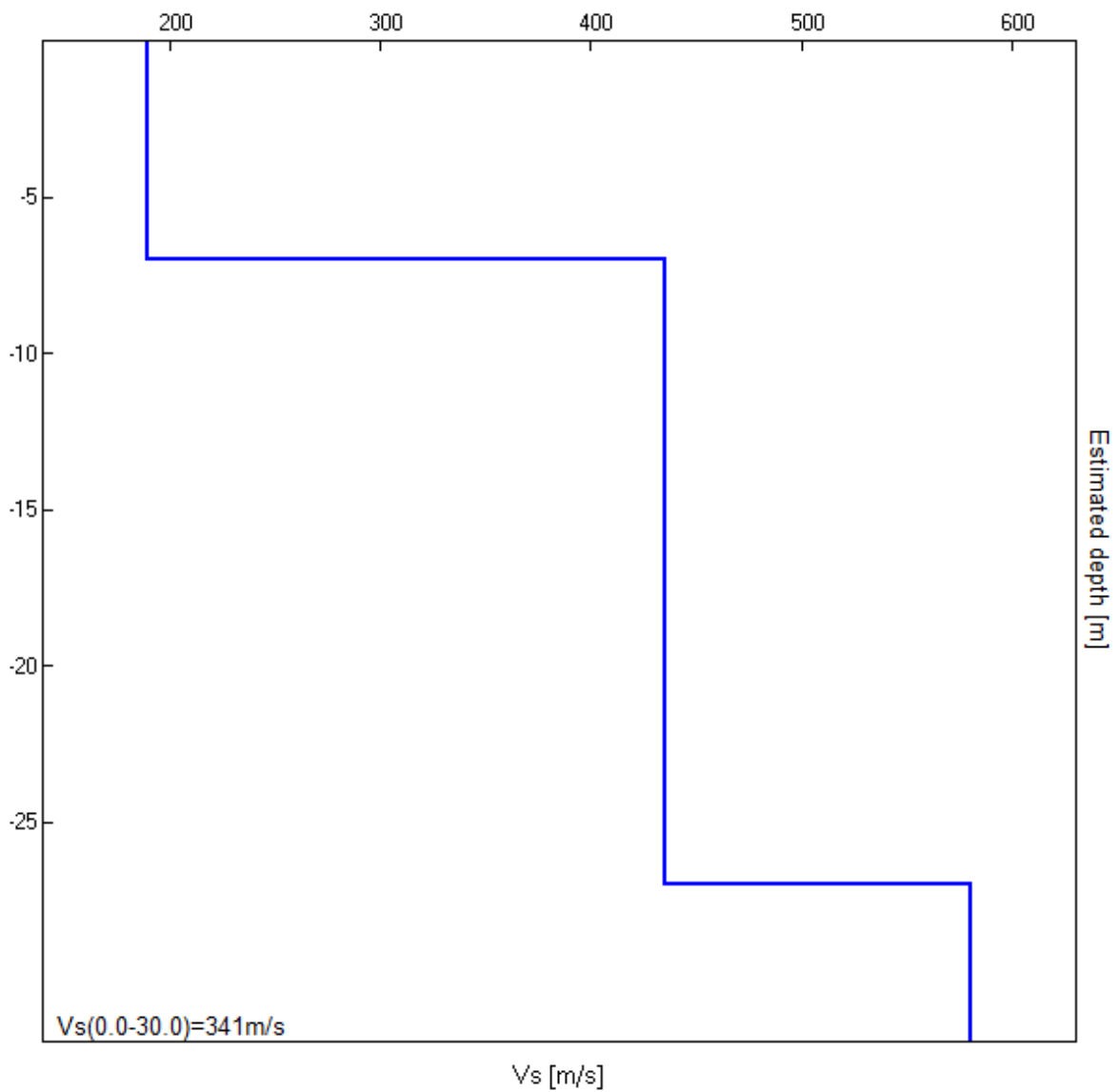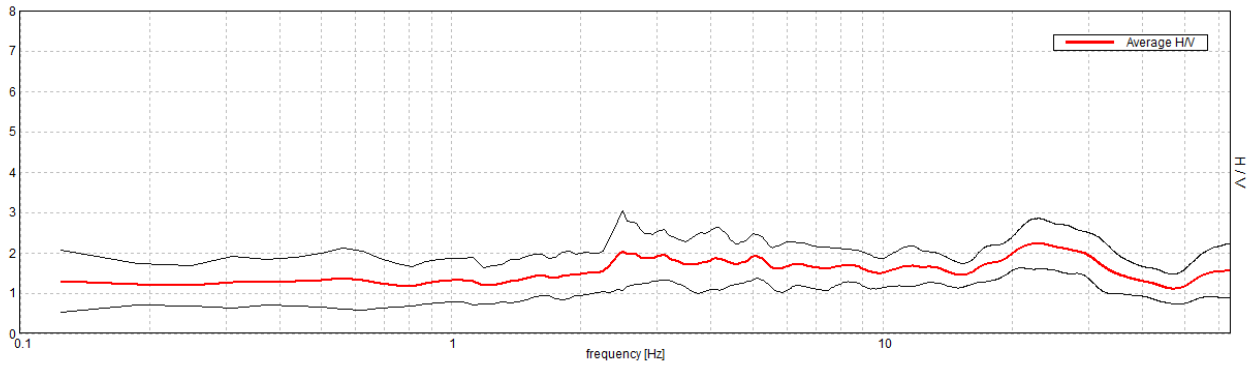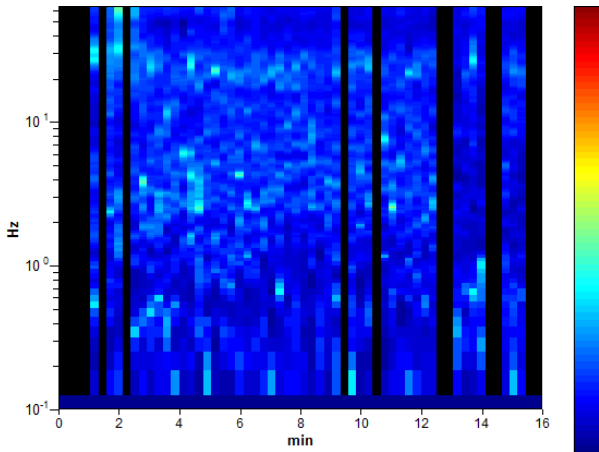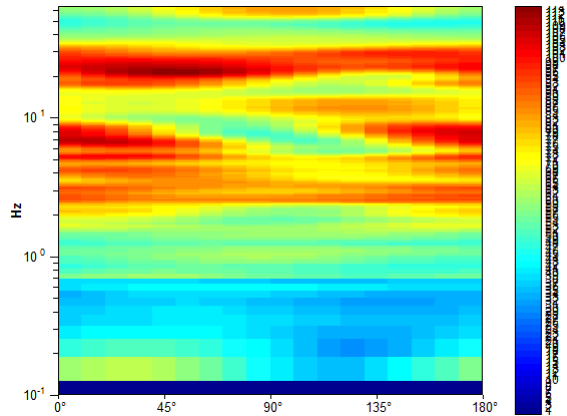
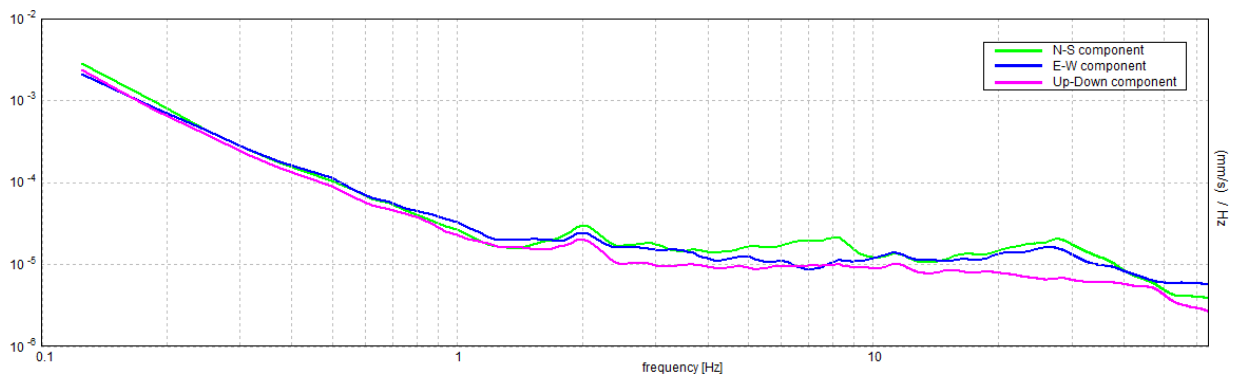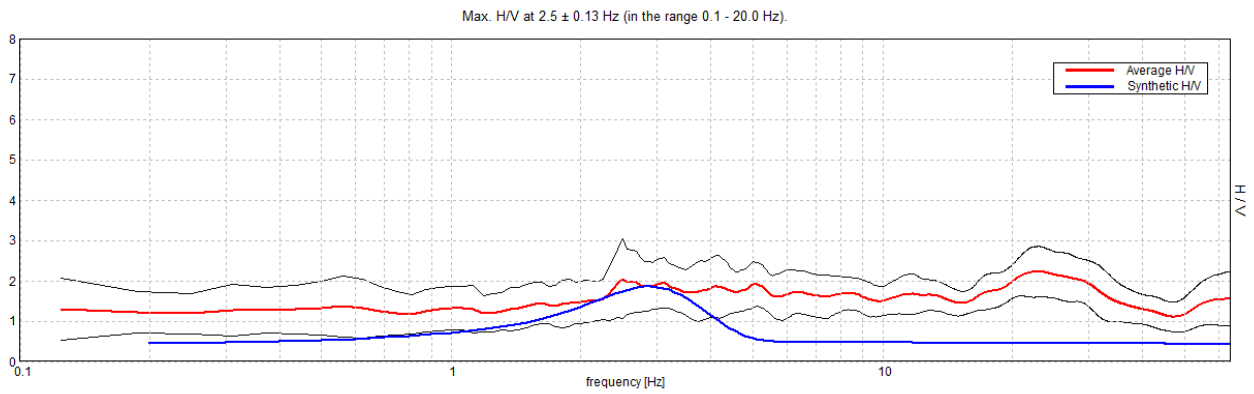Max. H/V at 2.5 ± 0.13 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY	DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 2.5 ± 0.13 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
10.00	10.00	350
20.00	10.00	400
37.00	17.00	450
inf.	inf.	670

Vs(0.0-30.0)=396m/s

Vs(0.0-30.0)=396m/s

Vs [m/s]

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="border:1px solid">

Max. H/V at 2.5 ± 0.13 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	2.50 > 0.63	**OK**	
$n_c(f_0) > 200$	1840.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 61 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	2.05 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$\mid 0.02635 \mid < 0.05$	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.06588 < 0.125	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.4849 < 1.58	**OK**	

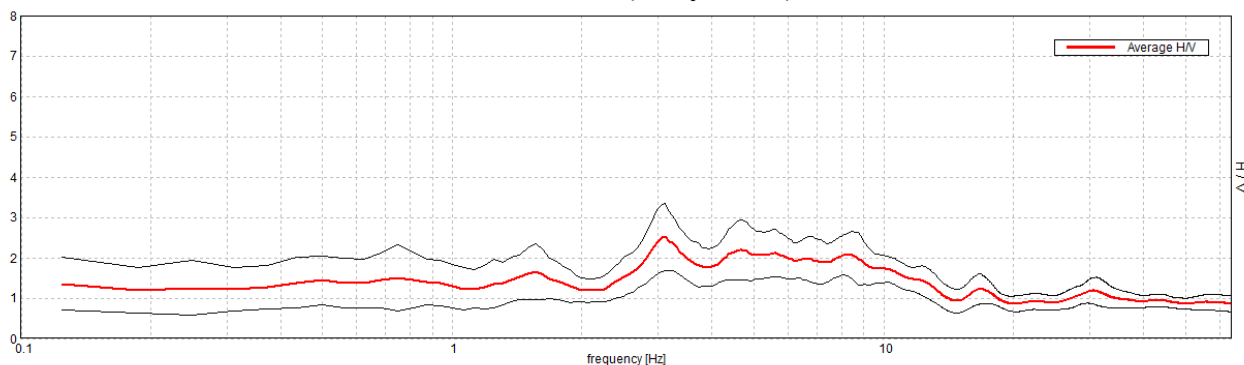|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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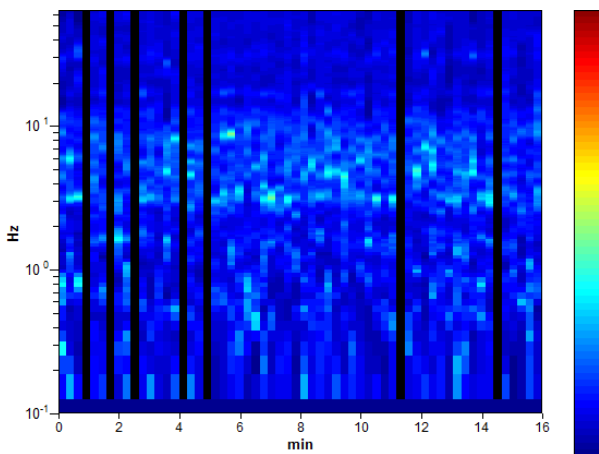## MONZUNO_MS, TR29 MONTORIO

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 12:02:16   End recording: 19/11/18 12:18:17
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
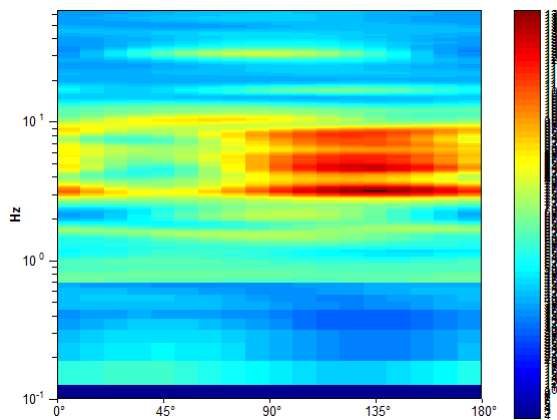Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

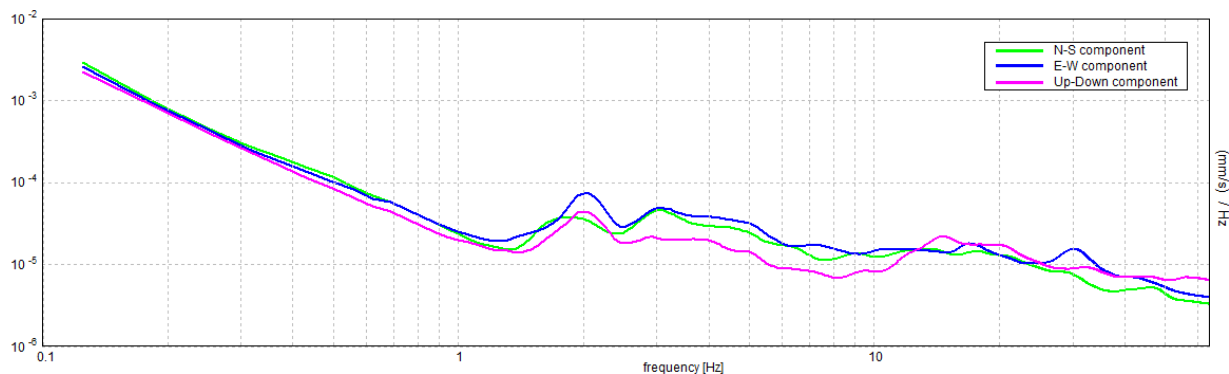Max. H/V at 3.13 ± 0.15 Hz. (In the range 0.1 - 20.0 Hz).
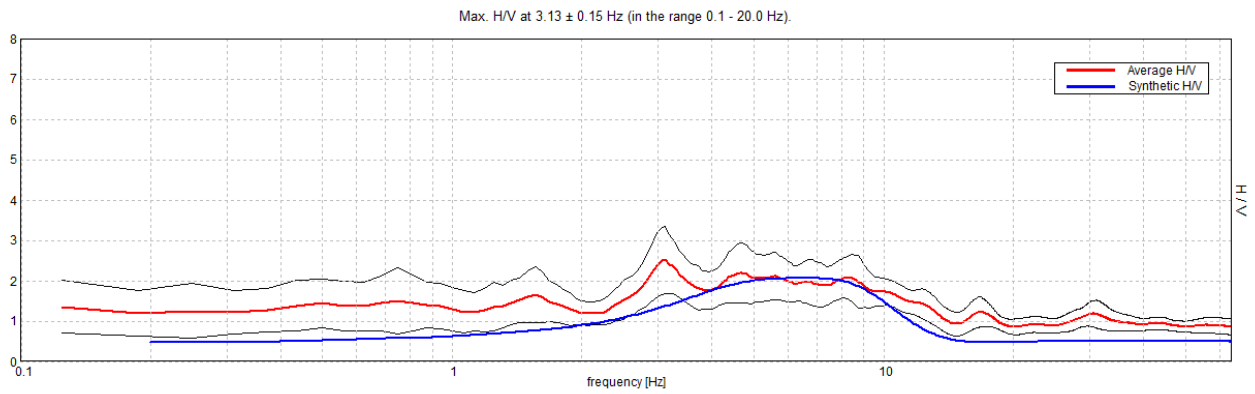

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 3.13 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
1.00	1.00	230
4.00	3.00	250
8.00	4.00	300
17.00	9.00	470
37.00	20.00	580
inf.	inf.	700

Vs(0.0-30.0)=421m/s

Vs(0.0-30.0)=421m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 3.13 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	3.13 > 0.63	**OK**	
$n_c(f_0) > 200$	2650.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 76 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	2.25 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$			**NO**
$A_0 > 2$	2.52 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	$\mid 0.02381 \mid < 0.05$	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.0744 < 0.15625	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.4096 < 1.58	**OK**	

