PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

RegioneEmiliaRomagna

CONFERENZA DELLE REGIONI E DELLE PROVINCE AUTONOME

Attuazione dell'articolo 11 della legge 24 giugno 2009, n.77

MICROZONAZIONE SISMICA

Livello 3

Regione Emilia-Romagna

Comune di Mirabello

Relazione Illustrativa - Allegato 2

Rapporti di Prova

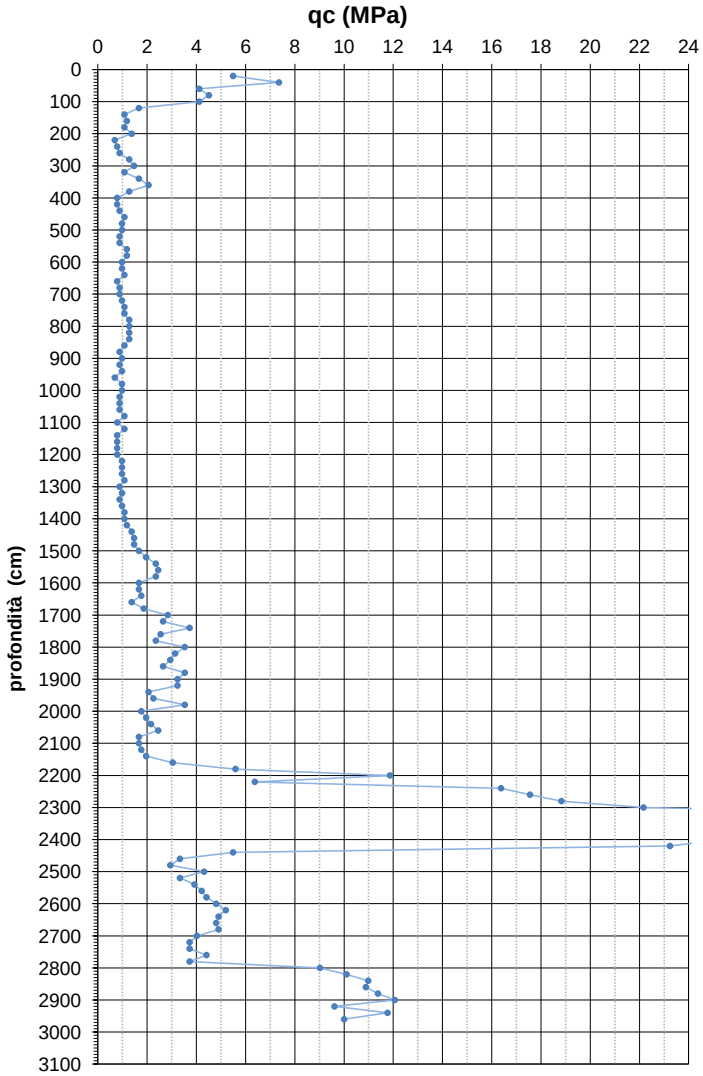
Regione	Soggetto realizzatore	Data
Emilia-Romagna	Geotema S.r.l.	30/09/2016

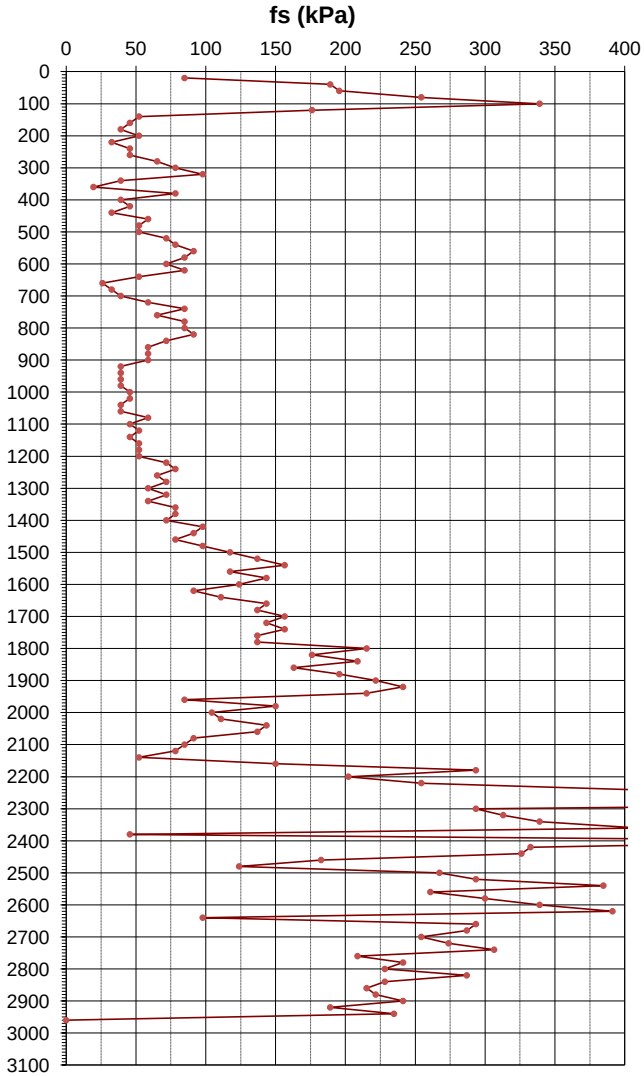
INDAGINI PENETROMETRICHE

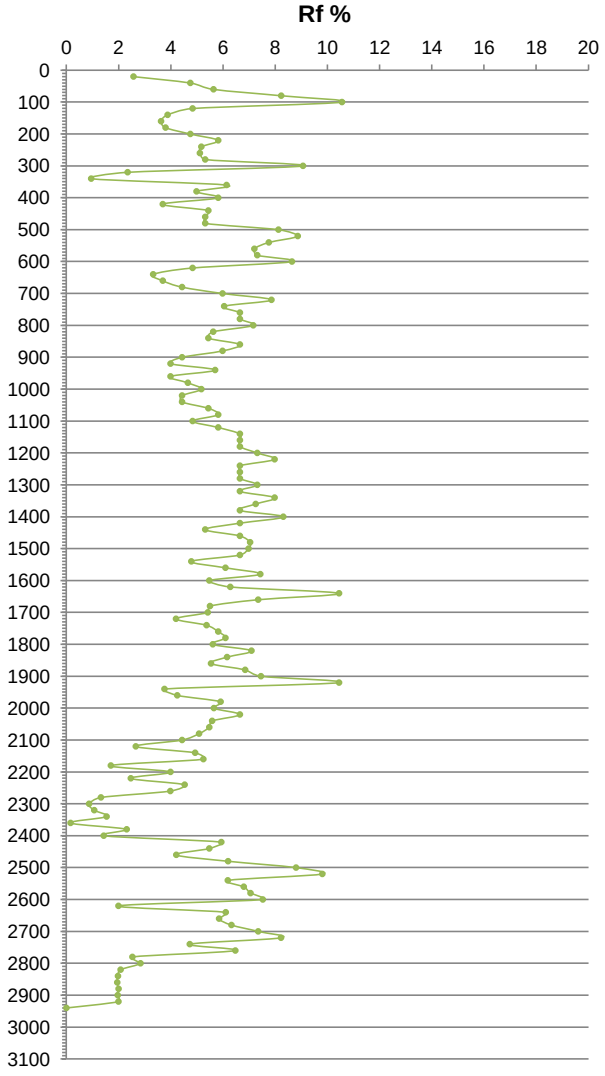
Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

Committ.:	Comune di Mirabello	**Prova:**	CPT 1	**Latitudine:**	44.807457
Località :	Mirabello	**Data:**	05/07/2014	**Longitudine:**	11.441884
Indirizzo :		**Falda:**	2.1 metri da p.c.		



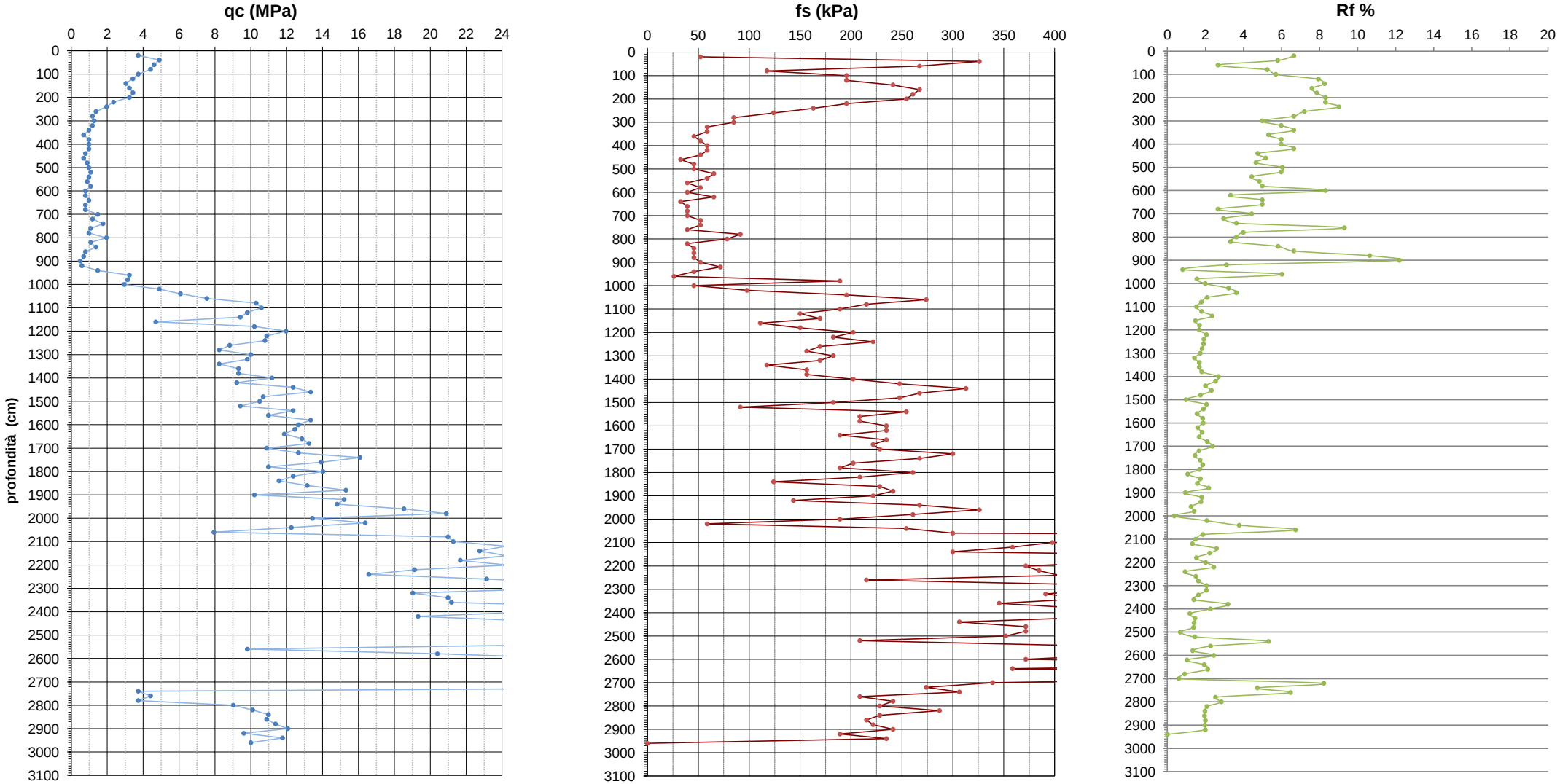




Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

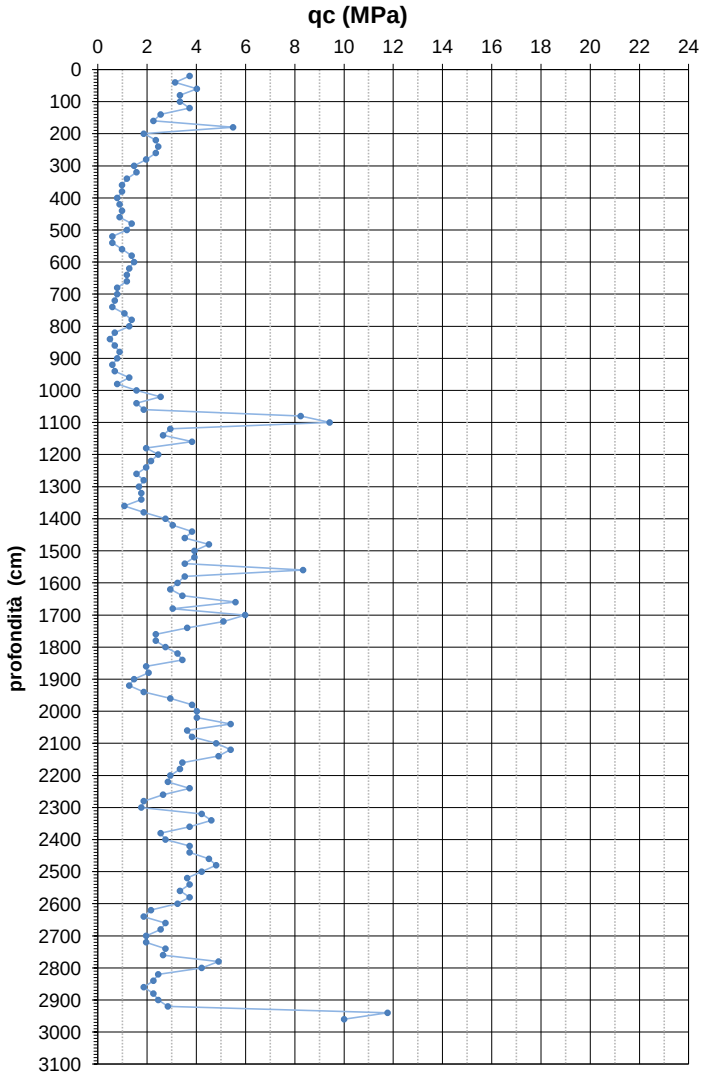
Committ.:	Comune di Mirabello	**Prova:**	CPT 2	**Latitudine:**	44.834126
Località :	Mirabello	**Data:**	05/07/2014	**Longitudine:**	11.427548
Indirizzo :		**Falda:**	3.8 metri da p.c.		

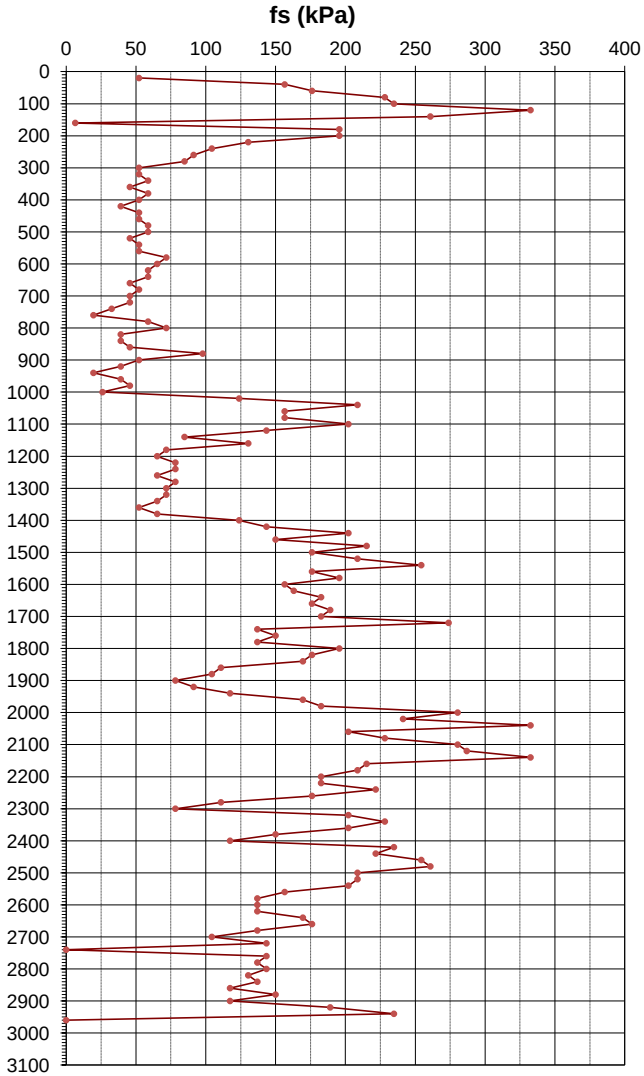


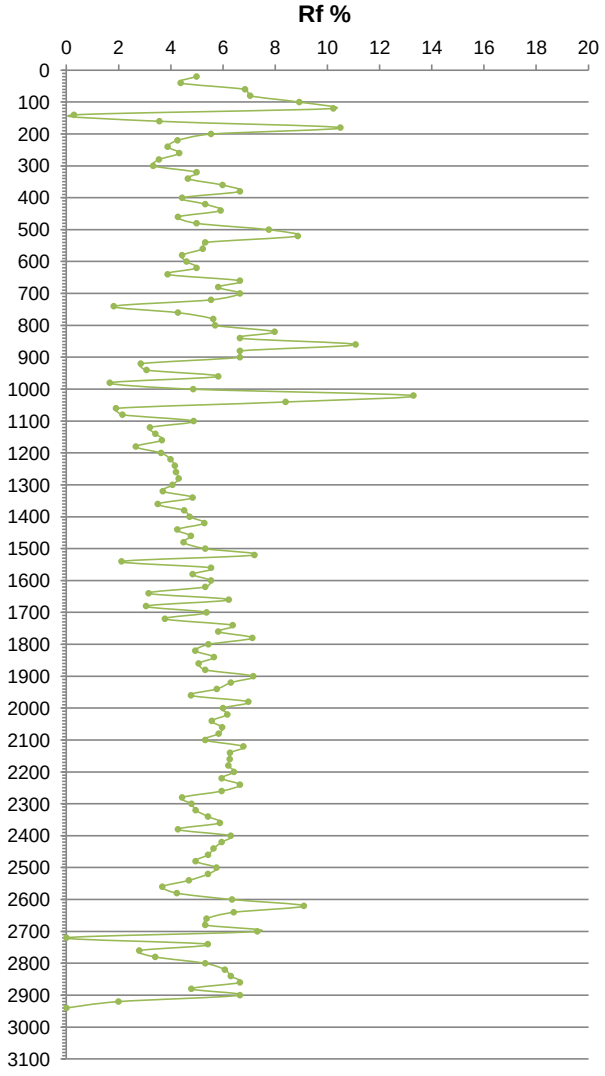
Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

Committ.:	Comune di Mirabello	**Prova:**	CPT 3	**Latitudine:**	44.83312
Località :	Mirabello	**Data:**	28/06/2014	**Longitudine:**	11.41461
Indirizzo :		**Falda:**	3.8 metri da p.c.		



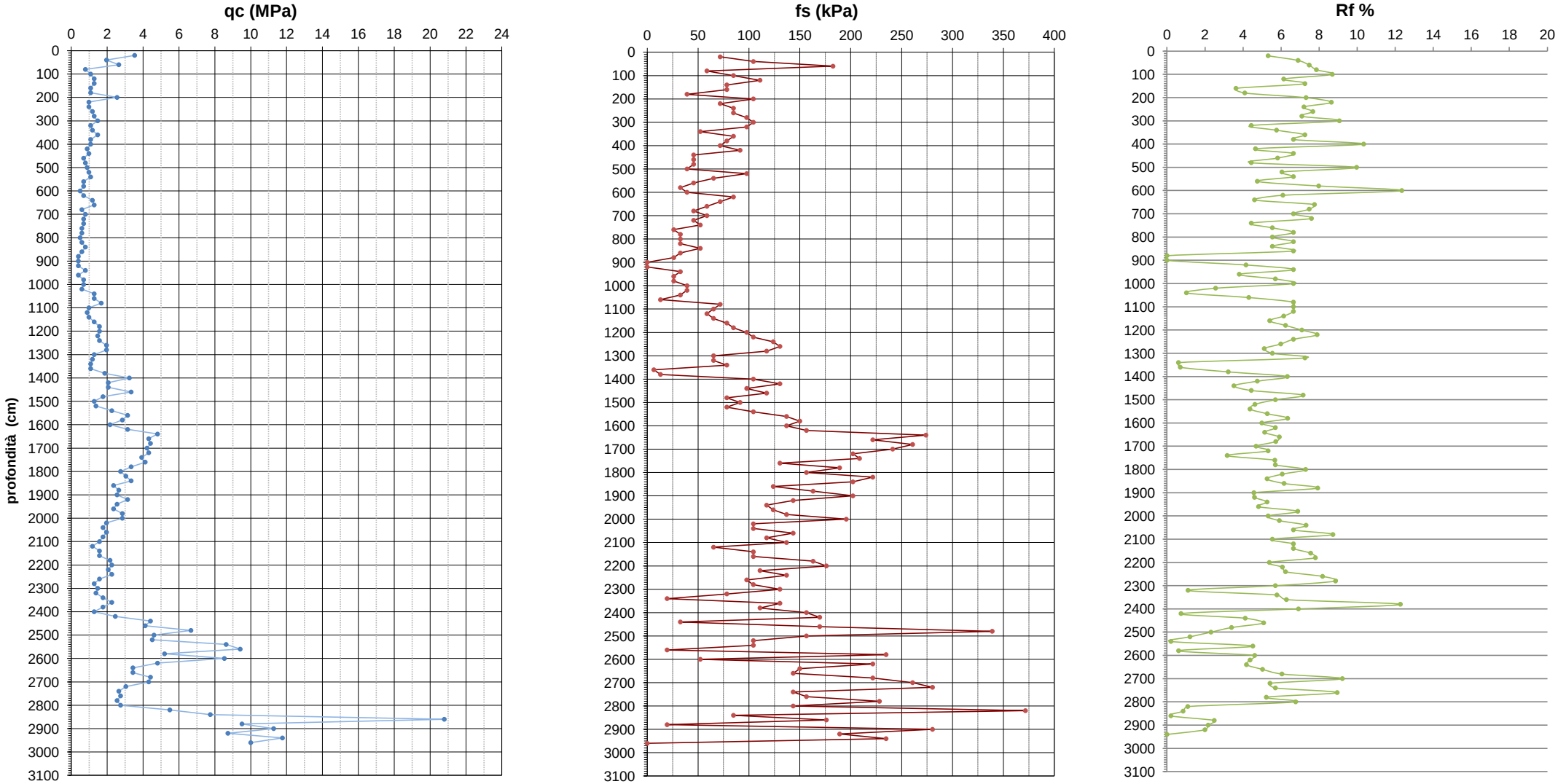




Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

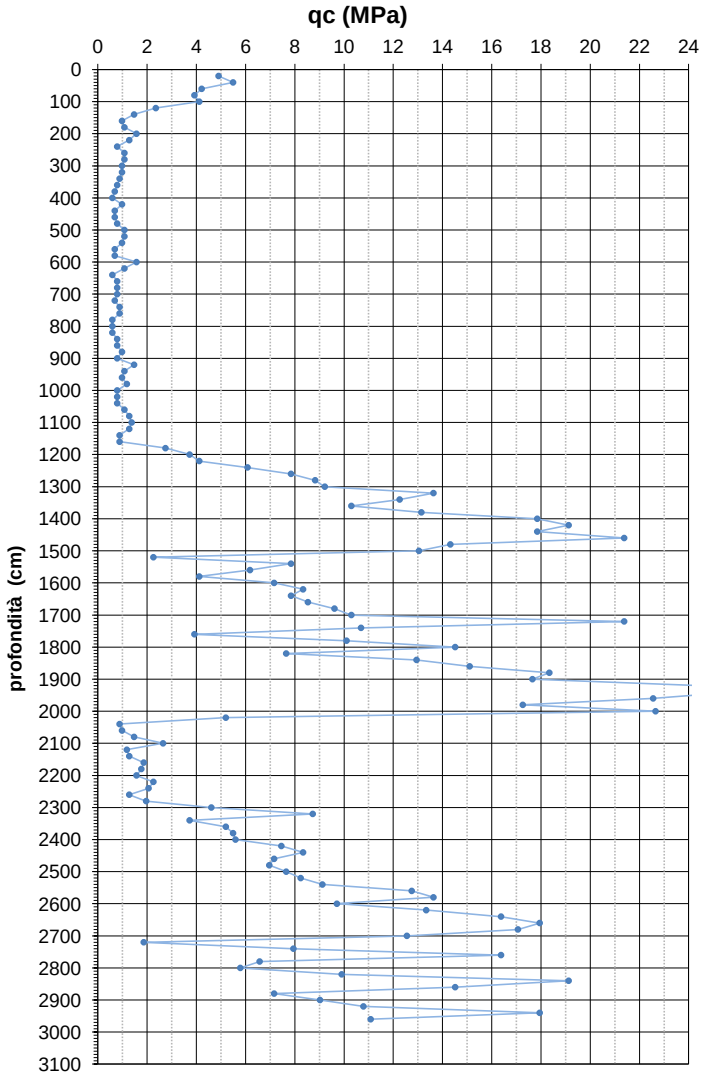
Committ.:	Comune di Mirabello	**Prova:**	CPT 4	**Latitudine:**	44.822442
Località :	Mirabello	**Data:**	28/06/2014	**Longitudine:**	11.432846
Indirizzo :		**Falda:**	3.9 metri da p.c.		

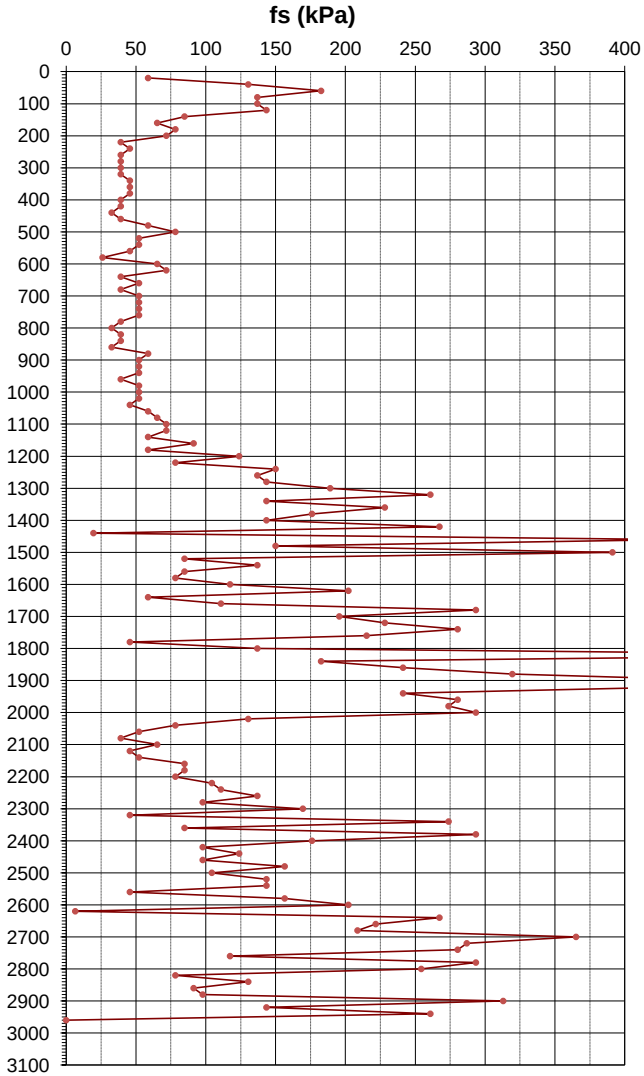


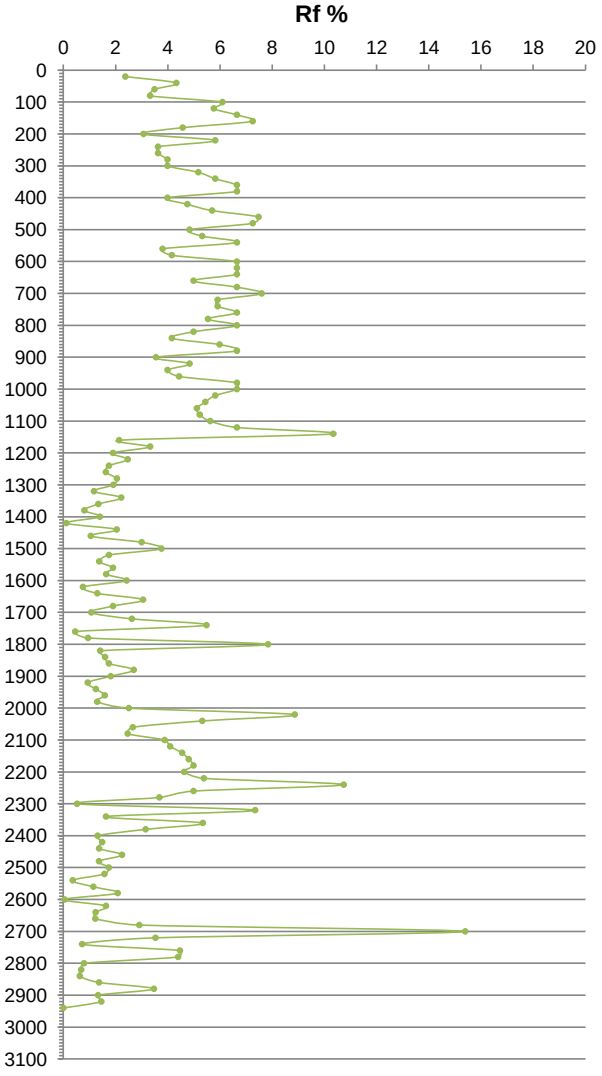
Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

Committ.:	Comune di Mirabello	**Prova:**	CPT 5	**Latitudine:**	44.826978
Località :	Mirabello	**Data:**	05/07/2014	**Longitudine:**	11.437231
Indirizzo :		**Falda:**	#VALORE!		



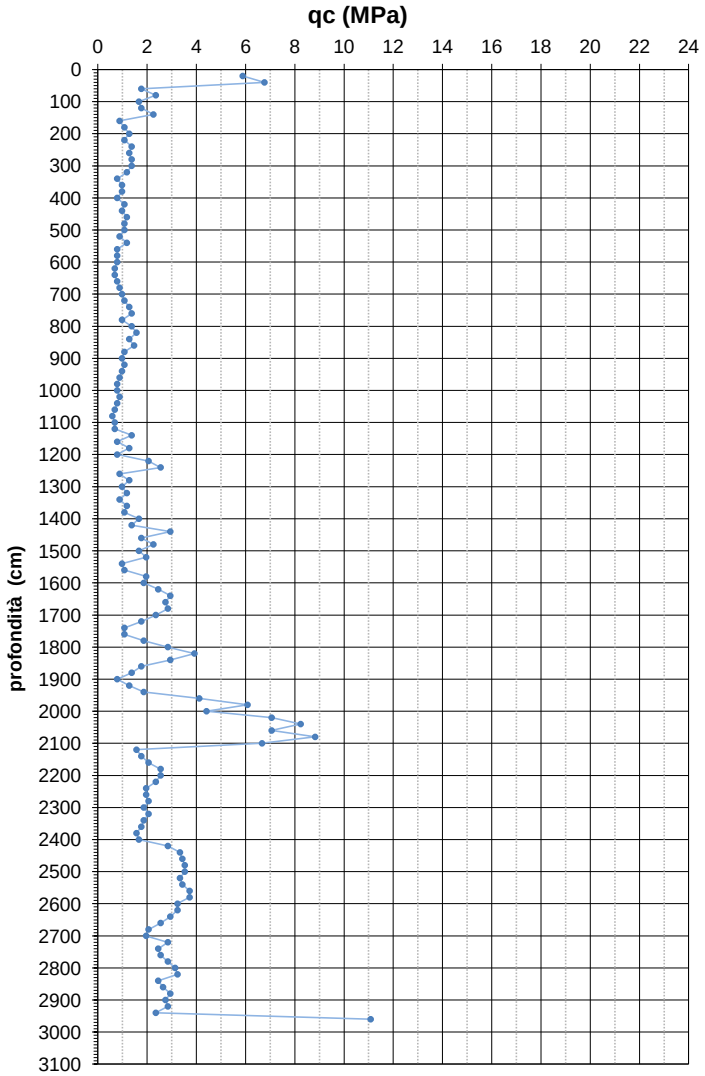


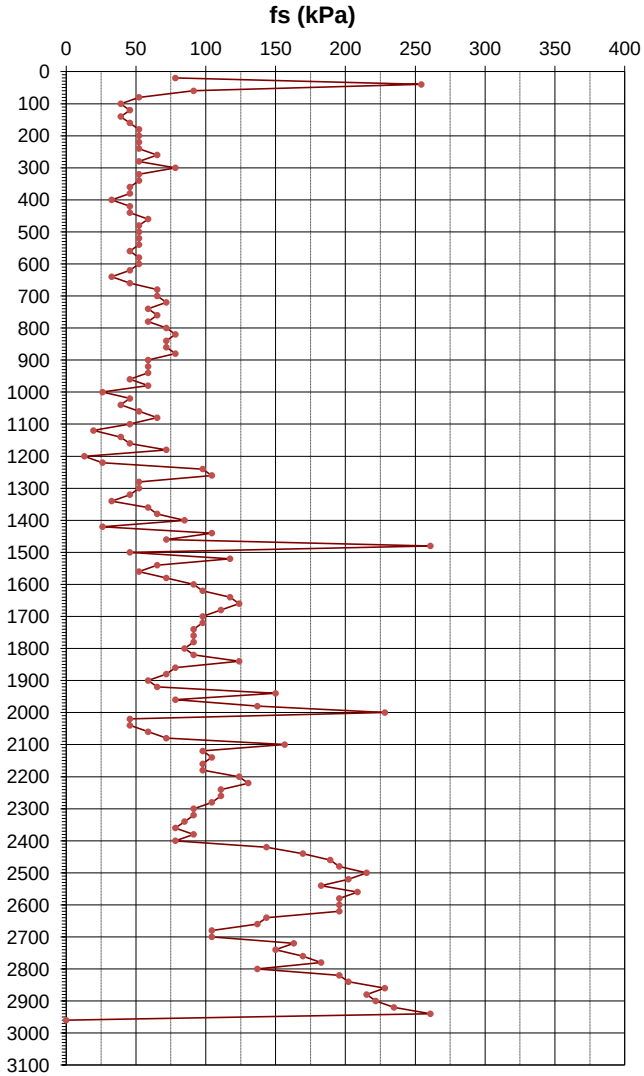


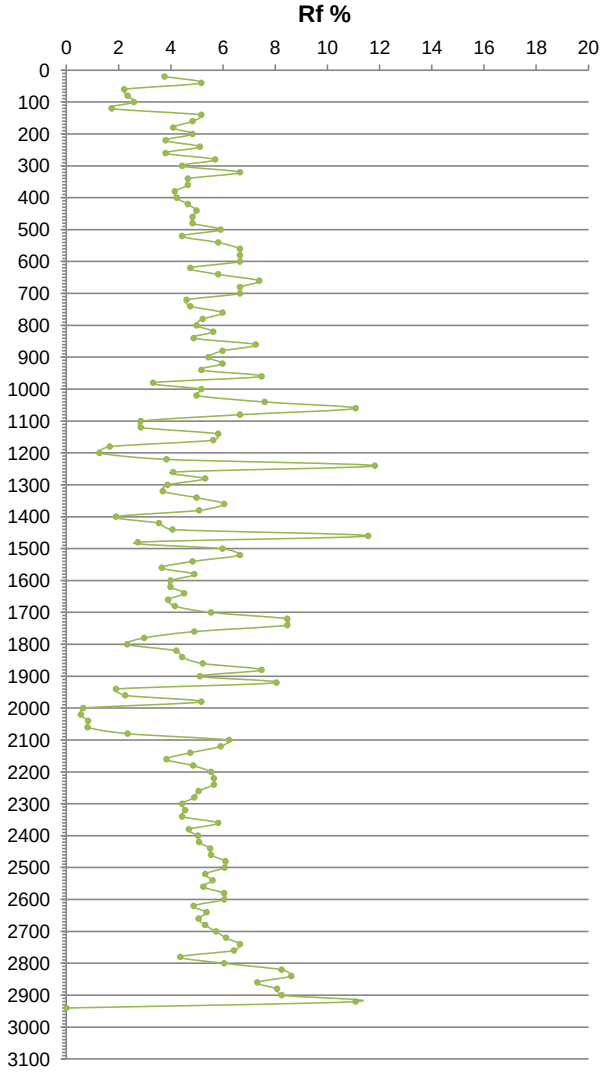
Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

Committ.:	Comune di Mirabello	**Prova:**	CPT 6	**Latitudine:**	44.812339
Località :	Mirabello	**Data:**	28/06/2014	**Longitudine:**	11.469441
Indirizzo :		**Falda:**	5.5 metri da p.c.		



