REGOLAMENTO URBANISTICO
VARIANTE 4 – TEMATICA E DI ADEGUAMENTO

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ELABORATO

MISURE HVSR

DATA

FEBBRAIO 2019

INDICE

ALLEGATI IN CALCE:

REPORT MISURE HVSR

1. PREMESSA

Nel presente rapporto vengono illustrati i risultati dell'indagine sismica eseguita per conto del Comune di Agliana nell'ambito della Variante 4, Tematica e di Adeguamento, al Regolamento Urbanistico.

L'indagine sismica è stata eseguita allo scopo precipuo di misurare le frequenze di risonanza fondamentali del territorio comunale oggetto del presente studio e verificare la presenza di contrasti di velocità delle onde sismiche di taglio nel terreno, al fine di riconoscere eventuali risposte anomale locali.

Il presente rapporto illustra le metodologie esecutive ed interpretative delle misure sismiche passive a stazione singola ed i risultati della prospezione secondo un criterio essenzialmente geofisico.

2. PROSPEZIONI ESEGUITE

Le operazioni di campagna si sono svolte per la parte settentrionale del territorio comunale tra il 9 marzo 2015 e il 18 marzo 2015 e sono consistite in 15 misure HVSR mentre per la parte meridionale le operazioni di campagna si sono svolte tra il 4 dicembre 2015 e il 15 dicembre 2015 e sono consistite in 10 misure HVSR.

In totale sono state quindi realizzate 25 misure HVSR.

Per l'esecuzione delle misure sperimentali sono state utilizzate le seguenti strumentazioni ed attrezzature:

- sismometro GEOBOX 3CH 24Bit SS45PACK (integrated 4,5 Hz sensors) della SARA Electronic Instruments s.r.l. con matricola n° 1286
- computer portatile di acquisizione dati ASUS X53S;

3. METODOLOGIA DELLE INDAGINI SISMICHE

Le misure della funzione H/V sono state effettuate tramite l'acquisizione del rumore sismico ambientale per un tempo di registrazione usualmente compreso tra 30 minuti ed un'ora. Le stazioni 7 (HVSR 787) e 8 (HVSR 780) sono state acquisite per un tempo di circa 15 minuti, trattandosi di aree a basso rumore ambientale. Al contrario

alcune stazioni nella parte meridionale del territorio comunale sono state acquisite per tempi superiori all'ora.

La prolungata durata della registrazione ha lo scopo di garantire la corretta misura del campo di rumore generato da una molteplicità di sorgenti dalle diverse direzioni dello spazio. Inoltre, all'abbassarsi delle frequenze caratteristiche dei terreni, come avviene nella parte meridionale del territorio comunale, si assiste ad un aumento dei possibili disturbi e conseguentemente dello scarto quadratico medio delle misure. Poiché i picchi attesi, a causa del notevole spessore di sedimenti fluvio-lacustri presenti al di sopra del substrato sismico, erano caratterizzati da frequenze intorno a 0,3 -0,5 Hz si è quindi proceduto a registrazioni di considerevole durata.

Le misure sono state effettuate utilizzando un sistema di acquisizione tri-direzionale caratterizzato da sufficiente sensibilità.

La tecnica HVSR (Horizontal to Vertical Spectral Ratios) è basata sulla misura dei rapporti medi fra le ampiezze spettrali delle componenti orizzontali e verticale del rumore sismico ambientale. Le frequenze di risonanza corrispondono ai massimi della funzione che rappresenta rapporti spettrali medi in funzione della frequenza (funzione H/V). L'ampiezza di questi massimi è proporzionale (anche se non linearmente) all'entità del contrasto di impedenza sismica esistente alla base della copertura.

L'idea di base è quella secondo cui il rapporto H/V consente in media di eliminare il ruolo delle variazioni di intensità delle sorgenti nel corso della registrazione mettendo in evidenza il ruolo della struttura.

Sperimentalmente si osserva che, in presenza di un campo di onde diffuso, la forma della funzione (e in particolare la posizione dei suoi valori massimi) risulta con buona approssimazione stabile nel tempo e fortemente correlata con le caratteristiche del sottosuolo al di sotto del sito di misura.

In particolare, in presenza di forti variazioni nel profilo di velocità delle onde S nel sottosuolo (legate per esempio alla transizione fra sedimenti soffici e basamento rigido), la funzione H/V mostra dei massimi marcati in corrispondenza della frequenza di risonanza fr relativa a quella configurazione strutturale (con fr circa uguale al rapporto fra la velocità media delle onde S fino alla profondità del salto di velocità e il quadruplo di questa profondità).

Generalmente si nota anche una certa correlazione (fortemente non lineare) fra l'entità della variazione di velocità responsabile dei fenomeni di risonanza e l'ampiezza del massimo della funzione H/V (maggiore è il contrasto di impedenza sismica, maggiore è l'entità del massimo).

La struttura del campo di onde presente nel terreno (rumore sismico ambientale, microtremore, rumore sismico o seismic noise) è condizionata dalle caratteristiche delle sorgenti che lo determinano (siano esse naturali o antropiche) e dalle proprietà

meccaniche dei terreni. Infatti, ciascuna sorgente genera un treno di onde che raggiunge il punto di misura con caratteristiche che dipendono dall'entità delle sollecitazioni nelle componenti orizzontali e verticali del moto e dalle modalità di propagazione fra la sorgente e il sito in funzione dei fenomeni di riflessione, rifrazione e diffrazione che hanno luogo in corrispondenza di variazioni delle proprietà meccaniche dei terreni nel sottosuolo. In genere, nel campo di rumore ambientale, saranno presenti sia onde di volume (P e S in quantità variabili) che onde superficiali (Love e Rayleigh).