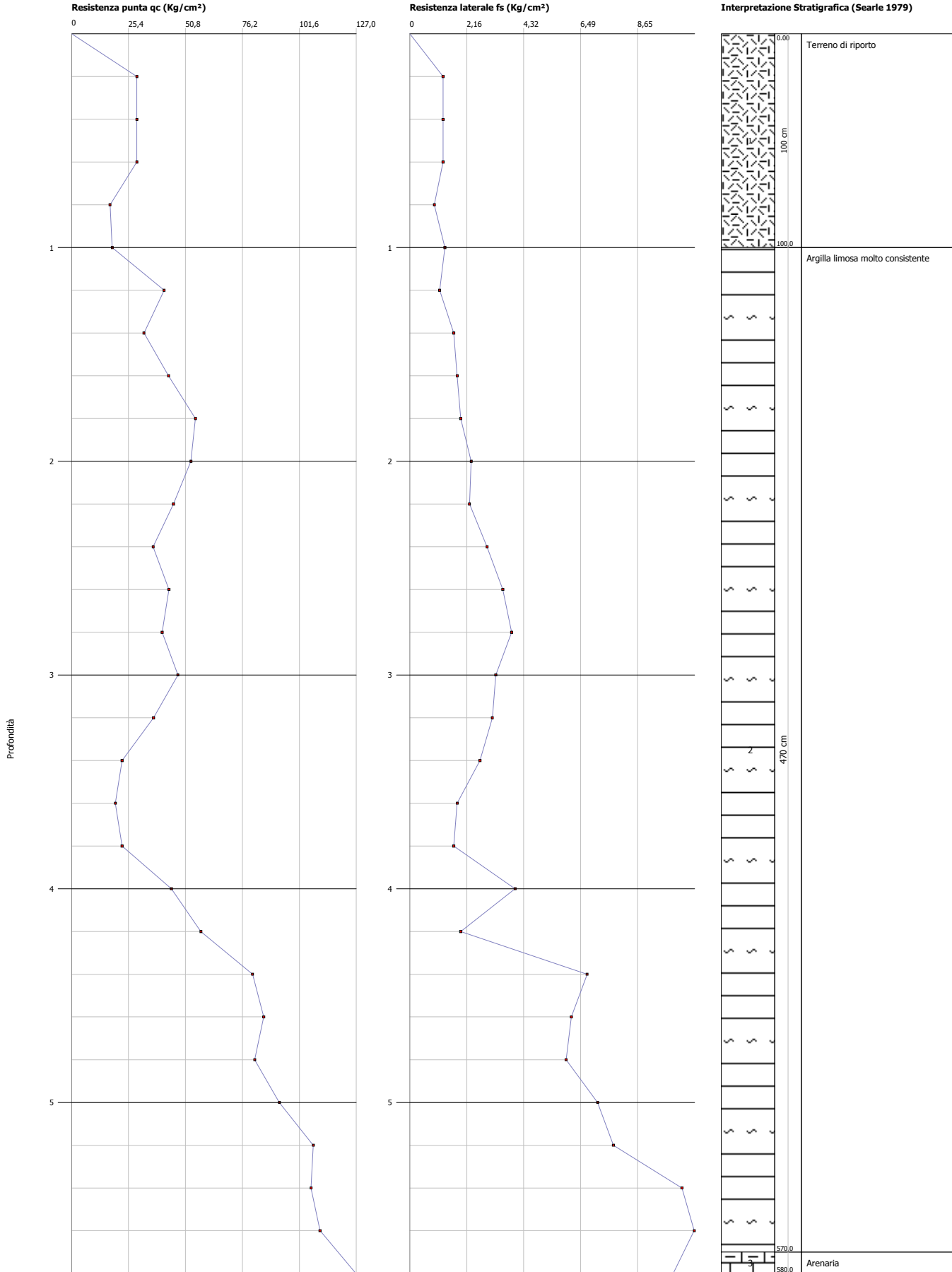|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w \, n_w \, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

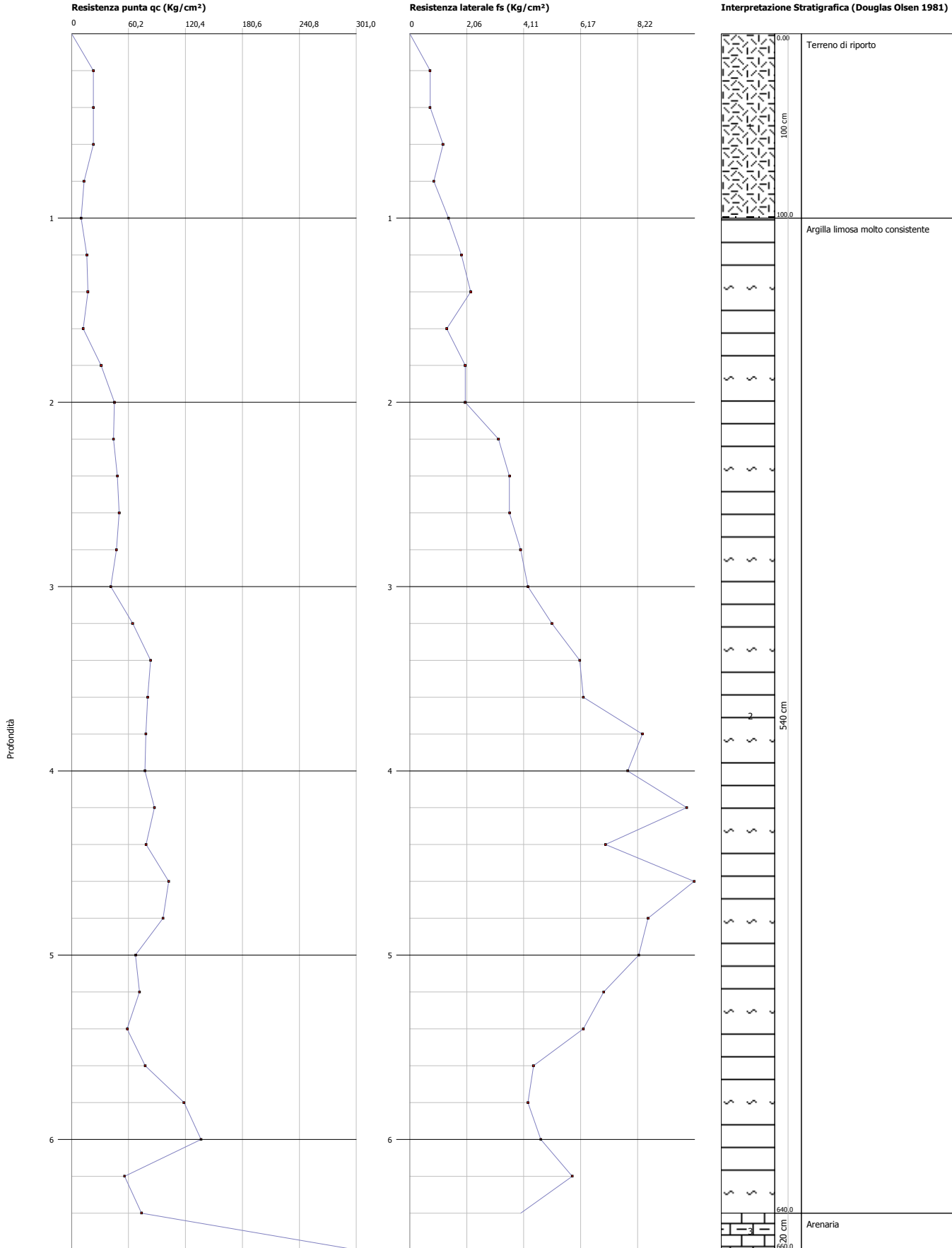| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

037044P161CPT189

Probe CPT - Cone Penetration CPT1
Strumento utilizzato... PAGANI TG 63 (200 kN)
Diagramma Resistenze qc fs

Committente :	Sig.ra Annalisa Casali	Data :15/02/2019
Cantiere :	Via Monte Adone n. 4	
Località :	Brento - Monzuno (BO)	

Scala 1:25

Resistenza punta qc (Kg/cm²)

0   25,4   50,8   76,2   101,6   127,0

Resistenza laterale fs (Kg/cm²)

0   2,16   4,32   6,49   8,65

Interpretazione Stratigrafica (Searle 1979)

Terreno di riporto

Argilla limosa molto consistente
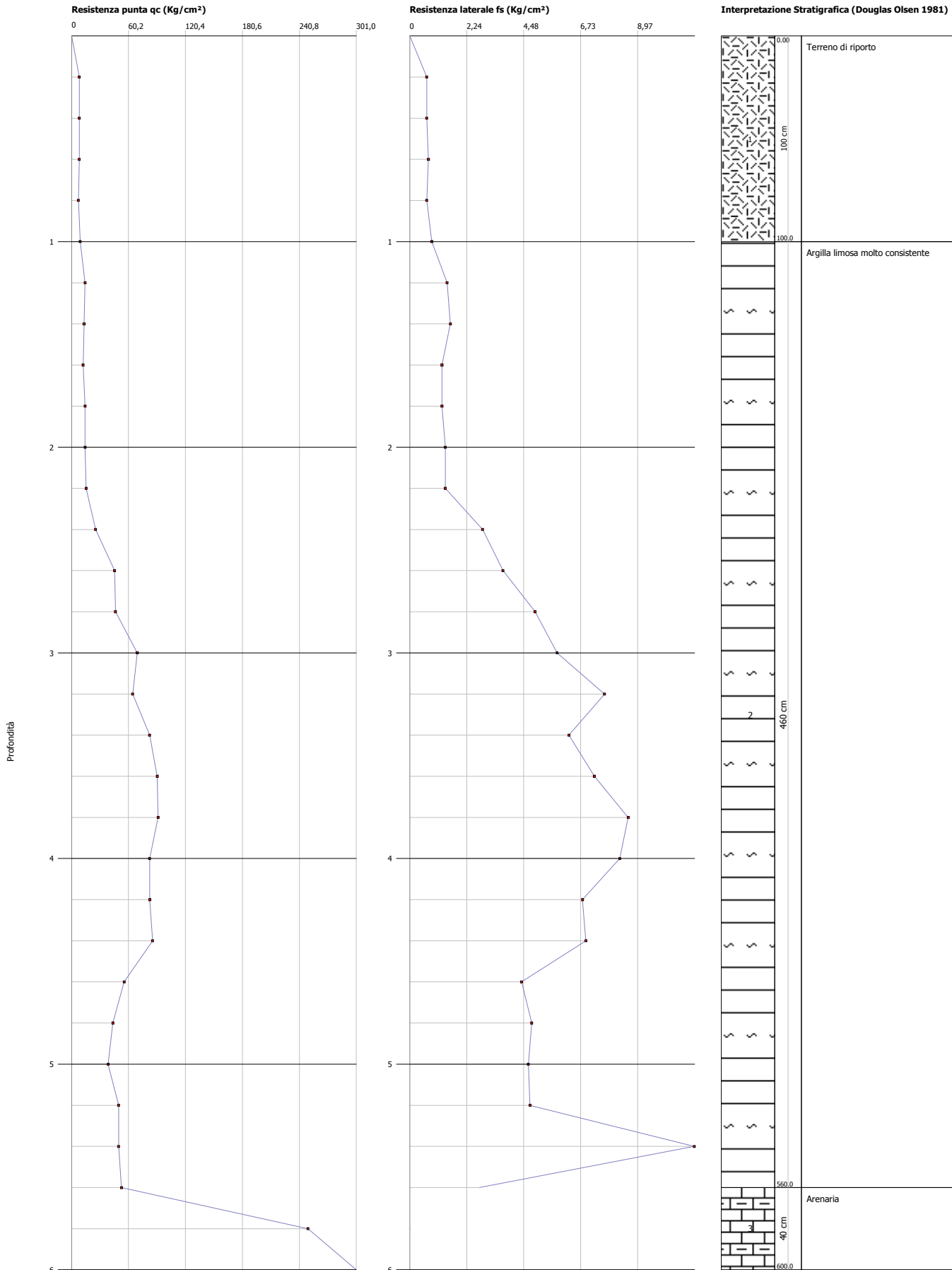
Arenaria

Profondità

Probe CPT - Cone Penetration CPT2
Strumento utilizzato... PAGANI TG 63 (200 kN)
Diagramma Resistenze qc fs

Committente :	Sig.ra Annalisa Casali	Data :15/02/2019
Cantiere :	Via Monte Adone n. 4	
Località :	Brento - Monzuno (BO)	

Scala 1:29

Resistenza punta qc (Kg/cm²)

Resistenza laterale fs (Kg/cm²)

Interpretazione Stratigrafica (Douglas Olsen 1981)

Terreno di riporto

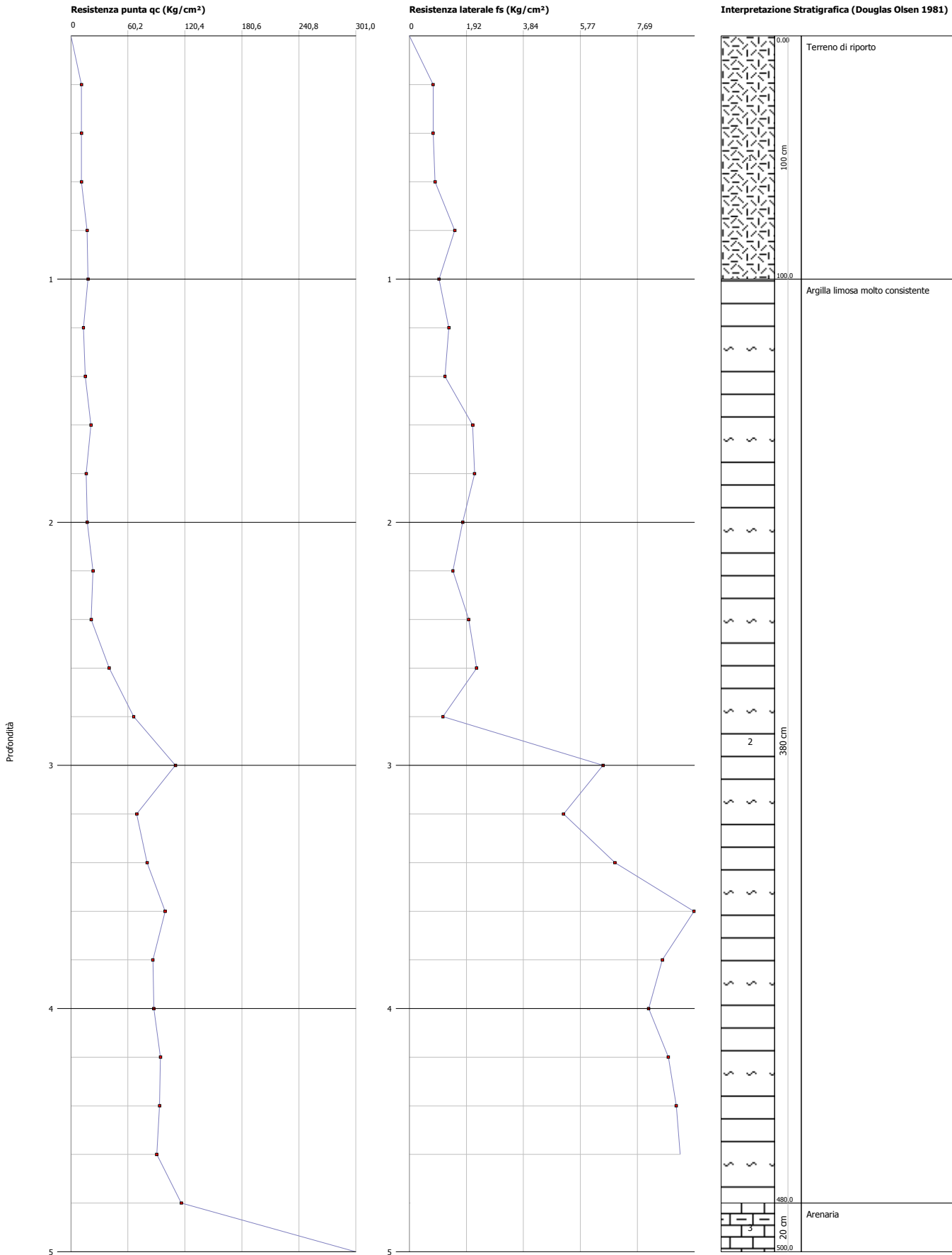Argilla limosa molto consistente

Arenaria

Probe CPT - Cone Penetration CPT3
Strumento utilizzato... PAGANI TG 63 (200 kN)
Diagramma Resistenze qc fs

Committente :	Sig.ra Annalisa Casali	Data :15/02/2019
Cantiere :	Via Monte Adone n. 4	
Località :	Brento - Monzuno (BO)	

Scala 1:26

Resistenza punta qc (Kg/cm²)

Resistenza laterale fs (Kg/cm²)

Interpretazione Stratigrafica (Douglas Olsen 1981)

Terreno di riporto

Argilla limosa molto consistente

Arenaria

Profondità

037044P161CPT192

Probe CPT - Cone Penetration CPT4
Strumento utilizzato... PAGANI TG 63 (200 kN)
Diagramma Resistenze qc fs

Committente :	Sig.ra Annalisa Casali	Data :15/02/2019
Cantiere :	Via Monte Adone n. 4	
Località :	Brento - Monzuno (BO)	

Scala 1:22

Resistenza punta qc (Kg/cm²)
0   60,2   120,4   180,6   240,8   301,0

Resistenza laterale fs (Kg/cm²)
0   1,92   3,84   5,77   7,69

Interpretazione Stratigrafica (Douglas Olsen 1981)

Profondità

0.00   Terreno di riporto
100 cm
100,0   Argilla limosa molto consistente

380 cm

480,0   Arenaria
20 cm
500,0

MONZUNO - BRENTO, TR34   037044P161HVSR175

Instrument: TRZ-0108/01-10
Start recording: 15/02/19 10:21:05   End recording: 15/02/19 10:41:06
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h20'00".   Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
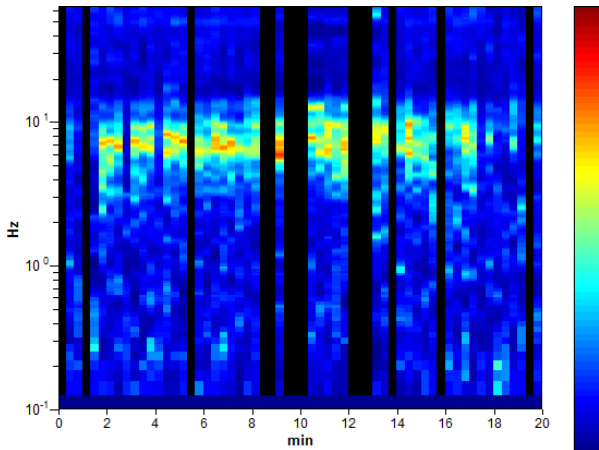Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%
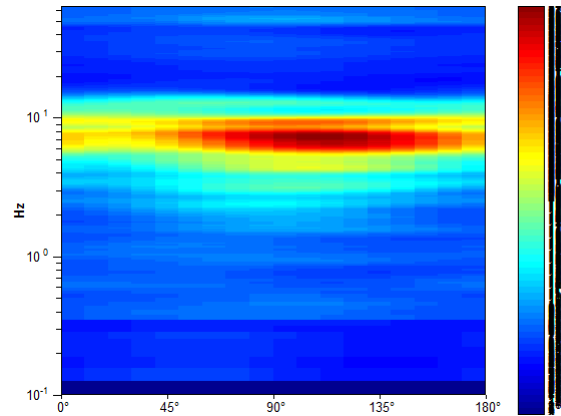
HORIZONTAL TO VERTICAL SPECTRAL RATIO
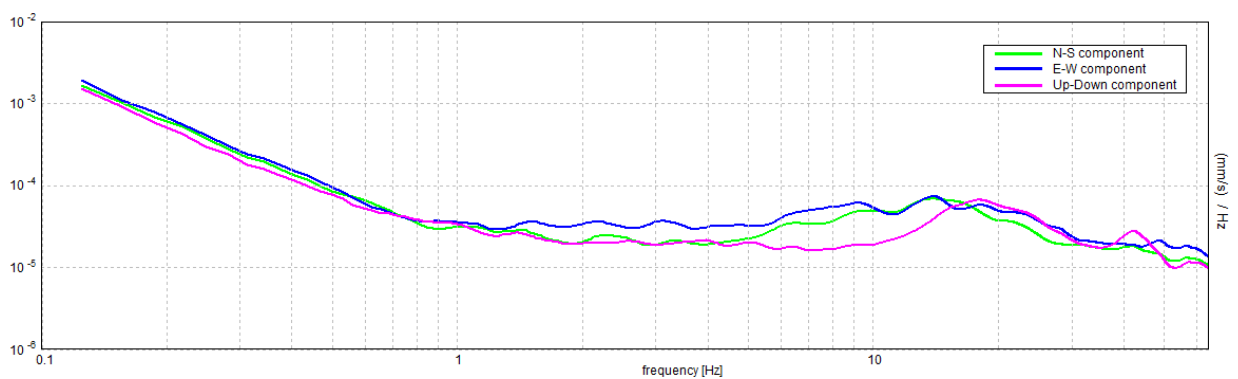
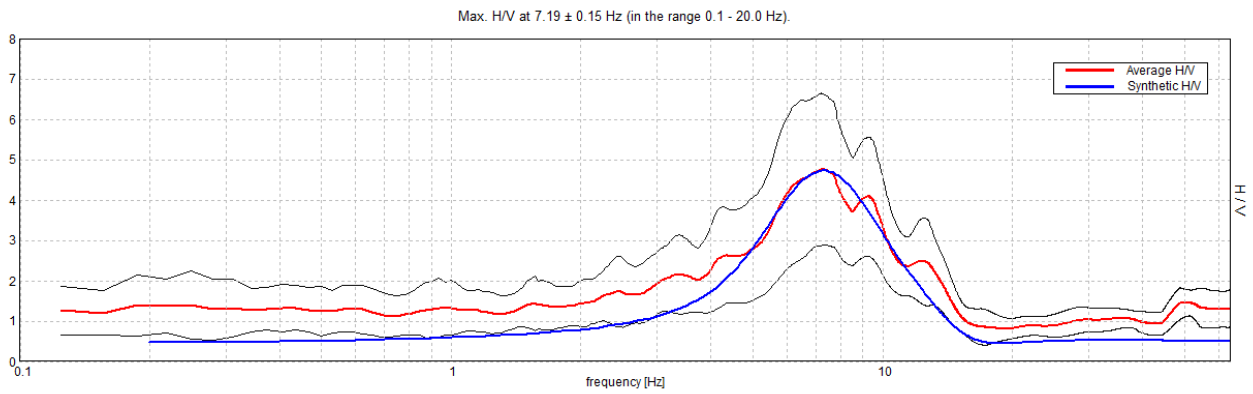Max. H/V at 7.19 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 7.19 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
1.00	1.00	190
3.00	2.00	215
5.50	2.50	240
16.00	10.50	460
29.00	13.00	690
inf.	inf.	820