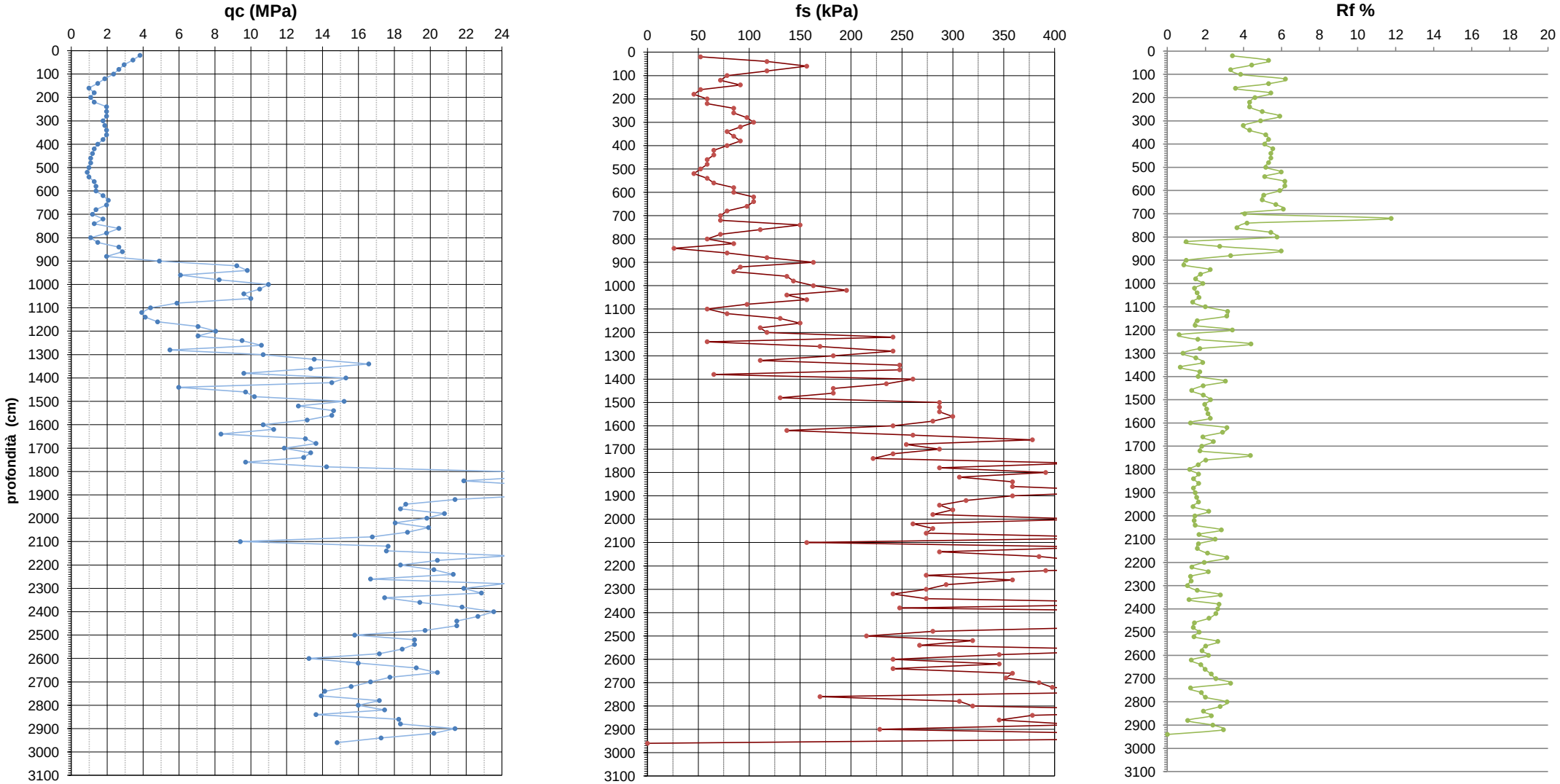




Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

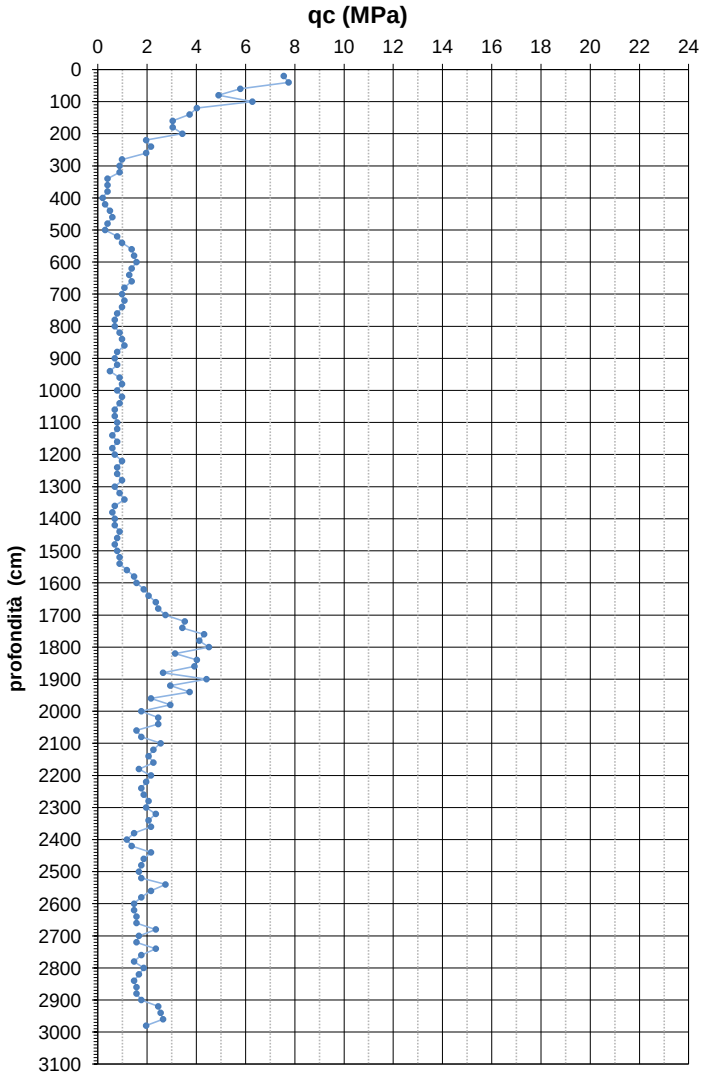
Committ.:	Comune di Mirabello	**Prova:**	CPT 7	**Latitudine:**	44.814526
Località :	Mirabello	**Data:**	28/06/2014	**Longitudine:**	11.482511
Indirizzo :		**Falda:**	4.2 metri da p.c.		

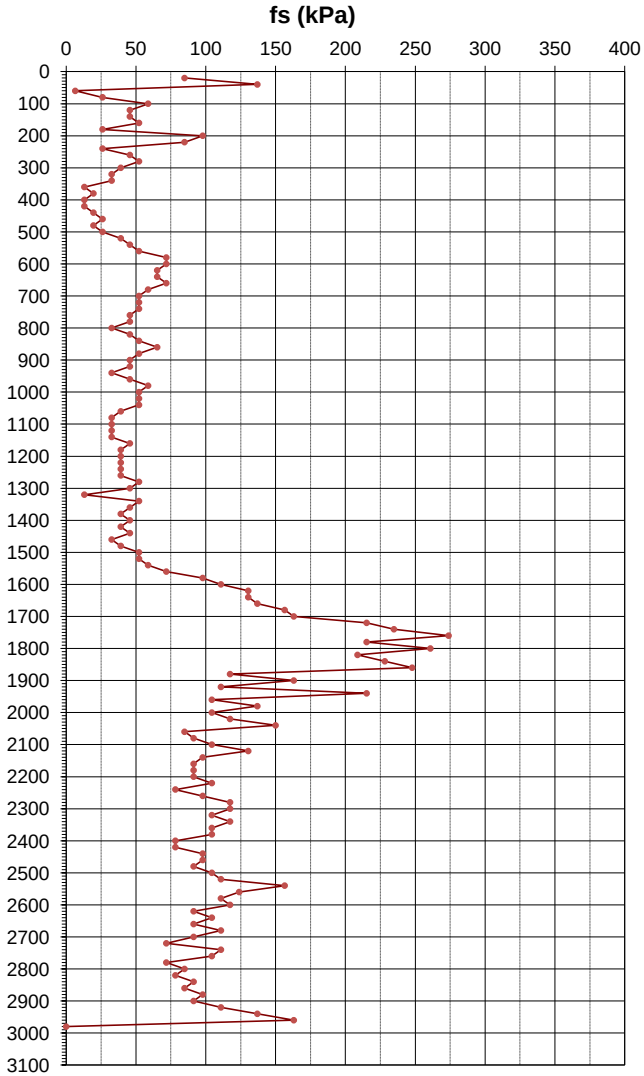


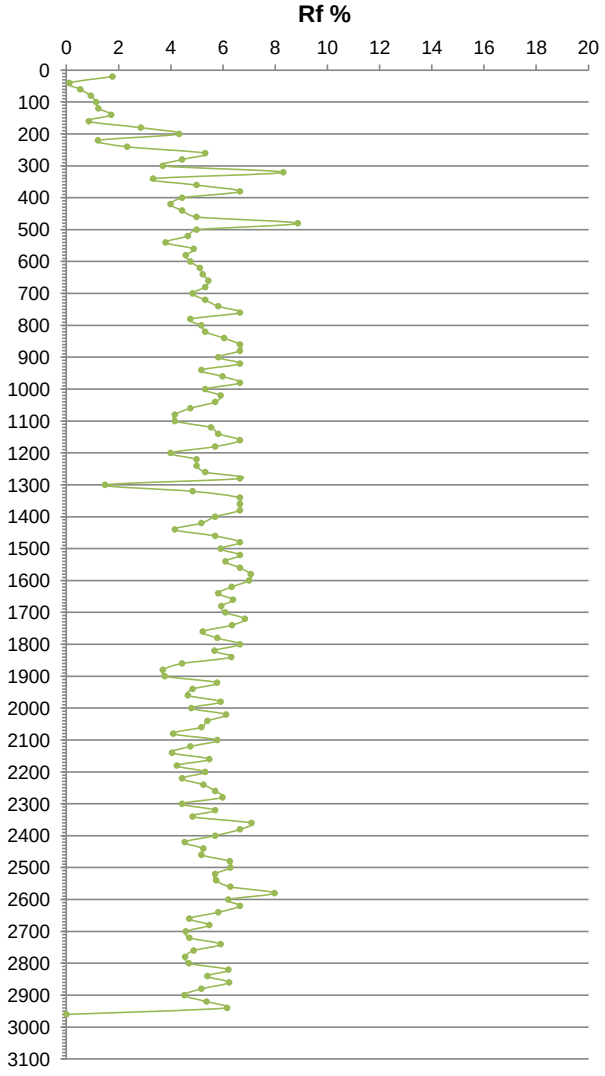
Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

Committ.:	Comune di Mirabello	**Prova:**	CPT 8	**Latitudine:**	44.80768
Località :	Mirabello	**Data:**	05/07/2014	**Longitudine:**	11.457641
Indirizzo :		**Falda:**	2.7 metri da p.c.		



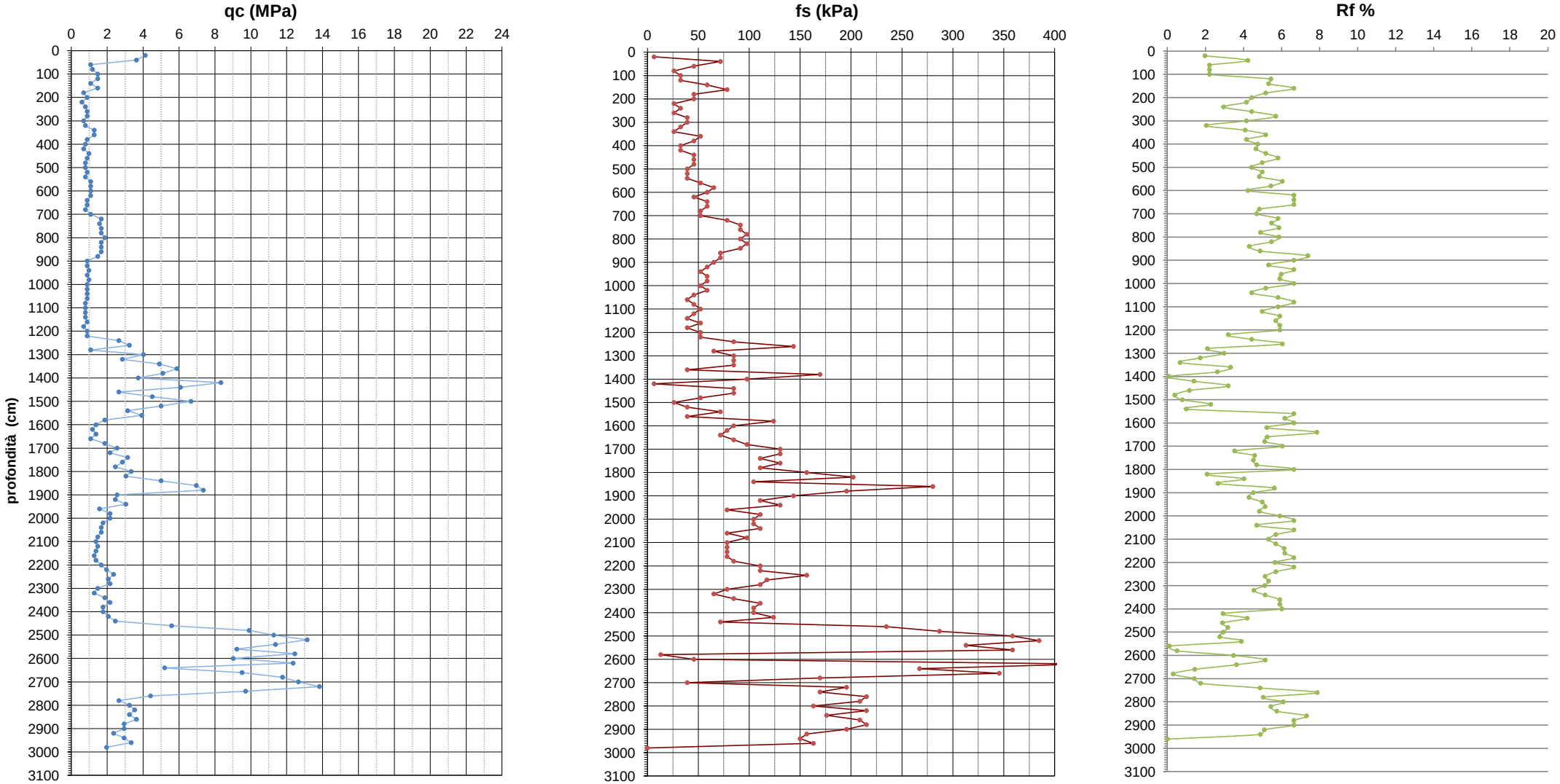




Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

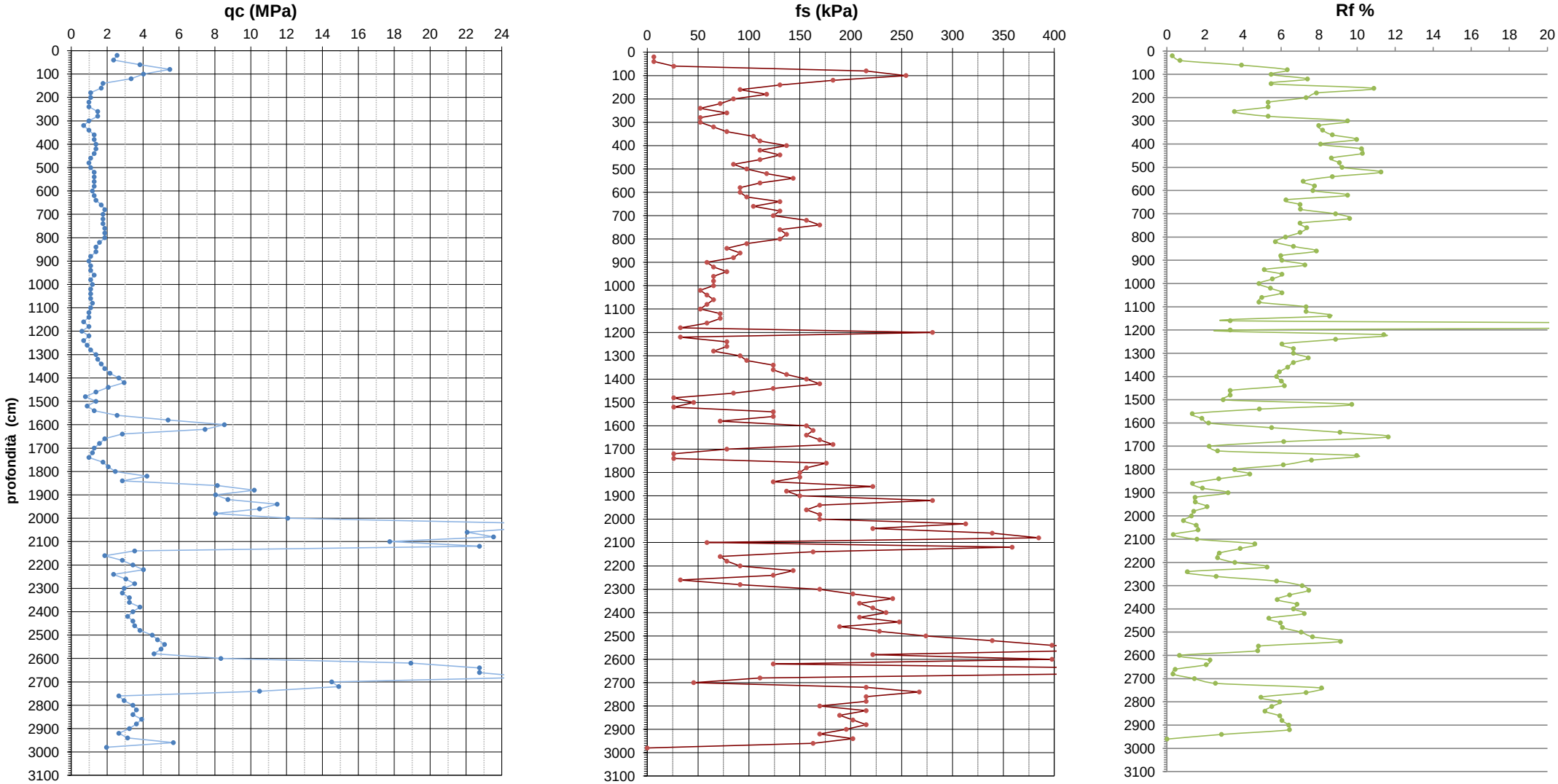
Committ.:	Comune di Mirabello	**Prova:**	CPT9	**Latitudine:**	44.803818
Località :	Mirabello	**Data:**	05/07/2014	**Longitudine:**	11.452016
Indirizzo :		**Falda:**	1.7 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

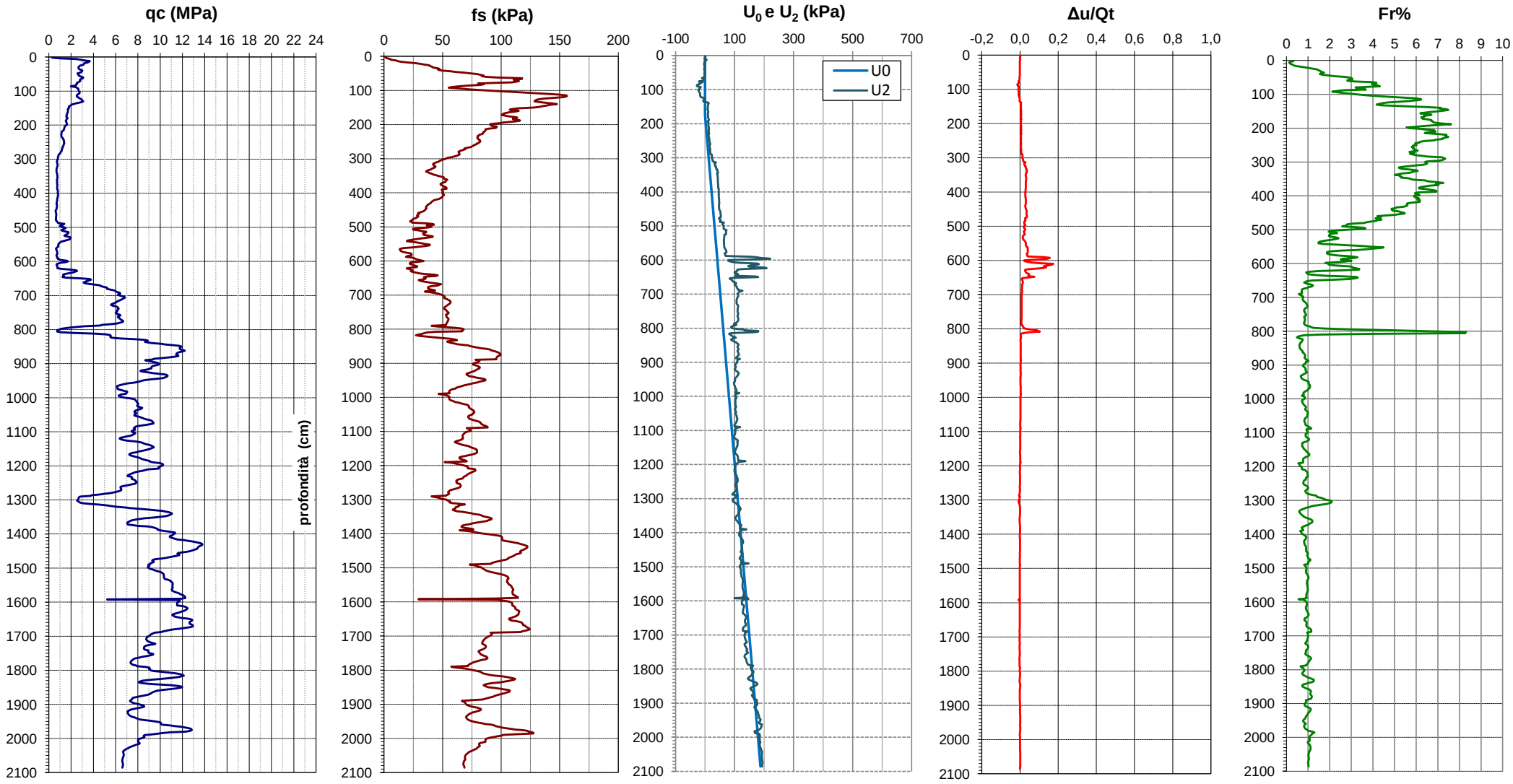
Committ.:	Comune di Mirabello	**Prova:**	CPT10	**Latitudine:**	44.802711
Località :	Mirabello	**Data:**	05/07/2014	**Longitudine:**	11.434666
Indirizzo :		**Falda:**	2.3 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

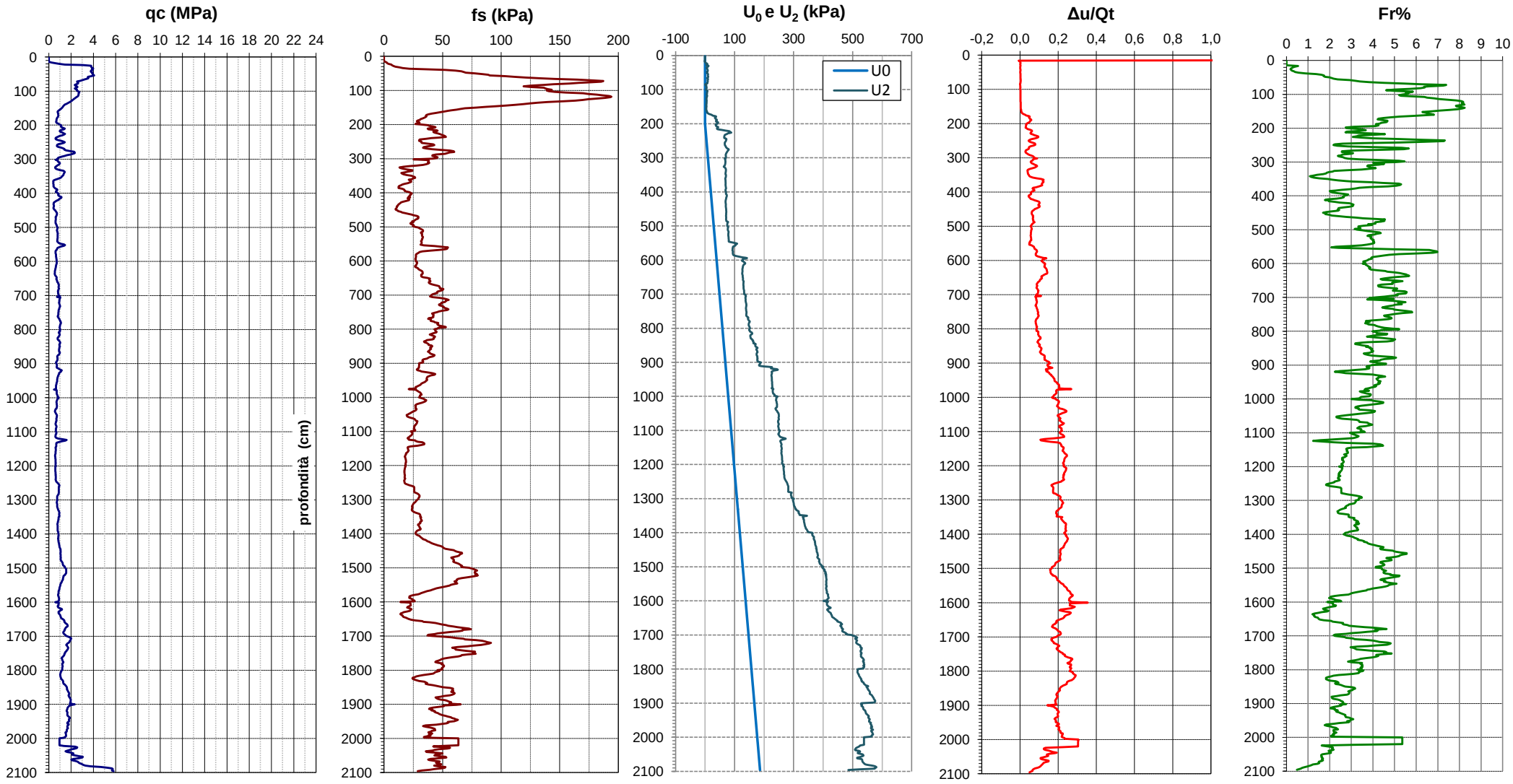
Committ.:	Comune di Mirabello	**Prova:**	CPTU 1	**Latitudine:**	44,834165
Località :	Mirabello (FE)	**Data:**	28/06/2014	**Longitudine:**	11,450522
Indirizzo :		**Falda:**	1.75 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

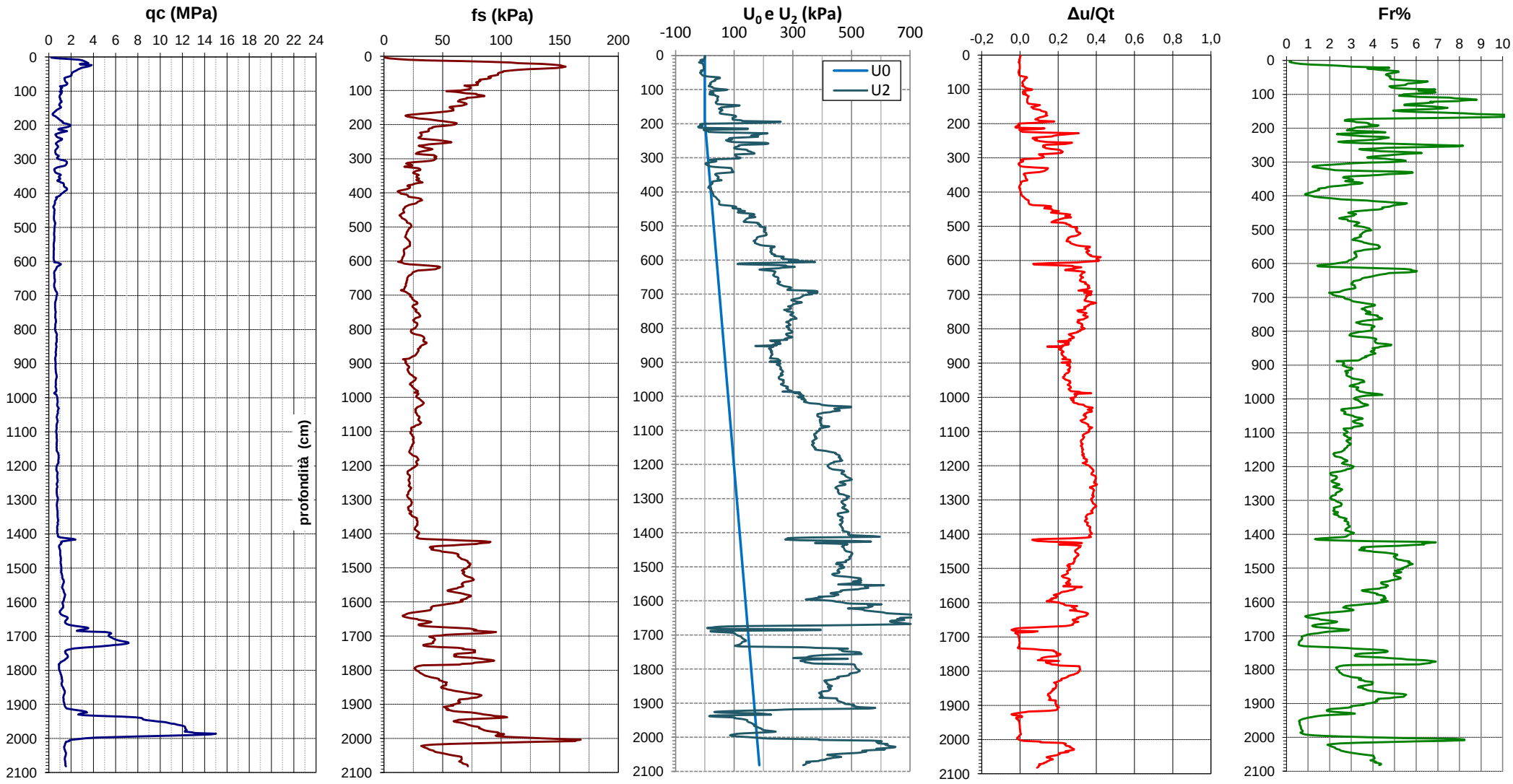
Committ.:	Comune di Mirabello	**Prova:**	CPTU 2	**Latitudine:**	44,825182
Località :	Mirabello (FE)	**Data:**	28/06/2014	**Longitudine:**	11,46913
Indirizzo :		**Falda:**	2 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

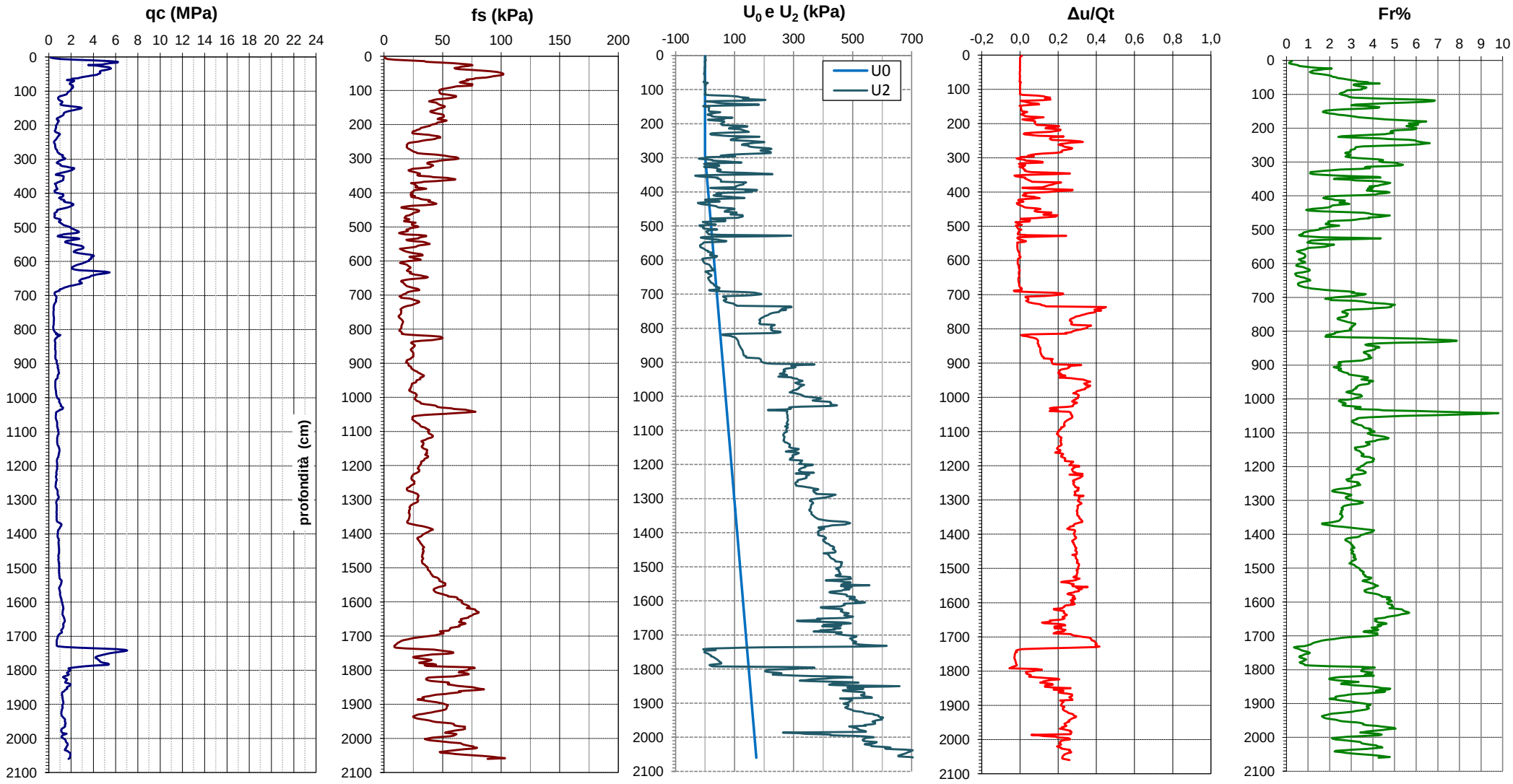
Committ.:	Comune di Mirabello	**Prova:**	CPTU 3	**Latitudine:**	44,816878
Località :	Mirabello (FE)	**Data:**	10/07/2014	**Longitudine:**	11,465415
Indirizzo :		**Falda:**	1,9 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

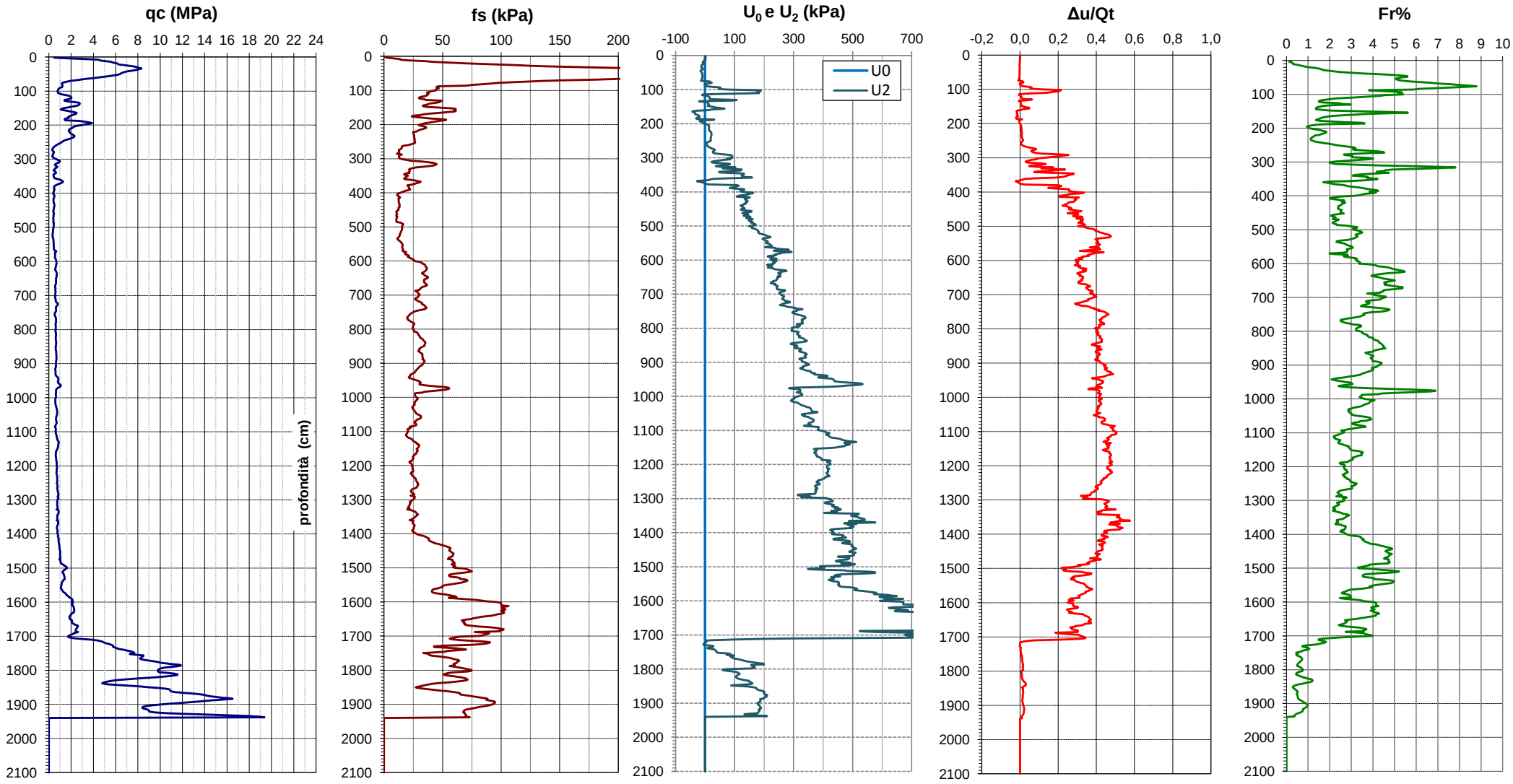
Committ.:	Comune di Mirabello	**Prova:**	CPTU 4	**Latitudine:**	44,818795
Località :	Mirabello (FE)	**Data:**	10/07/2014	**Longitudine:**	11,455407
Indirizzo :		**Falda:**	2,9 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

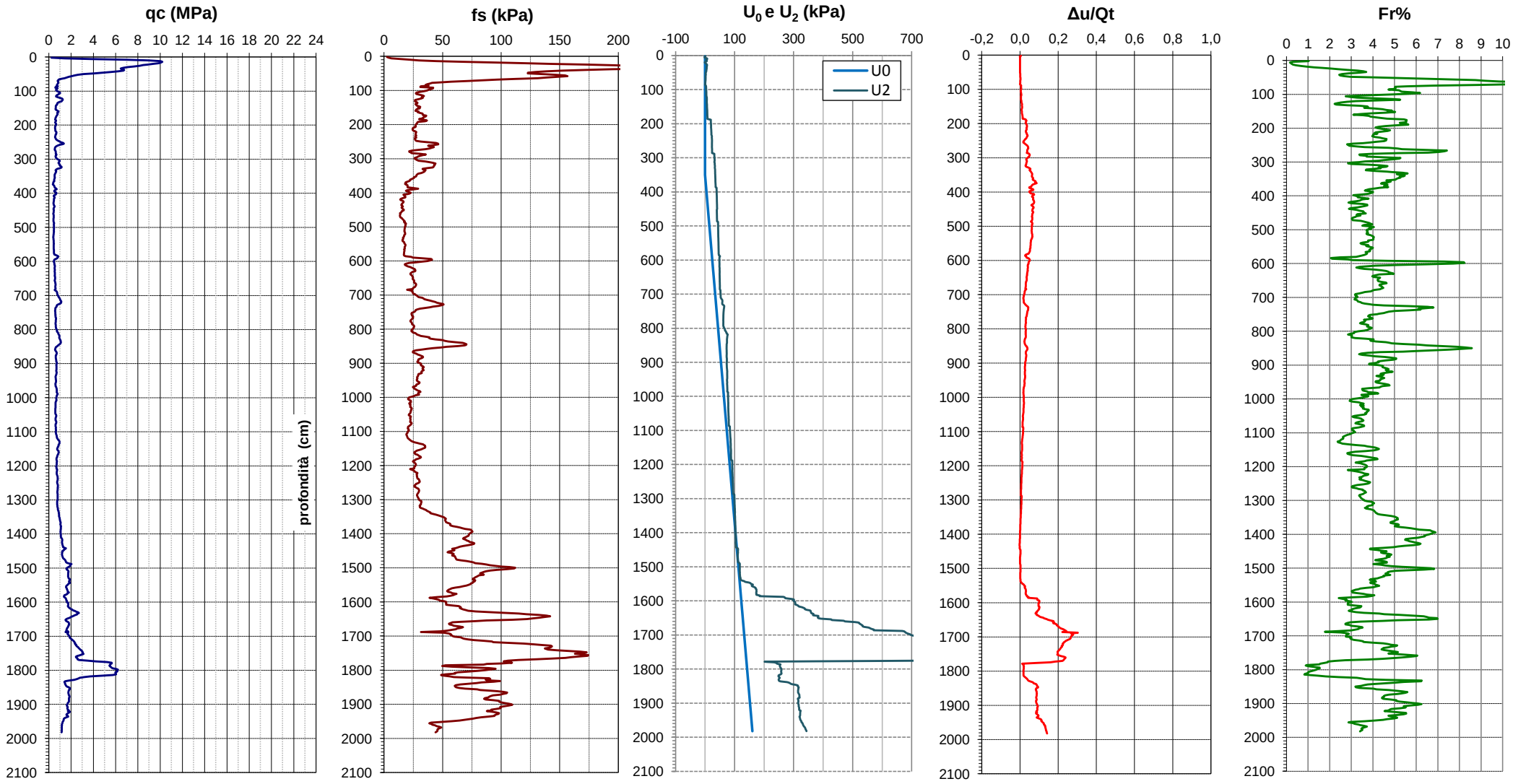
Committ.:	Comune di Mirabello	**Prova:**	CPTU 5	**Latitudine:**	44,810417
Località :	Mirabello (FE)	**Data:**	28/06/2014	**Longitudine:**	11,436313
Indirizzo :		**Falda:**	non rilevata		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

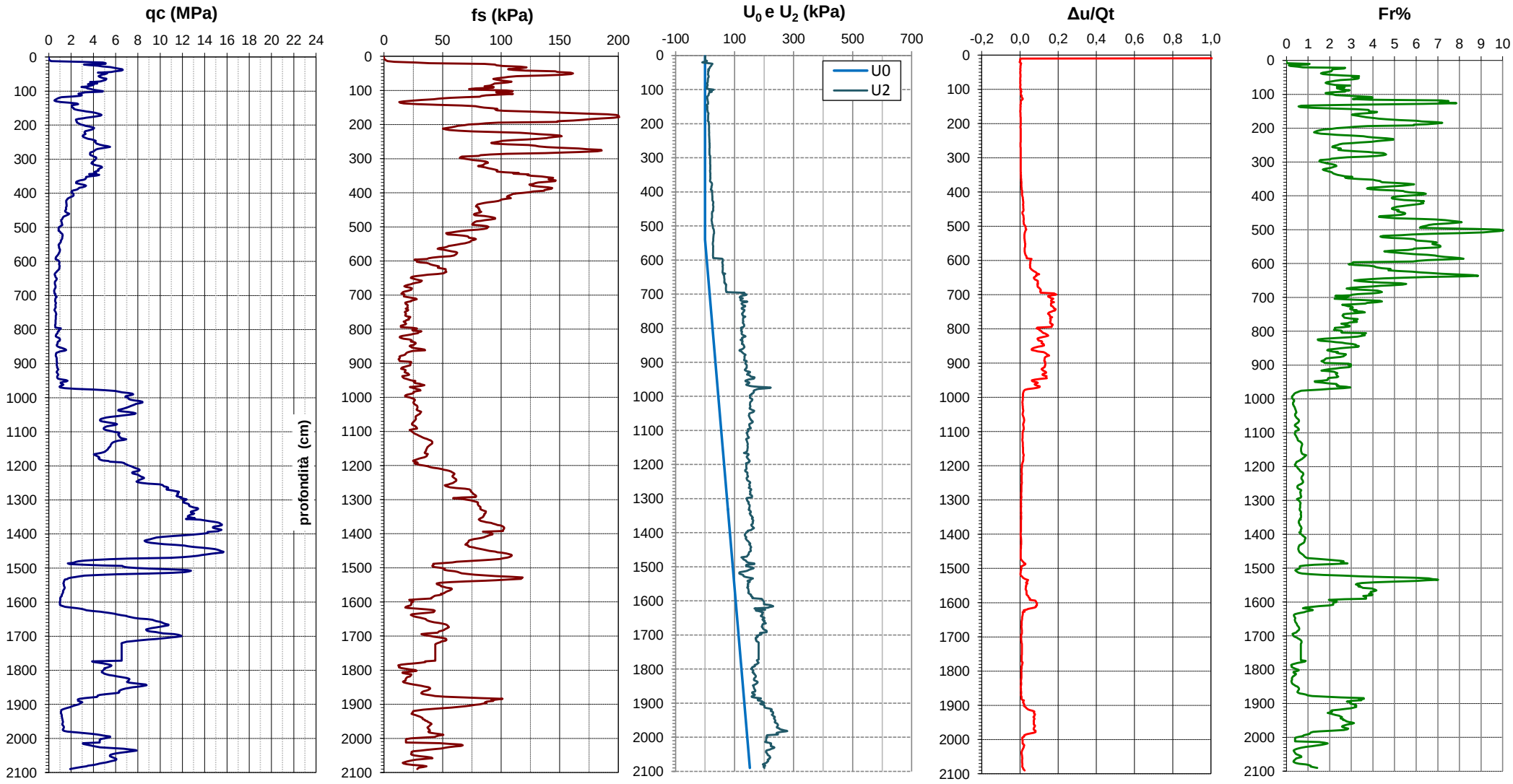
Committ.:	Comune di Mirabello	**Prova:**	CPTU 6	**Latitudine:**	44,820503
Località :	Mirabello (FE)	**Data:**	28/06/2014	**Longitudine:**	11,44189
Indirizzo :		**Falda:**	3,5 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

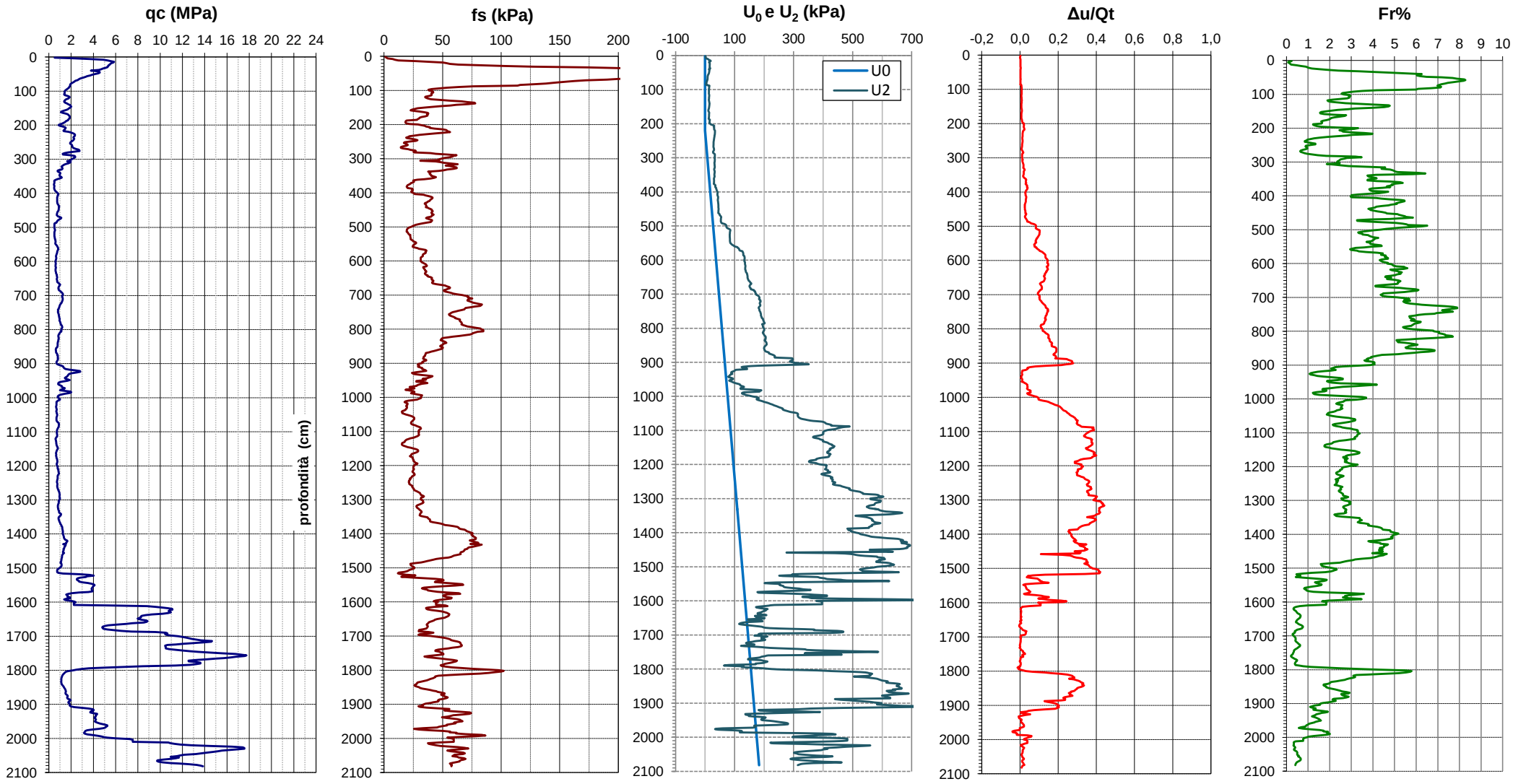
Committ.:	Comune di Mirabello	**Prova:**	CPTU 7	**Latitudine:**	44,832712
Località :	Mirabello (FE)	**Data:**	28/06/2014	**Longitudine:**	11,459033
Indirizzo :		**Falda:**	5,4 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

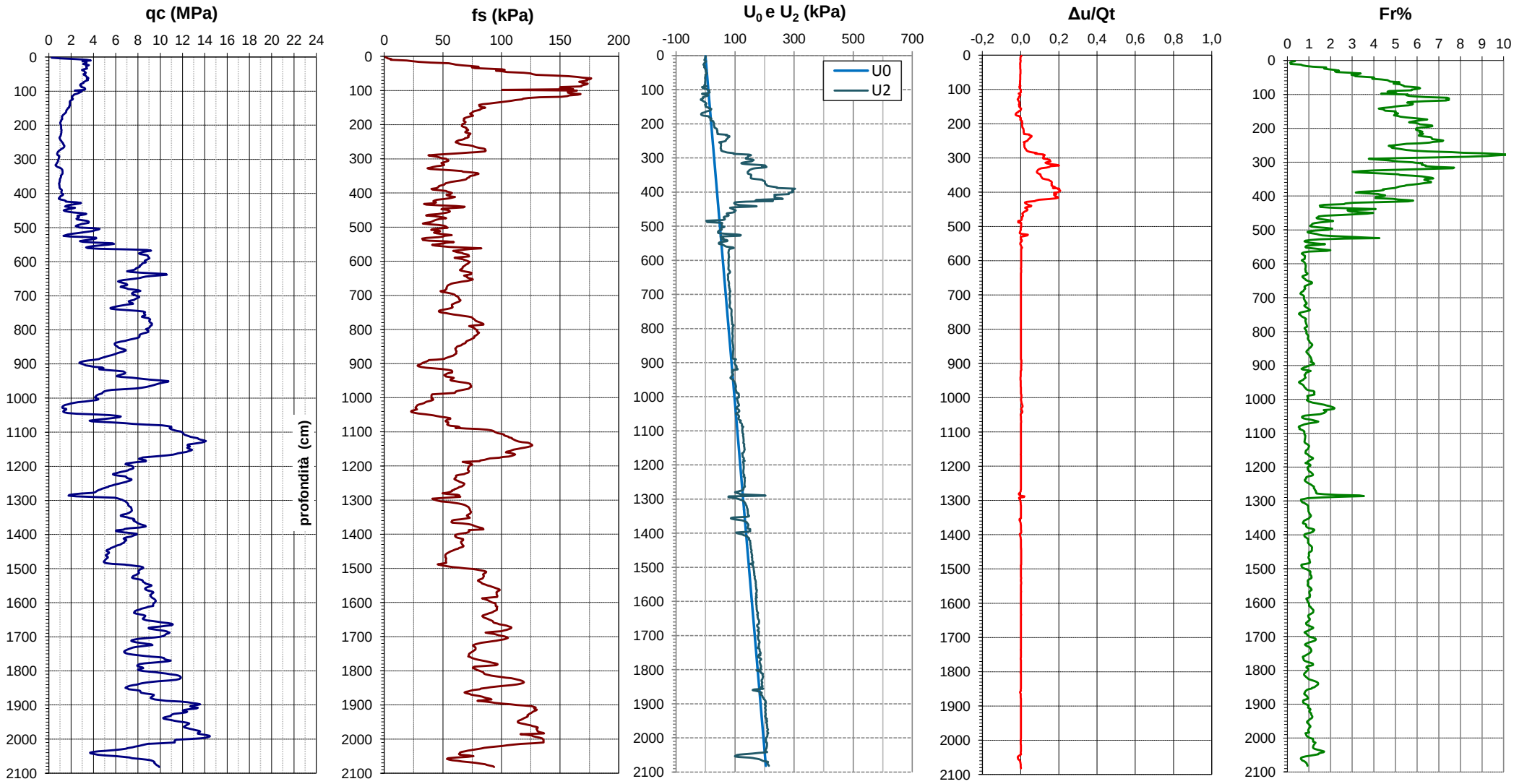
Committ.:	Comune di Mirabello	**Prova:**	CPTU 8	**Latitudine:**	44,822625
Località :	Mirabello (FE)	**Data:**	28/06/2014	**Longitudine:**	11,476317
Indirizzo :		**Falda:**	2,2 metri da p.c.		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

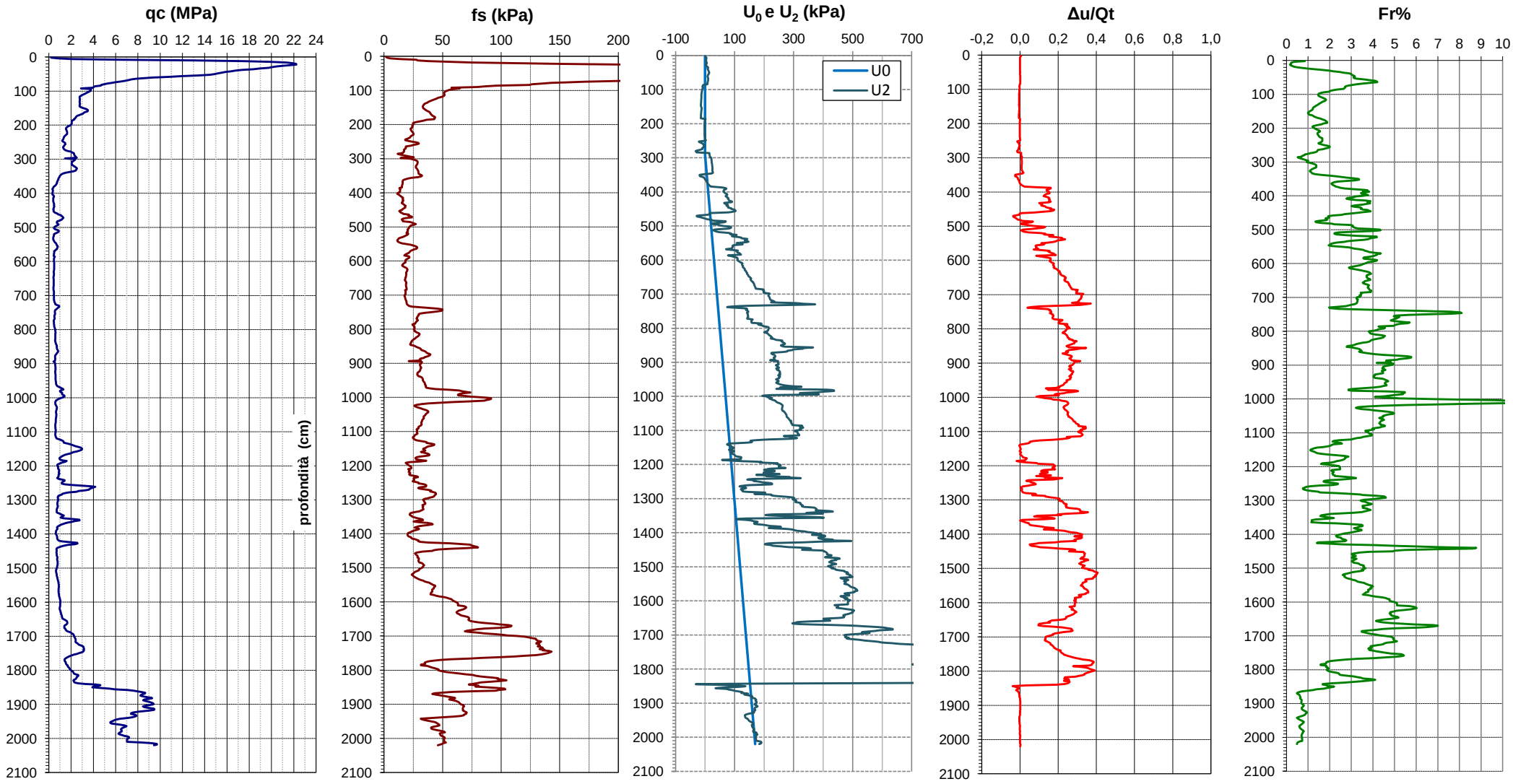
Committ.:	Comune di Mirabello	**Prova:**	CPTU 9	**Latitudine:**	44,837025
Località :	Mirabello (FE)	**Data:**	05/07/2014	**Longitudine:**	11,416725
Indirizzo :		**Falda:**	non rilevata		



Studio di Geologia Tarabusi

Viale A. Oriani 42 - 40137 Bologna
www.studiotarabusi.it

Committ.:	Comune di Mirabello	**Prova:**	CPTU 10	**Latitudine:**	44,818795
Località :	Mirabello (FE)	**Data:**	05/07/2014	**Longitudine:**	11,455407
Indirizzo :		**Falda:**	2,9 metri da p.c.		



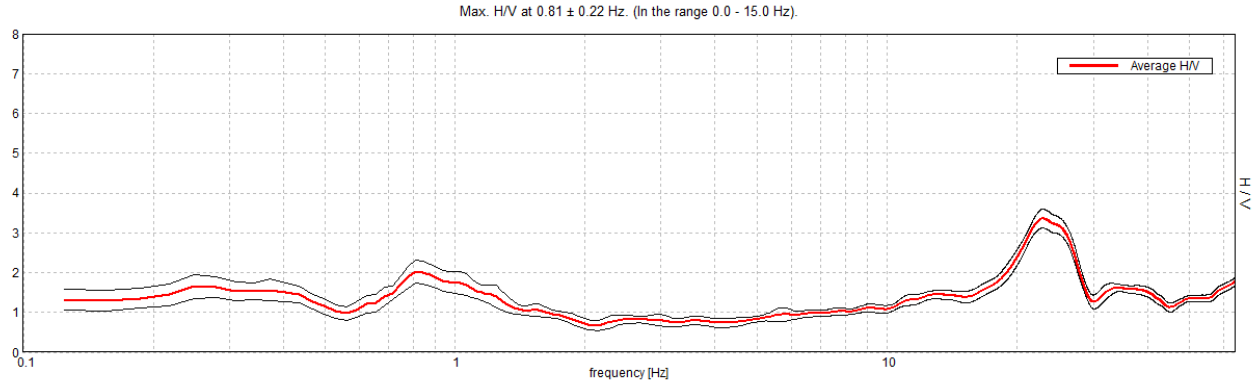
TROMINI

MIRABELLO, MIR 0001

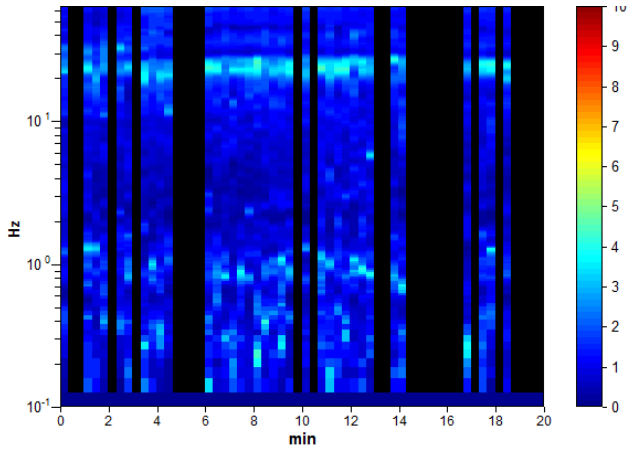
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 25/06/14 07:45:11 End recording: 25/06/14 08:05:12
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 58% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

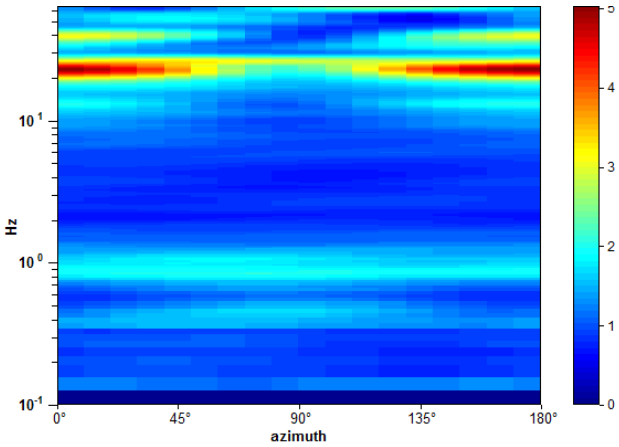
HORIZONTAL TO VERTICAL SPECTRAL RATIO



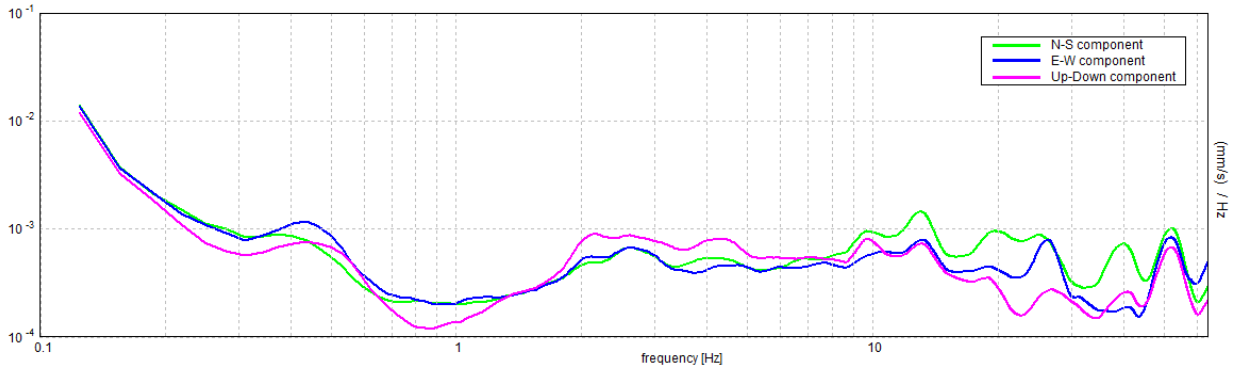
H/V TIME HISTORY



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 0.81 ± 0.22 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.81 > 0.50	OK	
$n_c(f_0) > 200$	568.8 > 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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.625 Hz	OK	
$A_0 > 2$	2.01 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.27212| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.2211 < 0.12188		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2879 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

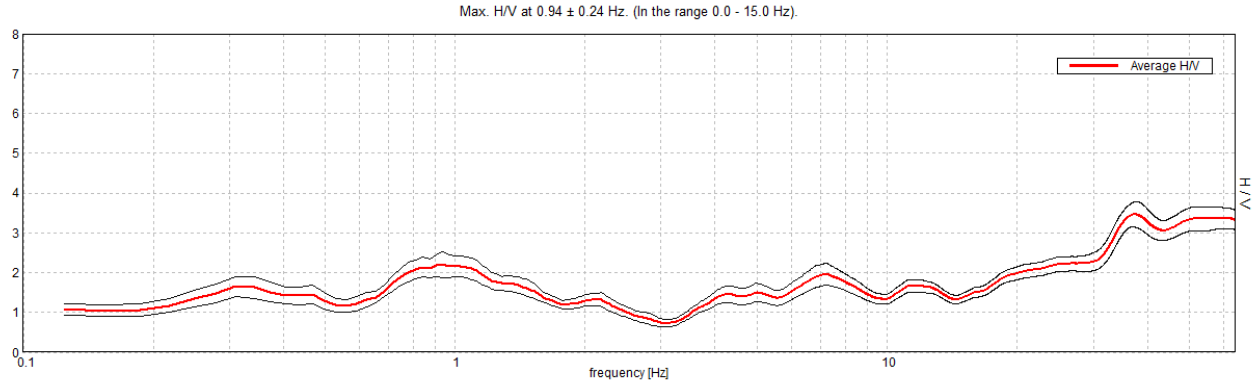
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0002

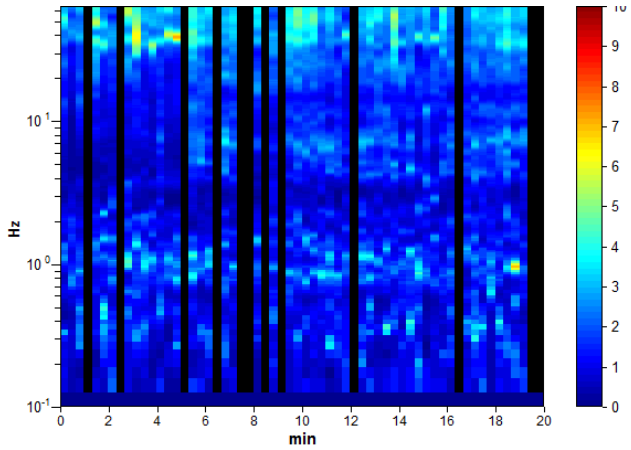
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 25/06/14 08:37:07 End recording: 25/06/14 08:57:08
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 82% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

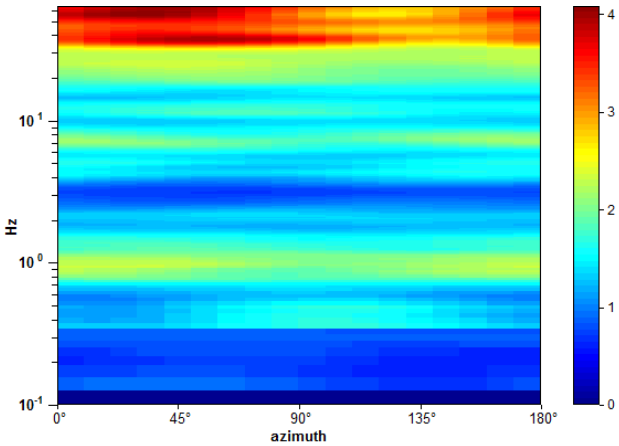
HORIZONTAL TO VERTICAL SPECTRAL RATIO



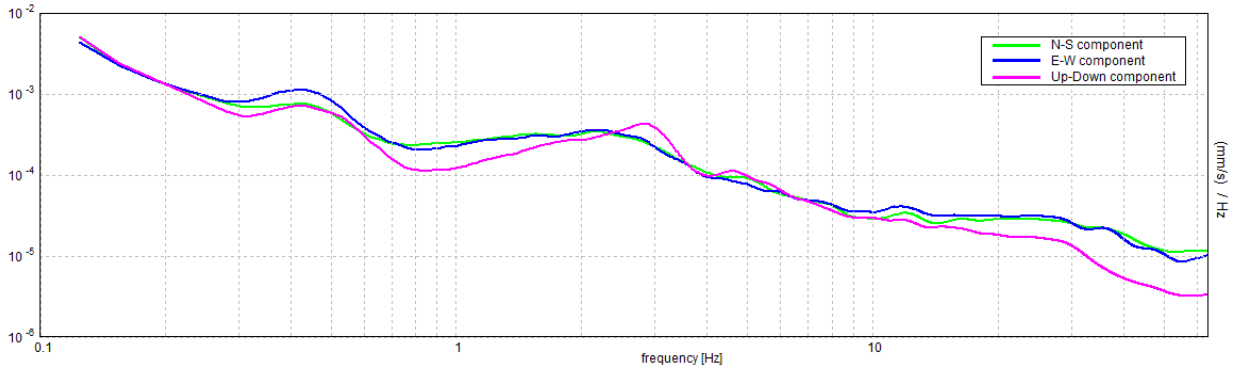
H/V TIME HISTORY



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 0.94 ± 0.24 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.94 > 0.50	OK	
$n_c(f_0) > 200$	900.0 > 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 46 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.406 Hz	OK	
$A_0 > 2$	2.20 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.25838| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.24223 < 0.14063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3324 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