Vs(0.0-30.0)=442m/s

Vs(0.0-30.0)=442m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 7.19 ± 0.15 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	7.19 > 0.50	**OK**
$n_c(f_0) > 200$	6612.5 > 200	**OK**
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 346 times	**OK**

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	4.031 Hz	**OK**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	11.188 Hz	**OK**
$A_0 > 2$	4.75 > 2	**OK**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01047| < 0.05	**OK**
$\sigma_f < \varepsilon(f_0)$	0.07528 < 0.35938	**OK**
$\sigma_A(f_0) < \theta(f_0)$	0.9268 < 1.58	**OK**

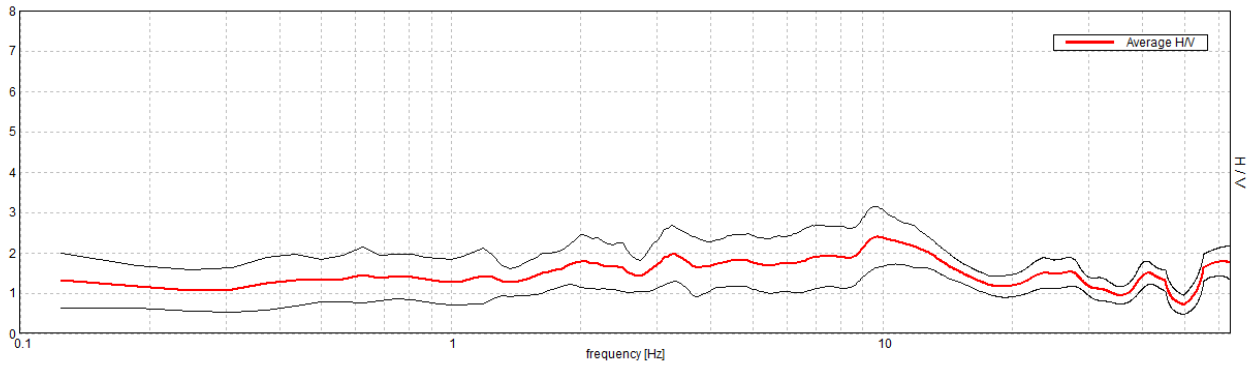|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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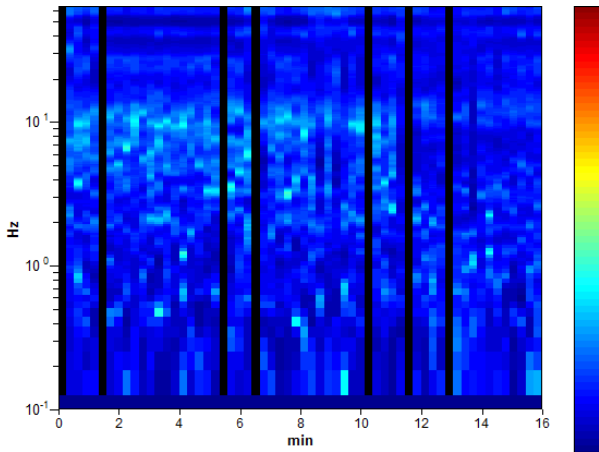## MONZUNO_MS, TR35 SAN ROCCO VIA DELLE AP

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 14:41:42   End recording: 19/11/18 14:57:43
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00''.   Analyzed 88% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
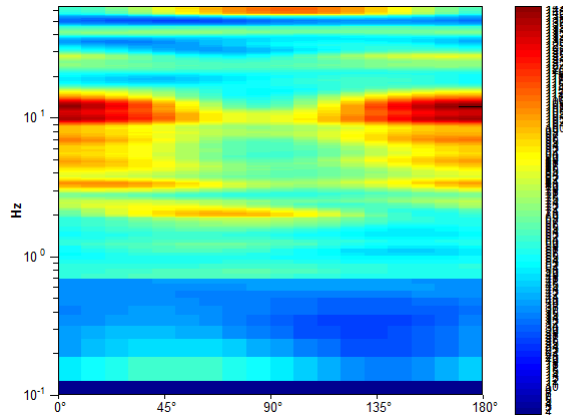Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

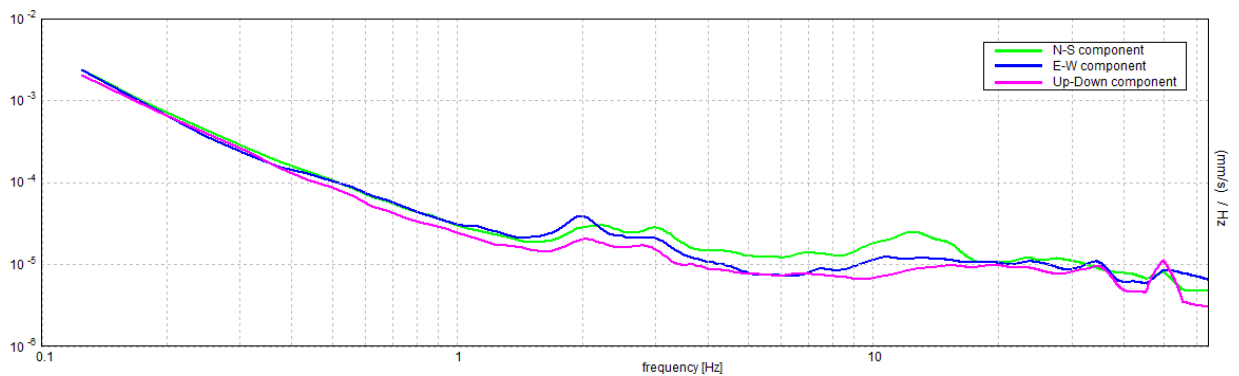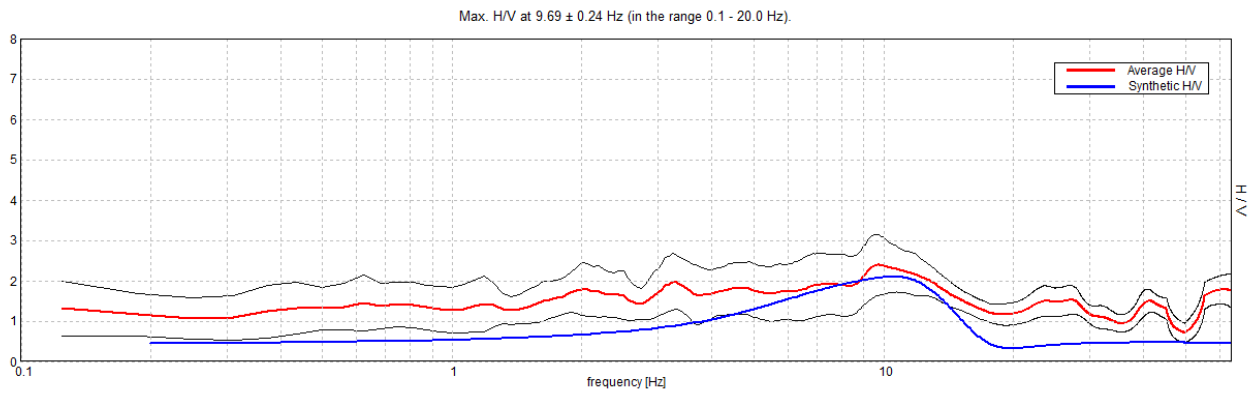Max. H/V at 9.69 ± 0.24 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 9.69 ± 0.24 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.50	5.50	250
20.50	15.00	500
inf.	inf.	620

Vs(0.0-30.0)=446m/s

Vs(0.0-30.0)=446m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 9.69 ± 0.24 Hz (in the range 0.1 - 20.0 Hz).			

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	9.69 > 0.63	**OK**	
$n_c(f_0) > 200$	8215.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 234 times	**OK**	

Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	17.75 Hz	**OK**	
$A_0 > 2$	2.39 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01239| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.12005 < 0.48438	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.3716 < 1.58	**OK**	

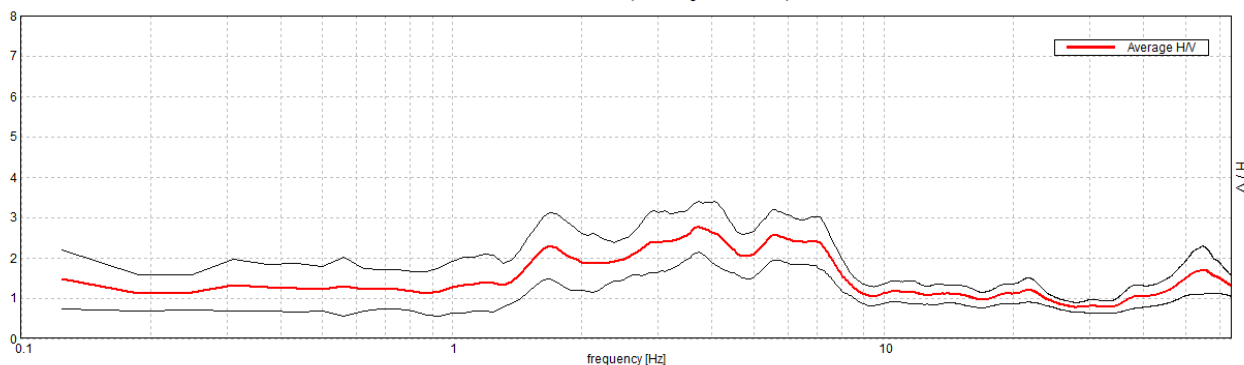|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25\, f_0$	$0.2\, f_0$	$0.15\, f_0$	$0.10\, f_0$	$0.05\, f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

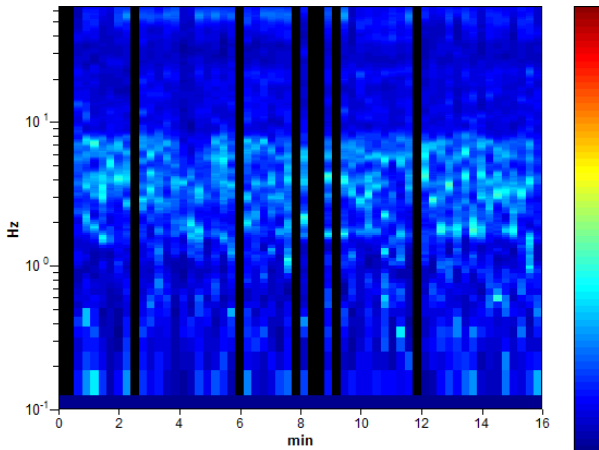## MONZUNO_MS, TR30 RIOVEGGIO

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 12:28:00   End recording: 19/11/18 12:44:01
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00''.   Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%
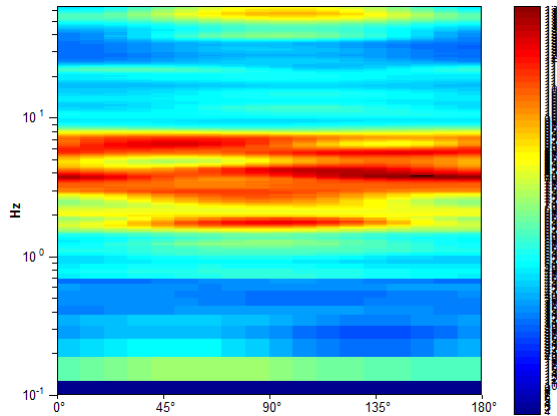
HORIZONTAL TO VERTICAL SPECTRAL RATIO
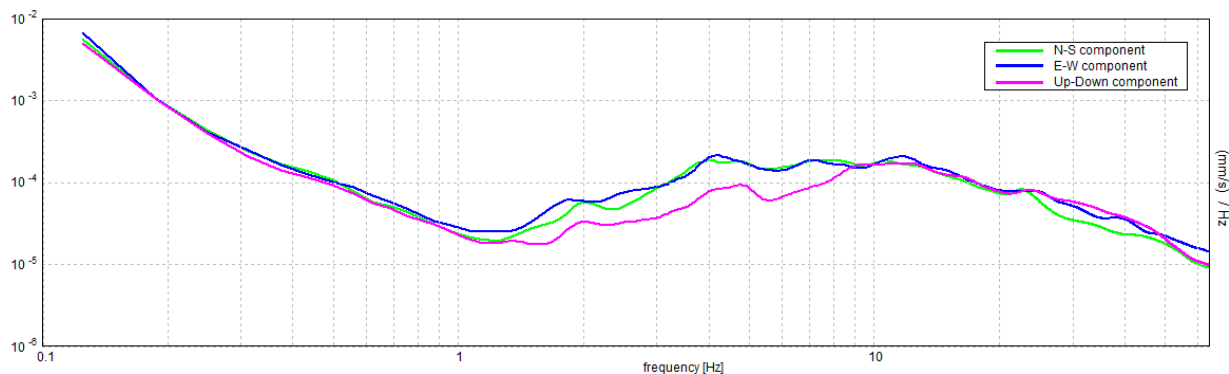
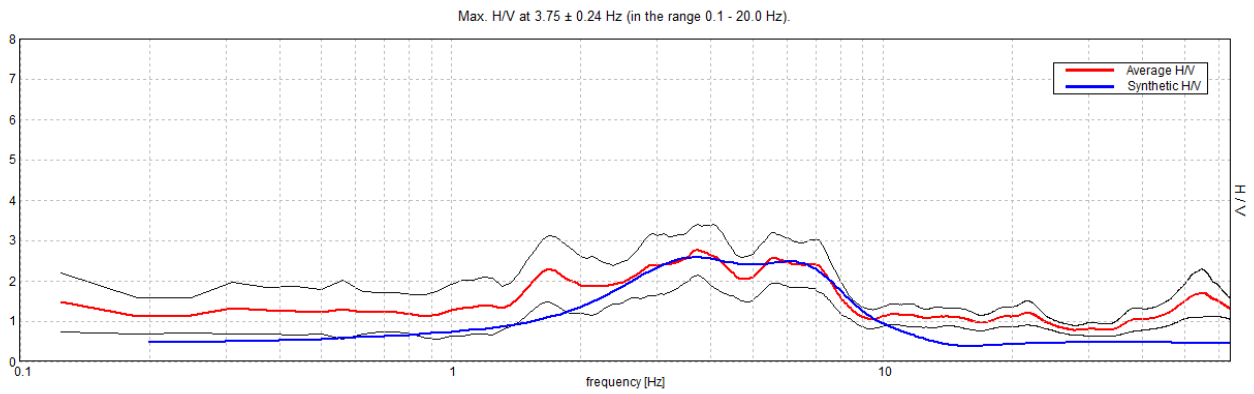Max. H/V at 3.75 ± 0.24 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 3.75 ± 0.24 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.50	4.50	165
13.50	9.00	300
38.50	25.00	470
inf.	inf.	640

Vs(0.0-30.0)=325m/s

Vs(0.0-30.0)=325m/s

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 3.75 ± 0.24 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	3.75 > 0.63	**OK**	
$n_c(f_0) > 200$	3060.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 91 times	**OK**	

Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$	$A_{H/V}(f^-) < A_0 / 2$	1.313 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0]$	$A_{H/V}(f^+) < A_0 / 2$	8.313 Hz	**OK**	
$A_0 > 2$	2.77 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.03107| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.1165 < 0.1875	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.305 < 1.58	**OK**	

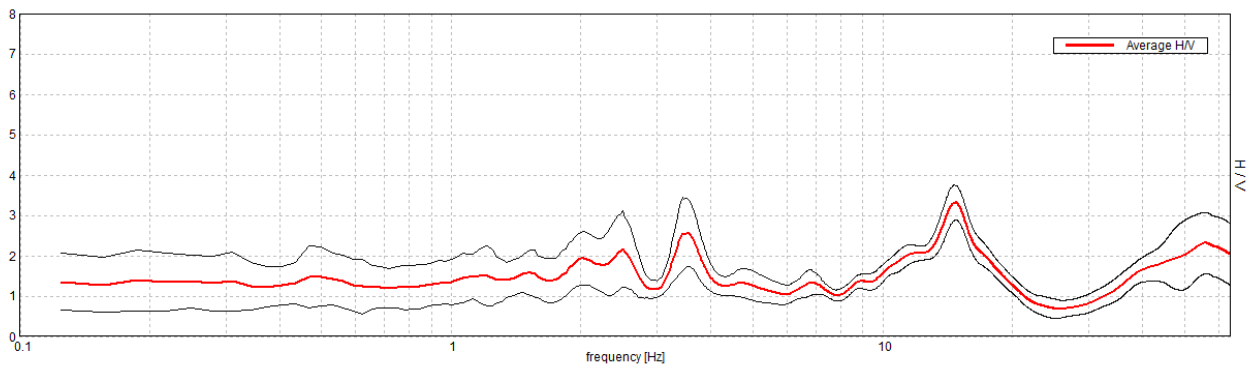|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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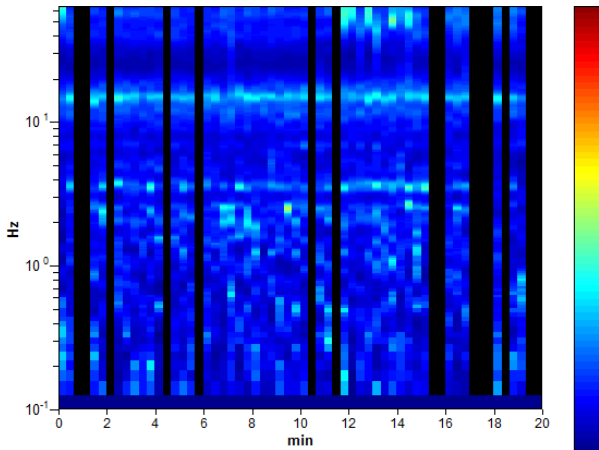## MONZUNO_MS, TR39 RIOVEGGIO SUD