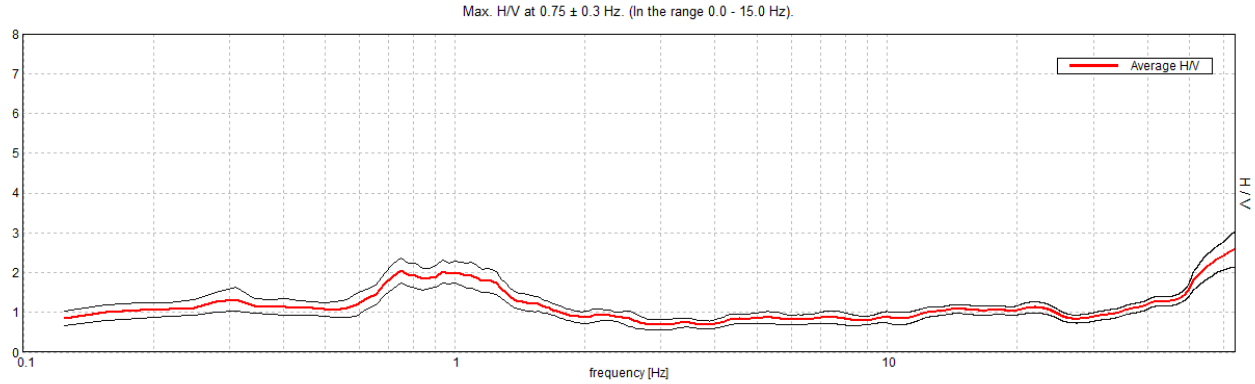
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0003

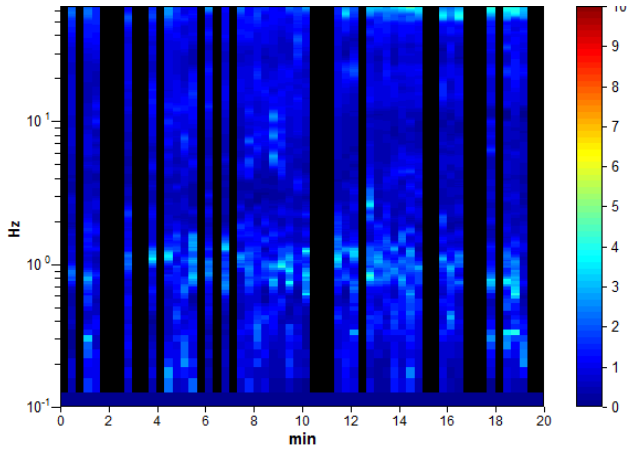
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 25/06/14 09:56:18 End recording: 25/06/14 10:16:19
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 65% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

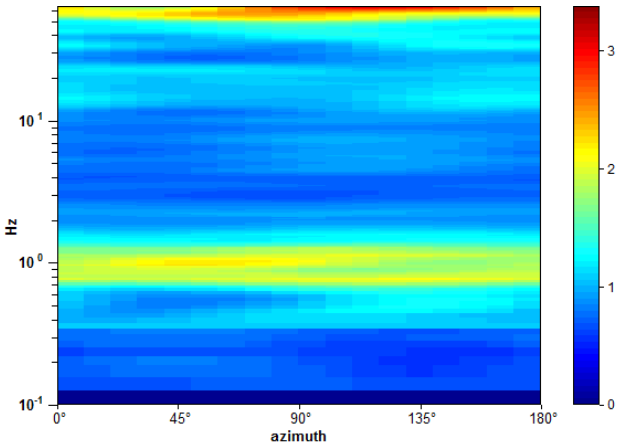
HORIZONTAL TO VERTICAL SPECTRAL RATIO



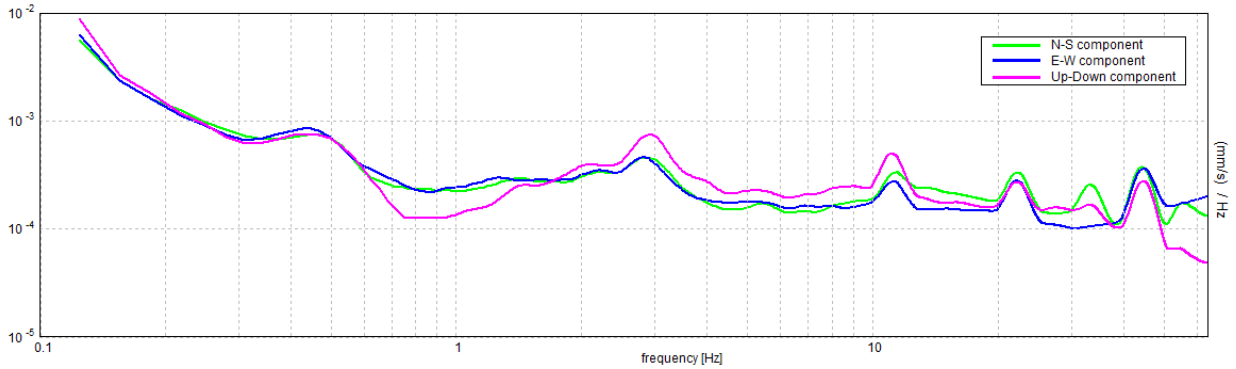
H/V TIME HISTORY



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 0.75 ± 0.3 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.75 > 0.50	OK	
$n_c(f_0) > 200$	555.0 > 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 37 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.75 Hz	OK	
$A_0 > 2$	2.04 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.39907| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.2993 < 0.1125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3155 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

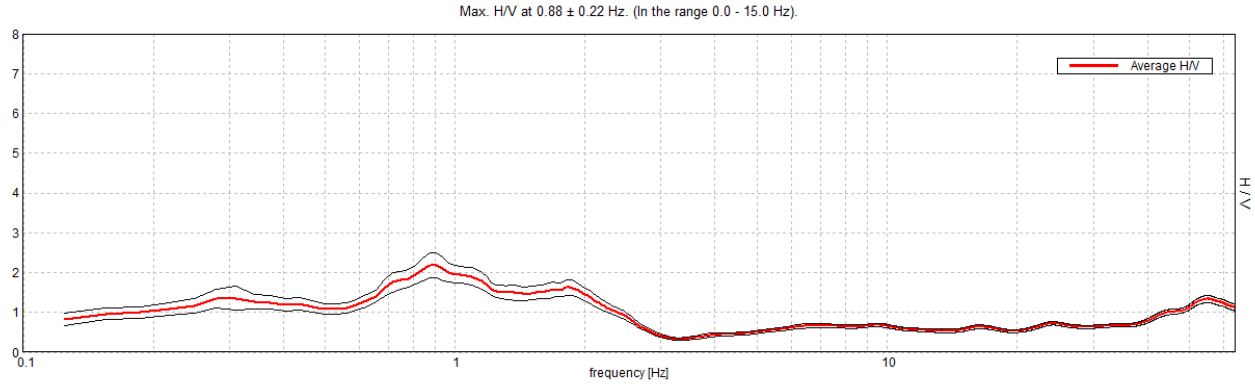
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0004

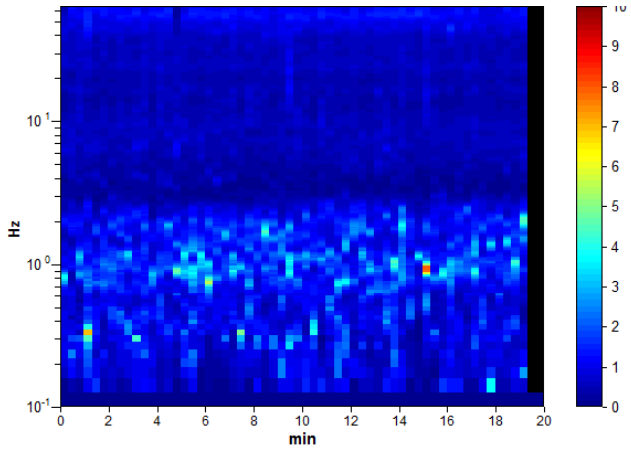
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 25/06/14 10:36:29 End recording: 25/06/14 10:56:30
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analysis performed on the entire trace.
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

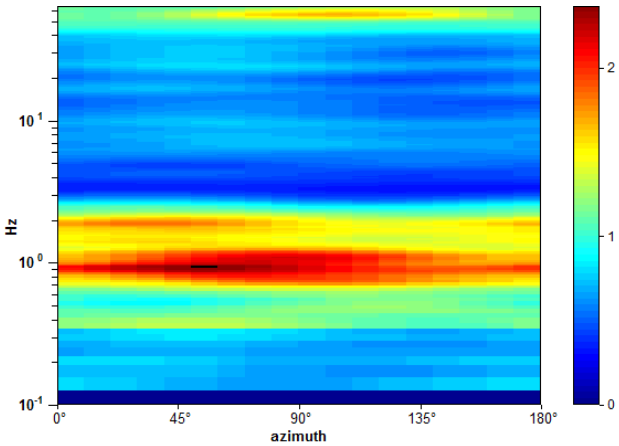
HORIZONTAL TO VERTICAL SPECTRAL RATIO



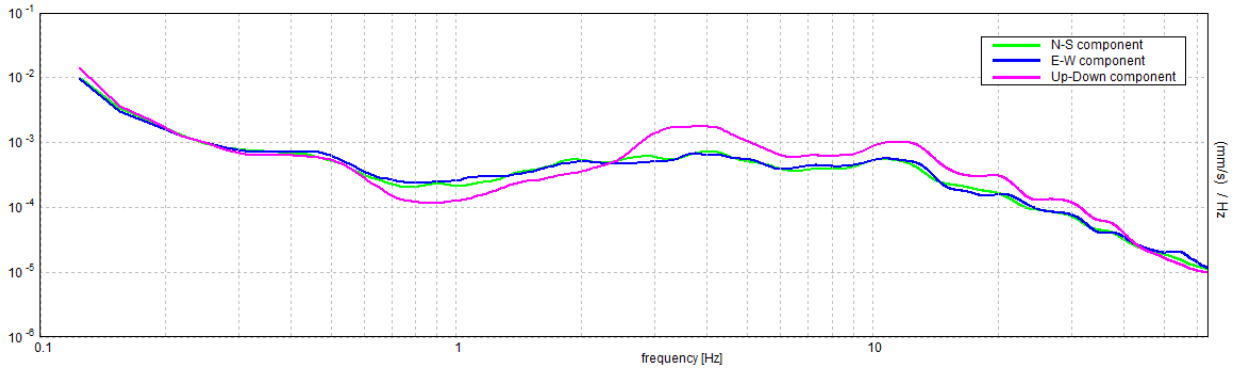
H/V TIME HISTORY



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 0.88 ± 0.22 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.88 > 0.50	OK	
$n_c(f_0) > 200$	1050.0 > 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 43 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.5 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.313 Hz	OK	
$A_0 > 2$	2.18 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.25472| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.22288 < 0.13125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3189 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

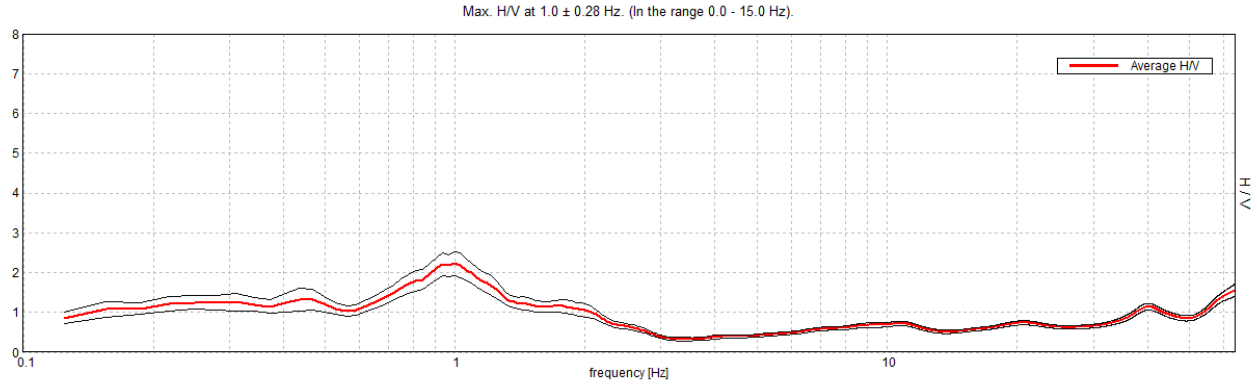
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0005

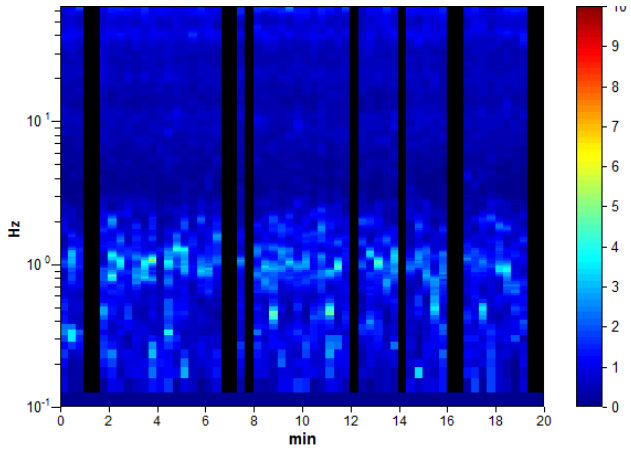
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 25/06/14 11:16:31 End recording: 25/06/14 11:36:32
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

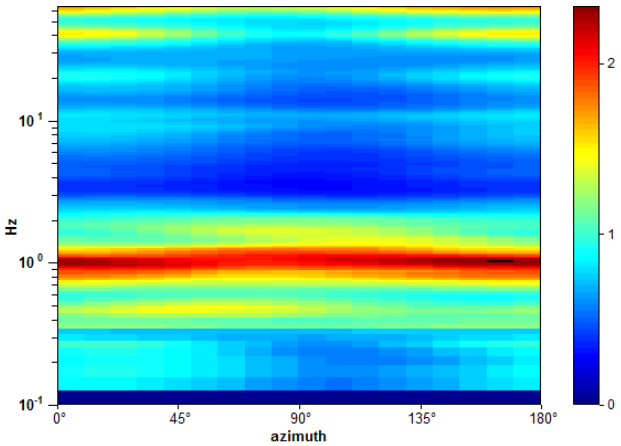
HORIZONTAL TO VERTICAL SPECTRAL RATIO



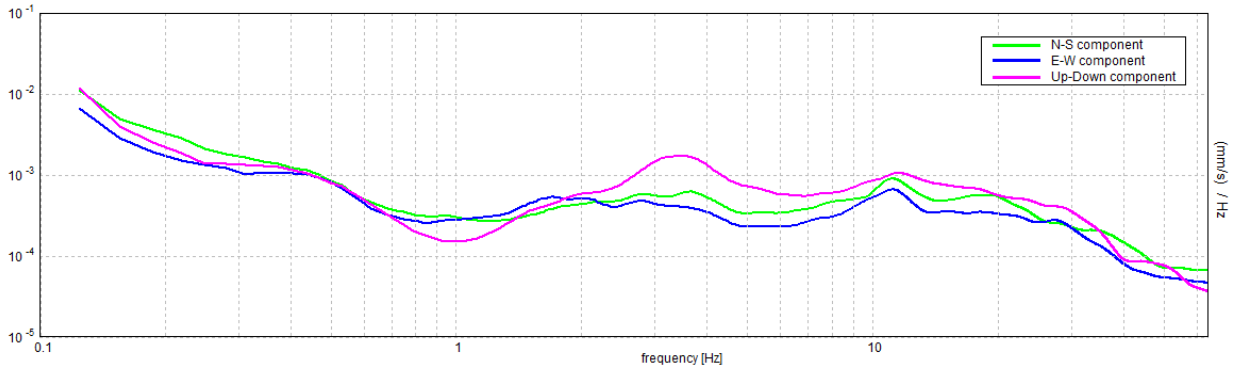
H/V TIME HISTORY



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 1.0 ± 0.28 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.00 > 0.50	OK	
$n_c(f_0) > 200$	980.0 > 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 49 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.594 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.906 Hz	OK	
$A_0 > 2$	2.22 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.28316| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.28316 < 0.1		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3019 < 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 $\sigma_A(f) < \theta(f_0)$

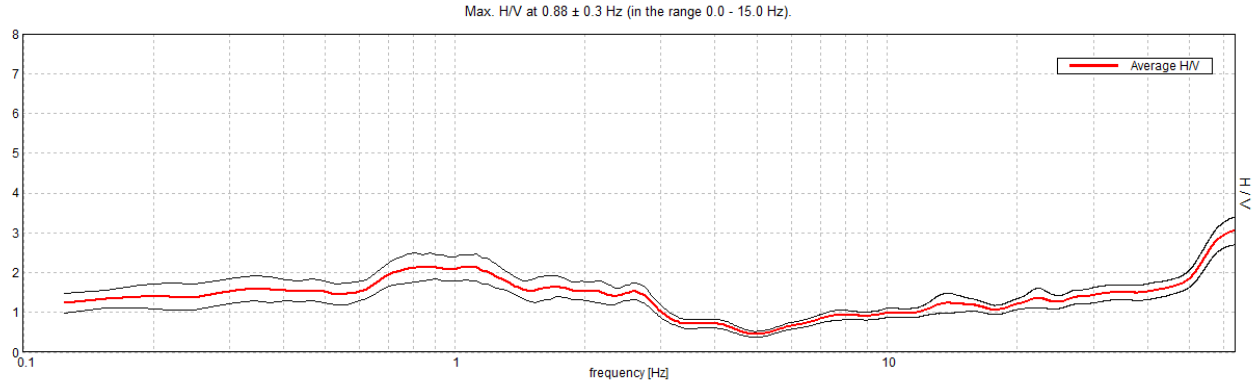
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0006

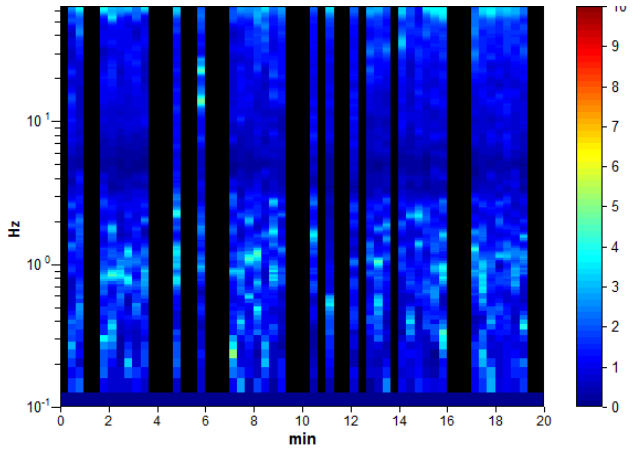
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 25/06/14 12:22:57 End recording: 25/06/14 12:42:58
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 63% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

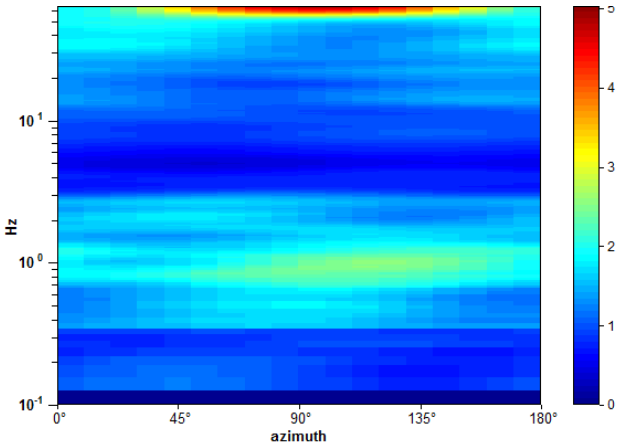
HORIZONTAL TO VERTICAL SPECTRAL RATIO



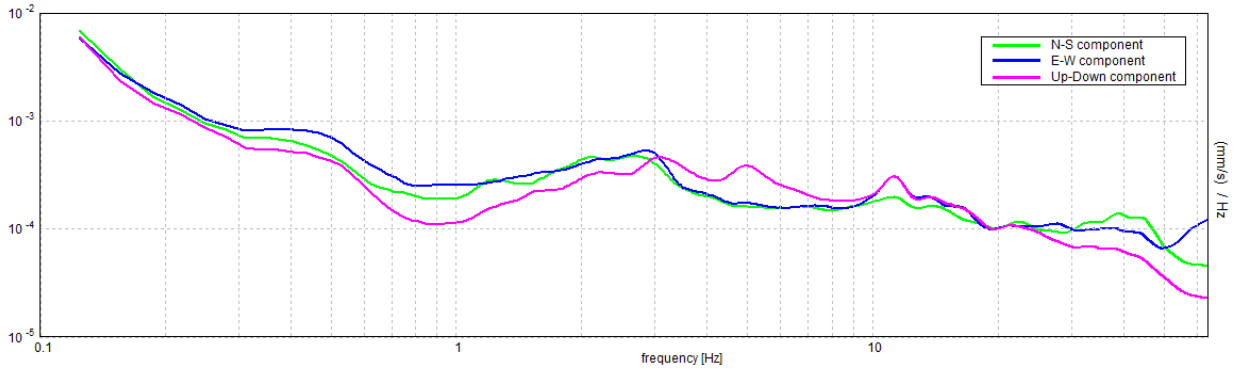
H/V TIME HISTORY



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 0.88 ± 0.3 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.88 > 0.50	OK	
$n_c(f_0) > 200$	630.0 > 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 43 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.969 Hz	OK	
$A_0 > 2$	2.16 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.34168| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.29897 < 0.13125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3386 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

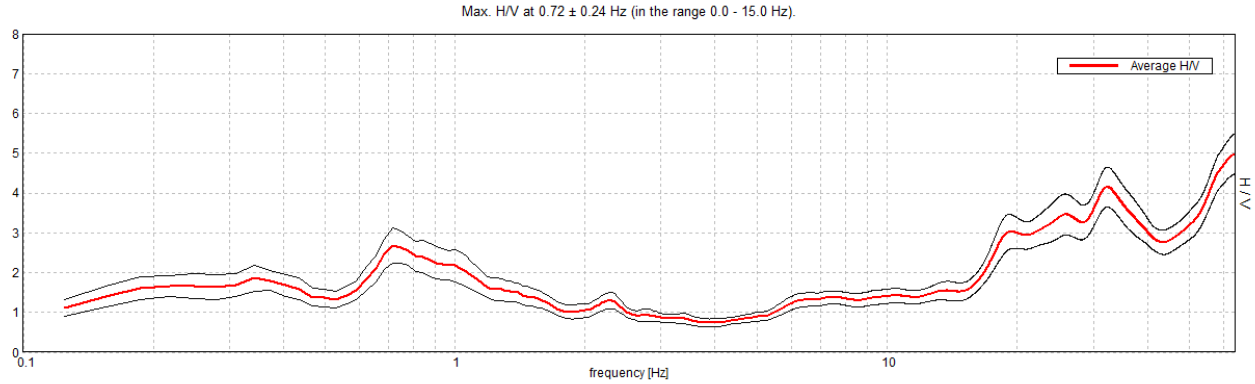
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0007

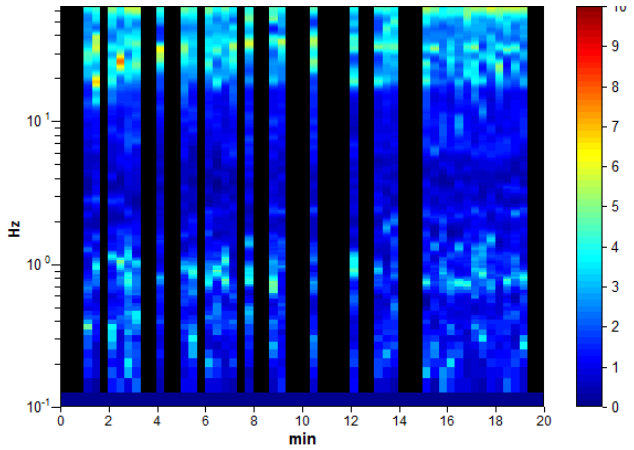
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 25/06/14 13:17:27 End recording: 25/06/14 13:37:28
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 60% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

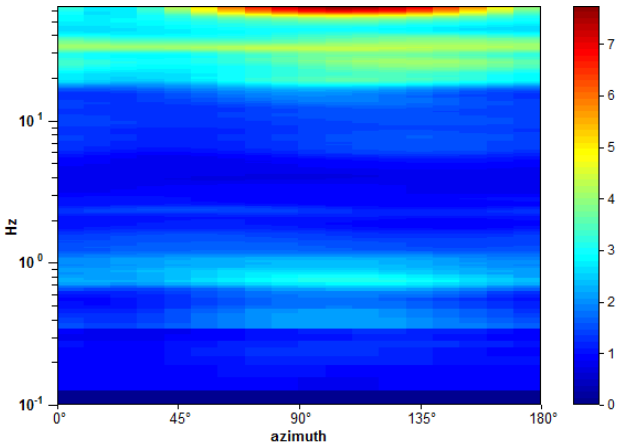
HORIZONTAL TO VERTICAL SPECTRAL RATIO



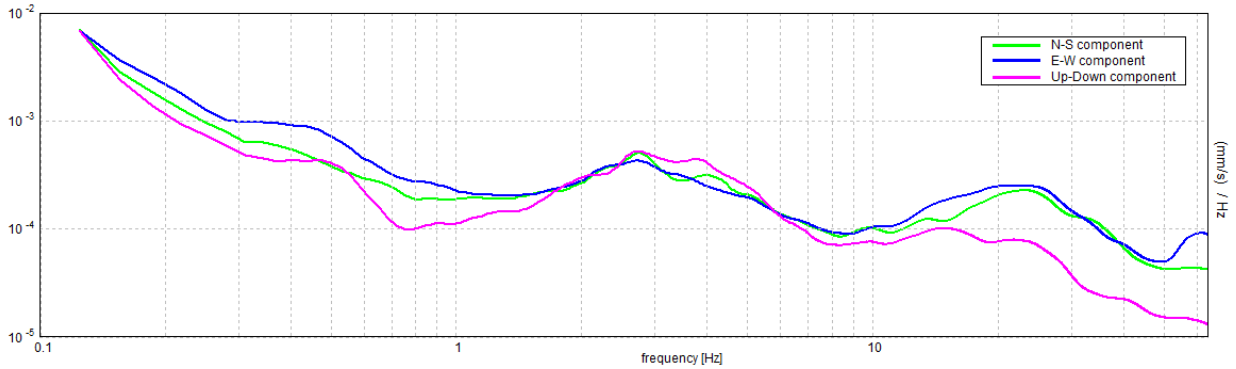
H/V TIME HISTORY



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 0.72 ± 0.24 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.72 > 0.50	OK	
$n_c(f_0) > 200$	488.8 > 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 36 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.531 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.594 Hz	OK	
$A_0 > 2$	2.69 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.33982| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.24425 < 0.10781		NO
$\sigma_A(f_0) < \theta(f_0)$	0.4445 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

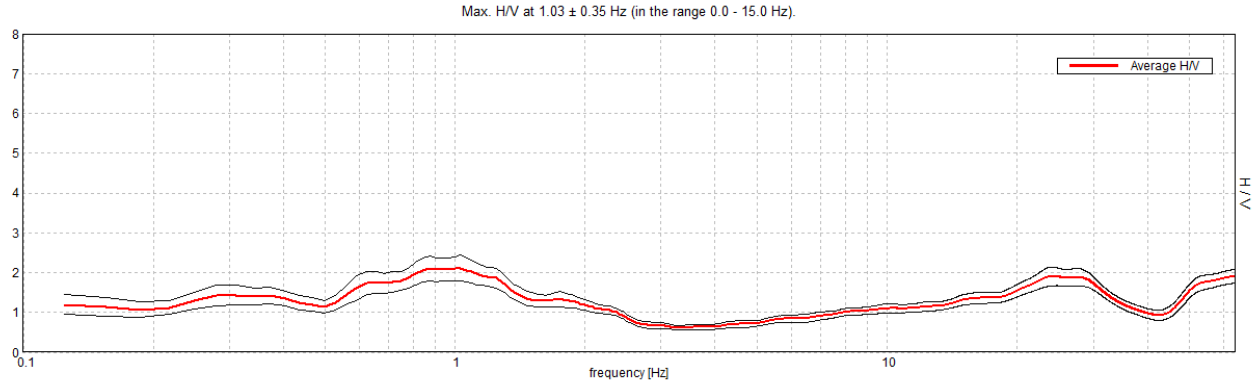
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0008

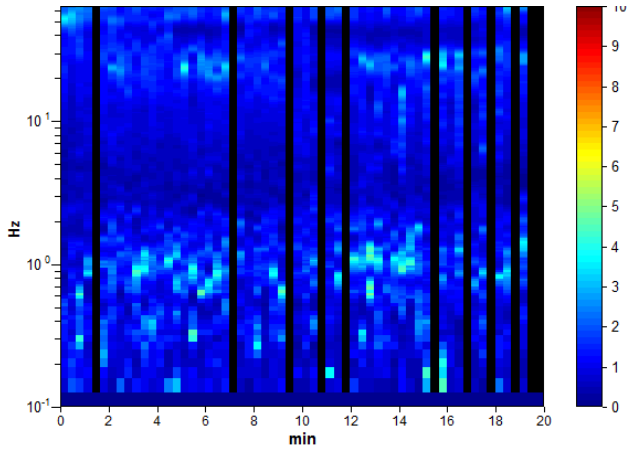
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 28/06/14 07:10:59 End recording: 28/06/14 07:31:00
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

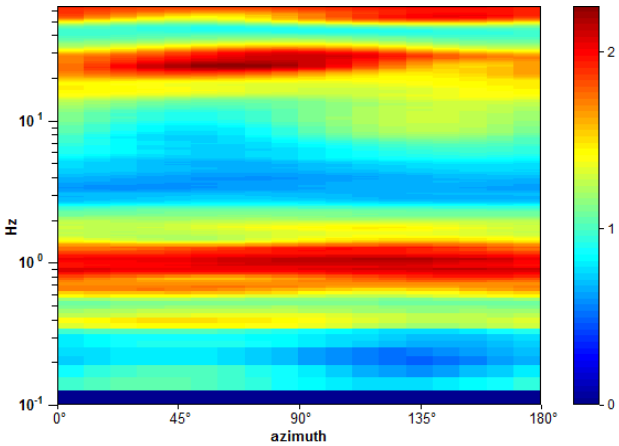
HORIZONTAL TO VERTICAL SPECTRAL RATIO



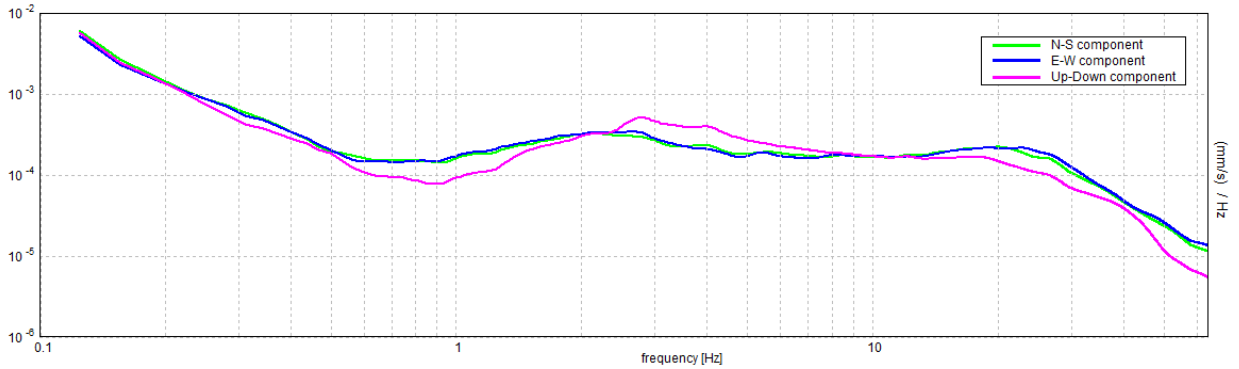
H/V TIME HISTORY



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 1.03 ± 0.35 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.03 > 0.50	OK	
$n_c(f_0) > 200$	1010.6 > 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.281 Hz	OK	
$A_0 > 2$	2.11 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.34243| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.35313 < 0.10313		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3208 < 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 $\sigma_A(f) < \theta(f_0)$

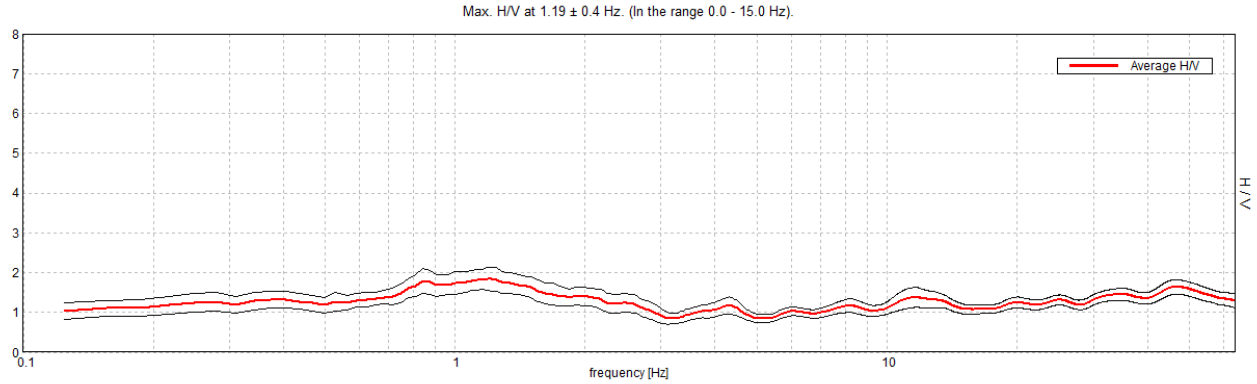
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0009

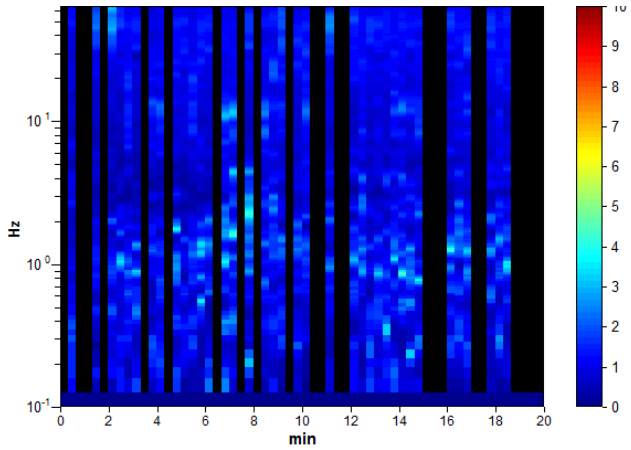
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 28/06/14 07:59:57 End recording: 28/06/14 08:19:58
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 65% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