Instrument: TRZ-0108/01-10
Start recording: 15/02/19 11:46:21   End recording: 15/02/19 12:06:21
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h20'00".   Analyzed 75% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
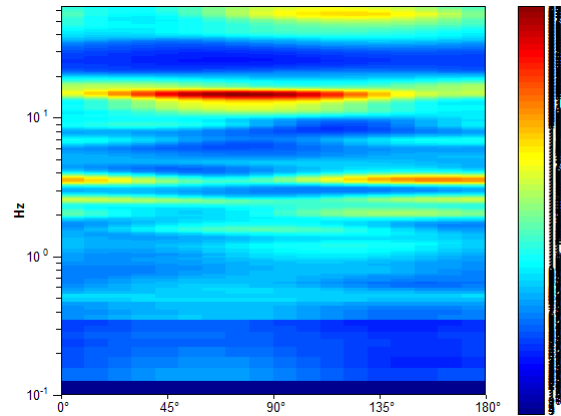Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

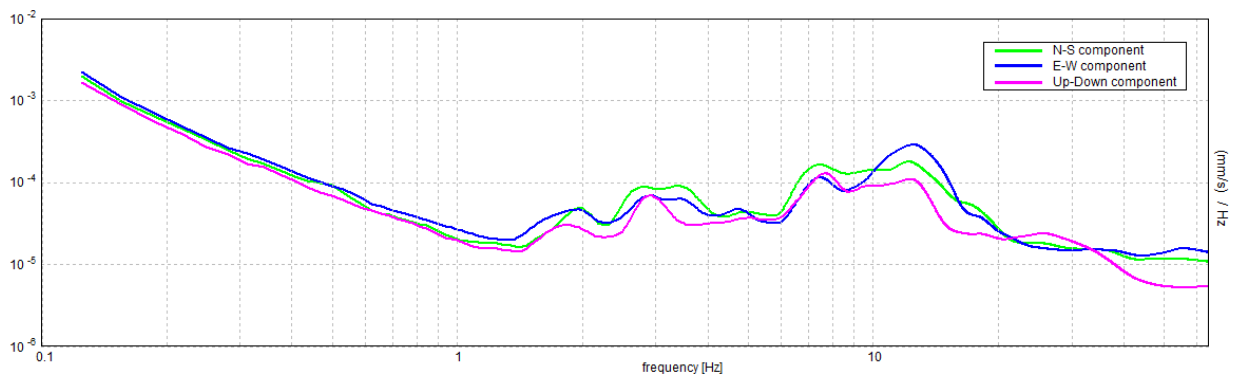Max. H/V at 14.69 ± 0.66 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<div style="text-align:center">

Max. H/V at 14.69 ± 0.66 Hz (in the range 0.1 - 20.0 Hz).

</div>

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	14.69 > 0.50	**OK**	
$n_c(f_0) > 200$	13218.8 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 706 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	10.188 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	18.438 Hz	**OK**	
$A_0 > 2$	3.32 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.02192| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.32197 < 0.73438	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.2144 < 1.58	**OK**	

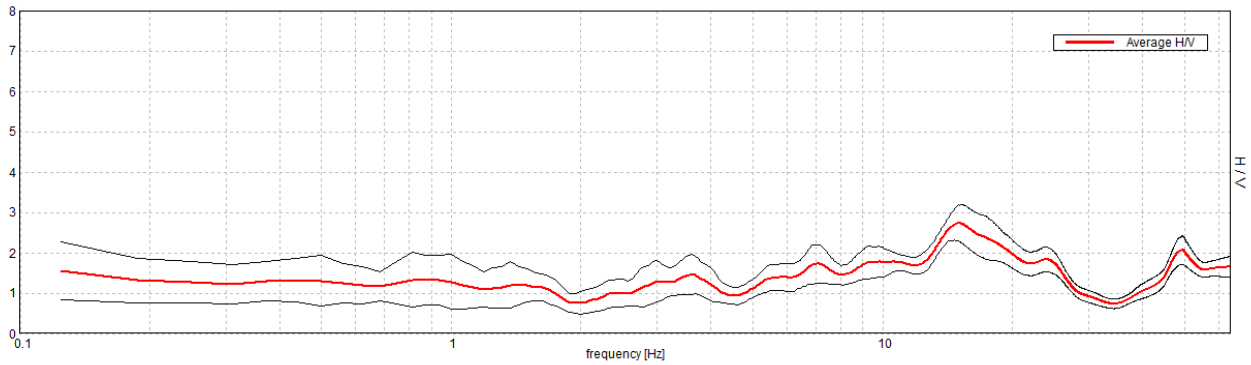|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25 f_0$	$0.2 f_0$	$0.15 f_0$	$0.10 f_0$	$0.05 f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR38 RIOVEGGIO CAMPO SPORTI
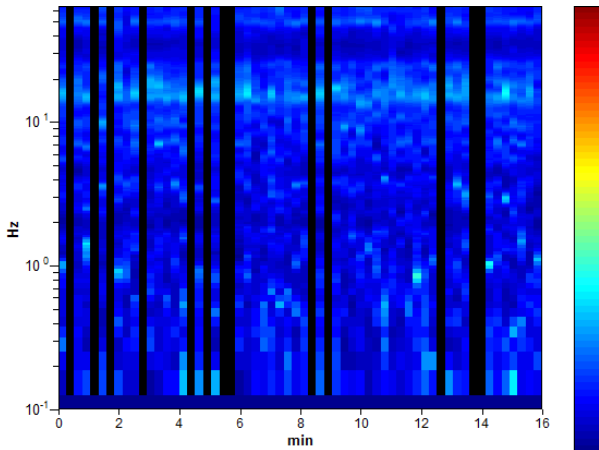
Instrument: TRZ-0108/01-10
Start recording: 07/02/19 15:03:44   End recording: 07/02/19 15:19:44
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
Trace length: 0h16'00''.   Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
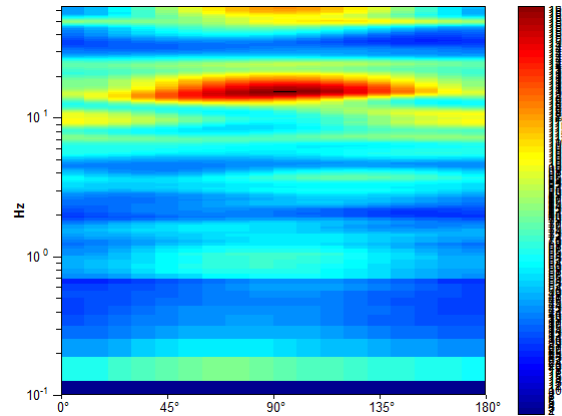Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

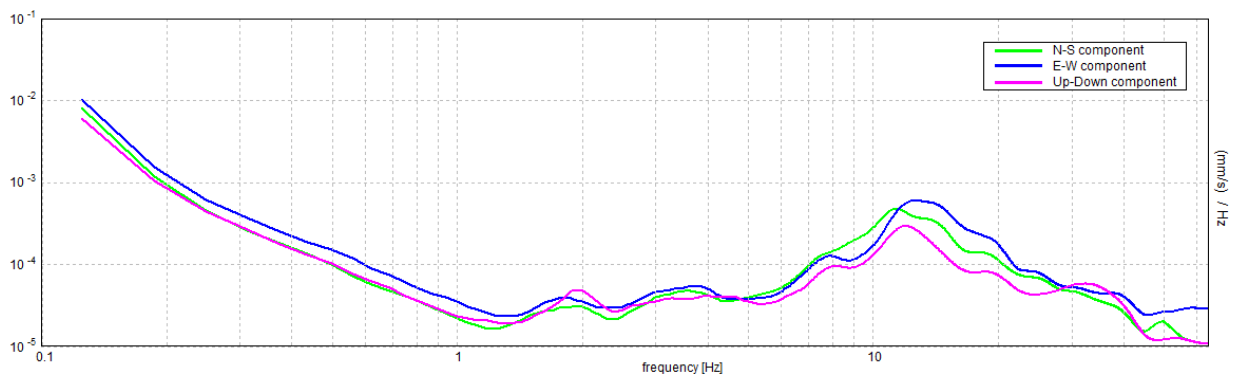Max. H/V at 15.0 ± 0.04 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 15.0 ± 0.04 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	15.00 > 0.63	**OK**	
$n_c(f_0) > 200$	11280.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 361 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	5.438 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	26.563 Hz	**OK**	
$A_0 > 2$	2.74 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00138| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.02064 < 0.75	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.2218 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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MONZUNO_MS, TR31 RIOVEGGIO ZONA INDUSTR

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 12:51:05   End recording: 19/11/18 13:07:06
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 88% trace (manual window selection)
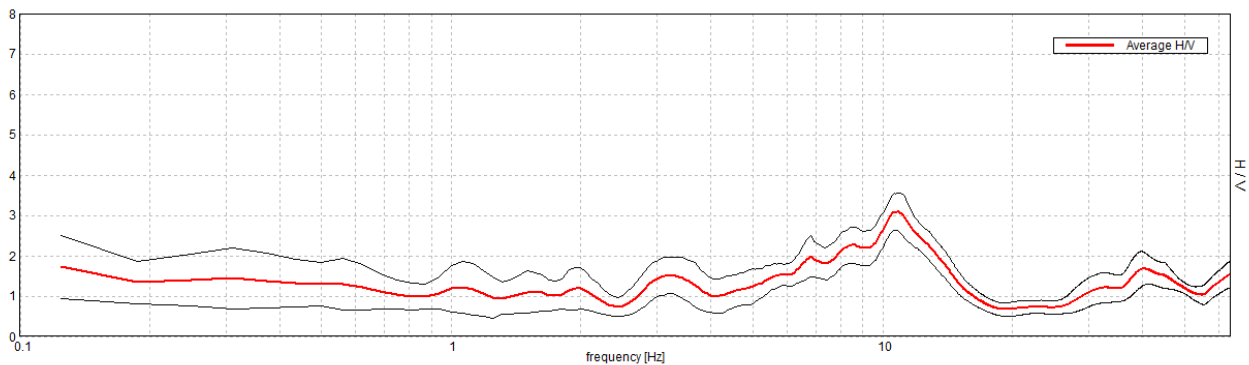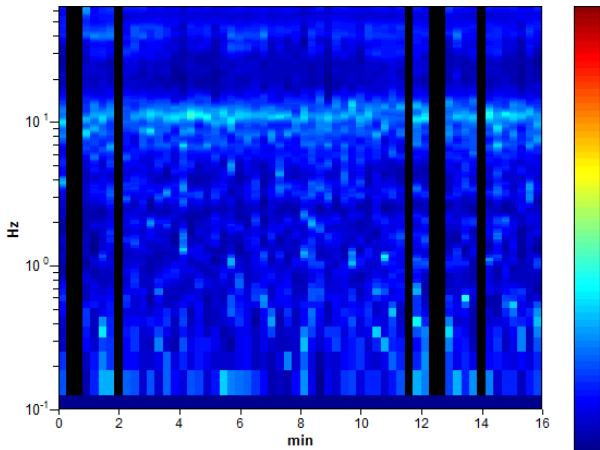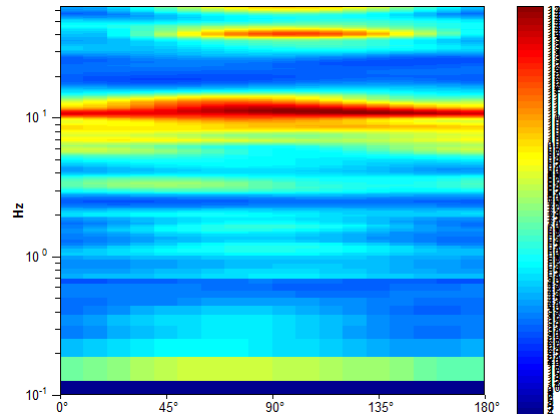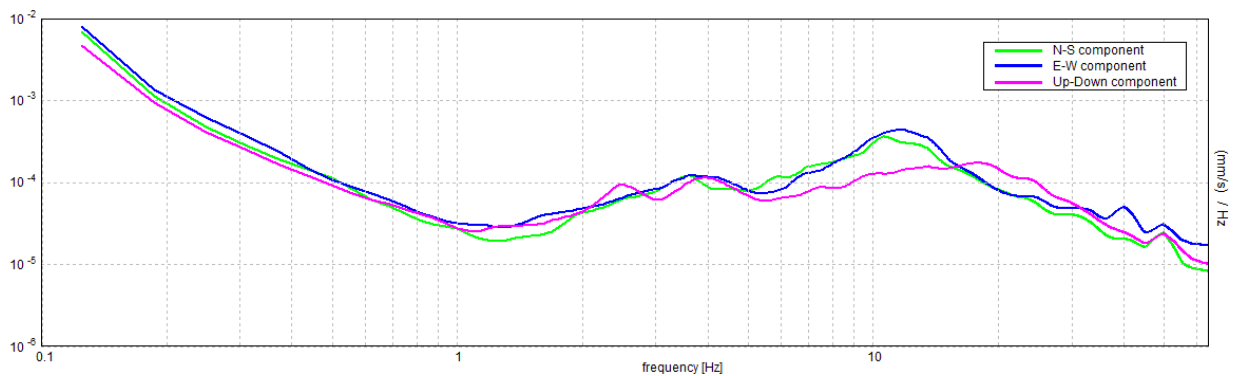Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 10.63 ± 0.06 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the $Grilla$ manual before interpreting the following tables**.]

Max. H/V at 10.63 ± 0.06 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	10.63 > 0.63	**OK**
$n_c(f_0) > 200$	9010.0 > 200	**OK**
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 256 times	**OK**

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$	$A_{H/V}(f^-) < A_0 / 2$	6.125 Hz	**OK**
Exists f^+ in $[f_0, 4f_0]$	$A_{H/V}(f^+) < A_0 / 2$	14.5 Hz	**OK**
$A_0 > 2$	3.09 > 2	**OK**
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00299| < 0.05	**OK**
$\sigma_f < \varepsilon(f_0)$	0.03173 < 0.53125	**OK**
$\sigma_A(f_0) < \theta(f_0)$	0.2254 < 1.58	**OK**

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

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MONZUNO_MS, TR33 RIOVEGGIO POLVERARA

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 13:49:32   End recording: 19/11/18 14:05:33
Channel labels: NORTH SOUTH;   EAST WEST ;   UP   DOWN
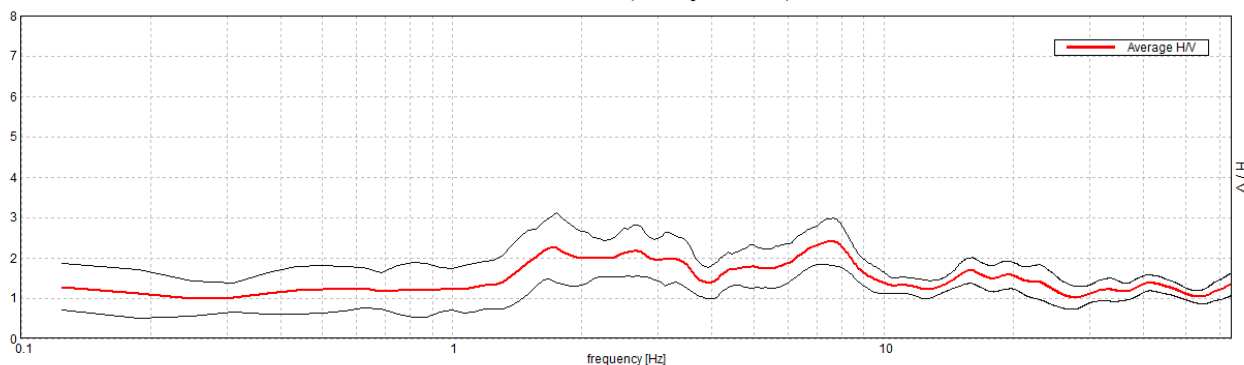Trace length: 0h16'00".   Analyzed 82% trace (manual window selection)
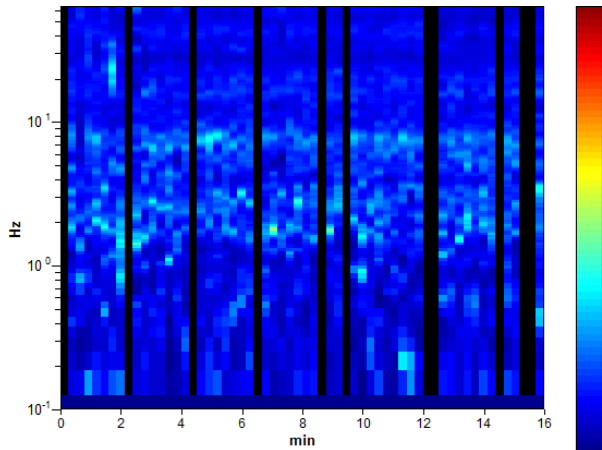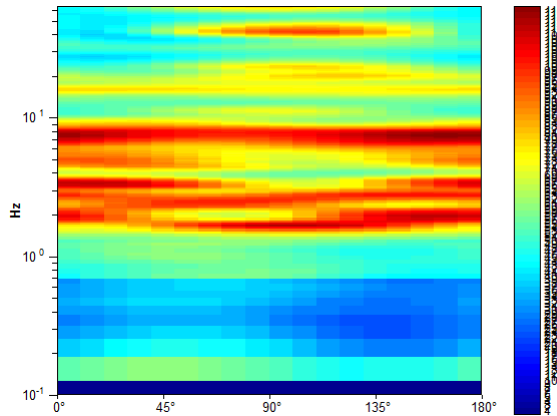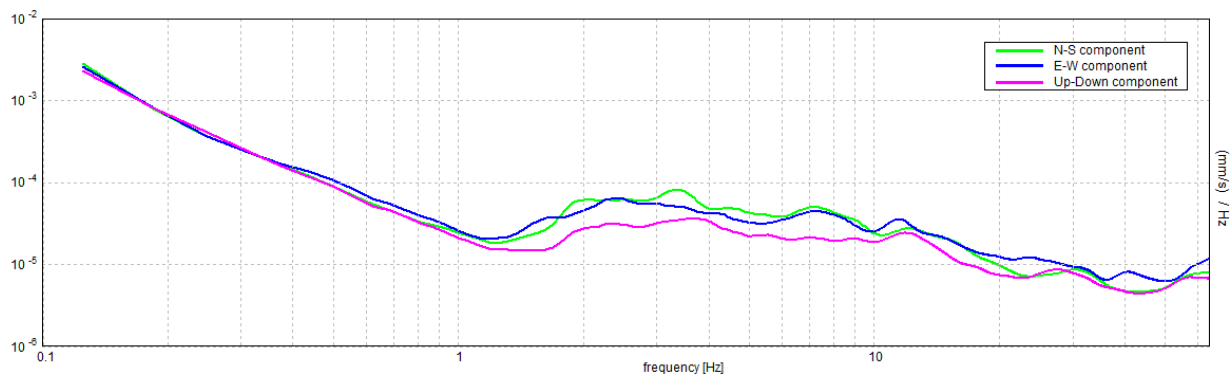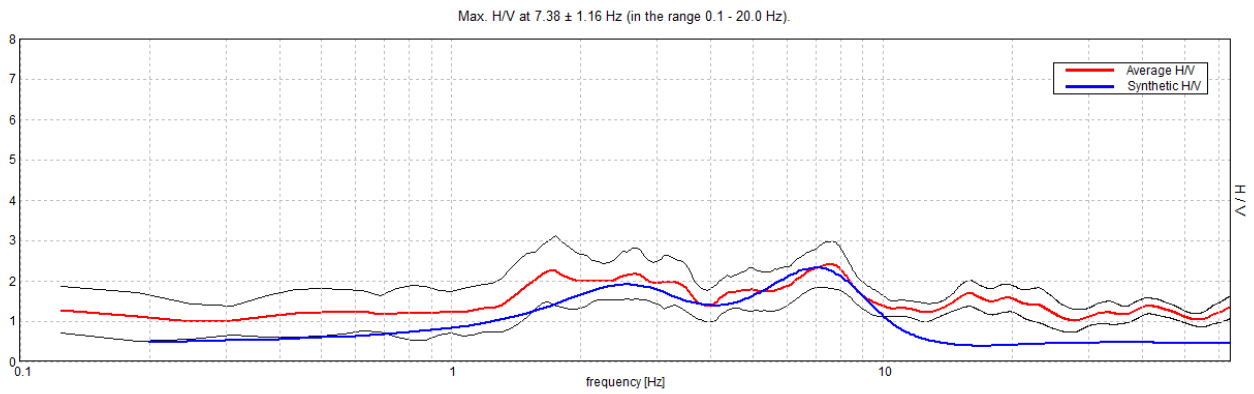Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

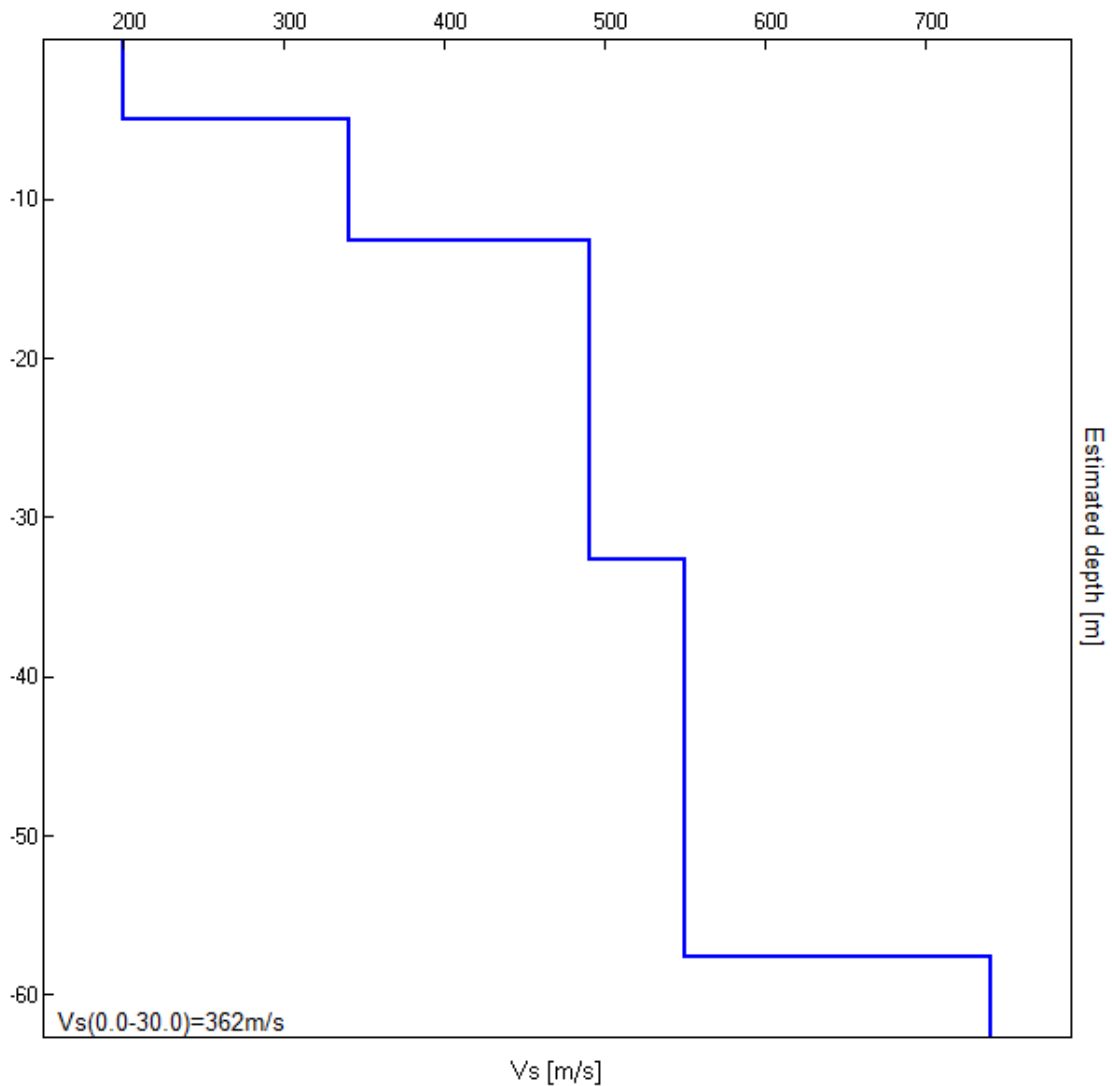Max. H/V at 7.38 ± 1.16 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 7.38 ± 1.16 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
5.00	5.00	200
12.60	7.60	340
32.60	20.00	490
57.60	25.00	550
inf.	inf.	740

Vs(0.0-30.0)=362m/s

Vs(0.0-30.0)=362m/s

Vs [m/s]

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 7.38 ± 1.16 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve
[All 3 should be fulfilled]

$f_0 > 10 / L_w$	7.38 > 0.63	**OK**	
$n_c(f_0) > 200$	5782.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz	Exceeded 0 out of 178 times	**OK**	

Criteria for a clear H/V peak
[At least 5 out of 6 should be fulfilled]

Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			**NO**
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	24.875 Hz	**OK**	
$A_0 > 2$	2.40 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.07749| < 0.05		**NO**
$\sigma_f < \varepsilon(f_0)$	0.57147 < 0.36875		**NO**
$\sigma_A(f_0) < \theta(f_0)$	0.2785 < 1.58	**OK**	

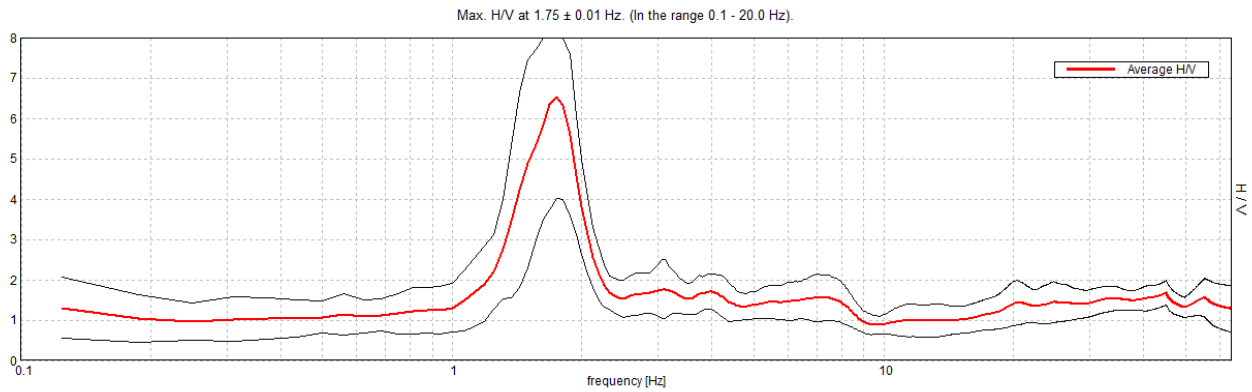|	
L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

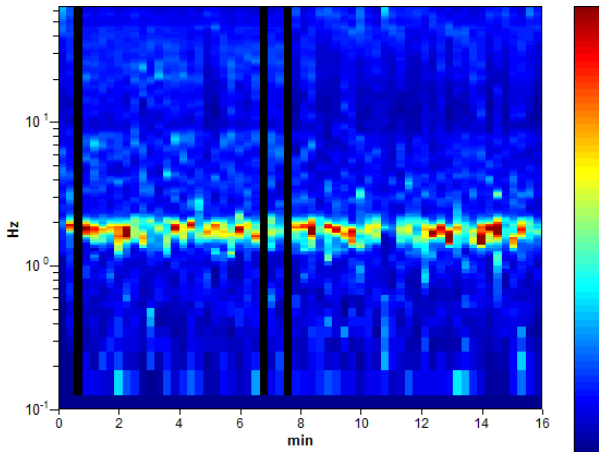| Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25\, f_0$	$0.2\, f_0$	$0.15\, f_0$	$0.10\, f_0$	$0.05\, f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR32 RIOVEGGIO BRAINE

Instrument: TRZ-0108/01-10
Start recording: 19/11/18 13:16:44   End recording: 19/11/18 13:32:45
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00".   Analyzed 95% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 16 s
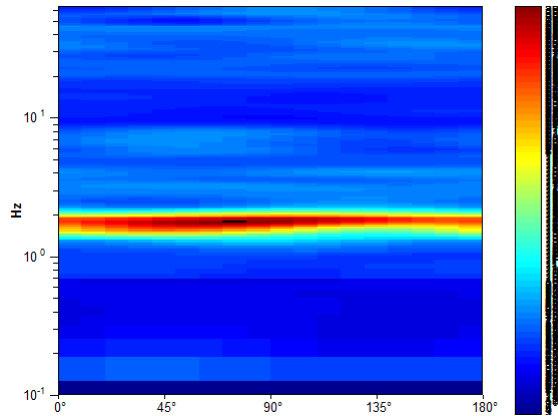Smoothing type: Triangular window
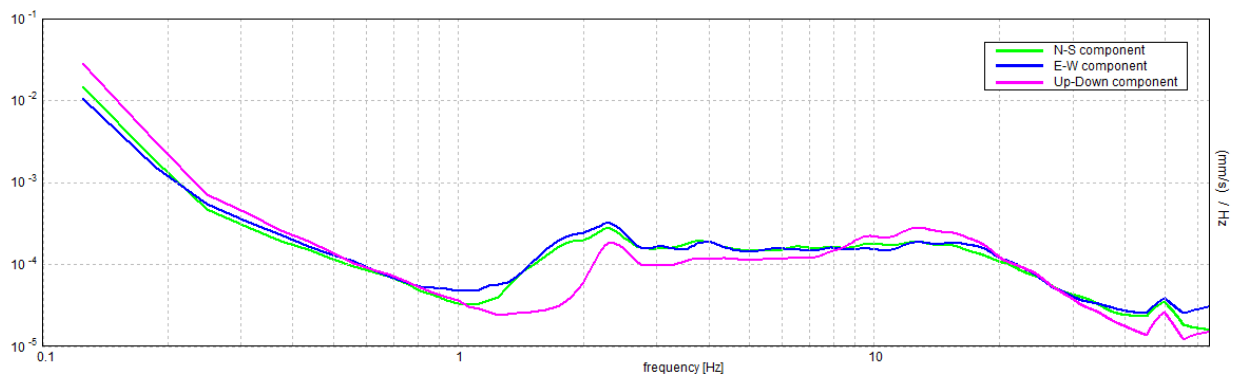Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 1.75 ± 0.01 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

<table>
<tr><td colspan="4" align="center">**Max. H/V at 1.75 ± 0.01 Hz (in the range 0.1 - 20.0 Hz).**</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">**Criteria for a reliable H/V curve**
[All 3 should be fulfilled]</td></tr>
<tr><td align="center">$f_0 > 10 / L_w$</td><td align="center">1.75 > 0.63</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$n_c(f_0) > 200$</td><td align="center">1596.0 > 200</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz</td><td align="center">Exceeded 8 out of 43 times</td><td></td><td align="center">**NO**</td></tr>
<tr><td colspan="4" align="center">**Criteria for a clear H/V peak**
[At least 5 out of 6 should be fulfilled]</td></tr>
<tr><td align="center">Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$</td><td align="center">1.313 Hz</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$</td><td align="center">2.063 Hz</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$A_0 > 2$</td><td align="center">6.53 > 2</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$</td><td align="center">|0.00287| < 0.05</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$\sigma_f < \varepsilon(f_0)$</td><td align="center">0.00502 < 0.175</td><td align="center">**OK**</td><td></td></tr>
<tr><td align="center">$\sigma_A(f_0) < \theta(f_0)$</td><td align="center">1.2479 < 1.78</td><td align="center">**OK**</td><td></td></tr>
</table>

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	$0.25\, f_0$	$0.2\, f_0$	$0.15\, f_0$	$0.10\, f_0$	$0.05\, f_0$
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MONZUNO_MS, TR9 VADO GARDELETTA