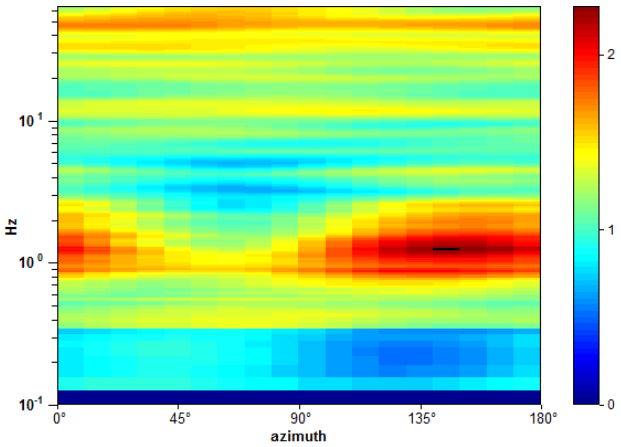
HORIZONTAL TO VERTICAL SPECTRAL RATIO



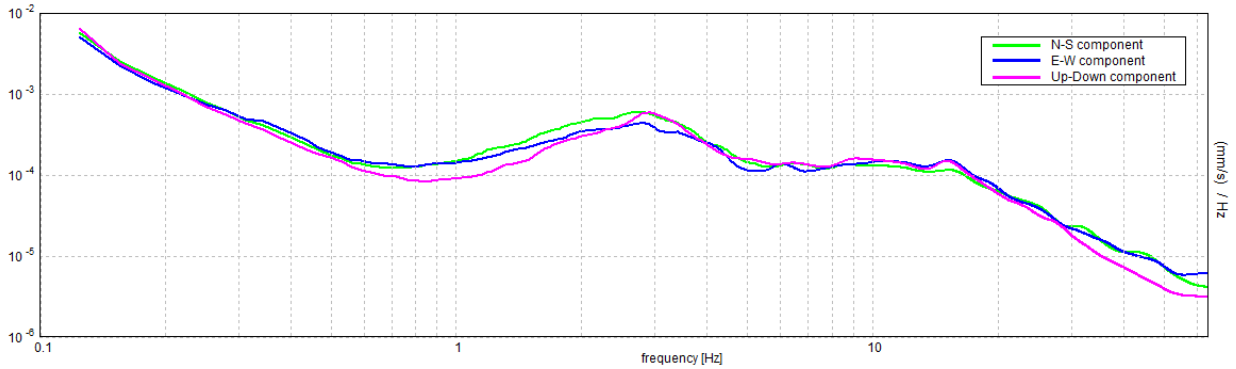
H/V TIME HISTORY



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 1.19 ± 0.4 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.19 > 0.50	OK	
$n_c(f_0) > 200$	878.8 > 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	3.0 Hz	OK	
$A_0 > 2$	1.84 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.33562| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.39854 < 0.11875		NO
$\sigma_A(f_0) < \theta(f_0)$	0.281 < 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 $\sigma_A(f) < \theta(f_0)$

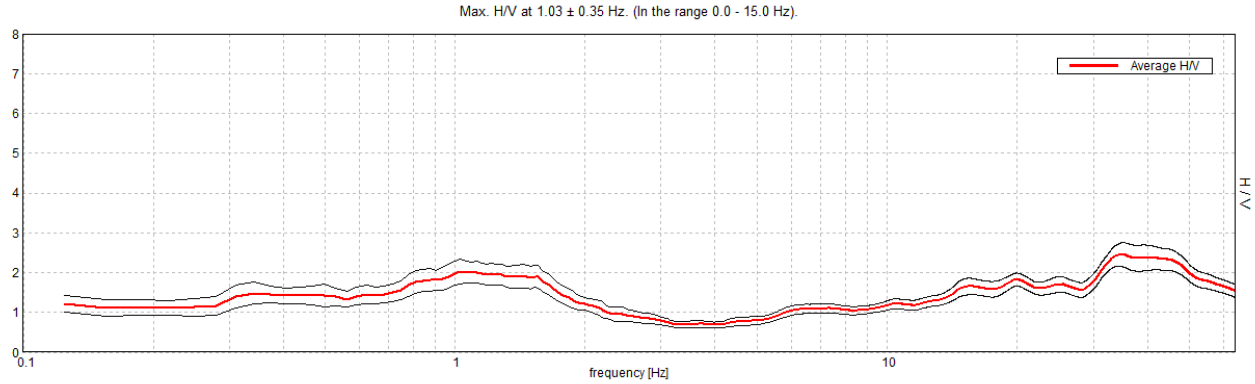
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0010

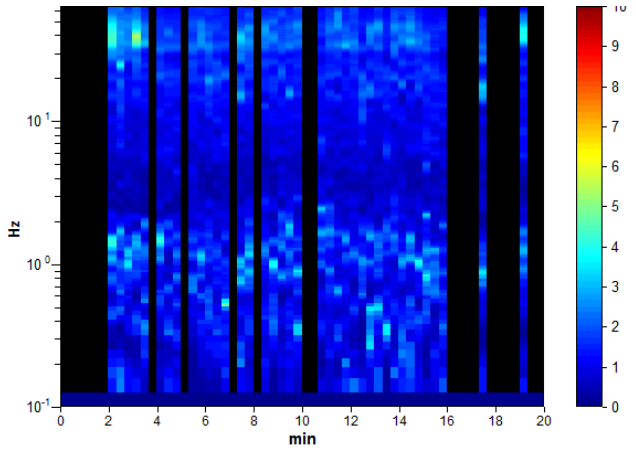
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 28/06/14 08:34:35 End recording: 28/06/14 08:54:35
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 67% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

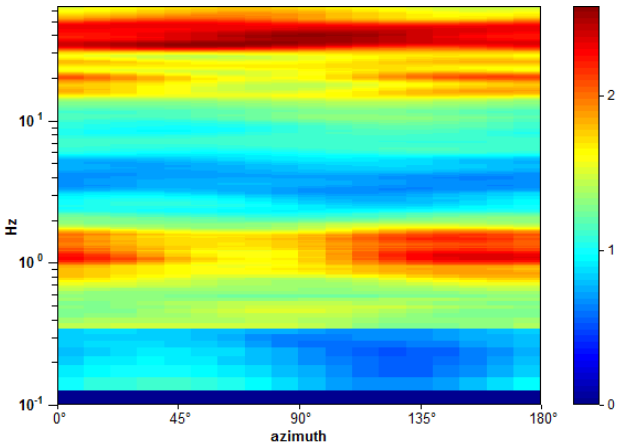
HORIZONTAL TO VERTICAL SPECTRAL RATIO



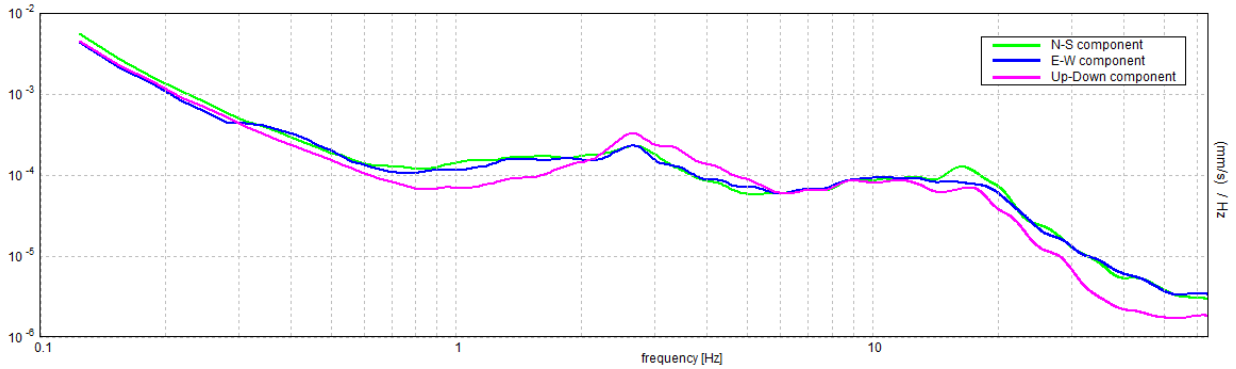
H/V TIME HISTORY



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 1.03 ± 0.35 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.03 > 0.50	OK	
$n_c(f_0) > 200$	783.8 > 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.25 Hz	OK	
$A_0 > 2$	2.02 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.33514| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.34561 < 0.10313		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3079 < 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 $\sigma_A(f) < \theta(f_0)$

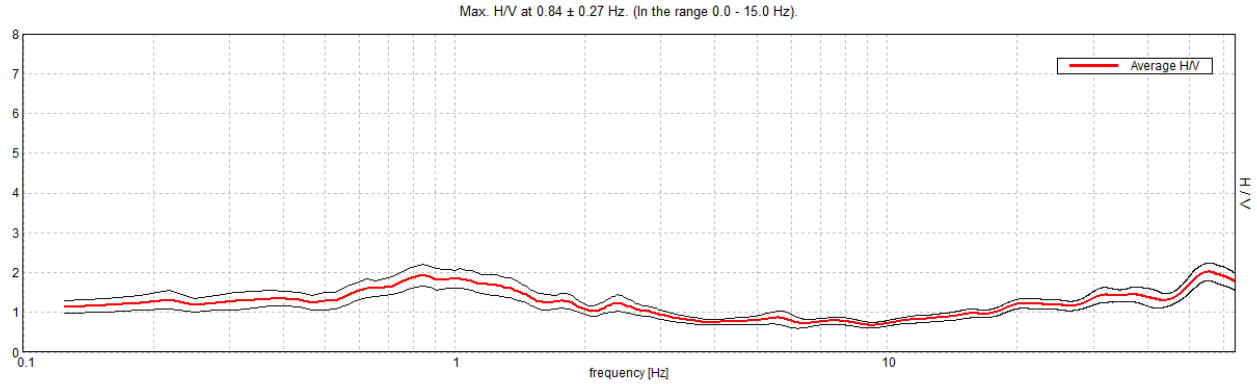
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0011

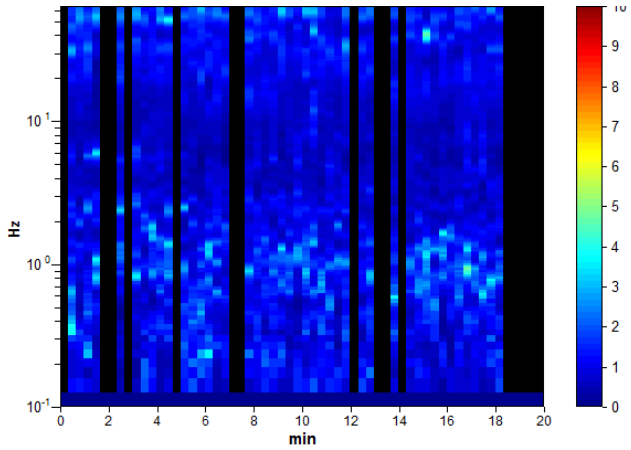
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 28/06/14 09:41:21 End recording: 28/06/14 10:01:22
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

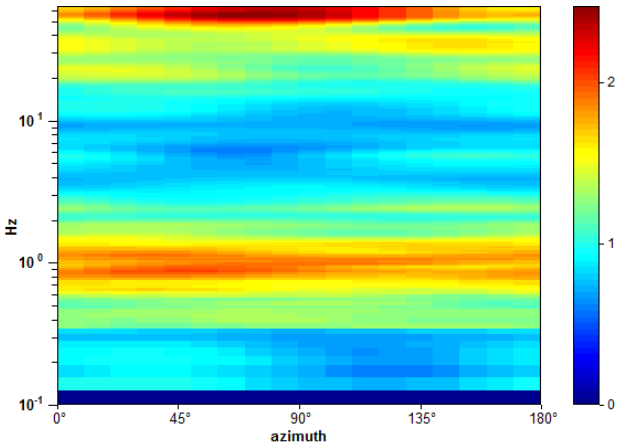
HORIZONTAL TO VERTICAL SPECTRAL RATIO



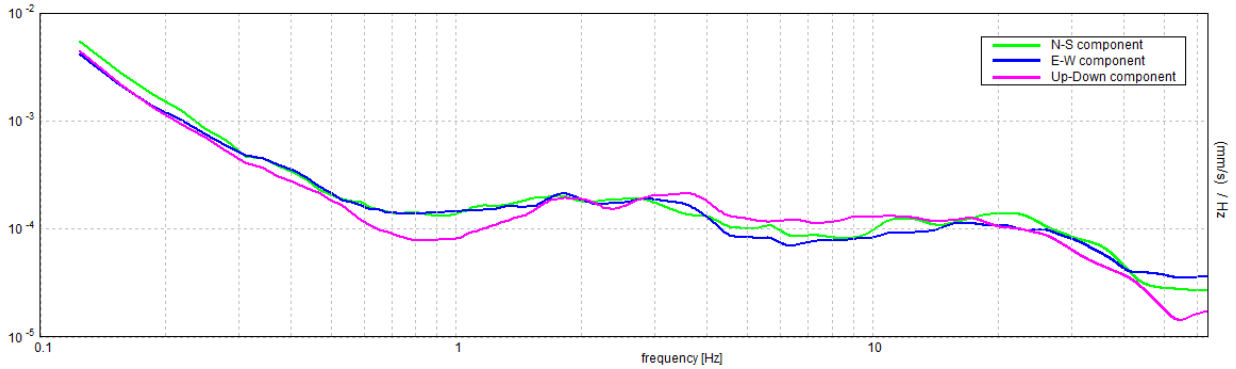
H/V TIME HISTORY



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 0.84 ± 0.27 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.84 > 0.50	OK	
$n_c(f_0) > 200$	742.5 > 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 42 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.938 Hz	OK	
$A_0 > 2$	1.94 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.31875| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.26895 < 0.12656		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2722 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

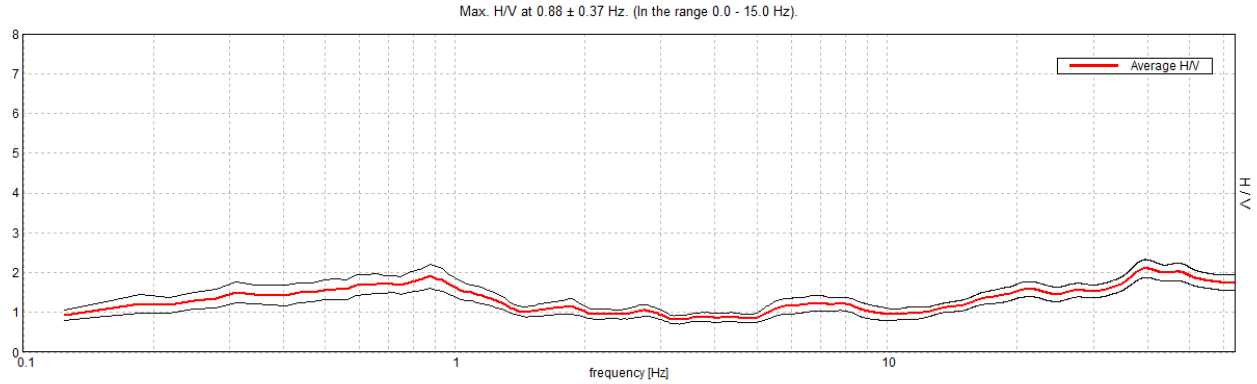
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0012

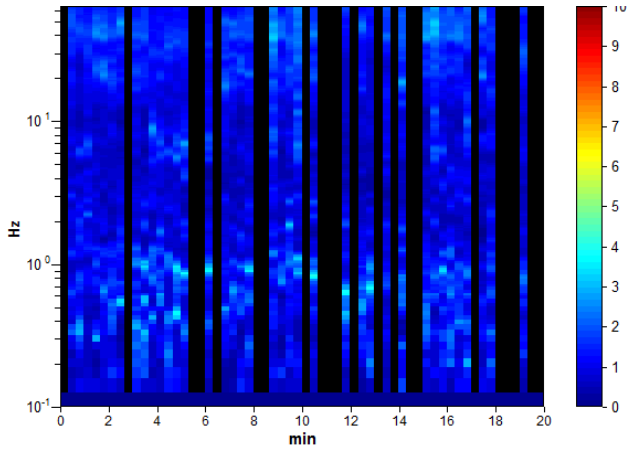
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 12:58:34 End recording: 04/07/14 13:18:35
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 67% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

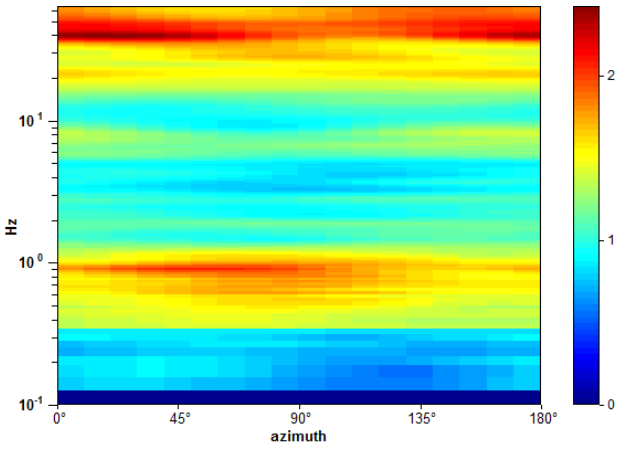
HORIZONTAL TO VERTICAL SPECTRAL RATIO



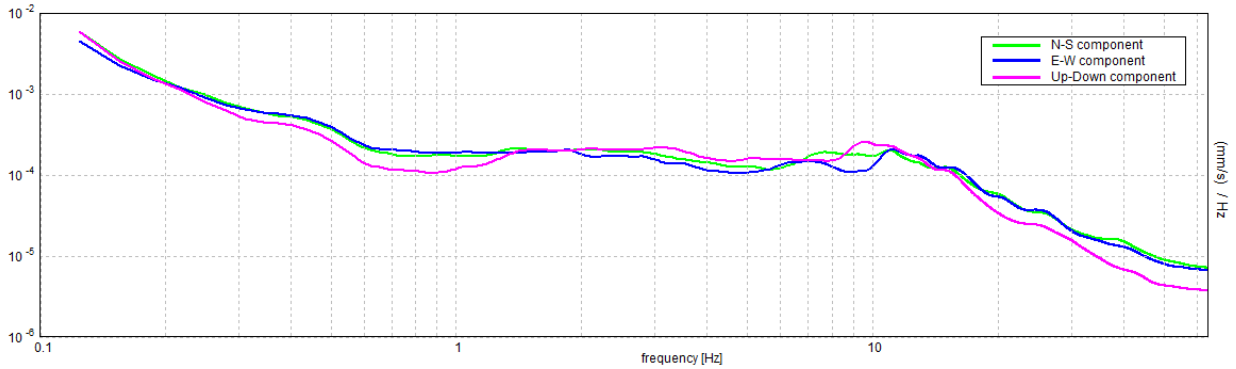
H/V TIME HISTORY



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 0.88 ± 0.37 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.88 > 0.50	OK	
$n_c(f_0) > 200$	665.0 > 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 43 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.094 Hz	OK	
$A_0 > 2$	1.91 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.42704| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.37366 < 0.13125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2984 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

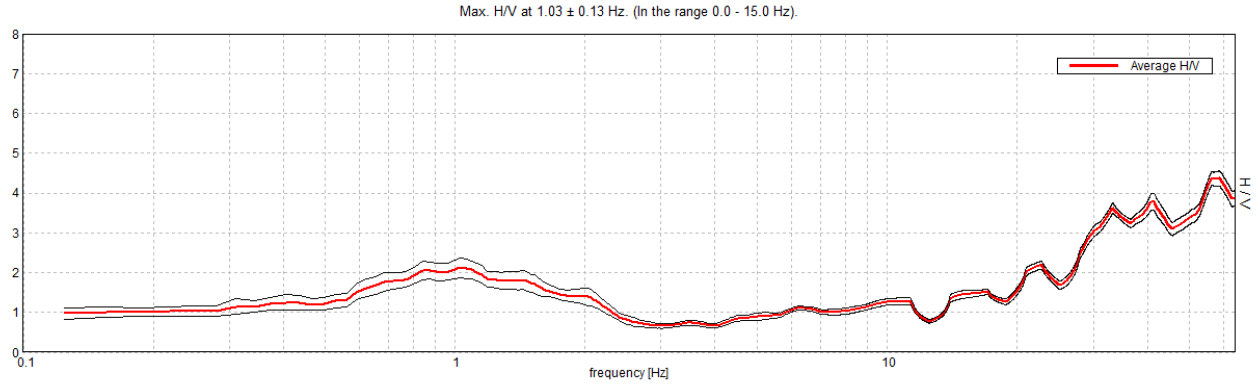
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0013

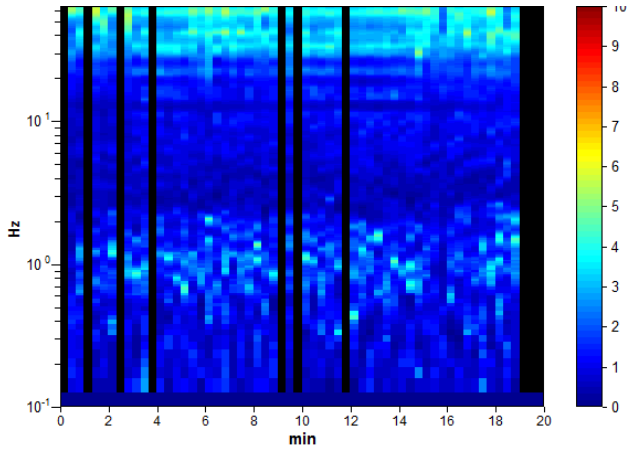
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 09:46:04 End recording: 04/07/14 10:06:05
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

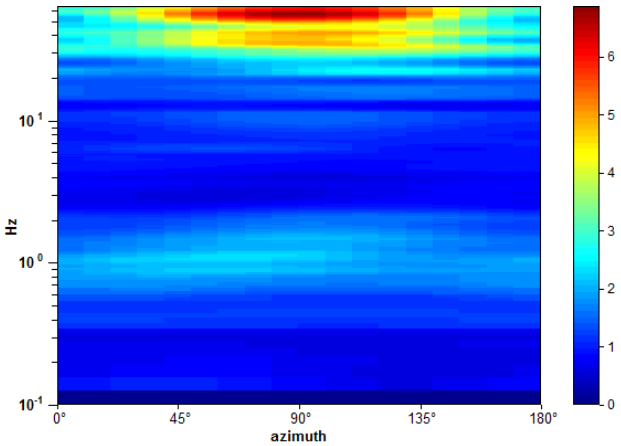
HORIZONTAL TO VERTICAL SPECTRAL RATIO



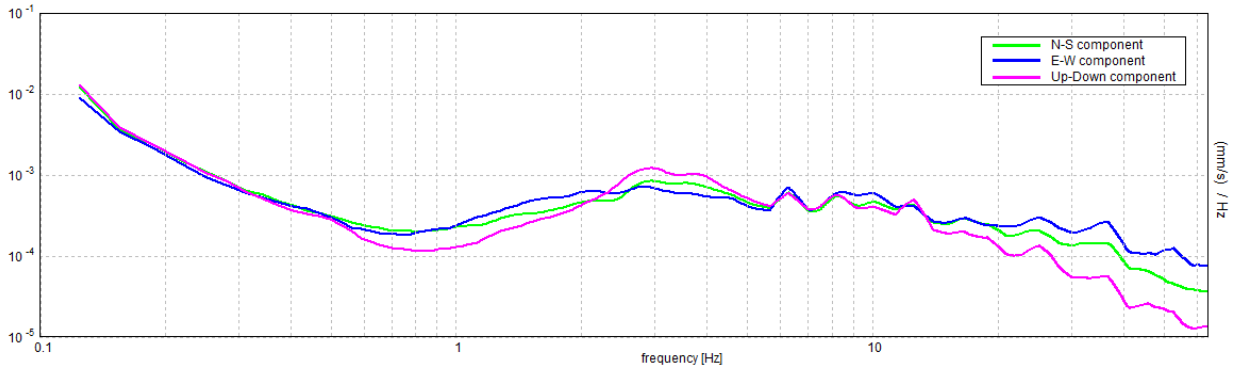
H/V TIME HISTORY



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 1.03 ± 0.13 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.03 > 0.50	OK	
$n_c(f_0) > 200$	1031.3 > 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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.281 Hz	OK	
$A_0 > 2$	2.13 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.12713| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.1311 < 0.10313		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2471 < 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 $\sigma_A(f) < \theta(f_0)$

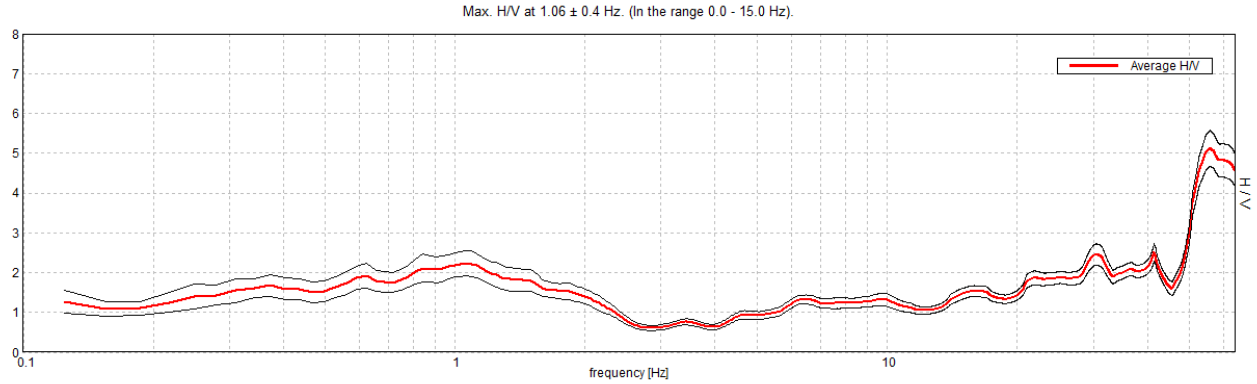
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0013a

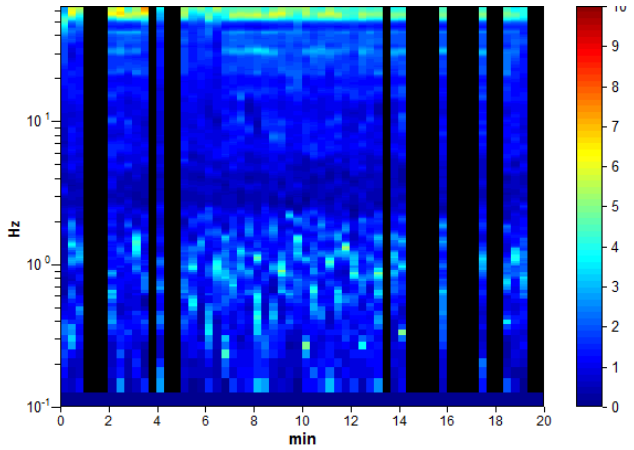
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 09:42:20 End recording: 04/07/14 10:02:21
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 72% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

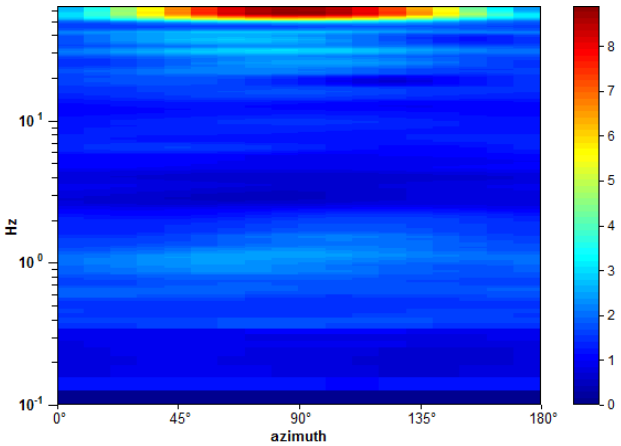
HORIZONTAL TO VERTICAL SPECTRAL RATIO



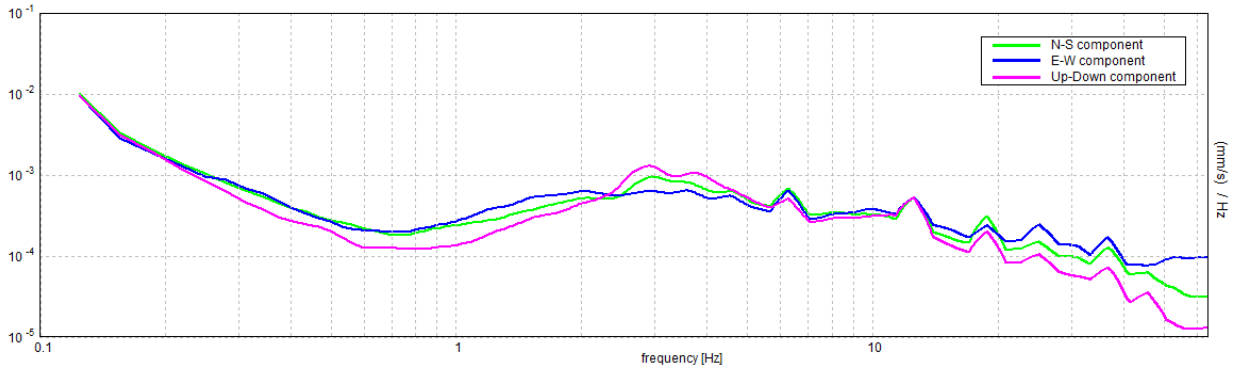
H/V TIME HISTORY



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 1.06 ± 0.4 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.06 > 0.50	OK	
$n_c(f_0) > 200$	871.3 > 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 52 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.281 Hz	OK	
$A_0 > 2$	2.23 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.37531| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.39876 < 0.10625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.3152 < 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 $\sigma_A(f) < \theta(f_0)$

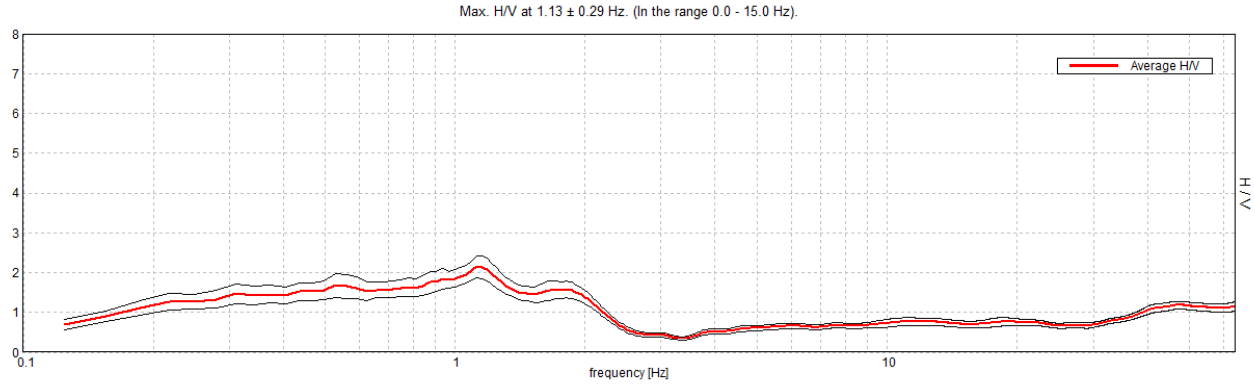
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0014

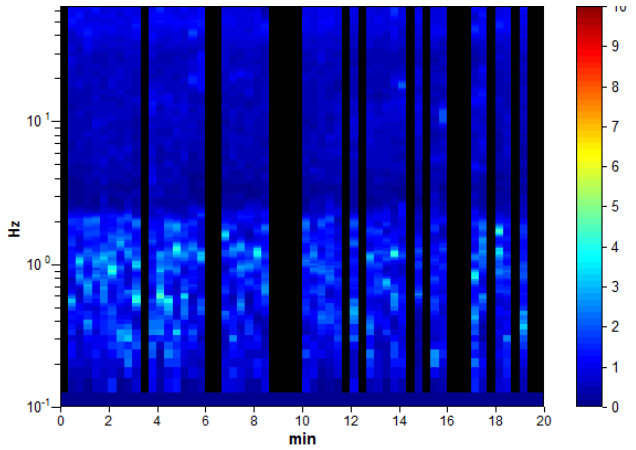
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 11:25:33 End recording: 04/07/14 11:45:34
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 72% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

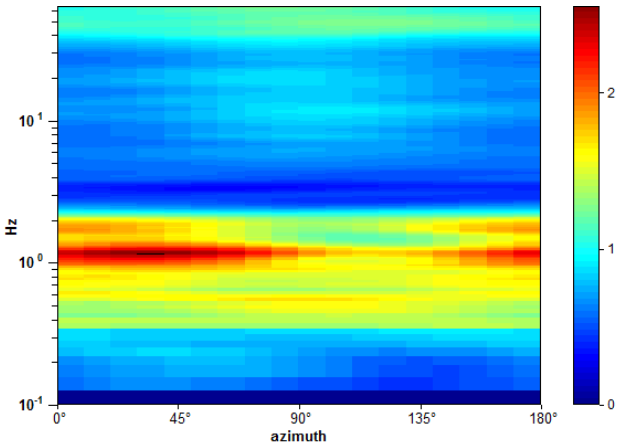
HORIZONTAL TO VERTICAL SPECTRAL RATIO



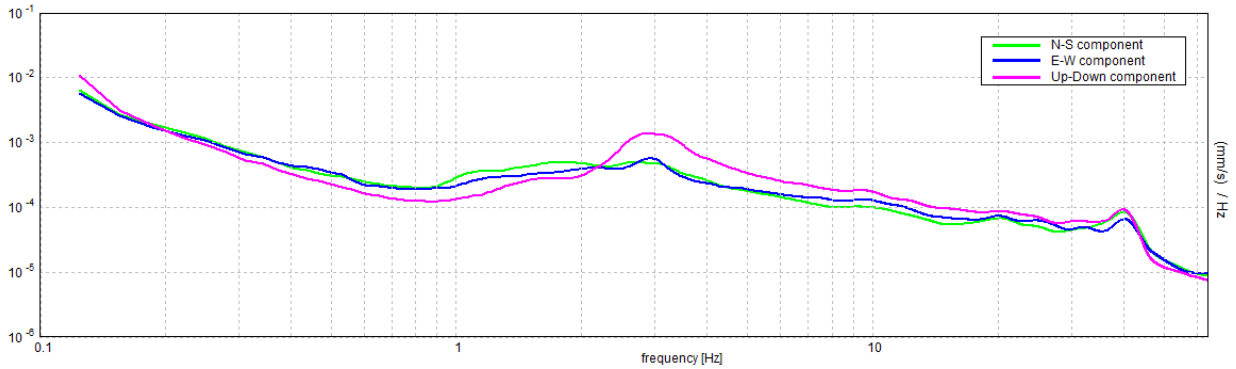
H/V TIME HISTORY



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 1.13 ± 0.29 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.13 > 0.50	OK	
$n_c(f_0) > 200$	922.5 > 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 55 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.188 Hz	OK	
$A_0 > 2$	2.14 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.25745| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.28964 < 0.1125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2667 < 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 $\sigma_A(f) < \theta(f_0)$

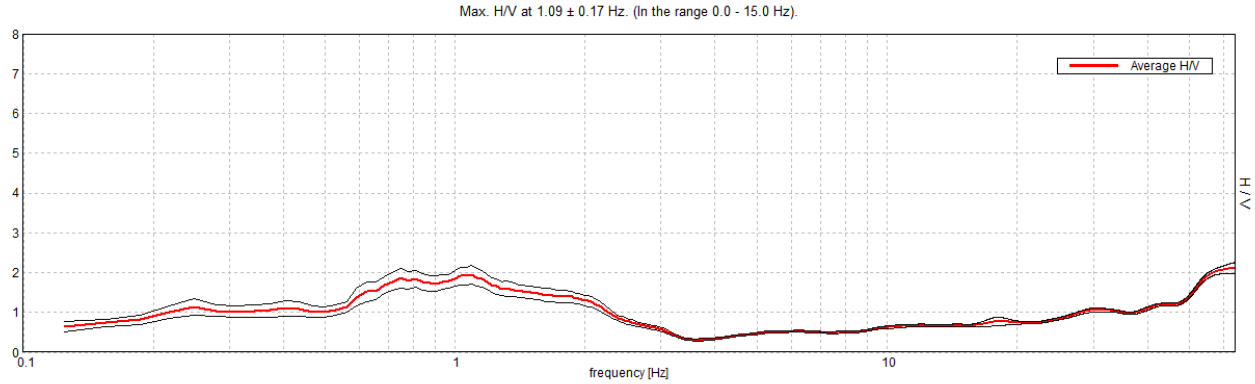
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0015