Instrument: TRZ-0108/01-10
Start recording: 15/11/18 14:13:11   End recording: 15/11/18 14:29:12
Channel labels: NORTH SOUTH; EAST WEST ; UP   DOWN
Trace length: 0h16'00''.   Analyzed 88% trace (manual window selection)
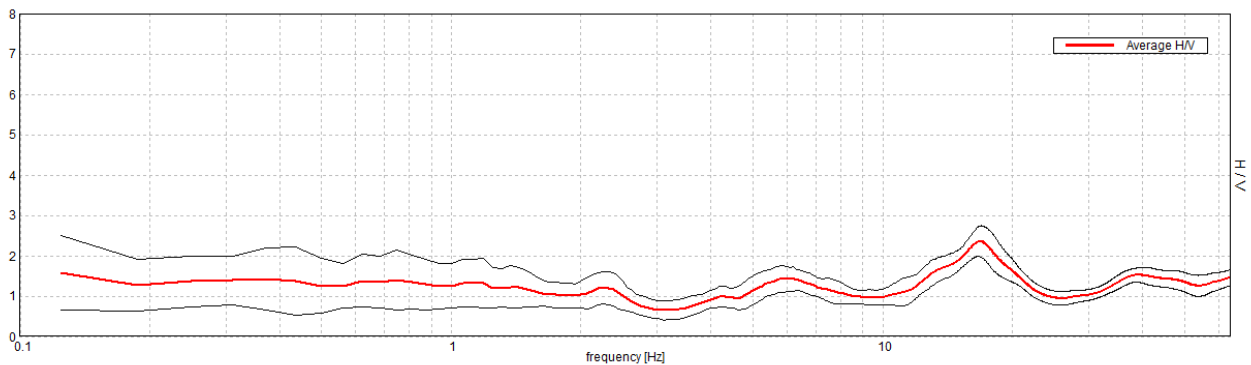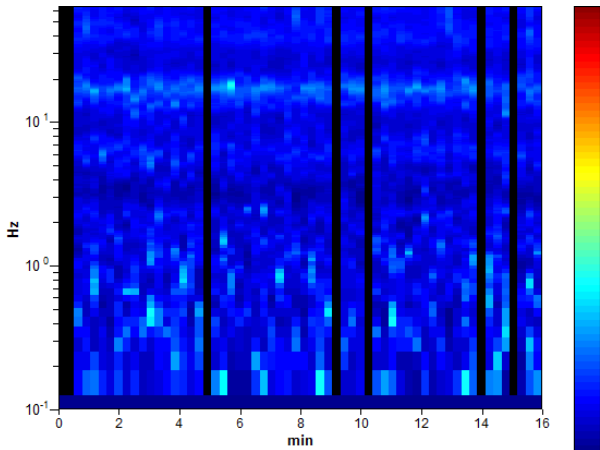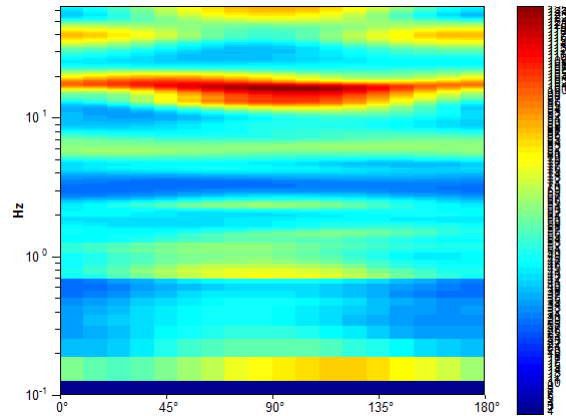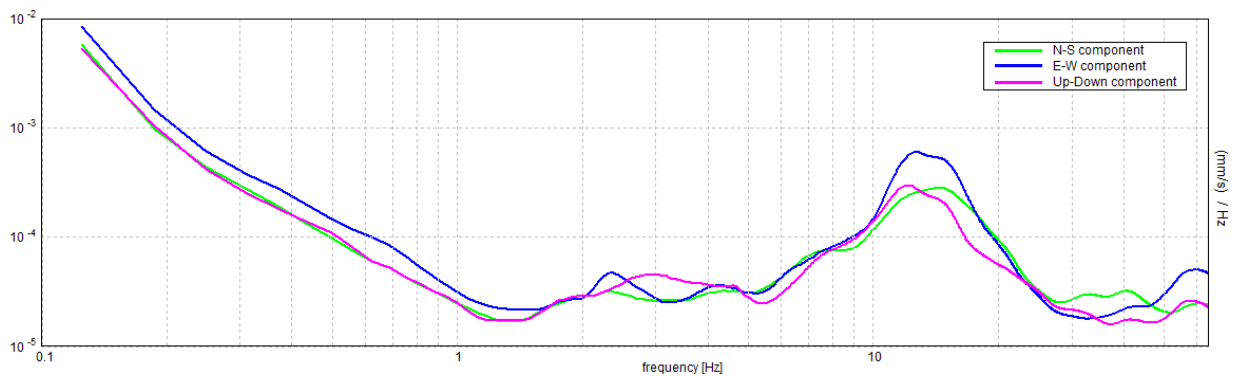Sampling rate: 128 Hz
Window size: 16 s
Smoothing type: Triangular window
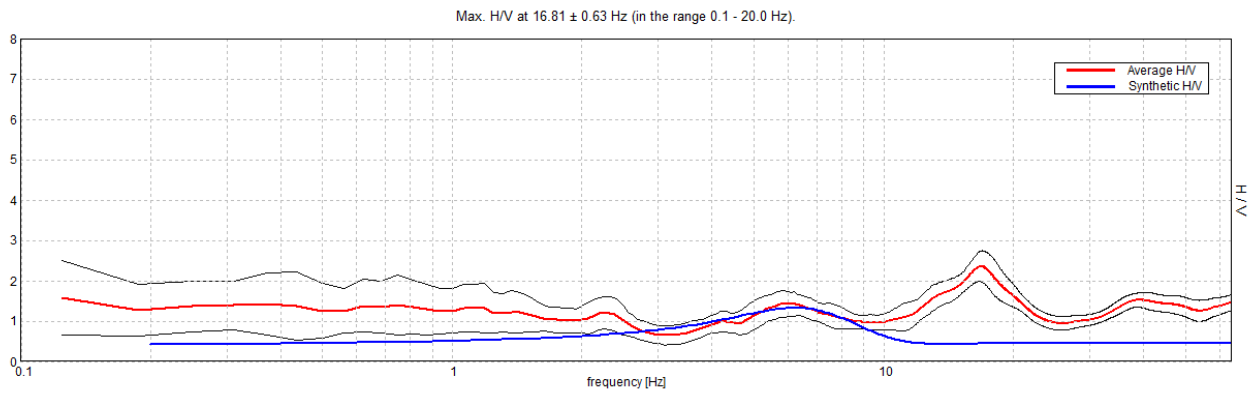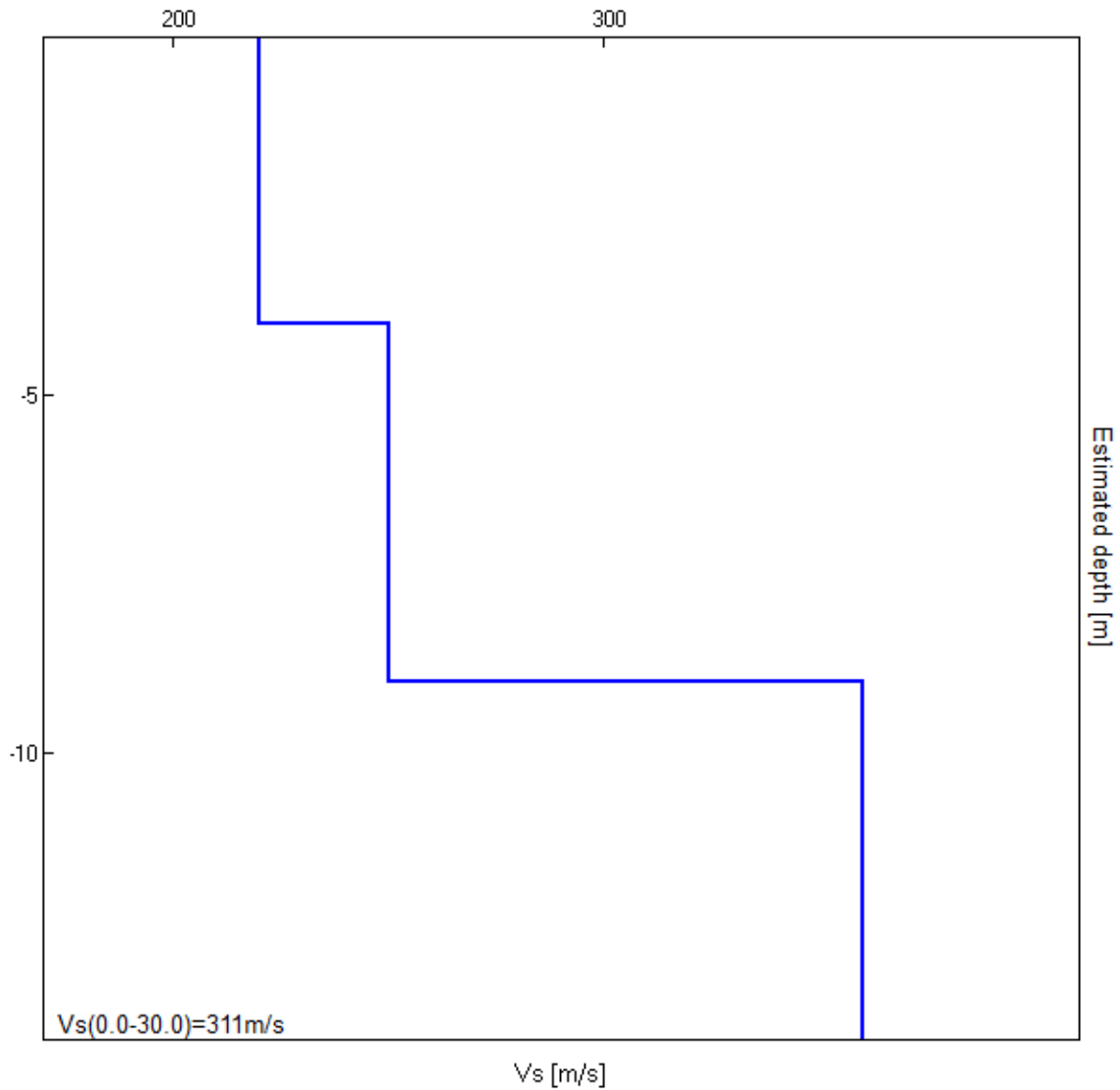Smoothing: 10%

HORIZONTAL TO VERTICAL SPECTRAL RATIO

Max. H/V at 16.81 ± 0.63 Hz. (In the range 0.1 - 20.0 Hz).

H/V TIME HISTORY

DIRECTIONAL H/V

SINGLE COMPONENT SPECTRA

EXPERIMENTAL vs. SYNTHETIC H/V

Max. H/V at 16.81 ± 0.63 Hz (in the range 0.1 - 20.0 Hz).

Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]
4.00	4.00	220
9.00	5.00	250
inf.	inf.	360

Vs(0.0-30.0)=311m/s

Vs(0.0-30.0)=311m/s

Vs [m/s]

[According to the SESAME, 2005 guidelines. **Please read carefully the** *Grilla* **manual before interpreting the following tables**.]

Max. H/V at 16.81 ± 0.63 Hz (in the range 0.1 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	16.81 > 0.63	**OK**	
$n_c(f_0) > 200$	14257.0 > 200	**OK**	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5Hz$ $\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5Hz$	Exceeded 0 out of 404 times	**OK**	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0 / 2$	11.688 Hz	**OK**	
Exists f^+ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0 / 2$	22.313 Hz	**OK**	
$A_0 > 2$	2.36 > 2	**OK**	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01842| < 0.05	**OK**	
$\sigma_f < \varepsilon(f_0)$	0.30971 < 0.84063	**OK**	
$\sigma_A(f_0) < \theta(f_0)$	0.1896 < 1.58	**OK**	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w\, n_w\, f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

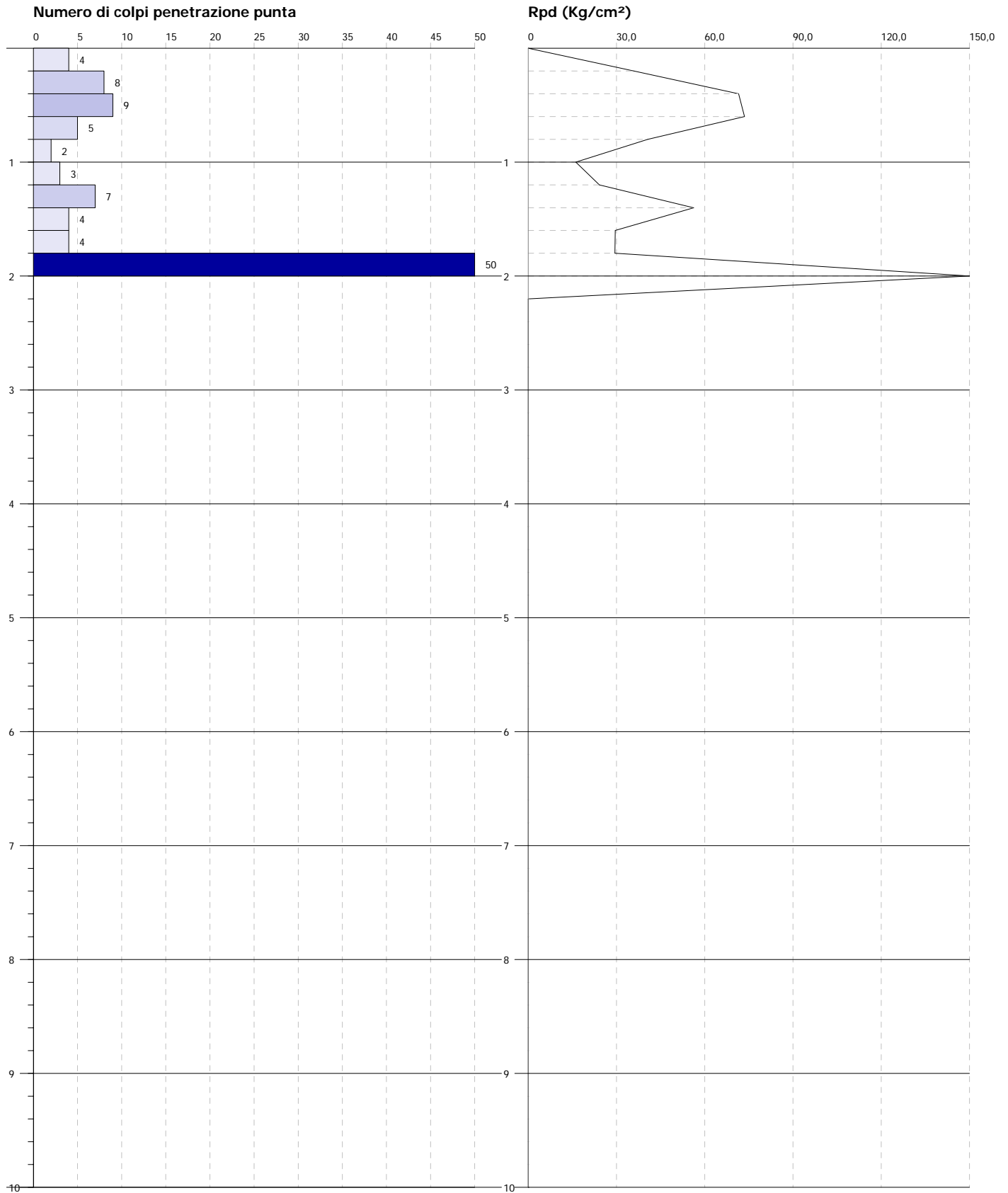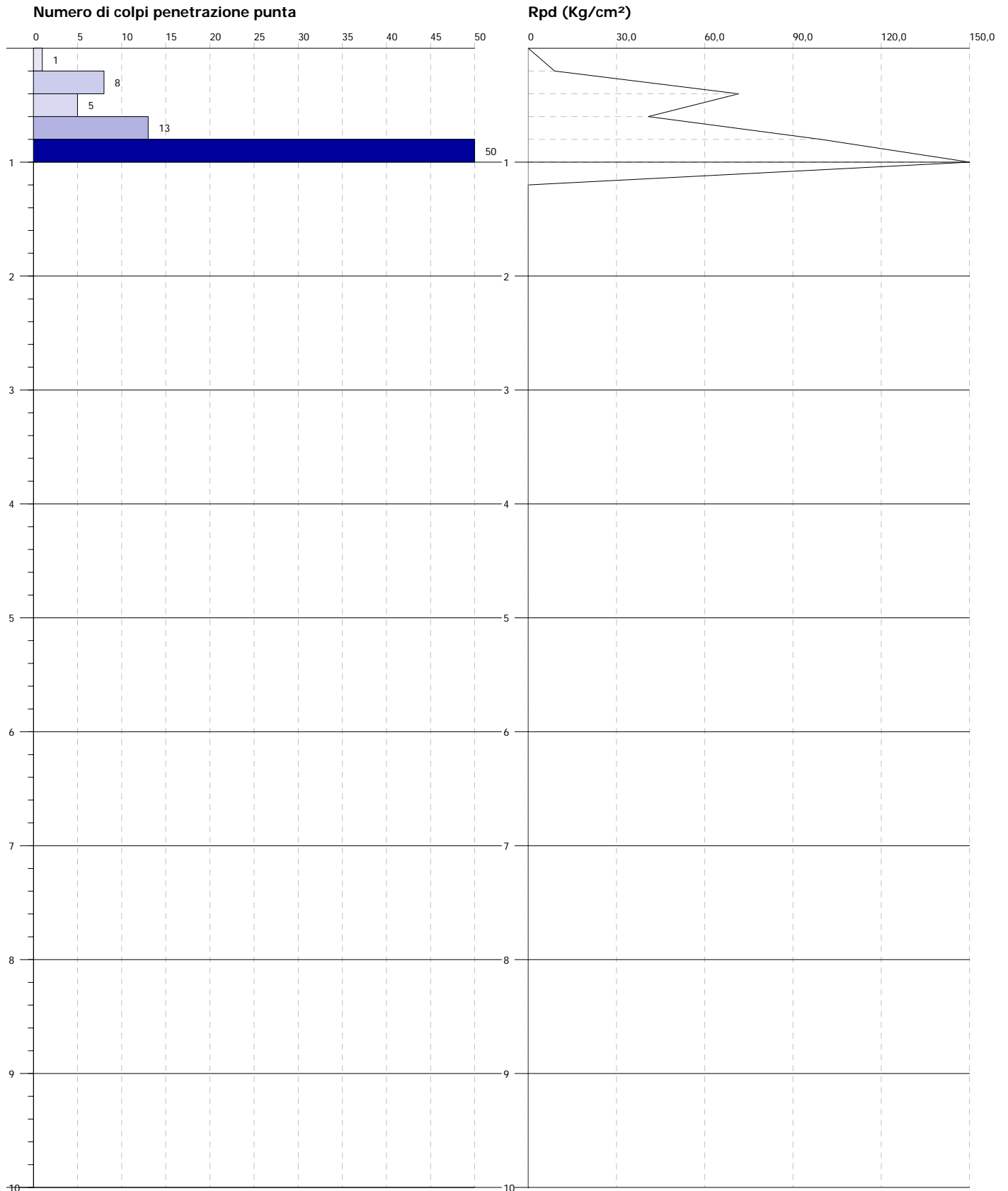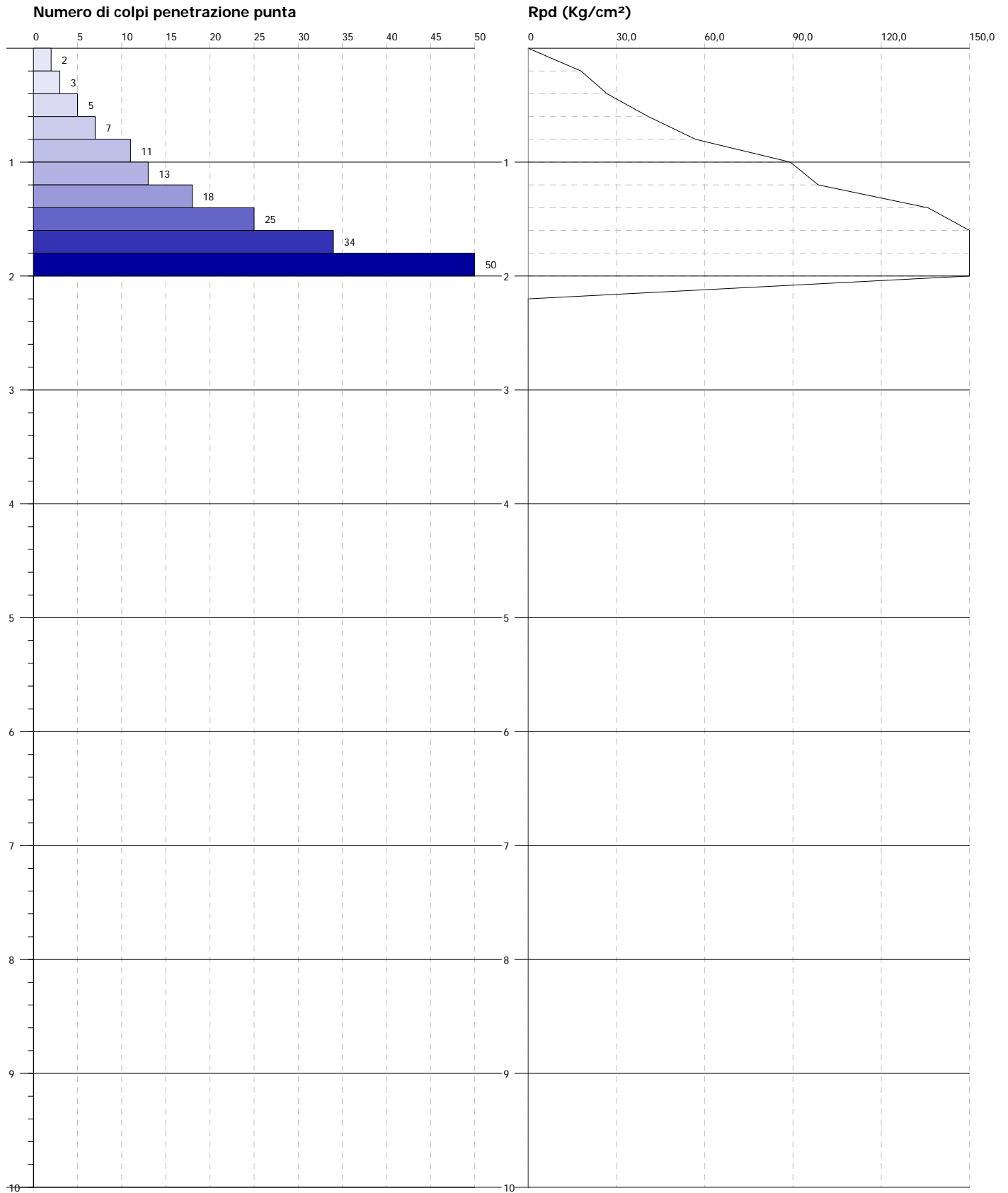# PROVA PENETROMETRICA DINAMICA 037044P170DS184
Strumento utilizzato... DPSH TG 63-200 PAGANI
DIAGRAMMA NUMERO COLPI PUNTA-Rpd

Committente : RTP Sangiorgi, Brunaldi, Zamboni, Milioto, Soglia
Cantiere : Microzonazione Sismica Livello 2
Località : Campo sportivo Vado, Monzuno (BO)
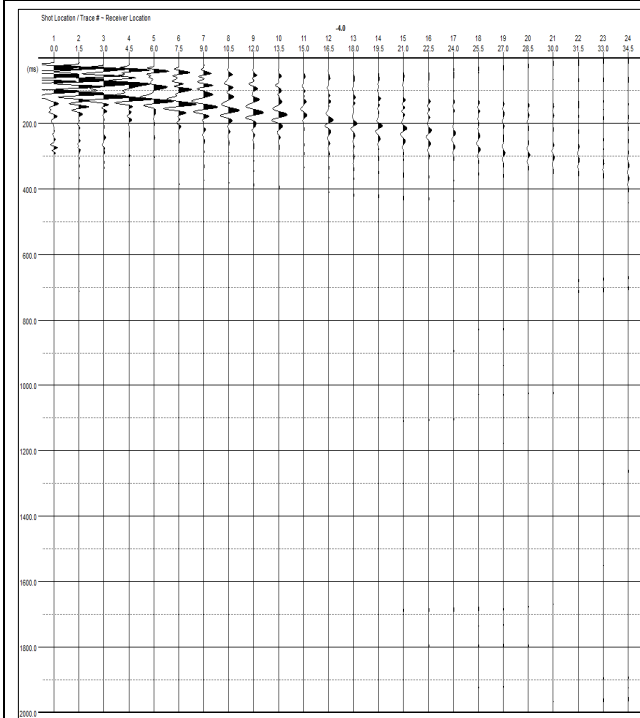
Data : 01/04/2019

Scala 1:47

Numero di colpi penetrazione punta

Rpd (Kg/cm²)

PROVA PENETROMETRICA DINAMICA 037044P171DS185
Strumento utilizzato... DPSH TG 63-200 PAGANI
DIAGRAMMA NUMERO COLPI PUNTA-Rpd

Committente : RTP Sangiorgi, Brunaldi, Zamboni, Milioto, Soglia
Cantiere : Microzonazione Sismica Livello 2
Località : Campo sportivo Rioveggio, Monzuno (BO)

Data : 01/04/2019

Scala 1:47

Numero di colpi penetrazione punta

Rpd (Kg/cm²)

PROVA PENETROMETRICA DINAMICA 037044P172DS186
Strumento utilizzato... DPSH TG 63-200 PAGANI
DIAGRAMMA NUMERO COLPI PUNTA-Rpd

Committente : RTP Sangiorgi, Brunaldi, Zamboni, Milioto, Soglia

Data : 01/04/2019

Cantiere : Microzonazione Sismica Livello 2

Località : Campo sportivo Monzuno (BO)

Scala 1:47

Numero di colpi penetrazione punta

Rpd (Kg/cm²)

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

Cimitero, Monzuno (BO) – 037044L2MASW2

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio f–v e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

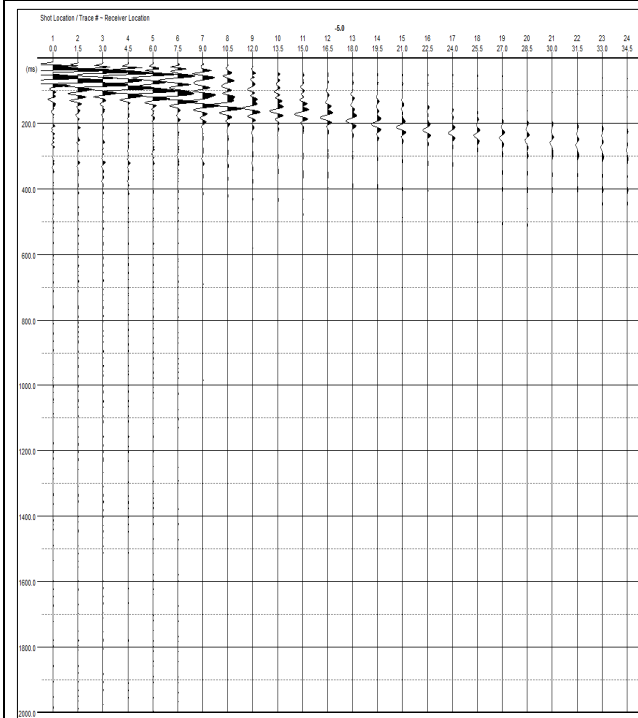| n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	1.5	1.5	161.6
2	3.1	1.6	170.3
3	4.9	1.8	229.7
4	6.9	2.0	300.0
5	9.2	2.3	333.1
6	11.9	2.7	449.5
7	15.1	3.2	475.2
8	18.9	3.8	498.9
9	23.4	4.5	548.4
10	∞	∞	615.1

$V_{S30} = 377.9 \pm 10\%$ [m/s]

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.

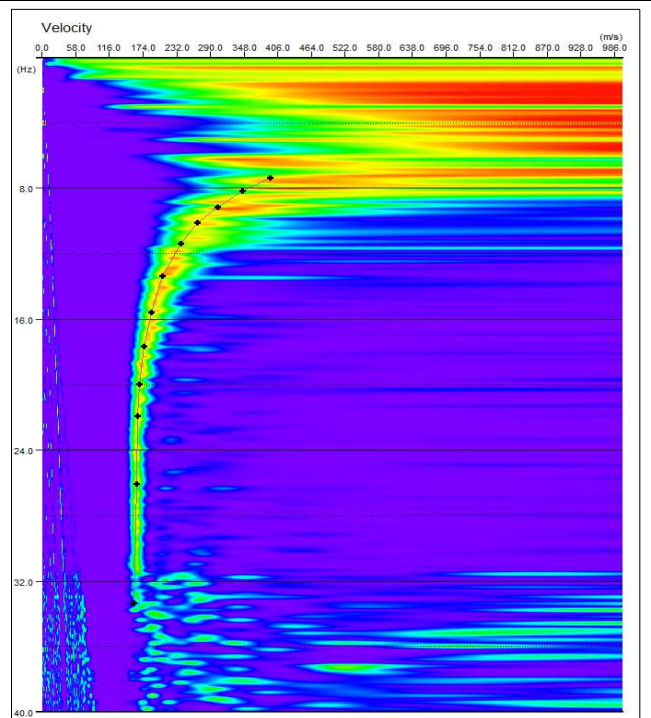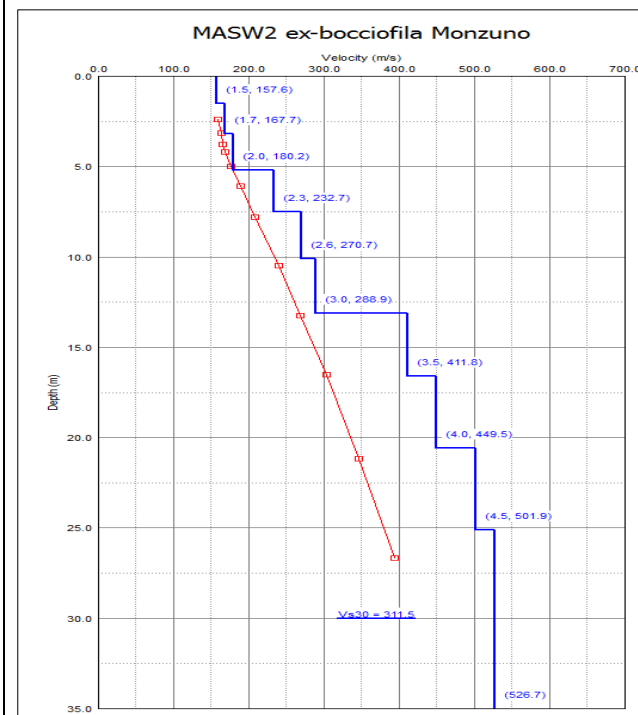# PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

Ex-bocciofila, Monzuno (BO) – 037044L3MASW3

n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio *f–v* e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

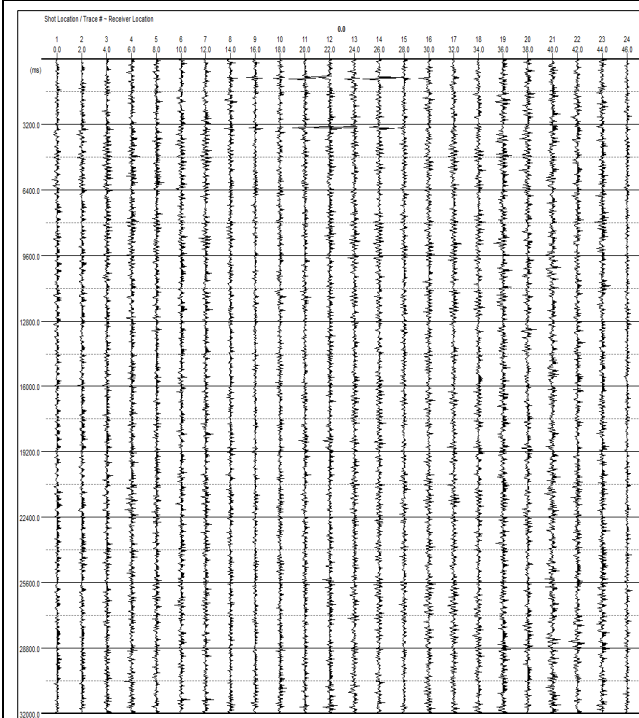| n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	1.5	1.5	157.6
2	3.2	1.7	167.7
3	5.2	2.0	180.2
4	7.5	2.3	232.7
5	10.1	2.6	270.7
6	13.1	3.0	288.9
7	16.6	3.5	411.8
8	20.6	4.0	449.5
9	25.1	4.5	501.9
10	∞	∞	526.7

$$V_{S30} = 311.5 \pm 10\% \ [m/s]$$

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.
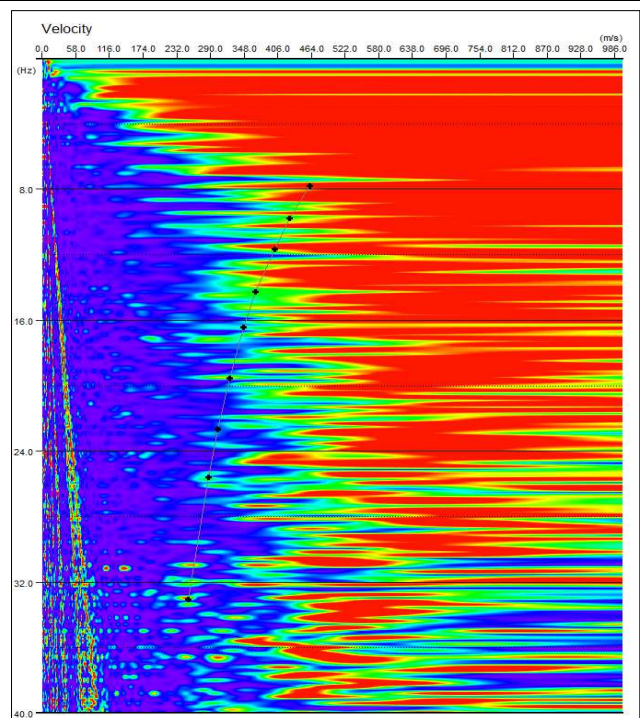
PROSPEZIONE SISMICA CON METODOLOGIA PASSIVA Re.Mi.

Campo sportivo, Monzuno (BO) – 037044L4REMI4

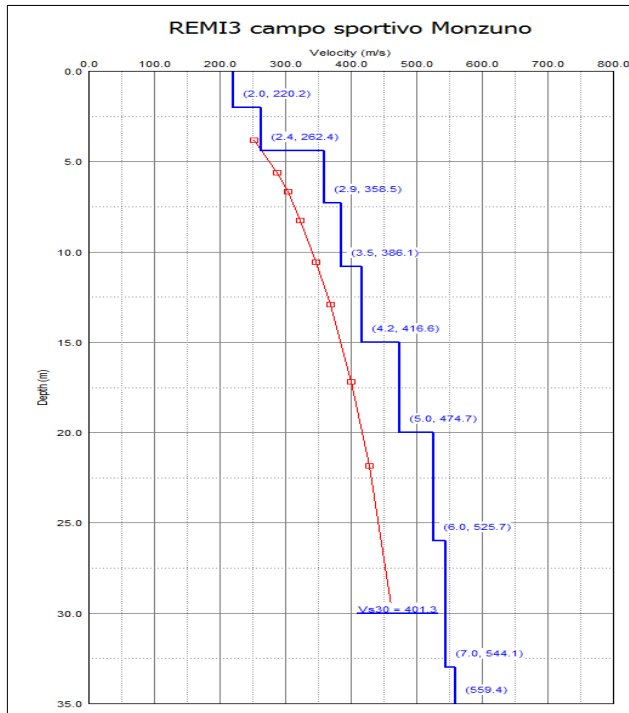| n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	2,0	46,0	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio f–v e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

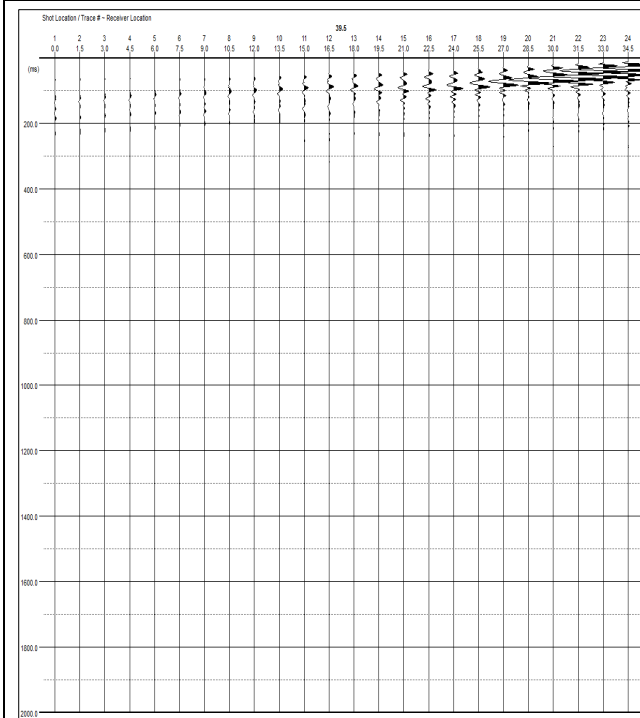| n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	2.0	2.0	220.2
2	4.4	2.4	262.4
3	7.3	2.9	358.5
4	10.8	3.5	386.1
5	15.0	4.2	416.6
6	20.0	5.0	474.7
7	26.0	6.0	525.7
8	33.0	7.0	544.1
9	∞	∞	559.4

$$V_{S30} = 401.3 \pm 10\% \ [m/s]$$

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.

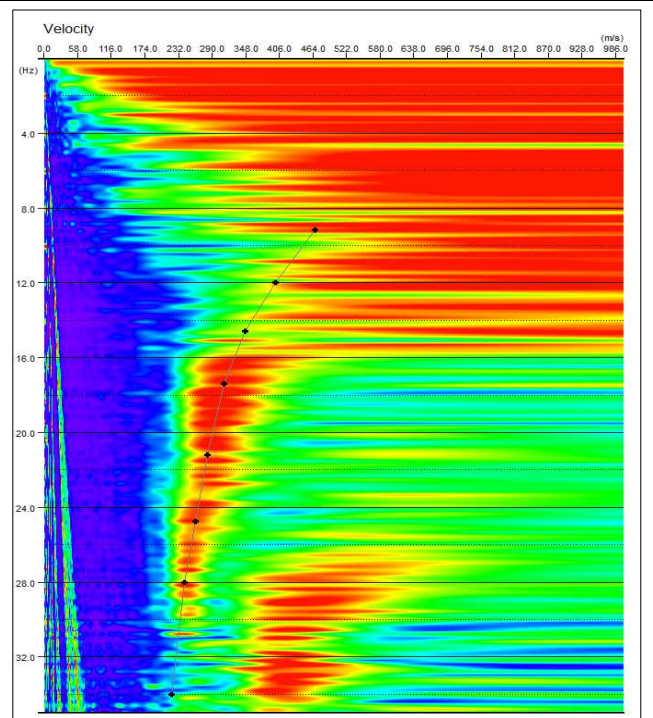# PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

Brento, Comune di Monzuno (BO) – 037044L5MASW5

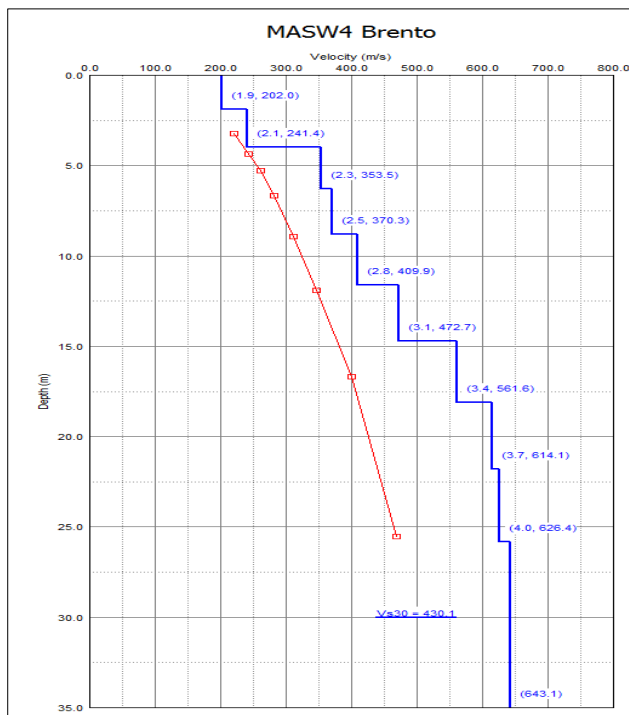| n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	1,5	34,5	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio f–v e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

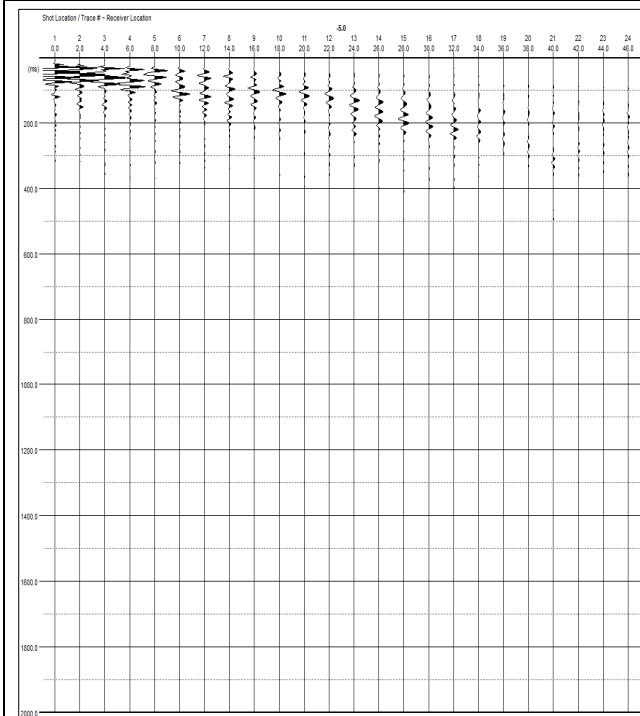| n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	1.9	1.9	202.0
2	4.0	2.1	241.4
3	6.3	2.3	353.5
4	8.8	2.5	370.3
5	11.6	2.8	409.9
6	14.7	3.1	472.7
7	18.1	3.4	561.6
8	21.8	3.7	614.1
9	25.8	4.0	626.4
10	∞	∞	643.1

$$V_{S30} = 430.1 \pm 10\% \text{ [m/s]}$$

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.