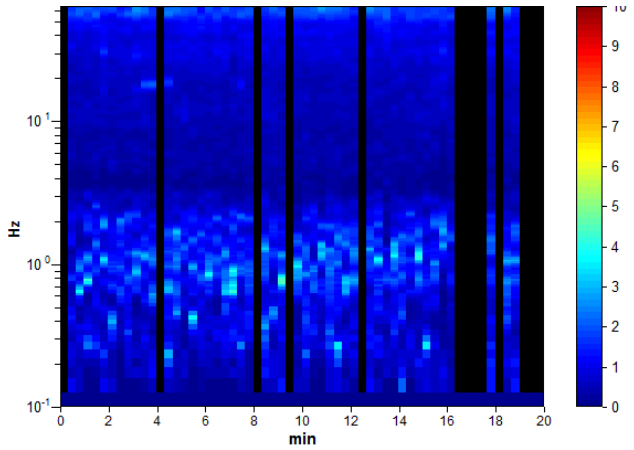
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 10:43:29 End recording: 04/07/14 11:03:30
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 78% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

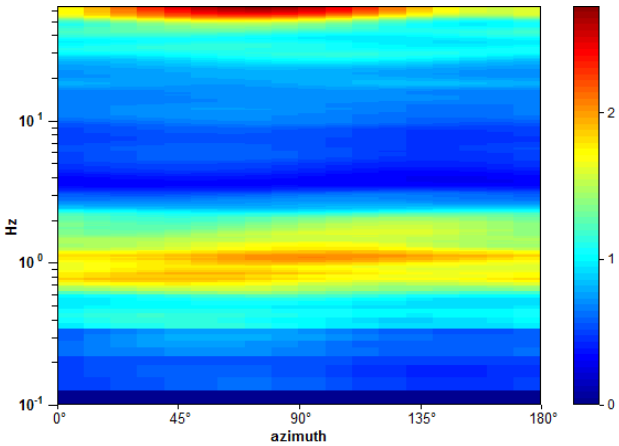
HORIZONTAL TO VERTICAL SPECTRAL RATIO



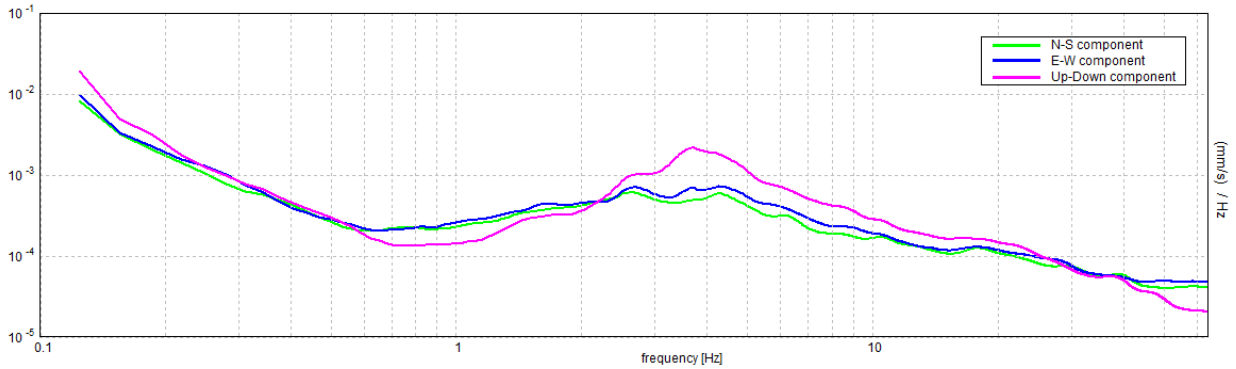
H/V TIME HISTORY



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 1.09 ± 0.17 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	1.09 > 0.50	OK	
$n_c(f_0) > 200$	1028.1 > 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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.313 Hz	OK	
$A_0 > 2$	1.94 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.15222| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.16649 < 0.10938		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2301 < 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 $\sigma_A(f) < \theta(f_0)$

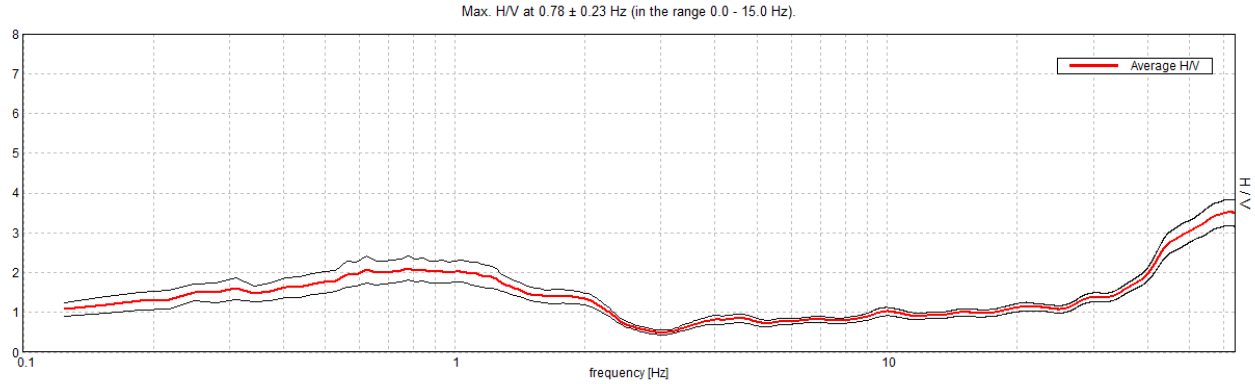
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0016

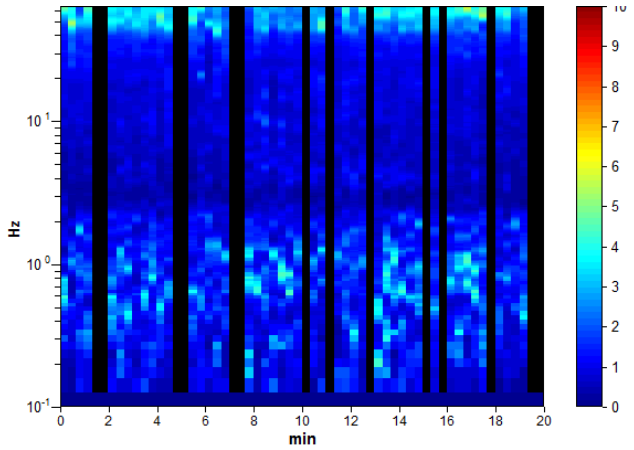
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 12:06:12 End recording: 04/07/14 12:26:13
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

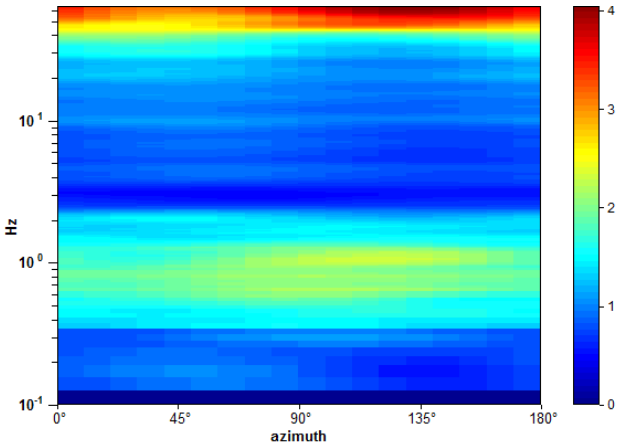
HORIZONTAL TO VERTICAL SPECTRAL RATIO



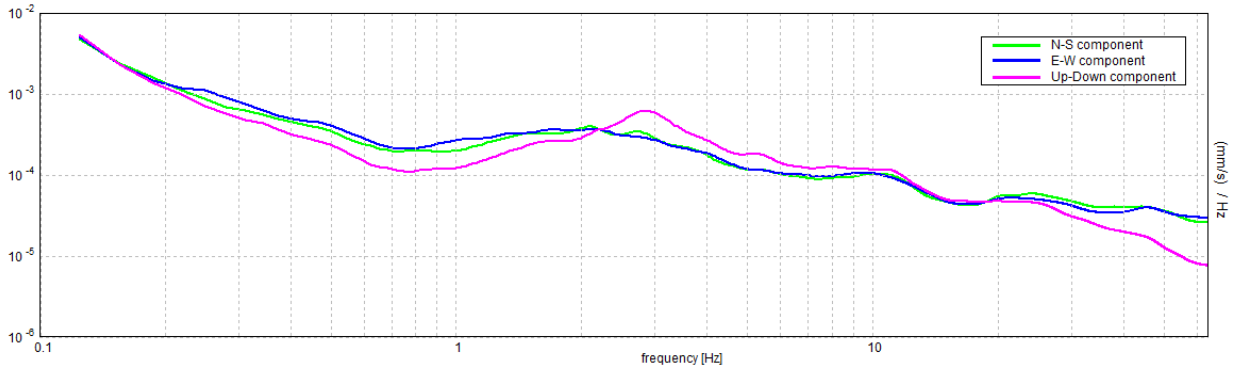
H/V TIME HISTORY



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 0.78 ± 0.23 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.78 > 0.50	OK	
$n_c(f_0) > 200$	718.8 > 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 38 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.25 Hz	OK	
$A_0 > 2$	2.12 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.29263| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.22862 < 0.11719		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2932 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

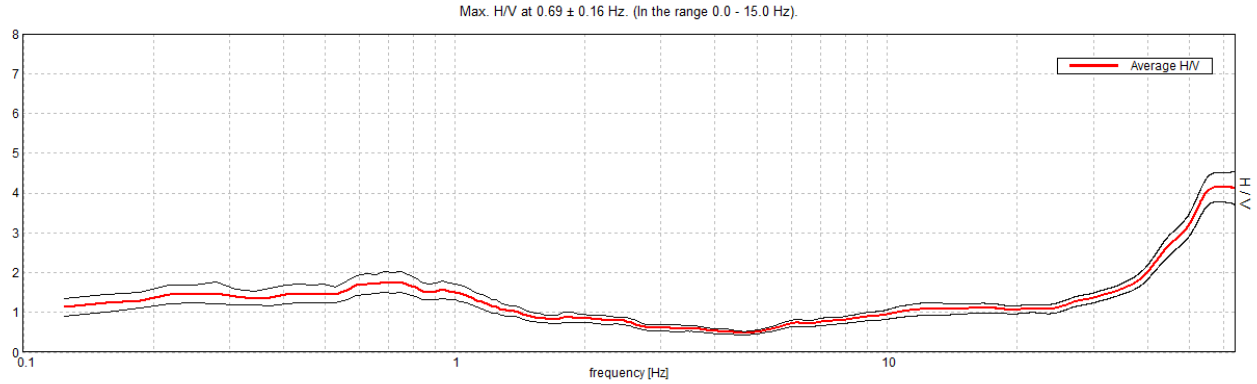
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0017

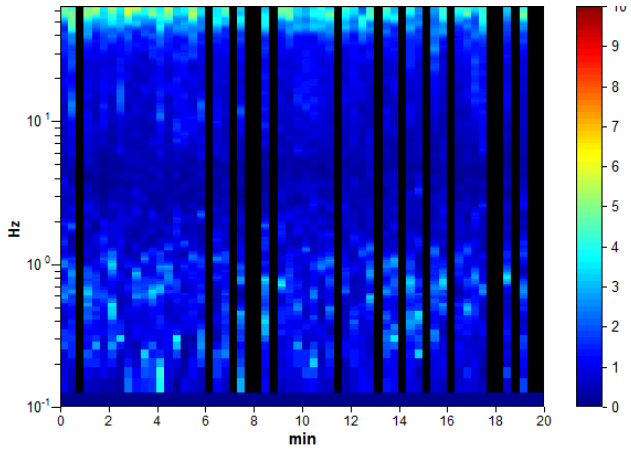
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 12:41:23 End recording: 04/07/14 13:01:24
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 77% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

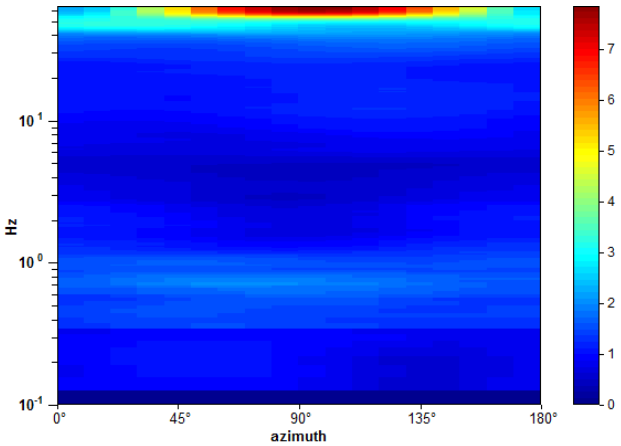
HORIZONTAL TO VERTICAL SPECTRAL RATIO



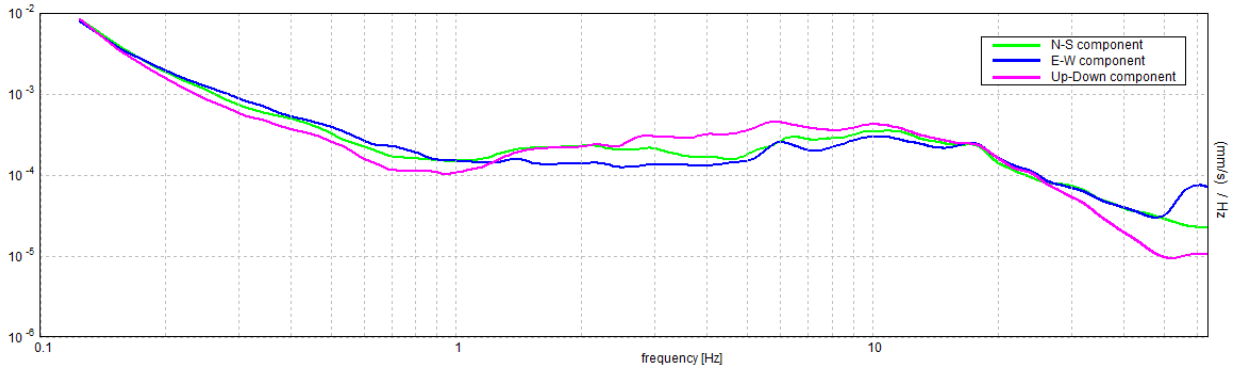
H/V TIME HISTORY



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 0.69 ± 0.16 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.69 > 0.50	OK	
$n_c(f_0) > 200$	605.0 > 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 34 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.531 Hz	OK	
$A_0 > 2$	1.77 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.23768| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.1634 < 0.10313		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2509 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

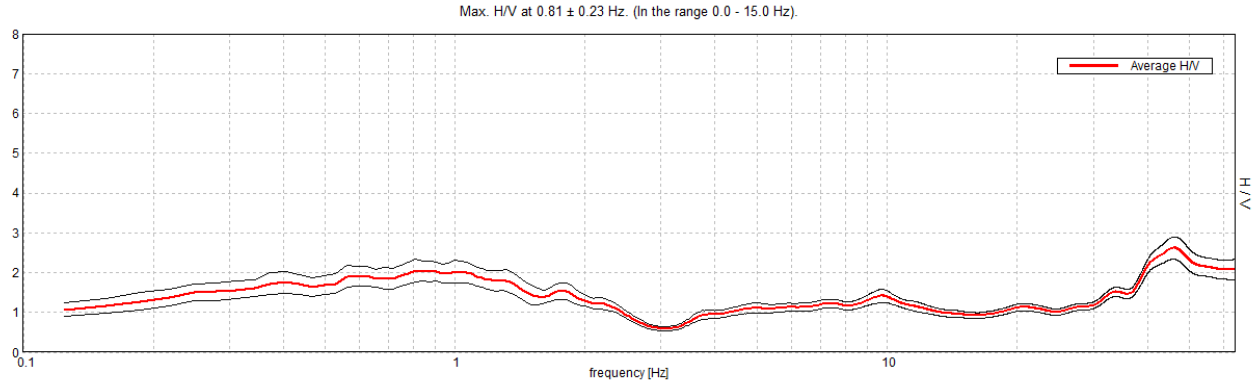
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0018

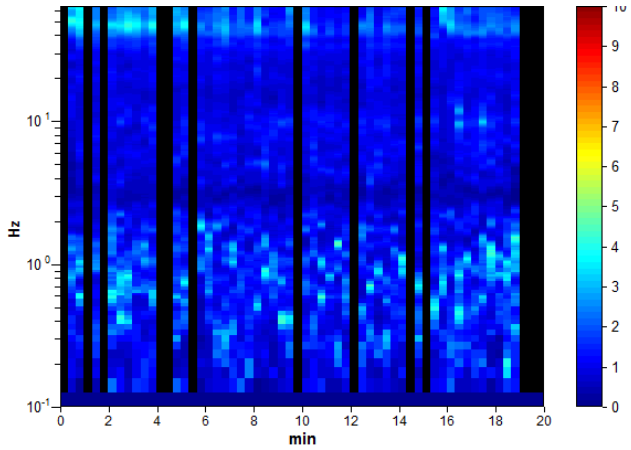
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 11:24:44 End recording: 04/07/14 11:44:45
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 82% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

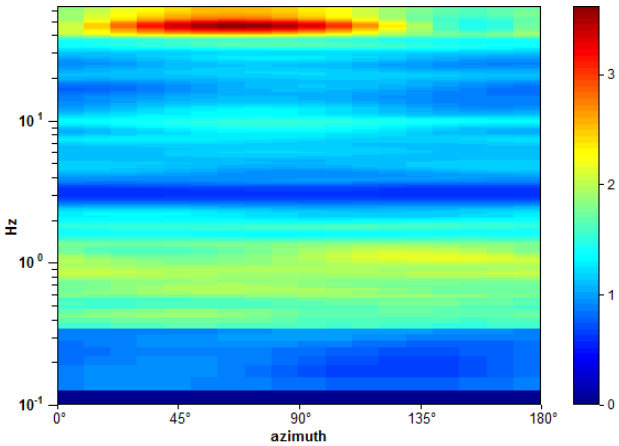
HORIZONTAL TO VERTICAL SPECTRAL RATIO



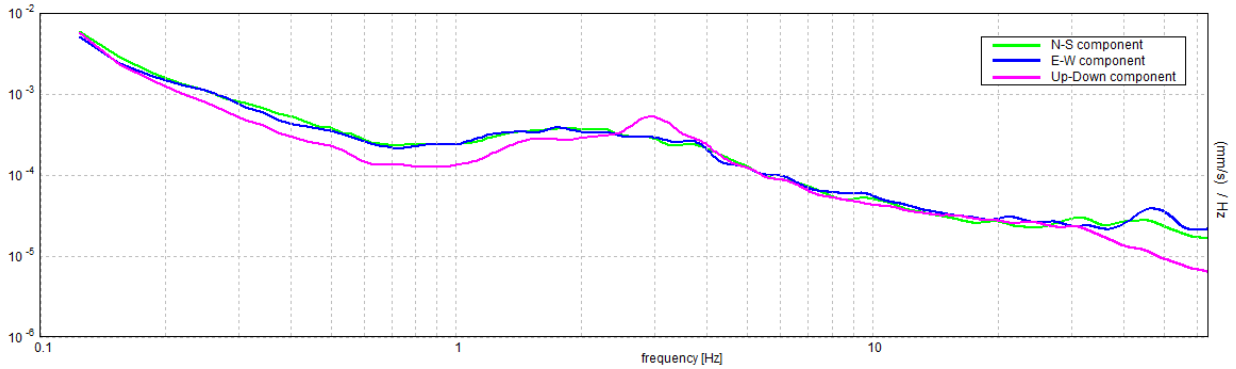
H/V TIME HISTORY



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 0.81 ± 0.23 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.81 > 0.50	OK	
$n_c(f_0) > 200$	763.8 > 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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.438 Hz	OK	
$A_0 > 2$	2.05 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.2843| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.23099 < 0.12188		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2899 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

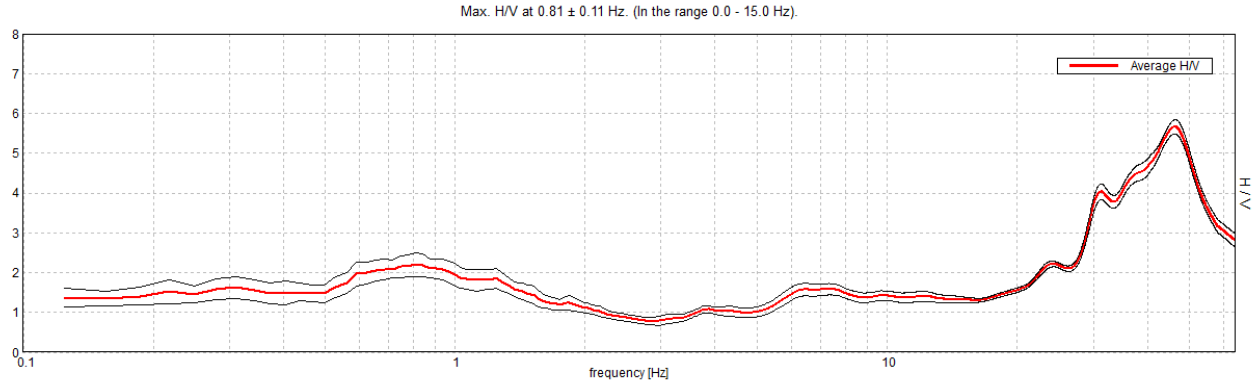
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0019

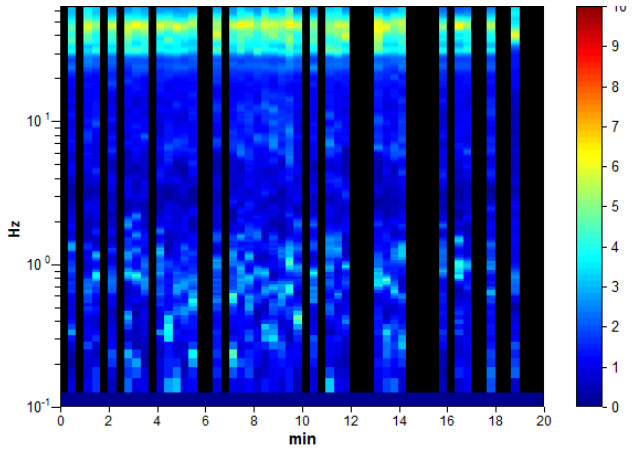
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 10:44:19 End recording: 04/07/14 11:04:20
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 58% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

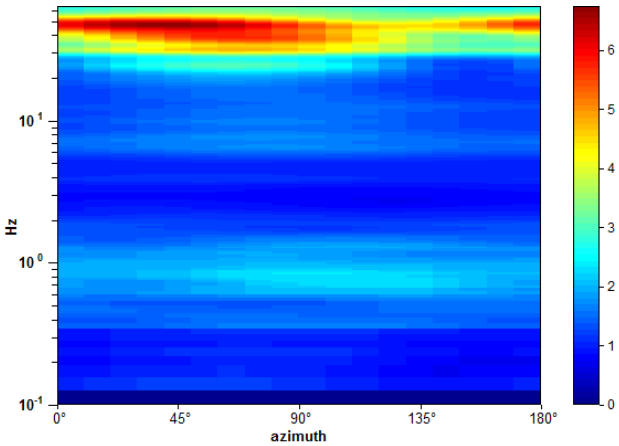
HORIZONTAL TO VERTICAL SPECTRAL RATIO



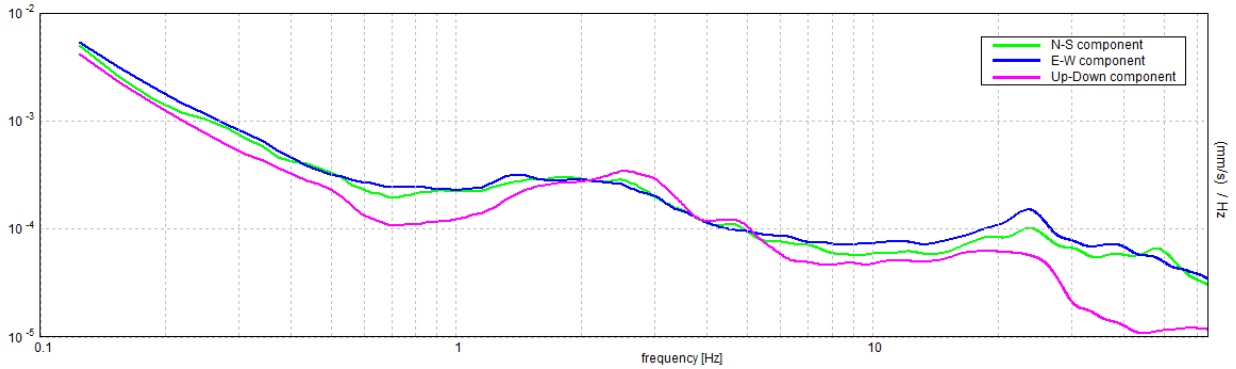
H/V TIME HISTORY



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 0.81 ± 0.11 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.81 > 0.50	OK	
$n_c(f_0) > 200$	568.8 > 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 $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.063 Hz	OK	
$A_0 > 2$	2.20 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.14124| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.11476 < 0.12188	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.2942 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

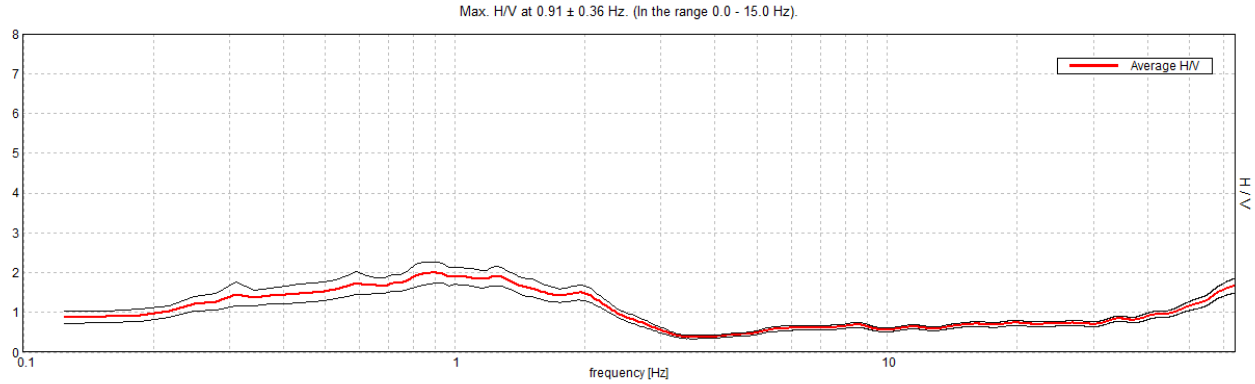
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0020

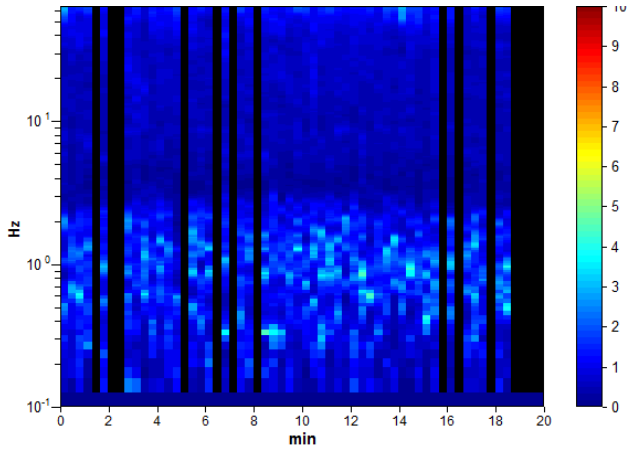
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 13:34:42 End recording: 04/07/14 13:54:43
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

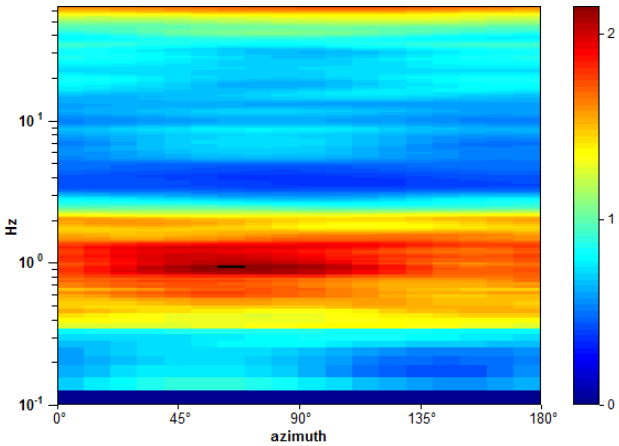
HORIZONTAL TO VERTICAL SPECTRAL RATIO



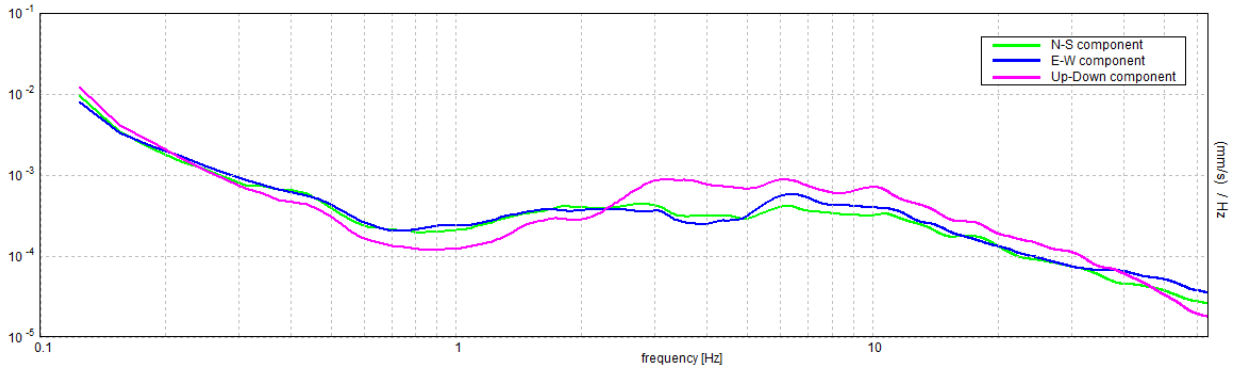
H/V TIME HISTORY



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 0.91 ± 0.36 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.91 > 0.50	OK	
$n_c(f_0) > 200$	833.8 > 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 44 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 $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	2.375 Hz	OK	
$A_0 > 2$	1.99 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.39231| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.35553 < 0.13594		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2553 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

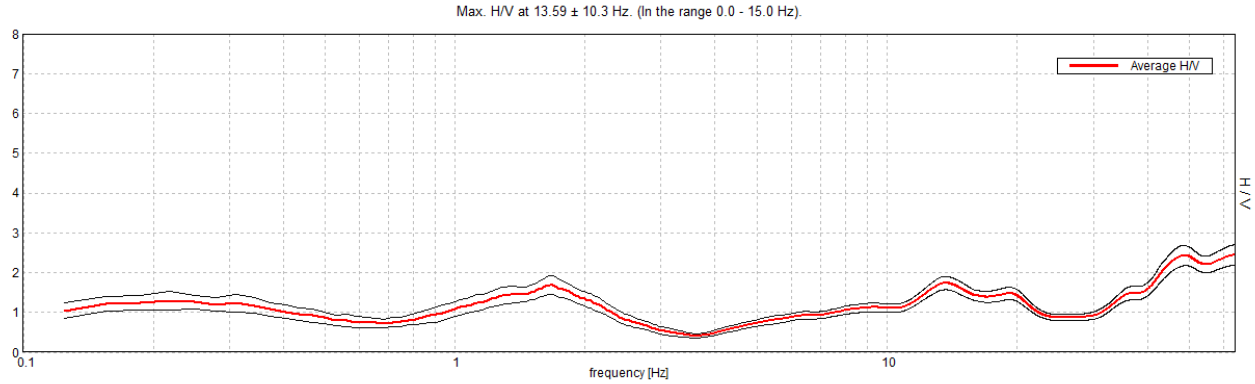
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

MIRABELLO, MIR 0021

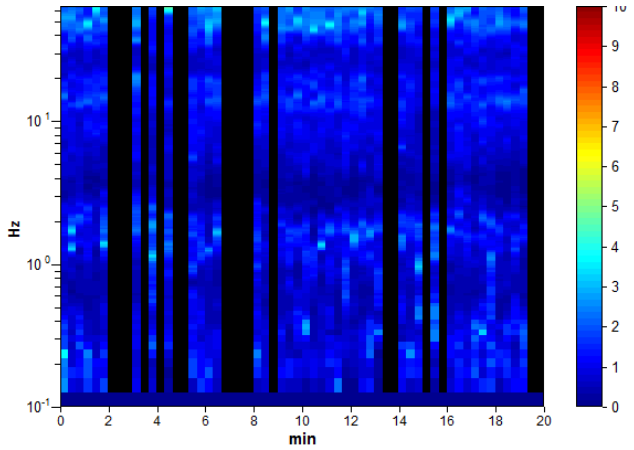
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 04/07/14 13:39:38 End recording: 04/07/14 13:59:39
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00''. Analyzed 73% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

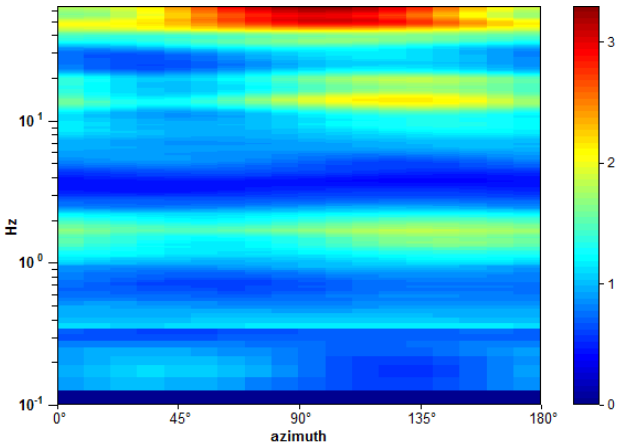
HORIZONTAL TO VERTICAL SPECTRAL RATIO



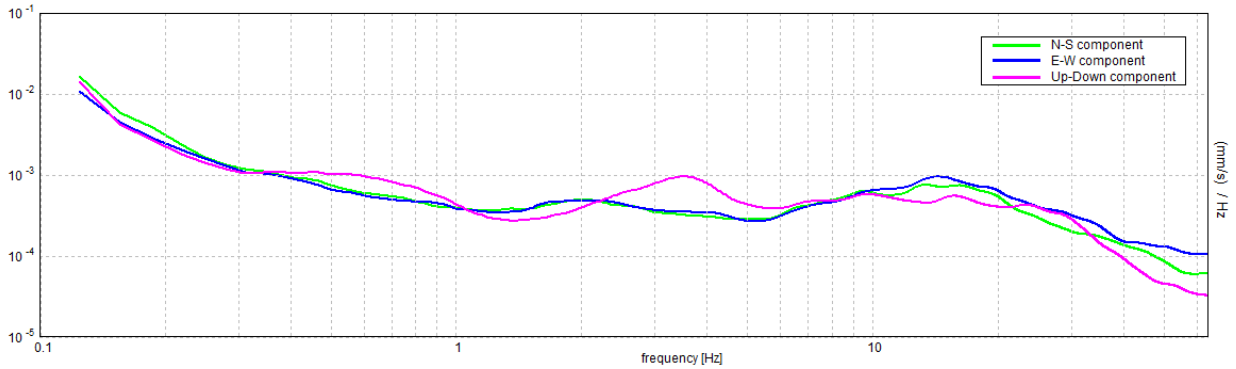
H/V TIME HISTORY



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 13.59 ± 10.3 Hz (in the range 0.0 - 15.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	13.59 > 0.50	OK	
$n_c(f_0) > 200$	11418.8 > 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 654 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	5.906 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	24.813 Hz	OK	
$A_0 > 2$	1.73 > 2		NO
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.75791| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	10.30278 < 0.67969		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1644 < 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 $\sigma_A(f) < \theta(f_0)$