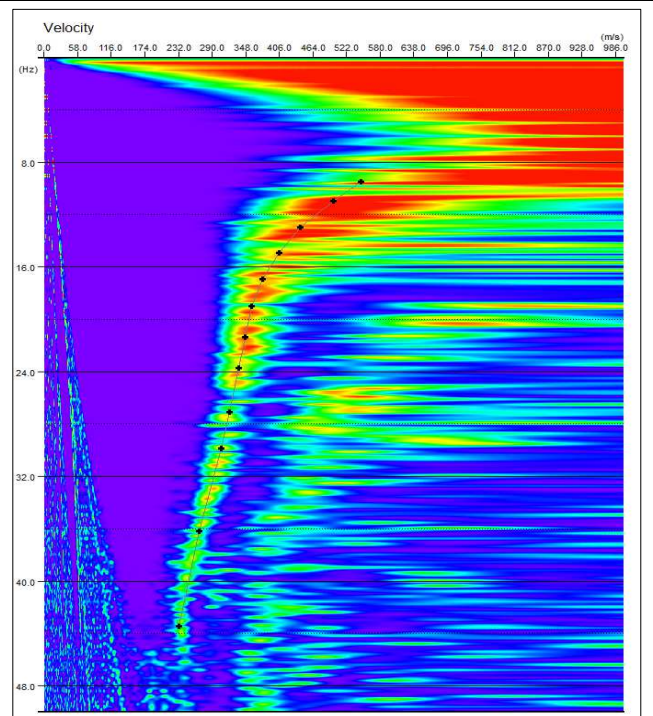# PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

Vado, Comune di Monzuno (BO) – 037044L6MASW6

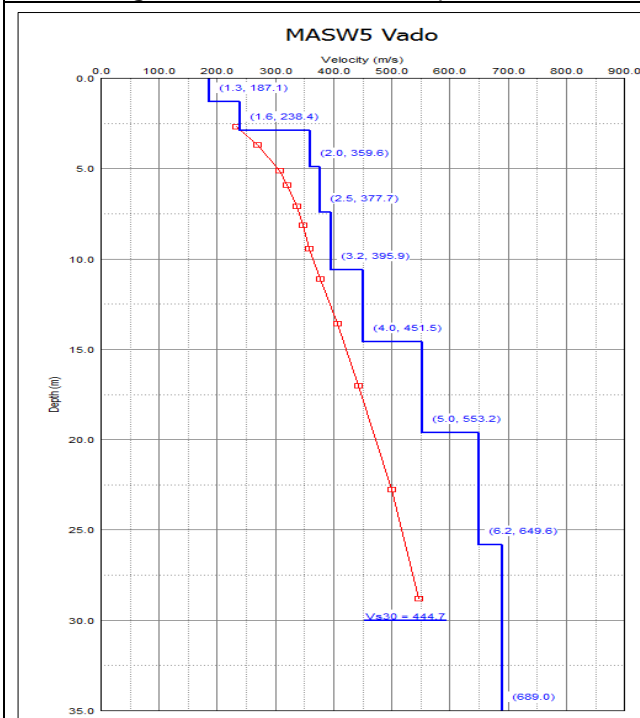| n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	2,0	46,0	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio f–v e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	1.3	1.3	187.1
2	2.9	1.6	238.4
3	4.9	2.0	359.6
4	7.4	2.5	377.7
5	10.6	3.2	395.9
6	14.6	4.0	451.5
7	19.6	5.0	553.2
8	25.8	6.2	649.6
9	∞	∞	689.0

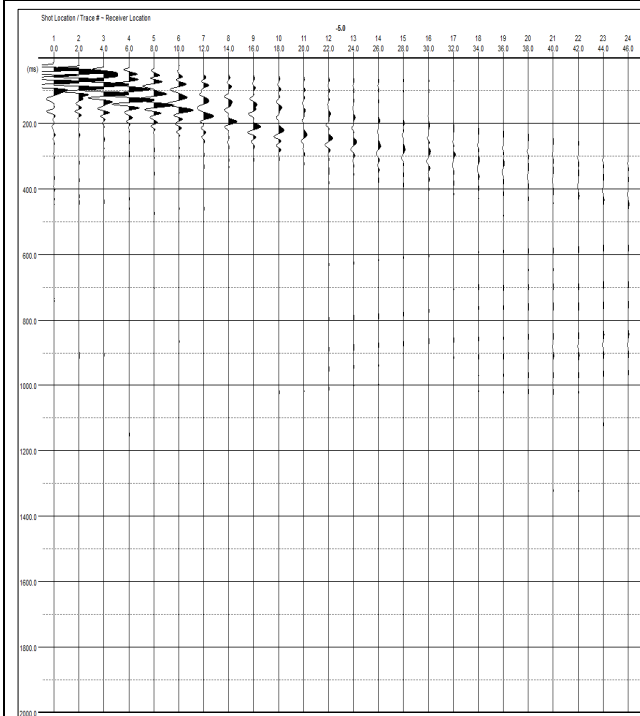$$V_{S30} = 444.7 \pm 10\% \, [m/s]$$

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.

PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.
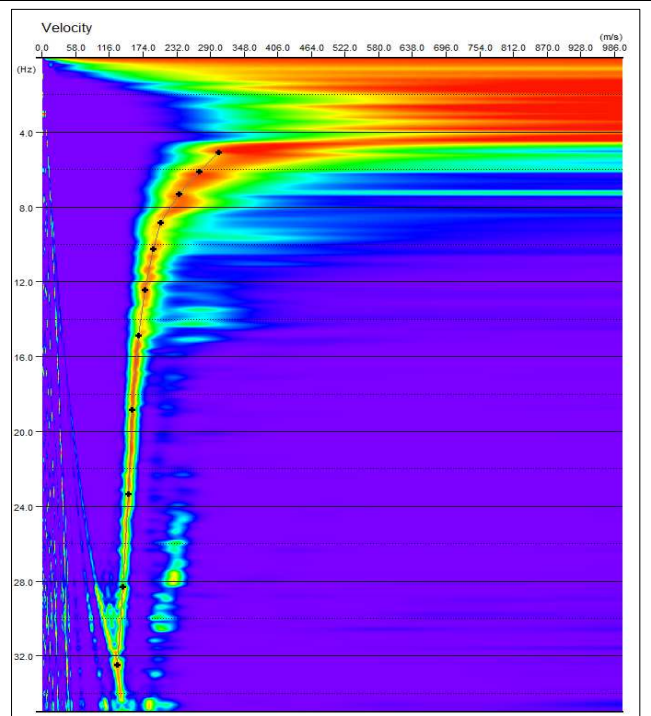
Le Braine, Comune di Monzuno (BO) – 037044L7MASW7

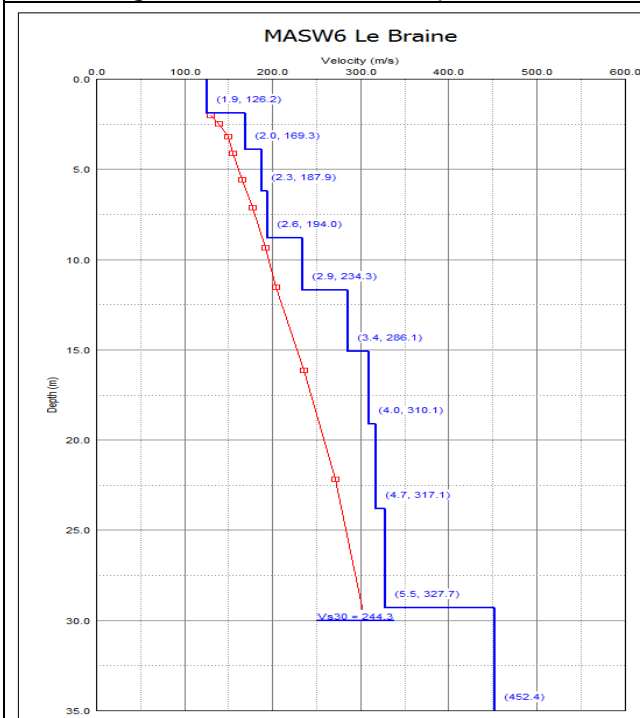| n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	2,0	46,0	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio f–v e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	1.9	1.9	126.2
2	3.9	2.0	169.3
3	6.2	2.3	187.9
4	8.8	2.6	194.0
5	11.7	2.9	234.3
6	15.1	3.4	286.1
7	19.1	4.0	310.1
8	23.8	4.7	317.1
9	29.3	5.5	327.7
10	∞	∞	452.4

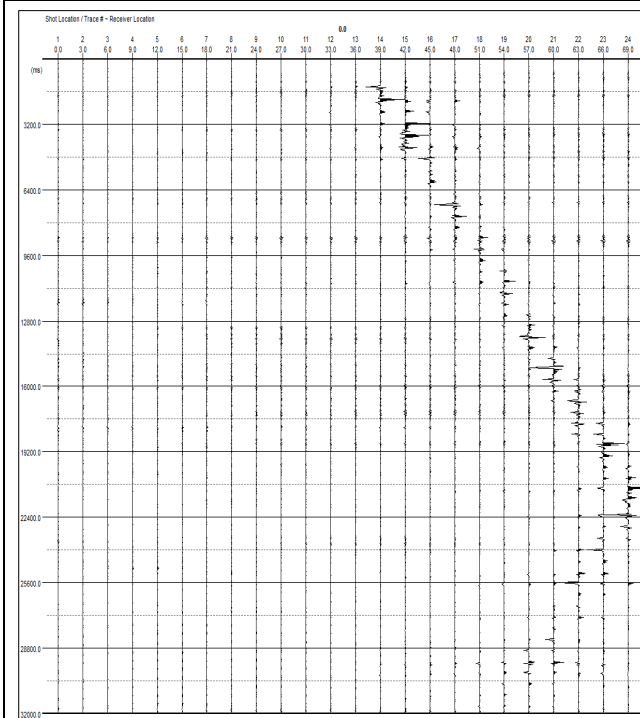$$V_{S30} = 244.3 \pm 10\% \ [m/s]$$

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.
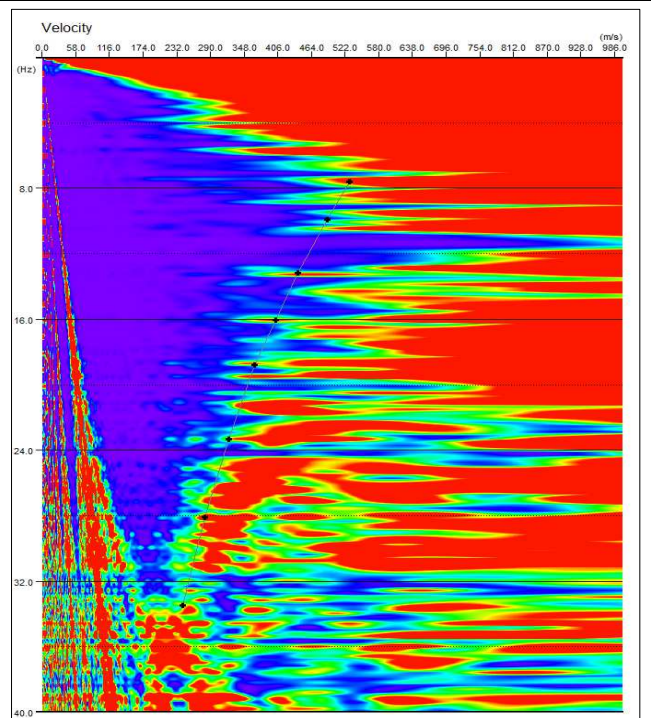
PROSPEZIONE SISMICA CON METODOLOGIA PASSIVA Re.Mi.

Campo sportivo Rioveggio, Comune di Monzuno (BO) – 037044L8REMI8

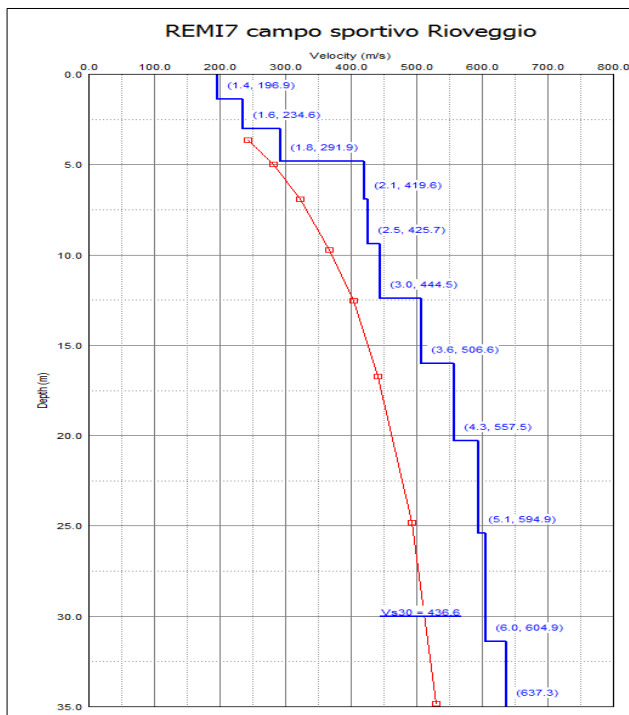| n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	3,0	69,0	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio f–v e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

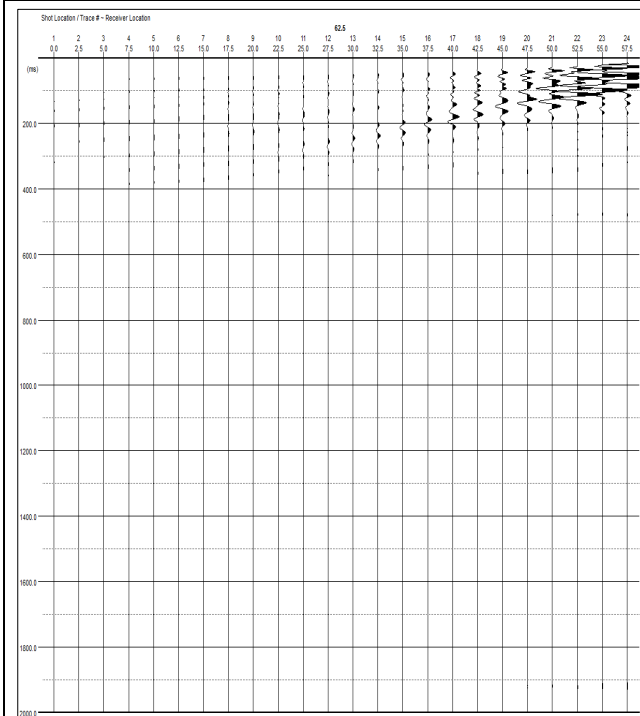| n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	1.4	1.4	196.9
2	3.0	1.6	234.6
3	4.8	1.8	291.9
4	6.9	2.1	419.6
5	9.4	2.5	425.7
6	12.4	3.0	444.5
7	16.0	3.6	506.6
8	20.3	4.3	557.5
9	25.4	5.1	594.9
10	31.4	6.0	604.9
11	∞	∞	637.3

$$V_{S30} = 436.6 \pm 10\% \; [m/s]$$

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.

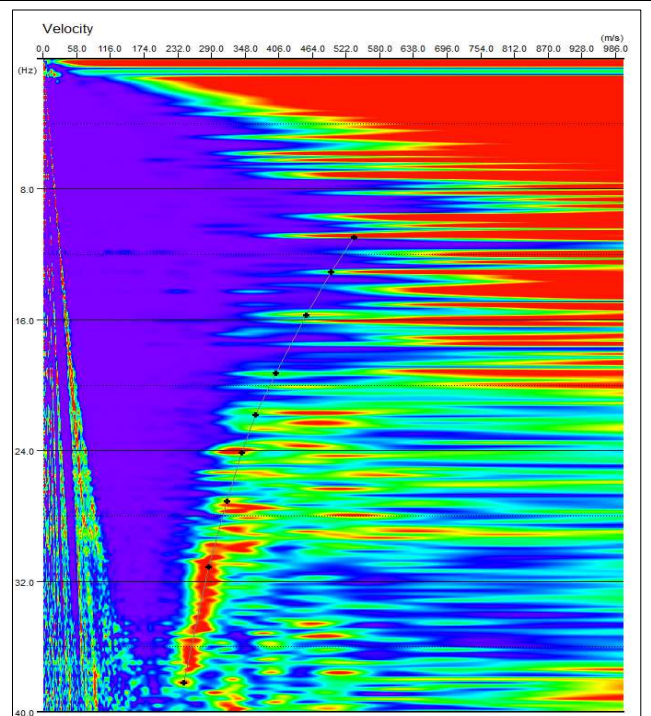# PROSPEZIONE SISMICA CON METODOLOGIA ATTIVA/PASSIVA MASW/Re.Mi.

Via Cerreta Rioveggio, Comune di Monzuno (BO) – 037044L9MASW9

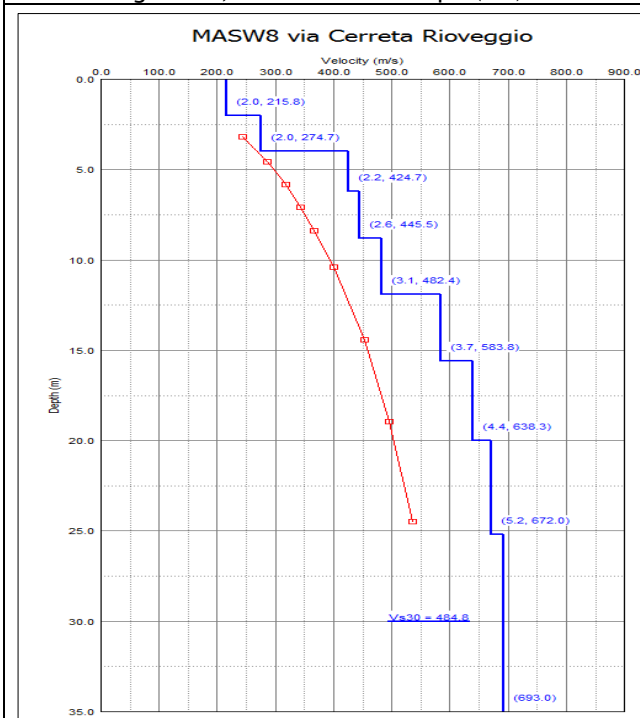| n° tracce	Δx (m)	L tot (m)	Δt (ms)	T (s)
15	2,5	57,5	0,5/2,0	2,0/32,0

Δx: interdistanza geofonica; L tot: lunghezza profilo; Δt: passo di campionamento; T: durata registrazione.

Sismogramma registrato durante le acquisizioni di microtremore sismico. In ascissa il numero dei geofoni, in ordinata il tempo (ms).

Spettro di potenza nel dominio $f-v$ e Picking della curva sperimentali delle onde R (croci nere).

Modello di sottosuolo (1D) descritti in termini di Vs e spessore dei sismostrati (spezzata blu) e curva di dispersione sperimentale delle onde R (curva rossa).

Tabella di sintesi

n. Strato	Profondità letto (m dal p.c.)	Spessore (m)	V_S (m/s)
1	2.0	2.0	215.8
2	4.0	2.0	274.7
3	6.2	2.2	424.7
4	8.8	2.6	445.5
5	11.9	3.1	482.4
6	15.6	3.7	583.8
7	20.0	4.4	638.3
8	25.2	5.2	672.0
9	∞	∞	693.0

$V_{S30} = 484.8 \pm 10\%$ [m/s]

Sintesi dei parametri del modello di sottosuolo ottenuto e Valore di Vs30 calcolato.