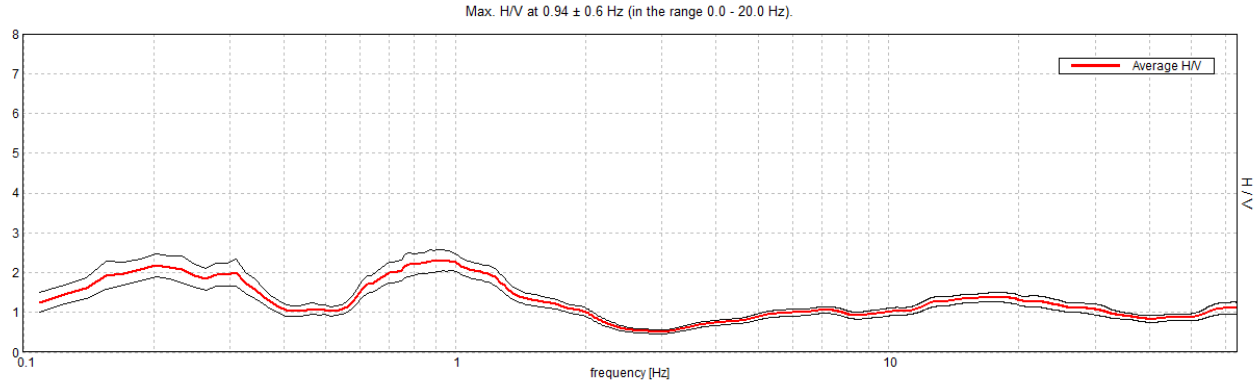
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SANTA_TERESA, ST 01

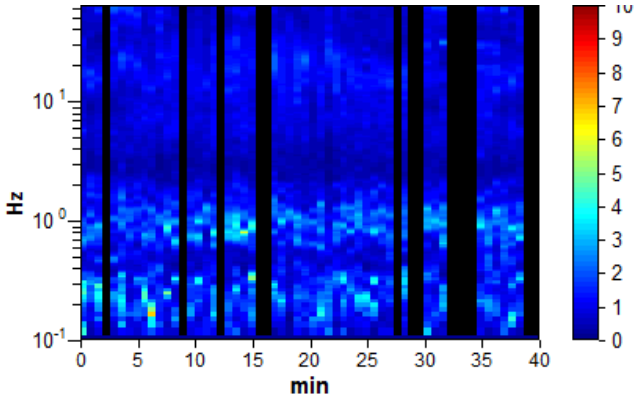
Instrument: TRS-0025/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 12/03/15 10:13:10 End recording: 12/03/15 10:53:11
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h40'00''. Analyzed 80% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 40 s
Smoothing type: Triangular window
Smoothing: 10%

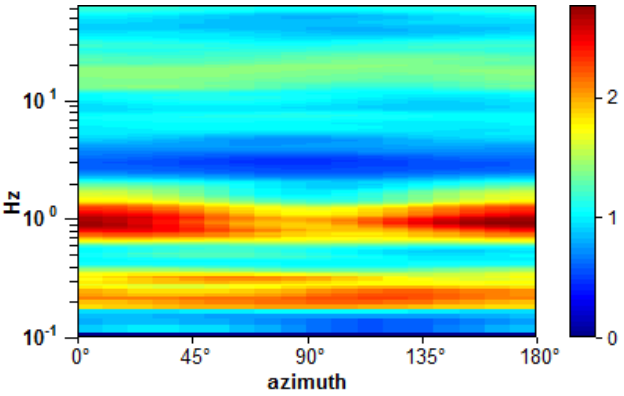
HORIZONTAL TO VERTICAL SPECTRAL RATIO



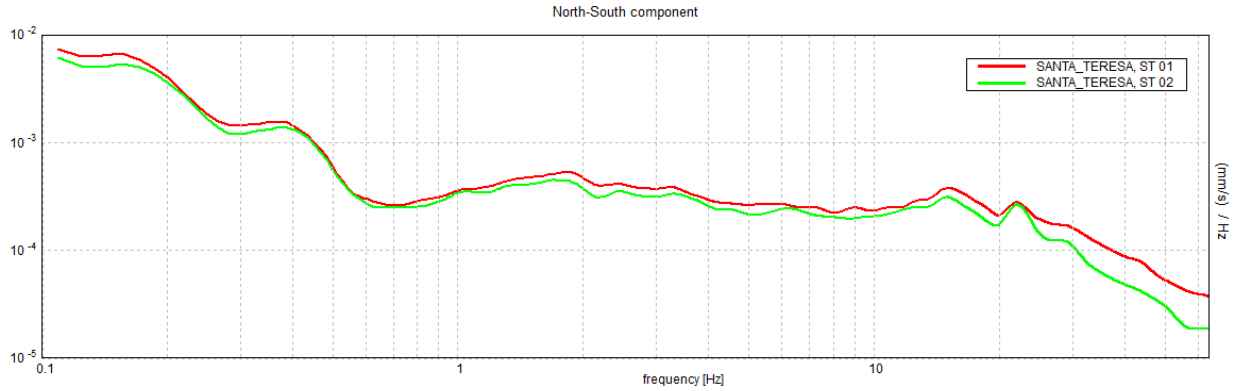
H/V TIME HISTORY



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 0.94 ± 0.6 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.94 > 0.25	OK	
$n_c(f_0) > 200$	1725.0 > 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 91 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.766 Hz	OK	
$A_0 > 2$	2.31 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.64265| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.60248 < 0.14063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.266 < 2.0	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 $\sigma_A(f) < \theta(f_0)$

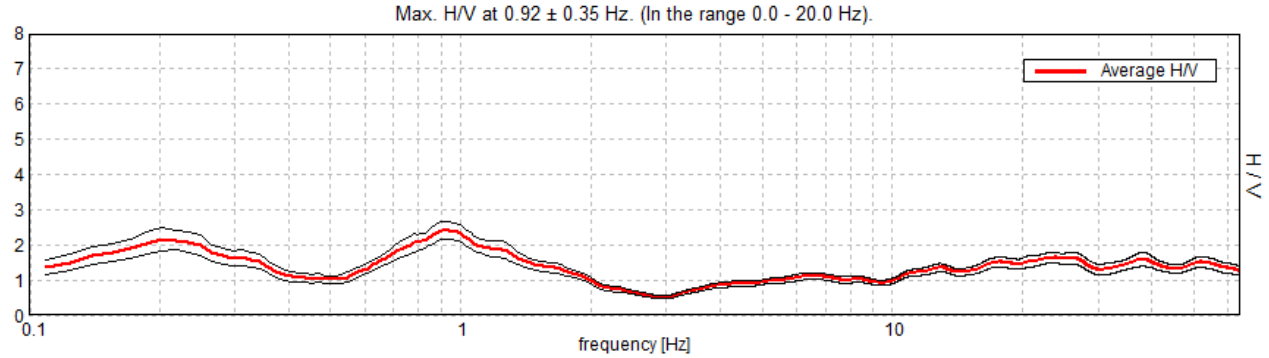
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

SANTA_TERESA, ST 02

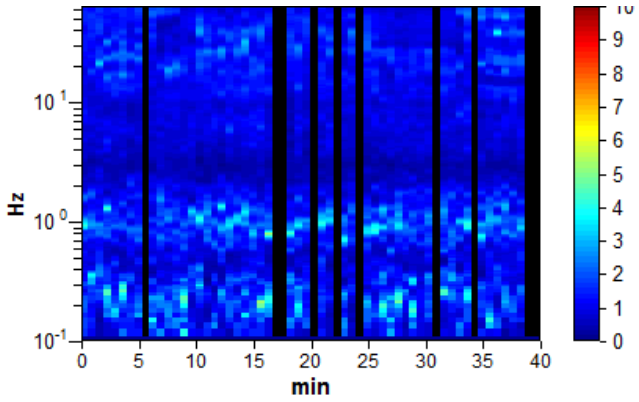
Instrument: TEN-0029/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 12/03/15 10:15:48 End recording: 12/03/15 10:55:49
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h40'00''. Analyzed 87% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 40 s
Smoothing type: Triangular window
Smoothing: 10%

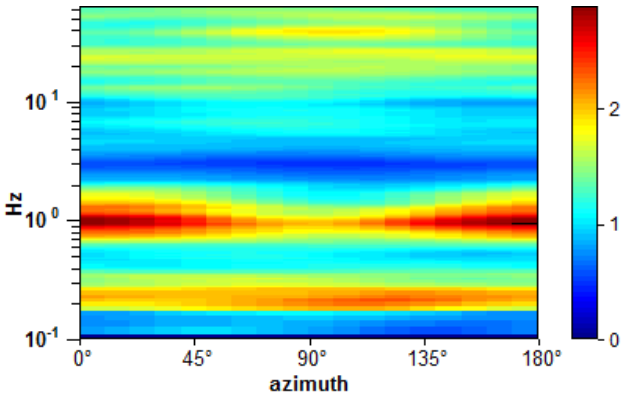
HORIZONTAL TO VERTICAL SPECTRAL RATIO



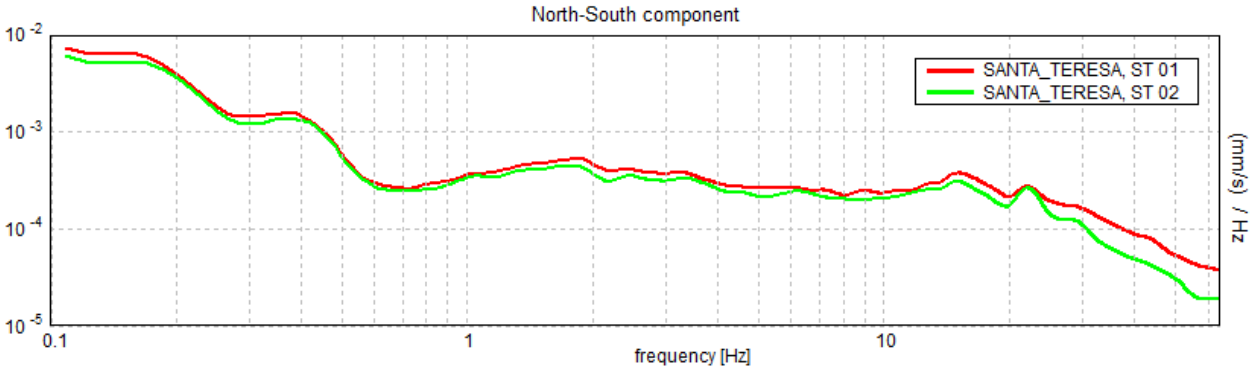
H/V TIME HISTORY



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 0.92 ± 0.35 Hz (in the range 0.0 - 20.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	0.92 > 0.25	OK	
$n_c(f_0) > 200$	1843.8 > 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 90 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	0.563 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	1.781 Hz	OK	
$A_0 > 2$	2.42 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.38067| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	0.35093 < 0.13828		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2576 < 2.0	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

DOWN HOLE

COMMITTENTE	Dott. Luca Minarelli
DOWN HOLE	S1 0-265m
Località	Mirabello - Durandi
Data acquisizione	18/12/2015

CODICE LAVORO: 1173/2011
SISMOGRAMMI
INDAGINE SU TERRENO NATURALE
SHOT a 11.5 m da bocca foro

PROGEO s.r.l.
Via Talete 10/6
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

Profondità misura

Sismogrammi onde di compressione

Sismogrammi onde di taglio

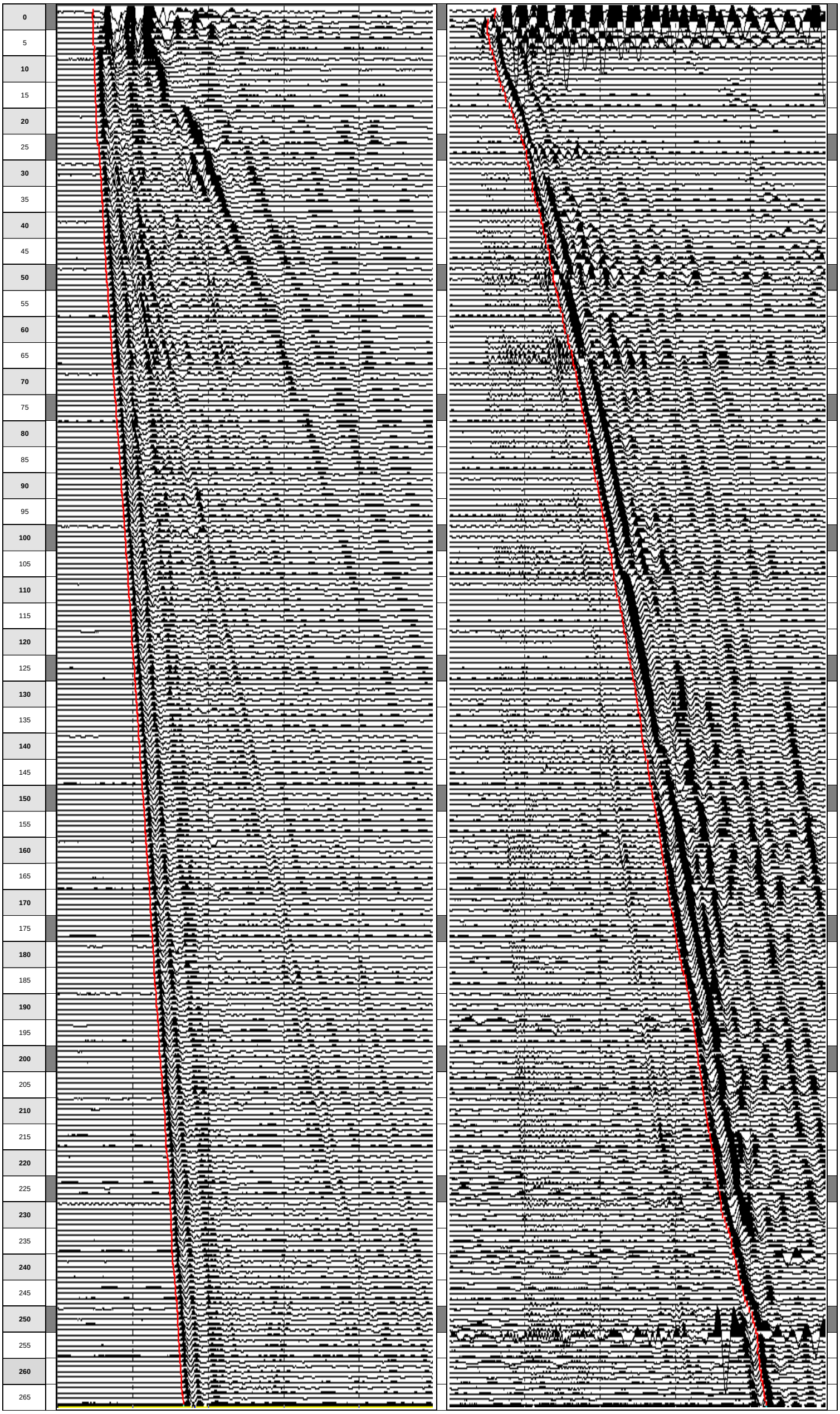


Fig. 1

COMMITTENTE	**Dott. Luca Minarelli**
DOWN HOLE	**S1 0-40m**
Località	**Mirabello - Durandi**
Data acquisizione	**18/12/2015**

CODICE LAVORO: 1649

TABELLA DATI

INDAGINE SU TERRENO NATURALE

SHOT a 11.5 m da bocca foro

PROGEO s.r.l.
Via Talete 11/9
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

m	Tempi Onde p msec	Tempi Onde s msec	Vp Km/sec.	Vs Km/sec.	ν -	γ T/m³	Edin Kg/cm²	Gdin Kg/cm²	Kdin Kg/cm²	STRATIGRAFIA SINTETICA	PARAMETRI INTERVALLARI PER LIVELLI OMOGENEI Vp Km/sec.	Vs Km/sec.	ν	γ T/m³	Edin Kg/cm²	Gdin Kg/cm²	Kdin Kg/cm²	STIMA DEGLI ERRORI Vp (km/sec) I°	Vp II°	Vp III°	Vp ε	Vs (km/sec) I°	Vs II°	Vs III°	Vs ε
0										**INTERFERENZA RIVESTIMENTO METALLICO**															
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10	**36.3**	**38.8**	**0.617**	**0.289**	**0.36**	**1.73**	**4012**	**1476**	**4740**	**ALTERNANZE SABBIA ARGILLA**								0.61	0.62	0.62	0.00	0.29	0.29	0.29	0.00
11	36.7	41.4	0.704	0.268	0.42	1.77	3677	1299	7220									0.69	0.70	0.72	0.02	0.27	0.27	0.27	0.00
12	37.1	44.6	0.812	0.251	0.45	1.82	3384	1169	10670									0.78	0.81	0.83	0.02	0.25	0.25	0.25	0.00
13	37.3	48.6	0.919	0.237	0.46	1.86	3116	1064	14620									0.89	0.92	0.94	0.03	0.24	0.24	0.24	0.00
14	37.6	53.4	1.010	0.226	0.47	1.90	2905	986	18443		0.968	0.232	0.455	1.876	2996	1036	17700	0.97	1.01	1.06	0.05	0.22	0.23	0.23	0.00
15	**37.6**	**59.8**	**1.069**	**0.218**	**0.48**	**1.92**	**2741**	**927**	**21119**									1.02	1.07	1.10	0.04	0.21	0.22	0.22	0.00
16	37.9	63.8	1.121	0.211	0.48	1.94	2593	875	23649									1.08	1.12	1.16	0.04	0.21	0.21	0.22	0.01
17	38.1	67.8	1.196	0.201	0.49	1.96	2389	804	27491									1.14	1.20	1.23	0.04	0.20	0.20	0.21	0.01
18	38.7	76.6	1.265	0.189	0.49	1.98	2149	722	31344									1.22	1.26	1.30	0.04	0.19	0.19	0.19	0.00
19	39.7	81.8	1.321	0.180	0.49	2.00	1976	663	34633	**ARGILLA**								1.27	1.32	1.37	0.05	0.18	0.18	0.18	0.00
20	**39.7**	**86.3**	**1.353**	**0.181**	**0.49**	**2.01**	**1997**	**670**	**36534**									1.31	1.35	1.39	0.04	0.18	0.18	0.18	0.00
21	39.7	91.8	1.405	0.189	0.49	2.02	2194	736	39697									1.36	1.41	1.43	0.04	0.19	0.19	0.19	0.00
22	40.2	95.8	1.455	0.200	0.49	2.03	2462	826	42832									1.42	1.46	1.49	0.03	0.19	0.20	0.21	0.01
23	40.6	102.2	1.482	0.207	0.49	2.04	2670	896	44542		1.410	0.203	0.489	2.022	2546	855	39930	1.45	1.48	1.52	0.03	0.20	0.21	0.21	0.01
24	40.6	106.8	1.472	0.212	0.49	2.04	2793	938	43793									1.46	1.47	1.49	0.02	0.21	0.21	0.22	0.00
25	**42.0**	**110.3**	**1.440**	**0.216**	**0.49**	**2.03**	**2869**	**964**	**41612**									1.43	1.44	1.45	0.01	0.21	0.22	0.22	0.00
26	43.6	115.6	1.395	0.219	0.49	2.02	2932	986	38759									1.37	1.40	1.42	0.02	0.22	0.22	0.22	0.00
27	44.2	119.1	1.367	0.223	0.49	2.01	3023	1017	36973									1.34	1.37	1.40	0.03	0.22	0.22	0.22	0.00
28	44.7	122.6	1.359	0.228	0.49	2.01	3166	1066	36404	**SABBIA**								1.34	1.36	1.39	0.03	0.23	0.23	0.23	0.00
29	45.3	126.1	1.365	0.236	0.48	2.01	3391	1142	36640		1.390	0.242	0.484	2.017	3578	1205	38157	1.34	1.36	1.39	0.03	0.23	0.24	0.24	0.00
30	**46.2**	**129.1**	**1.388**	**0.246**	**0.48**	**2.02**	**3696**	**1245**	**37959**									1.35	1.39	1.41	0.03	0.24	0.25	0.25	0.00
31	46.7	130.9	1.448	0.257	0.48	2.03	4061	1368	41627									1.43	1.45	1.46	0.02	0.26	0.26	0.26	0.00
32	47.2	132.2	1.532	0.266	0.48	2.05	4406	1484	47178	**ARGILLA**								1.51	1.53	1.55	0.02	0.26	0.27	0.27	0.00
33	47.7	137.9	1.635	0.272	0.49	2.08	4674	1573	54630									1.62	1.64	1.65	0.01	0.27	0.27	0.27	0.00
34	48.1	137.9	1.714	0.275	0.49	2.10	4824	1622	60717									1.70	1.71	1.73	0.01	0.27	0.28	0.28	0.00
35	**48.8**	**141.8**	**1.770**	**0.276**	**0.49**	**2.11**	**4883**	**1641**	**65259**									1.75	1.77	1.79	0.02	0.27	0.28	0.28	0.00
36	49.1	145.3	1.791	0.276	0.49	2.12	4876	1639	67038		1.742	0.292	0.485	2.105	5479	1845	62823	1.79	1.79	1.80	0.01	0.27	0.28	0.28	0.00
37	49.5	151.0	1.799	0.275	0.49	2.12	4857	1632	67706									1.79	1.80	1.81	0.01	0.27	0.27	0.28	0.00
38	50.1	154.9	1.800	0.276	0.49	2.12	4880	1640	67794									1.79	1.80	1.81	0.01	0.27	0.28	0.28	0.00
39	50.4	156.2	1.798	0.278	0.49	2.12	4964	1668	67577									1.79	1.80	1.80	0.00	0.28	0.28	0.28	0.00
40	**51.4**	**159.3**	**1.79**	**0.28**	**0.49**	**2.12**	**5070**	**1704**	**66989**									1.79	1.79	1.80	0.01	0.28	0.28	0.28	0.00

Legenda parametri dinamici

Tp	Tempi onde di compressione	millisecondi	**γ**	Peso di volume	T/m³
Ts	Tempi onde di taglio	millisecondi	**Edin**	Modulo di Elasticità dinamico	Kg/cm²
Vp	Velocità onde di compressione	Km/sec	**Gdin**	Modulo di Taglio dinamico	Kg/cm²
Vs	Velocità onde di taglio	Km/sec	**Kdin**	Modulo di Compressibilità dinamico	Kg/cm²
ν	Coefficiente di Poisson				

CLASSIFICAZIONE SISMICA DEI SUOLI
(NUOVE NORME TECNICHE PER LE COSTRUZIONI - D.M. del 14 gennaio 2008)

Vs_{30} = m/sec

G_0 = Kg/cm²

CATEGORIA SUOLO =

Fig. 2

COMMITTENTE	**Dott. Luca Minarelli**
DOWN HOLE	**S1 40-80m**
Località	**Mirabello - Durandi**
Data acquisizione	**18/12/2015**

CODICE LAVORO: 1649

TABELLA DATI

INDAGINE SU TERRENO NATURALE

SHOT a 11.5 m da bocca foro

PROGEO s.r.l.
Via Talete 10/8
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

m	Tempi									STRATIGRAFIA SINTETICA	PARAMETRI INTERVALLARI PER LIVELLI OMOGENEI							STIMA DEGLI ERRORI								
	Onde p	Onde s	Vp	Vs	ν	γ	Edin	Gdin	Kdin		Vp	Vs	ν	γ	Edin	Gdin	Kdin	Vp (km/sec)				Vs (km/sec)			
	msec	msec	Km/sec.	Km/sec.	-	T/m³	Kg/cm²	Kg/cm²	Kg/cm²		Km/sec.	Km/sec.		T/m³	Kg/cm²	Kg/cm²	Kg/cm²	I°	II°	III°	ε	I°	II°	III°	ε
40	**51.4**	**159.3**	**1.792**	**0.281**	**0.49**	**2.12**	**5070**	**1704**	**66989**	**ARGILLA**	1.742	0.292	0.485	2.105	5479	1845	62823	1.79	1.79	1.80	0.01	0.28	0.28	0.28	0.00
41	51.8	163.2	1.785	0.283	0.49	2.12	5124	1723	66397									1.78	1.78	1.79	0.01	0.28	0.28	0.28	0.00
42	52.2	166.7	1.781	0.283	0.49	2.11	5127	1724	66070									1.77	1.78	1.79	0.01	0.28	0.28	0.28	0.00
43	52.6	170.6	1.780	0.283	0.49	2.11	5136	1727	65960									1.77	1.78	1.79	0.01	0.28	0.28	0.29	0.00
44	53.1	172.8	1.776	0.287	0.49	2.11	5290	1779	65558									1.77	1.78	1.79	0.01	0.28	0.29	0.29	0.00
45	**53.4**	**178.1**	**1.768**	**0.297**	**0.49**	**2.11**	**5622**	**1892**	**64763**									1.76	1.77	1.78	0.01	0.29	0.30	0.30	0.00
46	54.0	181.6	1.759	0.309	0.48	2.11	6089	2051	63767									1.75	1.76	1.77	0.01	0.31	0.31	0.31	0.00
47	54.4	181.6	1.749	0.319	0.48	2.11	6490	2188	62765									1.74	1.75	1.75	0.01	0.32	0.32	0.32	0.00
48	55.1	184.2	1.737	0.325	0.48	2.10	6706	2263	61683									1.73	1.74	1.74	0.00	0.32	0.32	0.33	0.00
49	55.6	188.1	1.723	0.326	0.48	2.10	6735	2273	60592									1.72	1.72	1.73	0.00	0.33	0.33	0.33	0.00
50	**56.1**	**192.5**	**1.713**	**0.325**	**0.48**	**2.10**	**6686**	**2257**	**59773**									1.71	1.71	1.71	0.00	0.32	0.32	0.33	0.00
51	56.8	192.0	1.703	0.324	0.48	2.10	6633	2239	59009									1.70	1.70	1.71	0.00	0.32	0.32	0.32	0.00
52	57.5	196.4	1.692	0.323	0.48	2.09	6584	2223	58176	**SABBIA**	1.648	0.322	0.480	2.083	6534	2208	54745	1.69	1.69	1.70	0.01	0.32	0.32	0.32	0.00
53	58.2	199.9	1.684	0.322	0.48	2.09	6534	2206	57544									1.67	1.68	1.70	0.01	0.32	0.32	0.32	0.00
54	58.8	203.0	1.679	0.320	0.48	2.09	6480	2187	57188									1.67	1.68	1.69	0.01	0.32	0.32	0.32	0.00
55	**59.1**	**206.9**	**1.675**	**0.319**	**0.48**	**2.09**	**6430**	**2171**	**56844**									1.66	1.67	1.69	0.02	0.32	0.32	0.32	0.00
56	60.1	208.2	1.666	0.318	0.48	2.09	6381	2154	56235									1.65	1.67	1.69	0.02	0.32	0.32	0.32	0.00
57	60.4	212.1	1.656	0.317	0.48	2.09	6329	2137	55437									1.64	1.66	1.68	0.02	0.32	0.32	0.32	0.00
58	61.4	215.2	1.644	0.316	0.48	2.08	6268	2116	54578									1.63	1.64	1.68	0.02	0.31	0.32	0.32	0.00
59	62.0	218.3	1.634	0.314	0.48	2.08	6201	2094	53837									1.62	1.63	1.67	0.03	0.31	0.31	0.32	0.00
60	**62.9**	**221.3**	**1.634**	**0.313**	**0.48**	**2.08**	**6138**	**2072**	**53834**									1.62	1.63	1.67	0.02	0.31	0.31	0.32	0.00
61	63.6	223.5	1.641	0.311	0.48	2.08	6086	2054	54426									1.63	1.64	1.67	0.02	0.31	0.31	0.31	0.00
62	64.2	230.1	1.653	0.310	0.48	2.08	6054	2043	55312									1.64	1.65	1.67	0.02	0.31	0.31	0.31	0.00
63	64.6	231.8	1.665	0.310	0.48	2.09	6046	2040	56270									1.66	1.66	1.68	0.01	0.31	0.31	0.31	0.00
64	64.9	234.9	1.675	0.310	0.48	2.09	6063	2045	57018									1.67	1.67	1.68	0.01	0.31	0.31	0.31	0.00
65	**65.3**	**241.4**	**1.678**	**0.311**	**0.48**	**2.09**	**6100**	**2058**	**57256**									1.67	1.68	1.68	0.01	0.31	0.31	0.31	0.00
66	65.8	244.0	1.674	0.312	0.48	2.09	6162	2079	56945									1.67	1.67	1.68	0.01	0.31	0.31	0.32	0.00
67	66.5	246.2	1.664	0.315	0.48	2.09	6251	2110	56109									1.66	1.66	1.67	0.00	0.31	0.31	0.32	0.00
68	66.9	249.7	1.652	0.318	0.48	2.08	6383	2155	55135									1.65	1.65	1.66	0.00	0.32	0.32	0.32	0.00
69	67.6	252.8	1.643	0.323	0.48	2.08	6545	2211	54340									1.64	1.64	1.65	0.00	0.32	0.32	0.32	0.00
70	**68.3**	**255.4**	**1.636**	**0.327**	**0.48**	**2.08**	**6723**	**2272**	**53768**									1.63	1.64	1.64	0.01	0.33	0.33	0.33	0.00
71	68.8	258.0	1.629	0.331	0.48	2.08	6873	2324	53162									1.62	1.63	1.64	0.01	0.33	0.33	0.33	0.00
72	69.7	261.0	1.621	0.334	0.48	2.08	6994	2366	52462									1.61	1.62	1.63	0.01	0.33	0.33	0.33	0.00
73	70.1	262.5	1.612	0.338	0.48	2.07	7135	2415	51744									1.60	1.61	1.63	0.01	0.34	0.34	0.34	0.00
74	71.0	264.1	1.603	0.343	0.48	2.07	7330	2483	50974									1.60	1.60	1.62	0.01	0.34	0.34	0.34	0.00
75	**71.5**	**267.1**	**1.596**	**0.348**	**0.47**	**2.07**	**7553**	**2560**	**50344**									1.59	1.60	1.61	0.01	0.35	0.35	0.35	0.00
76	71.9	268.7	1.588	0.352	0.47	2.07	7719	2618	49682									1.58	1.59	1.60	0.01	0.35	0.35	0.35	0.00
77	72.7	272.8	1.578	0.354	0.47	2.07	7791	2644	48921	**ARGILLA**	1.572	0.354	0.473	2.065	7794	2645	48524	1.57	1.58	1.59	0.01	0.35	0.35	0.35	0.00
78	73.3	275.3	1.567	0.355	0.47	2.06	7797	2647	48128									1.56	1.57	1.58	0.01	0.35	0.35	0.36	0.00
79	73.9	278.4	1.557	0.355	0.47	2.06	7783	2643	47432	**LEGNO SABBIA**	1.557	0.355	0.473	2.061	7783	2643	47432	1.55	1.56	1.57	0.01	0.35	0.35	0.36	0.00
80	**74.9**	**280.9**	1.552	0.355	0.47	2.06	7773	2640	47049	**ARGILLA**								1.54	1.55	1.57	0.01	0.35	0.35	0.36	0.00

Fig. 3

COMMITTENTE	**Dott. Luca Minarelli**	**CODICE LAVORO: 1649**	
DOWN HOLE	**S1 80-120m**	**TABELLA DATI**	
Località	**Mirabello - Durandi**	**INDAGINE SU TERRENO NATURALE**	
Data acquisizione	**18/12/2015**	**SHOT a 11.5 m da bocca foro**	

PROGEO s.r.l.
Via Talete 10/8
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

m	Tempi									STRATIGRAFIA SINTETICA	PARAMETRI INTERVALLARI PER LIVELLI OMOGENEI							STIMA DEGLI ERRORI								
	Onde p	Onde s	Vp	Vs	ν	γ	Edin	Gdin	Kdin		Vp	Vs	ν	γ	Edin	Gdin	Kdin	Vp (km/sec)				Vs (km/sec)			
	msec	msec	Km/sec.	Km/sec.	-	T/m³	Kg/cm²	Kg/cm²	Kg/cm²		Km/sec.	Km/sec.		T/m³	Kg/cm²	Kg/cm²	Kg/cm²	I°	II°	III°	ε	I°	II°	III°	ε
80	**74.9**	**280.9**	**1.552**	**0.355**	**0.47**	**2.06**	**7773**	**2640**	**47049**	**ARGILLA**	1.560	0.355	0.473	2.062	7785	2643	47607	1.54	1.55	1.57	0.01	0.35	0.35	0.36	0.00
81	75.6	286.1	1.552	0.354	0.47	2.06	7770	2638	47036									1.54	1.55	1.57	0.01	0.35	0.35	0.36	0.00
82	76.2	287.6	1.560	0.355	0.47	2.06	7785	2643	47656									1.56	1.56	1.57	0.01	0.35	0.35	0.36	0.00
83	76.9	290.7	1.575	0.355	0.47	2.07	7814	2652	48688									1.57	1.57	1.58	0.01	0.35	0.35	0.36	0.00
84	77.4	293.2	1.594	0.355	0.47	2.07	7860	2667	50060									1.59	1.59	1.60	0.01	0.35	0.36	0.36	0.00
85	**77.8**	**295.3**	**1.610**	**0.356**	**0.47**	**2.07**	**7905**	**2681**	**51244**									1.60	1.61	1.62	0.01	0.36	0.36	0.36	0.00
86	78.7	298.3	1.622	0.357	0.47	2.08	7947	2695	52092									1.62	1.62	1.63	0.00	0.36	0.36	0.36	0.00
87	79.2	300.9	1.629	0.357	0.47	2.08	7982	2706	52589									1.63	1.63	1.63	0.00	0.36	0.36	0.36	0.00
88	79.9	302.9	1.634	0.358	0.47	2.08	8009	2715	53020									1.63	1.63	1.64	0.00	0.36	0.36	0.36	0.00
89	80.3	305.5	1.641	0.358	0.48	2.08	8013	2716	53493									1.64	1.64	1.64	0.00	0.36	0.36	0.36	0.00
90	**80.8**	**310.1**	**1.646**	**0.357**	**0.48**	**2.08**	**8004**	**2713**	**53945**	**SABBIA**	1.640	0.357	0.475	2.081	7964	2699	53458	1.64	1.65	1.65	0.00	0.36	0.36	0.36	0.00
91	81.3	311.6	1.650	0.357	0.48	2.08	7988	2707	54195									1.65	1.65	1.65	0.00	0.36	0.36	0.36	0.00
92	81.7	313.7	1.651	0.357	0.48	2.08	7980	2704	54298									1.65	1.65	1.66	0.00	0.36	0.36	0.36	0.00
93	82.5	316.2	1.651	0.356	0.48	2.08	7967	2700	54280									1.65	1.65	1.65	0.00	0.36	0.36	0.36	0.00
94	83.0	319.3	1.649	0.356	0.48	2.08	7945	2692	54202									1.65	1.65	1.65	0.00	0.36	0.36	0.36	0.00
95	**83.9**	**321.9**	**1.649**	**0.355**	**0.48**	**2.08**	**7919**	**2683**	**54155**									1.65	1.65	1.65	0.00	0.35	0.36	0.36	0.00
96	84.7	324.4	1.648	0.355	0.48	2.08	7894	2675	54120									1.65	1.65	1.65	0.00	0.35	0.35	0.36	0.00
97	85.2	328.5	1.649	0.355	0.48	2.08	7881	2670	54177									1.65	1.65	1.65	0.00	0.35	0.35	0.36	0.00
98	85.5	331.1	1.651	0.355	0.48	2.08	7892	2674	54311									1.65	1.65	1.65	0.00	0.35	0.35	0.36	0.00
99	86.4	334.1	1.651	0.357	0.48	2.08	7972	2701	54342									1.65	1.65	1.65	0.00	0.35	0.36	0.36	0.00
100	**86.9**	**335.2**	**1.652**	**0.362**	**0.47**	**2.08**	**8232**	**2791**	**54257**									1.65	1.65	1.66	0.00	0.36	0.36	0.36	0.00
101	87.5	338.2	1.652	0.373	0.47	2.08	8697	2952	54061									1.65	1.65	1.66	0.00	0.37	0.37	0.37	0.00
102	87.7	339.8	1.652	0.386	0.47	2.08	9295	3159	53806									1.65	1.65	1.66	0.00	0.38	0.39	0.39	0.00
103	88.2	344.4	1.652	0.396	0.47	2.08	9781	3328	53584									1.65	1.65	1.66	0.00	0.39	0.40	0.40	0.00
104	89.0	347.9	1.652	0.401	0.47	2.08	10056	3423	53394									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
105	**89.8**	**347.9**	**1.650**	**0.403**	**0.47**	**2.08**	**10134**	**3451**	**53208**									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
106	90.6	350.5	1.649	0.403	0.47	2.08	10138	3453	53125									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
107	91.0	353.6	1.648	0.403	0.47	2.08	10115	3444	53125									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
108	91.6	354.6	1.649	0.402	0.47	2.08	10081	3433	53162									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
109	92.1	357.2	1.649	0.401	0.47	2.08	10046	3420	53194									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
110	**92.5**	**360.7**	**1.649**	**0.401**	**0.47**	**2.08**	**10010**	**3408**	**53212**	**ARGILLA**	1.660	0.399	0.469	2.086	9950	3386	54057	1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
111	93.4	362.8	1.648	0.400	0.47	2.08	9969	3394	53138									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
112	94.2	366.9	1.646	0.399	0.47	2.08	9927	3379	53060									1.64	1.65	1.65	0.00	0.40	0.40	0.40	0.00
113	95.0	368.9	1.646	0.398	0.47	2.08	9897	3369	53046									1.64	1.65	1.65	0.00	0.40	0.40	0.40	0.00
114	95.9	371.5	1.648	0.398	0.47	2.08	9887	3365	53231									1.65	1.65	1.65	0.00	0.40	0.40	0.40	0.00
115	**96.3**	**374.5**	**1.653**	**0.398**	**0.47**	**2.08**	**9895**	**3367**	**53604**									1.65	1.65	1.66	0.00	0.40	0.40	0.40	0.00
116	96.8	377.6	1.660	0.398	0.47	2.09	9922	3376	54106									1.65	1.66	1.66	0.00	0.40	0.40	0.40	0.00
117	97.4	380.2	1.667	0.399	0.47	2.09	9951	3386	54631									1.66	1.67	1.67	0.01	0.40	0.40	0.40	0.00
118	97.7	382.2	1.674	0.399	0.47	2.09	9979	3395	55161									1.66	1.67	1.68	0.01	0.40	0.40	0.40	0.00
119	97.9	385.8	1.679	0.399	0.47	2.09	9993	3399	55581									1.67	1.68	1.69	0.01	0.40	0.40	0.40	0.00
120	**98.2**	**387.3**	**1.681**	**0.400**	**0.47**	**2.09**	**10008**	**3404**	**55699**									1.67	1.68	1.69	0.01	0.40	0.40	0.40	0.00

Fig. 4

COMMITTENTE	**Dott. Luca Minarelli**
DOWN HOLE	**S1 120-160m**
Località	**Mirabello - Durandi**
Data acquisizione	**18/12/2015**

CODICE LAVORO: 1649

TABELLA DATI

INDAGINE SU TERRENO NATURALE

SHOT a 11.5 m da bocca foro

PROGEO s.r.l.
Via Talete 10/8
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

m	Tempi		Vp	Vs	ν	γ	Edin	Gdin	Kdin	STRATIGRAFIA SINTETICA	PARAMETRI INTERVALLARI PER LIVELLI OMOGENEI							STIMA DEGLI ERRORI								
	Onde p	Onde s									Vp	Vs	ν	γ	Edin	Gdin	Kdin	Vp (km/sec)				Vs (km/sec)			
	msec	msec	Km/sec.	Km/sec.	-	T/m³	Kg/cm²	Kg/cm²	Kg/cm²		Km/sec.	Km/sec.		T/m³	Kg/cm²	Kg/cm²	Kg/cm²	I°	II°	III°	ε	I°	II°	III°	ε
120	**98.2**	**387.3**	**1.681**	**0.400**	**0.47**	**2.09**	**10008**	**3404**	**55699**	**ARGILLA**	1.660	0.399	0.469	2.086	9950	3386	54057	1.67	**1.68**	1.69	0.01	0.40	**0.40**	0.40	0.00
121	99.0	389.9	1.678	0.400	0.47	2.09	10028	3411	55456									1.67	**1.68**	1.69	0.01	0.40	**0.40**	0.40	0.00
122	100.0	392.4	1.673	0.401	0.47	2.09	10058	3422	55045									1.67	**1.67**	1.68	0.01	0.40	**0.40**	0.40	0.00
123	100.4	394.0	1.670	0.402	0.47	2.09	10095	3435	54786									1.66	**1.67**	1.67	0.01	0.40	**0.40**	0.40	0.00
124	101.5	396.5	1.669	0.402	0.47	2.09	10132	3448	54710									1.66	**1.67**	1.67	0.00	0.40	**0.40**	0.40	0.00
125	**102.0**	**400.1**	**1.669**	**0.403**	**0.47**	**2.09**	**10162**	**3459**	**54707**									1.66	**1.67**	1.67	0.00	0.40	**0.40**	0.40	0.00
126	102.4	402.7	1.670	0.404	0.47	2.09	10187	3467	54796									1.66	**1.67**	1.67	0.01	0.40	**0.40**	0.40	0.00
127	102.9	404.2	1.672	0.404	0.47	2.09	10206	3474	54902									1.67	**1.67**	1.68	0.01	0.40	**0.40**	0.40	0.00
128	103.6	408.8	1.673	0.404	0.47	2.09	10226	3480	55007									1.67	**1.67**	1.68	0.01	0.40	**0.40**	0.40	0.00
129	104.4	411.9	1.675	0.405	0.47	2.09	10262	3493	55139									1.67	**1.68**	1.68	0.01	0.40	**0.40**	0.41	0.00
130	**104.9**	**412.4**	**1.677**	**0.406**	**0.47**	**2.09**	**10309**	**3509**	**55271**	**SABBIA**	1.687	0.410	0.469	2.093	10510	3578	55917	1.67	**1.68**	1.68	0.01	0.40	**0.41**	0.41	0.00
131	105.5	415.5	1.680	0.407	0.47	2.09	10358	3526	55425									1.67	**1.68**	1.69	0.01	0.40	**0.41**	0.41	0.00
132	106.0	417.5	1.682	0.407	0.47	2.09	10398	3540	55616									1.68	**1.68**	1.69	0.01	0.41	**0.41**	0.41	0.00
133	106.7	419.6	1.686	0.408	0.47	2.09	10444	3555	55904									1.68	**1.69**	1.69	0.01	0.41	**0.41**	0.41	0.00
134	107.3	422.1	1.691	0.409	0.47	2.09	10513	3579	56220									1.68	**1.69**	1.70	0.01	0.41	**0.41**	0.41	0.00
135	**107.9**	**424.7**	**1.694**	**0.411**	**0.47**	**2.09**	**10613**	**3613**	**56476**									1.69	**1.69**	1.70	0.01	0.41	**0.41**	0.41	0.00
136	108.3	426.2	1.697	0.414	0.47	2.10	10735	3655	56658									1.69	**1.70**	1.70	0.01	0.41	**0.41**	0.42	0.00
137	108.6	427.2	1.699	0.416	0.47	2.10	10849	3695	56743									1.69	**1.70**	1.71	0.01	0.41	**0.42**	0.42	0.00
138	109.3	429.8	1.698	0.417	0.47	2.10	10906	3715	56631									1.69	**1.70**	1.70	0.01	0.41	**0.42**	0.42	0.00
139	109.9	431.8	1.695	0.417	0.47	2.09	10889	3709	56394	**ARGILLA**	1.692	0.412	0.468	2.094	10663	3631	56261	1.69	**1.69**	1.70	0.01	0.41	**0.42**	0.42	0.00
140	**110.7**	**433.4**	**1.692**	**0.415**	**0.47**	**2.09**	**10783**	**3673**	**56209**									1.69	**1.69**	1.70	0.01	0.41	**0.41**	0.42	0.00
141	111.4	435.9	1.691	0.411	0.47	2.09	10603	3610	56192									1.69	**1.69**	1.70	0.01	0.41	**0.41**	0.41	0.00
142	111.6	439.5	1.690	0.407	0.47	2.09	10376	3531	56249									1.68	**1.69**	1.70	0.01	0.40	**0.41**	0.41	0.00
143	112.3	443.1	1.689	0.403	0.47	2.09	10178	3462	56283	**SABBIA**	1.689	0.403	0.470	2.093	10178	3462	56283	1.68	**1.69**	1.69	0.00	0.40	**0.40**	0.41	0.00
144	112.8	445.1	1.688	0.400	0.47	2.09	10059	3421	56195									1.68	**1.69**	1.69	0.00	0.40	**0.40**	0.40	0.00
145	**113.3**	**447.2**	**1.684**	**0.400**	**0.47**	**2.09**	**10008**	**3404**	**55949**									1.68	**1.68**	1.69	0.00	0.40	**0.40**	0.40	0.00
146	114.1	448.7	1.680	0.399	0.47	2.09	9979	3394	55656									1.68	**1.68**	1.68	0.00	0.40	**0.40**	0.40	0.00
147	114.9	450.2	1.676	0.398	0.47	2.09	9925	3375	55355	**ARGILLA**	1.679	0.396	0.470	2.091	9853	3350	55585	1.67	**1.68**	1.68	0.00	0.40	**0.40**	0.40	0.00
148	115.4	453.3	1.675	0.397	0.47	2.09	9852	3350	55280									1.67	**1.67**	1.68	0.00	0.39	**0.40**	0.40	0.00
149	116.2	456.9	1.675	0.395	0.47	2.09	9763	3319	55320									1.67	**1.67**	1.68	0.00	0.39	**0.39**	0.40	0.00
150	**116.7**	**458.7**	**1.675**	**0.393**	**0.47**	**2.09**	**9670**	**3287**	**55411**									1.67	**1.68**	1.68	0.00	0.39	**0.39**	0.39	0.00
151	117.2	462.1	1.676	0.391	0.47	2.09	9569	3252	55513									1.67	**1.68**	1.68	0.00	0.39	**0.39**	0.39	0.00
152	118.0	464.4	1.677	0.389	0.47	2.09	9471	3218	55598	**SABBIA**	1.677	0.389	0.472	2.090	9471	3218	55598	1.67	**1.68**	1.68	0.00	0.39	**0.39**	0.39	0.00
153	118.6	465.8	1.677	0.387	0.47	2.09	9391	3190	55698									1.68	**1.68**	1.68	0.00	0.38	**0.39**	0.39	0.00
154	119.3	468.5	1.679	0.386	0.47	2.09	9338	3172	55864									1.68	**1.68**	1.68	0.00	0.38	**0.39**	0.39	0.00
155	**119.9**	**470.8**	**1.683**	**0.386**	**0.47**	**2.09**	**9337**	**3171**	**56135**									1.68	**1.68**	1.68	0.00	0.38	**0.39**	0.39	0.00
156	120.2	473.2	1.686	0.388	0.47	2.09	9477	3219	56345	**ARGILLA**	1.685	0.408	0.469	2.092	10478	3569	55775	1.68	**1.69**	1.69	0.00	0.38	**0.39**	0.39	0.01
157	120.8	474.9	1.689	0.399	0.47	2.09	10006	3403	56300									1.69	**1.69**	1.69	0.00	0.39	**0.40**	0.41	0.01
158	121.3	477.6	1.690	0.419	0.47	2.09	11000	3749	55912									1.69	**1.69**	1.69	0.00	0.41	**0.42**	0.42	0.00
159	121.8	479.2	1.690	0.444	0.46	2.09	12319	4211	55323									1.69	**1.69**	1.70	0.00	0.44	**0.44**	0.45	0.00
160	**122.4**	**481.9**	**1.691**	**0.464**	**0.46**	**2.09**	**13408**	**4594**	**54941**									1.68	**1.69**	1.70	0.01	0.46	**0.46**	0.47	0.00

Fig. 5

COMMITTENTE	**Dott. Luca Minarelli**	**CODICE LAVORO: 1649**	
DOWN HOLE	**S1 160-200m**	**TABELLA DATI**	
Località	**Mirabello - Durandi**	**INDAGINE SU TERRENO NATURALE**	
Data acquisizione	**18/12/2015**	**SHOT a 11.5 m da bocca foro**	

PROGEO s.r.l.
Via Talete 10/B
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

m	Tempi		Vp	Vs	ν	γ	Edin	Gdin	Kdin	STRATIGRAFIA SINTETICA	PARAMETRI INTERVALLARI PER LIVELLI OMOGENEI							STIMA DEGLI ERRORI								
	Onde p	Onde s									Vp	Vs	ν	γ	Edin	Gdin	Kdin	Vp (km/sec)				Vs (km/sec)			
	msec	msec	Km/sec.	Km/sec.	-	T/m³	Kg/cm²	Kg/cm²	Kg/cm²		Km/sec.	Km/sec.		T/m³	Kg/cm²	Kg/cm²	Kg/cm²	I°	II°	III°	ε	I°	II°	III°	ε
160	**122.4**	**481.9**	**1.691**	**0.464**	**0.46**	**2.09**	**13408**	**4594**	**54941**	**ARGILLA**	1.685	0.408	0.469	2.092	10478	3569	55775	1.68	1.69	1.70	0.01	0.46	0.46	0.47	0.00
161	123.0	483.6	1.699	0.474	0.46	2.10	14017	4808	55236									1.69	1.70	1.71	0.01	0.47	0.47	0.48	0.00
162	123.7	485.6	1.721	0.476	0.46	2.10	14179	4861	56970									1.72	1.72	1.73	0.01	0.47	0.48	0.48	0.00
163	124.1	488.3	1.748	0.475	0.46	2.11	14159	4848	59180									1.75	1.75	1.75	0.00	0.47	0.48	0.48	0.00
164	124.7	490.7	1.771	0.473	0.46	2.11	14053	4807	61115									1.76	1.77	1.78	0.01	0.47	0.47	0.47	0.00
165	**125.5**	**493.7**	**1.778**	**0.469**	**0.46**	**2.11**	**13843**	**4732**	**61793**									1.77	1.78	1.78	0.00	0.47	0.47	0.47	0.00
166	126.5	495.4	1.780	0.463	0.46	2.11	13508	4614	62127	**SABBIA**	1.774	0.459	0.464	2.113	13303	4544	61759	1.78	1.78	1.78	0.00	0.46	0.46	0.47	0.00
167	127.1	497.4	1.783	0.455	0.47	2.11	13067	4459	62550									1.78	1.78	1.79	0.00	0.45	0.45	0.46	0.00
168	127.5	498.4	1.789	0.446	0.47	2.12	12613	4300	63270									1.78	1.79	1.79	0.00	0.45	0.45	0.45	0.00
169	127.8	500.8	1.796	0.440	0.47	2.12	12259	4175	64050									1.79	1.80	1.80	0.01	0.44	0.44	0.44	0.00
170	**128.3**	**503.5**	**1.803**	**0.436**	**0.47**	**2.12**	**12050**	**4101**	**64775**									1.79	1.80	1.81	0.01	0.43	0.44	0.44	0.00
171	128.7	507.2	1.808	0.434	0.47	2.12	11942	4063	65230	**ARGILLA**	1.809	0.433	0.470	2.121	11911	4052	65343	1.79	1.81	1.82	0.01	0.43	0.43	0.44	0.00
172	129.2	510.2	1.810	0.432	0.47	2.12	11880	4041	65456									1.79	1.81	1.82	0.02	0.43	0.43	0.44	0.00
173	129.6	512.6	1.812	0.431	0.47	2.12	11828	4023	65603									1.79	1.81	1.82	0.02	0.43	0.43	0.43	0.00
174	129.9	515.3	1.810	0.430	0.47	2.12	11759	4000	65527									1.79	1.81	1.82	0.02	0.43	0.43	0.43	0.00
175	**130.6**	**517.0**	**1.805**	**0.428**	**0.47**	**2.12**	**11633**	**3956**	**65105**	**SABBIA**	1.801	0.425	0.471	2.119	11472	3901	64869	1.79	1.80	1.82	0.01	0.42	0.43	0.43	0.00
176	131.4	518.6	1.798	0.424	0.47	2.12	11439	3890	64635									1.79	1.80	1.81	0.01	0.42	0.42	0.43	0.00
177	132.2	521.0	1.792	0.420	0.47	2.12	11204	3808	64225									1.78	1.79	1.80	0.01	0.42	0.42	0.42	0.00
178	132.7	522.4	1.790	0.416	0.47	2.12	10966	3726	64123									1.78	1.79	1.80	0.01	0.41	0.42	0.42	0.00
179	133.3	525.7	1.789	0.411	0.47	2.12	10744	3649	64206	**ARGILLA**	1.778	0.403	0.473	2.114	10322	3504	63468	1.78	1.79	1.80	0.01	0.41	0.41	0.42	0.00
180	**133.9**	**528.4**	**1.791**	**0.407**	**0.47**	**2.12**	**10545**	**3580**	**64398**									1.78	1.79	1.80	0.01	0.40	0.41	0.41	0.00
181	134.3	531.1	1.792	0.404	0.47	2.12	10373	3520	64644									1.78	1.79	1.80	0.01	0.40	0.40	0.41	0.01
182	134.7	533.5	1.793	0.401	0.47	2.12	10228	3470	64789									1.78	1.79	1.80	0.01	0.40	0.40	0.41	0.01
183	134.9	537.8	1.791	0.399	0.47	2.12	10107	3429	64642									1.78	1.79	1.80	0.01	0.39	0.40	0.41	0.01
184	135.3	542.6	1.784	0.398	0.47	2.12	10044	3407	64112									1.78	1.78	1.79	0.01	0.39	0.40	0.41	0.01
185	**136.1**	**545.3**	**1.774**	**0.398**	**0.47**	**2.11**	**10066**	**3416**	**63255**									1.77	1.77	1.78	0.01	0.39	0.40	0.41	0.01
186	136.6	547.6	1.764	0.401	0.47	2.11	10184	3457	62324									1.76	1.76	1.77	0.00	0.40	0.40	0.41	0.01
187	137.5	550.6	1.755	0.405	0.47	2.11	10364	3521	61522									1.75	1.76	1.76	0.00	0.40	0.40	0.41	0.01
188	138.0	553.0	1.747	0.409	0.47	2.11	10568	3592	60791									1.74	1.75	1.75	0.00	0.41	0.41	0.41	0.00
189	138.4	555.7	1.740	0.413	0.47	2.11	10772	3664	60053	**SABBIA**	1.740	0.413	0.470	2.105	10772	3664	60053	1.73	1.74	1.75	0.01	0.41	0.41	0.42	0.00
190	**139.2**	**558.0**	**1.733**	**0.417**	**0.47**	**2.10**	**10966**	**3732**	**59434**									1.73	1.73	1.74	0.01	0.41	0.42	0.42	0.00
191	140.1	561.4	1.728	0.421	0.47	2.10	11137	3792	58900									1.72	1.73	1.74	0.01	0.42	0.42	0.42	0.00
192	140.8	563.4	1.724	0.424	0.47	2.10	11299	3849	58536	**ARGILLA**	1.727	0.424	0.468	2.102	11301	3849	58763	1.71	1.72	1.74	0.01	0.42	0.42	0.43	0.00
193	141.4	564.1	1.724	0.427	0.47	2.10	11467	3908	58448									1.71	1.72	1.74	0.01	0.43	0.43	0.43	0.00
194	141.7	567.1	1.725	0.430	0.47	2.10	11636	3966	58498									1.71	1.73	1.74	0.01	0.43	0.43	0.43	0.00
195	**142.3**	**569.2**	**1.727**	**0.433**	**0.47**	**2.10**	**11794**	**4021**	**58538**	**SABBIA**	1.689	0.453	0.461	2.093	12802	4381	55101	1.72	1.73	1.74	0.01	0.43	0.43	0.43	0.00
196	142.8	571.5	1.727	0.436	0.47	2.10	11924	4067	58457									1.72	1.73	1.74	0.01	0.44	0.44	0.44	0.00
197	143.2	573.2	1.724	0.438	0.47	2.10	12038	4107	58197									1.71	1.72	1.74	0.01	0.44	0.44	0.44	0.00
198	143.4	574.2	1.719	0.440	0.47	2.10	12128	4139	57764									1.71	1.72	1.73	0.01	0.44	0.44	0.44	0.00
199	144.0	576.6	1.708	0.441	0.46	2.10	12181	4159	56859									1.69	1.71	1.73	0.02	0.44	0.44	0.44	0.00
200	**144.8**	**577.2**	**1.690**	**0.442**	**0.46**	**2.09**	**12206**	**4171**	**55427**									1.67	1.69	1.71	0.02	0.44	0.44	0.44	0.00

Fig. 6

COMMITTENTE	**Dott. Luca Minarelli**	**CODICE LAVORO: 1649**	
DOWN HOLE	**S1 200-240m**	**TABELLA DATI**	
Località	**Mirabello - Durandi**	**INDAGINE SU TERRENO NATURALE**	
Data acquisizione	**18/12/2015**	**SHOT a 11.5 m da bocca foro**	

PROGEO s.r.l.
Via Talete 10/8
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

m	Tempi									STRATIGRAFIA SINTETICA	PARAMETRI INTERVALLARI PER LIVELLI OMOGENEI							STIMA DEGLI ERRORI								
	Onde p	Onde s	Vp	Vs	ν	γ	Edin	Gdin	Kdin		Vp	Vs	ν	γ	Edin	Gdin	Kdin	Vp (km/sec)				Vs (km/sec)			
	msec	msec	Km/sec.	Km/sec.	-	T/m³	Kg/cm²	Kg/cm²	Kg/cm²		Km/sec.	Km/sec.		T/m³	Kg/cm²	Kg/cm²	Kg/cm²	I°	II°	III°	ε	I°	II°	III°	ε
200	**144.8**	**577.2**	**1.690**	**0.442**	**0.46**	**2.09**	**12206**	**4171**	**55427**									1.67	1.69	1.71	0.02	0.44	0.44	0.44	0.00
201	145.4	579.9	1.665	0.443	0.46	2.09	12215	4178	53408									1.64	1.66	1.70	0.03	0.44	0.44	0.45	0.00
202	146.6	582.6	1.642	0.445	0.46	2.08	12255	4196	51629									1.62	1.64	1.68	0.03	0.44	0.44	0.45	0.00
203	147.3	584.7	1.628	0.447	0.46	2.08	12364	4237	50486									1.60	1.63	1.67	0.04	0.44	0.45	0.45	0.00
204	147.9	586.7	1.625	0.451	0.46	2.08	12570	4310	50204									1.60	1.63	1.67	0.04	0.45	0.45	0.45	0.00
205	**148.4**	**587.3**	**1.630**	**0.456**	**0.46**	**2.08**	**12826**	**4400**	**50422**									1.61	1.63	1.68	0.04	0.45	0.46	0.46	0.00
206	148.9	590.4	1.637	0.460	0.46	2.08	13063	4482	50858									1.61	1.64	1.68	0.04	0.46	0.46	0.46	0.00
207	150.0	592.1	1.642	0.463	0.46	2.08	13235	4542	51195									1.62	1.64	1.69	0.04	0.46	0.46	0.47	0.00
208	150.5	593.4	1.650	0.464	0.46	2.08	13356	4583	51739	**SABBIA**	1.689	0.453	0.461	2.093	12802	4381	55101	1.62	1.65	1.69	0.04	0.46	0.46	0.47	0.00
209	151.5	596.4	1.668	0.466	0.46	2.09	13459	4616	53035									1.65	1.67	1.70	0.03	0.46	0.47	0.47	0.00
210	**152.1**	**597.8**	**1.691**	**0.466**	**0.46**	**2.09**	**13544**	**4642**	**54849**									1.67	1.69	1.71	0.02	0.46	0.47	0.47	0.00
211	152.5	600.8	1.712	0.466	0.46	2.10	13593	4655	56529									1.70	1.71	1.73	0.01	0.46	0.47	0.47	0.00
212	152.7	601.8	1.731	0.466	0.46	2.10	13609	4658	58037									1.73	1.73	1.74	0.01	0.46	0.47	0.47	0.00
213	153.0	603.8	1.746	0.465	0.46	2.11	13588	4648	59237									1.74	1.75	1.75	0.00	0.46	0.47	0.47	0.00
214	153.3	607.9	1.754	0.464	0.46	2.11	13516	4621	59966									1.75	1.75	1.76	0.00	0.46	0.46	0.47	0.00
215	**153.5**	**609.2**	**1.757**	**0.461**	**0.46**	**2.11**	**13373**	**4570**	**60288**									1.76	1.76	1.76	0.00	0.46	0.46	0.46	0.00
216	153.9	610.6	1.754	0.457	0.46	2.11	13163	4497	60129									1.75	1.75	1.76	0.00	0.45	0.46	0.46	0.00
217	155.4	615.0	1.746	0.454	0.46	2.11	12944	4421	59571									1.74	1.75	1.75	0.00	0.45	0.45	0.46	0.00
218	156.1	617.3	1.740	0.452	0.46	2.11	12829	4382	59107									1.74	1.74	1.75	0.01	0.45	0.45	0.46	0.00
219	157.0	617.7	1.740	0.452	0.46	2.11	12844	4387	59125									1.74	1.74	1.75	0.01	0.45	0.45	0.46	0.00
220	**157.9**	**620.7**	**1.749**	**0.453**	**0.46**	**2.11**	**12935**	**4418**	**59847**									1.74	1.75	1.75	0.00	0.45	0.45	0.46	0.00
221	158.5	621.0	1.767	0.454	0.46	2.11	13004	4439	61264									1.76	1.77	1.78	0.01	0.45	0.45	0.46	0.00
222	159.0	623.7	1.792	0.454	0.47	2.12	13015	4440	63408									1.78	1.79	1.81	0.02	0.45	0.45	0.46	0.00
223	159.6	626.1	1.828	0.452	0.47	2.12	12967	4418	66475									1.79	1.83	1.85	0.03	0.45	0.45	0.45	0.00
224	160.3	628.8	1.848	0.449	0.47	2.13	12846	4373	68274									1.80	1.85	1.87	0.04	0.45	0.45	0.45	0.00
225	**160.4**	**632.8**	**1.859**	**0.446**	**0.47**	**2.13**	**12730**	**4332**	**69322**									1.81	1.86	1.89	0.04	0.44	0.45	0.45	0.00
226	161.0	635.5	1.866	0.446	0.47	2.13	12711	4324	69969									1.82	1.87	1.89	0.04	0.44	0.45	0.45	0.00
227	161.4	636.9	1.874	0.448	0.47	2.13	12822	4362	70603									1.82	1.87	1.90	0.04	0.44	0.45	0.45	0.00
228	161.6	637.9	1.883	0.451	0.47	2.14	12999	4422	71372	**ARGILLA**	1.804	0.419	0.471	2.119	11311	3846	65386	1.83	1.88	1.91	0.04	0.45	0.45	0.45	0.00
229	161.9	641.2	1.897	0.453	0.47	2.14	13163	4478	72493									1.85	1.90	1.92	0.04	0.45	0.45	0.46	0.00
230	**162.2**	**642.8**	**1.913**	**0.455**	**0.47**	**2.14**	**13285**	**4519**	**73900**									1.86	1.91	1.94	0.04	0.45	0.45	0.46	0.00
231	162.6	644.4	1.929	0.457	0.47	2.15	13411	4561	75346									1.88	1.93	1.96	0.04	0.45	0.46	0.46	0.01
232	162.8	644.9	1.938	0.454	0.47	2.15	13290	4518	76281									1.89	1.94	1.97	0.04	0.45	0.45	0.46	0.01
233	163.2	647.1	1.938	0.448	0.47	2.15	12948	4399	76386									1.89	1.94	1.97	0.04	0.44	0.45	0.45	0.01
234	163.3	649.2	1.926	0.439	0.47	2.15	12402	4211	75573									1.88	1.93	1.96	0.04	0.43	0.44	0.44	0.00
235	**163.6**	**651.3**	**1.908**	**0.431**	**0.47**	**2.14**	**11940**	**4053**	**74128**									1.86	1.91	1.93	0.04	0.43	0.43	0.43	0.00
236	164.1	652.4	1.891	0.424	0.47	2.14	11561	3923	72683									1.84	1.89	1.92	0.04	0.42	0.42	0.43	0.00
237	164.8	655.1	1.875	0.418	0.47	2.14	11222	3807	71448									1.83	1.88	1.90	0.04	0.42	0.42	0.42	0.00
238	165.2	659.4	1.859	0.412	0.47	2.13	10893	3695	70139									1.81	1.86	1.89	0.04	0.41	0.41	0.41	0.00
239	165.7	664.2	1.824	0.406	0.47	2.12	10537	3575	67276									1.80	1.82	1.84	0.02	0.40	0.41	0.41	0.00
240	**167.0**	**665.8**	**1.769**	**0.400**	**0.47**	**2.11**	**10165**	**3450**	**62784**									1.77	1.77	1.77	0.00	0.40	0.40	0.40	0.00

Fig. 7

COMMITTENTE	**Dott. Luca Minarelli**
DOWN HOLE	**S1 240-280m**
Località	**Mirabello - Durandi**
Data acquisizione	**18/12/2015**

CODICE LAVORO: 1649

TABELLA DATI

INDAGINE SU TERRENO NATURALE

SHOT a 11.5 m da bocca foro

PROGEO s.r.l.
Via Talete 10/8
47100 Forlì
tel. 0543 723580
fax. 0543 721486
mail.progeo@gmail.com
www.progeo.info

m	Tempi		Vp	Vs	ν	γ	Edin	Gdin	Kdin	STRATIGRAFIA SINTETICA	PARAMETRI INTERVALLARI PER LIVELLI OMOGENEI							STIMA DEGLI ERRORI								
	Onde p	Onde s									Vp	Vs	ν	γ	Edin	Gdin	Kdin	Vp (km/sec)				Vs (km/sec)			
	msec	msec	Km/sec.	Km/sec.	-	T/m³	Kg/cm²	Kg/cm²	Kg/cm²		Km/sec.	Km/sec.		T/m³	Kg/cm²	Kg/cm²	Kg/cm²	I°	II°	III°	ε	I°	II°	III°	ε
240	**167.0**	**665.8**	**1.769**	**0.400**	**0.47**	**2.11**	**10165**	**3450**	**62784**	**ARGILLA**	1.804	0.419	0.471	2.119	11311	3846	65386	1.77	1.77	1.77	0.00	0.40	0.40	0.40	0.00
241	168.2	668.0	1.713	0.394	0.47	2.10	9766	3317	58340									1.68	1.71	1.75	0.03	0.39	0.39	0.40	0.00
242	169.1	670.1	1.683	0.385	0.47	2.09	9323	3166	56141									1.65	1.68	1.73	0.04	0.38	0.39	0.39	0.01
243	169.6	673.3	1.670	0.374	0.47	2.09	8764	2974	55449									1.64	1.67	1.72	0.04	0.37	0.37	0.38	0.01
244	170.3	676.6	1.668	0.357	0.48	2.09	8023	2718	55580									1.64	1.67	1.72	0.04	0.35	0.36	0.37	0.01
245	**171.1**	**681.4**	**1.668**	**0.335**	**0.48**	**2.09**	**7073**	**2391**	**56005**									1.64	1.67	1.72	0.04	0.33	0.34	0.35	0.01
246	171.7	685.7	1.669	0.316	0.48	2.09	6316	2132	56500									1.64	1.67	1.72	0.04	0.31	0.32	0.34	0.01
247	172.6	688.9	1.677	0.310	0.48	2.09	6072	2048	57221									1.65	1.68	1.72	0.04	0.30	0.31	0.33	0.01
248	172.9	691.6	1.692	0.319	0.48	2.09	6448	2176	58216									1.67	1.69	1.74	0.03	0.31	0.32	0.33	0.01
249	173.4	694.8	1.726	0.336	0.48	2.10	7174	2423	60561									1.70	1.73	1.75	0.02	0.33	0.34	0.34	0.01
250	**173.8**	**696.9**	**1.753**	**0.353**	**0.48**	**2.11**	**7915**	**2676**	**62490**	**SABBIA**	1.806	0.419	0.471	2.120	11369	3869	65335	1.74	1.75	1.77	0.01	0.35	0.35	0.36	0.01
251	174.1	700.2	1.780	0.367	0.48	2.11	8597	2909	64437									1.78	1.78	1.78	0.00	0.36	0.37	0.37	0.00
252	174.7	702.3	1.798	0.380	0.48	2.12	9195	3114	65657									1.79	1.80	1.81	0.01	0.38	0.38	0.38	0.00
253	175.0	705.5	1.808	0.393	0.48	2.12	9827	3330	66248									1.79	1.81	1.82	0.01	0.39	0.39	0.39	0.00
254	175.9	707.7	1.813	0.408	0.47	2.12	10599	3597	66317									1.80	1.81	1.82	0.01	0.41	0.41	0.41	0.00
255	**176.4**	**708.2**	**1.813**	**0.429**	**0.47**	**2.12**	**11681**	**3972**	**65777**									1.80	1.81	1.83	0.01	0.42	0.43	0.43	0.01
256	177.0	710.4	1.820	0.453	0.47	2.12	13008	4433	65810									1.80	1.82	1.84	0.02	0.43	0.45	0.46	0.01
257	177.4	711.4	1.839	0.478	0.46	2.13	14493	4950	66758									1.81	1.84	1.86	0.02	0.45	0.48	0.49	0.02
258	177.8	713.0	1.854	0.499	0.46	2.13	15787	5403	67446									1.81	1.85	1.88	0.04	0.46	0.50	0.51	0.03
259	178.4	715.7	1.856	0.515	0.46	2.13	16783	5754	67188									1.81	1.86	1.89	0.04	0.48	0.51	0.53	0.03
260	**179.0**	**715.2**	**1.849**	**0.525**	**0.46**	**2.13**	**17430**	**5985**	**66206**	**ARGILLA**	1.724	0.496	0.45	2.10	15400	5294	57125	1.81	1.85	1.87	0.03	0.49	0.53	0.54	0.03
261	179.5	718.4	1.833	0.521	0.46	2.13	17117	5878	64996									1.81	1.83	1.85	0.02	0.49	0.52	0.53	0.02
262	179.9	721.1	1.811	0.505	0.46	2.12	16071	5512	63559									1.80	1.81	1.85	0.03	0.48	0.50	0.51	0.02
263	180.5	723.8	1.748	0.482	0.46	2.11	14585	4999	58969									1.71	1.75	1.79	0.04	0.47	0.48	0.49	0.01
264	181.5	727.0	1.624	0.471	0.45	2.08	13687	4707	49613									1.60	1.62	1.66	0.03	0.46	0.47	0.48	0.01
265	**182.7**	**727.5**	**1.481**	**0.474**	**0.44**	**2.04**	**13509**	**4681**	**39404**									1.39	1.48	1.54	0.08	0.46	0.47	0.48	0.01
266																									
267																									
268																									
269																									
270																									
271																									
272																									
273																									
274																									
275																									
276																									
277																									
278																									
279																									
280																									

Fig. 8