Considerando un intervallo di tempo opportunamente lungo (dell'ordine delle decine di minuti), le proprietà medie di un campo di onde sismiche generato da una molteplicità di sorgenti differenti, distribuite casualmente attorno a un punto di misura, tendono ad avere un andamento che non dipende dalle singole sorgenti che hanno generato il campo, ma solo dalle proprietà del mezzo in cui le onde si propagano e dal livello energetico medio dell'attività antropica o naturale. In particolare, si può immaginare che, in media, le componenti orizzontali e verticali del moto del suolo tendano a essere sollecitate in modo equivalente, con un'ampiezza media pari al livello medio del rumore in quell'intervallo temporale. In questa ipotesi, i rapporti fra le ampiezze verticali e orizzontali del moto (H/V) saranno statisticamente indipendenti dalle caratteristiche delle sorgenti (dato che le ampiezze delle sollecitazioni sul piano orizzontale e verticale sono mediamente le stesse) e saranno condizionate dai soli effetti di propagazione ovvero dalle caratteristiche del mezzo interessato dal moto sismico. Queste ultime influenzeranno l'ampiezza relativa delle diverse fasi sismiche (onde P, S, Rayleigh e Love) e le direzioni di emergenza delle onde al punto di misura.

Si può dimostrare che la frequenza di risonanza v_0 di una copertura sedimentaria di spessore H sovrapposta a un basamento rigido e in condizioni di stratificazione piana è data dal rapporto fra la velocità media delle onde S nel sedimento (Vs) e 4 volte lo spessore H (v_0 = Vs/4H). Utilizzando questa relazione è possibile risalire dalla frequenza di risonanza misurata allo spessore della copertura una volta nota la velocità delle onde di taglio o, viceversa a questa ultima se lo spessore H è noto.

Studi teorici mostrano che se il rumore è effettivamente dominato da onde di volume emergenti da direzioni sub-verticali, l'andamento e l'ampiezza della funzione H/V riflettono quelle della funzione di risposta del deposito sedimentario analizzato. In caso contrario si nota che l'ampiezza dei massimi della funzione H/V è correlata (ma non linearmente) all'entità del contrasto di impedenza sismica presente alla base della copertura.

L'assenza di massimi significativi della funzione H/V suggerisce l'assenza di fenomeni di amplificazione sismica dovuti a fenomeni di risonanza.

4. METODOLOGIA INTERPRETATIVA

I risultati di ogni analisi presentati in questo lavoro sono stati ottenuti con il software GeoExplorerHVSR della SARA Electronic Instruments s.r.l., che permette di determinare i rapporti medi fra le componenti spettrali del rumore misurate sul piano orizzontale e verticale. A questo scopo, la serie di rumore ambientale è stata suddivisa in una serie di finestre temporali di uguale durata (in genere finestre comprese tra 30 e 40 secondi) per ciascuna delle quali è stato determinato lo spettro del moto. Su ciascuna di queste finestre viene calcolato lo spettro di ampiezza del segnale nelle tre componenti.

Le ordinate spettrali del moto sul piano orizzontale, ottenute mediando opportunamente i valori ottenuti nelle due direzioni principali, sono state divise per quelle ottenute nella direzione verticale.

L'andamento dei rapporti spettrali è stato quindi ottenuto mediando i valori ottenuti per le diverse finestre temporali considerate. Per definire la qualità delle misure sono state anche valutate le variazioni temporali e azimutali dei rapporti spettrali nel corso della sessione di misura e fatta una stima del relativo intervallo di confidenza.

Di seguito è brevemente descritta la procedura di analisi seguita:

1. Ciascuna delle tracce è suddivisa in segmenti o finestre della stessa durata (30 -40 secondi.
2. In ogni finestra e per ciascuna delle tracce viene eseguita:

- un'analisi preliminare: eliminazione di trend lineari (detrend) e tapering delle estremità.
- la trasformata di Fourier (FFT)

3. Le ampiezze spettrali delle componenti orizzontali vengono mediate in modo geometrico, e vengono calcolati i rapporti HVSR (f), in ciascuna finestra temporale.
4. Si calcolano i rapporti HVSR medi ed il relativo intervallo di confidenza al 95 %. Alla frequenza di risonanza viene associata una stima dell'incertezza sperimentale.

Lo spettro relativo alla componente orizzontale viene ottenuto effettuando la media (solitamente geometrica) delle due componenti spettrali del rumore sul piano orizzontale. La combinazione delle stime ottenute nelle diverse finestre temporali viene poi utilizzata per costruire la funzione H/V finale e stimare il relativo intervallo di confidenza. In particolare, la funzione H/V è ottenuta facendo la media dei valori delle funzioni H/V calcolate in ogni finestra temporale. Per verificare se le misure sono state effettuate in condizioni ottimali per i fini geognostici (campo di onde diffuso), oltre alla stima della curva H/V, risulta quindi utile valutare l'eventuale presenza di fenomeni direzionali (eterogeneità del campo di rumore) e la stabilità nel tempo della funzione H/V durante la misura (stazionarietà). In presenza di un campo di rumore diffuso il valore della funzione H/V non deve cambiare nel tempo o al variare della direzione. Al contrario, la presenza di sorgenti dominanti o il cattivo posizionamento dello strumento (basculamento) si manifesta come una variazione direzionale e/o temporale dei rapporti H/V.

Sperimentalmente, l'analisi di qualità della misura può essere effettuata confrontando le ampiezze spettrali medie del rumore misurato lungo le due componenti orizzontali, oppure calcolare diversi valori della funzione H/V di volta in volta proiettando lungo direzioni differenti le ampiezze spettrali ottenute sul piano orizzontale. La stazionarietà nel tempo, invece, può essere valutata rappresentando in funzione del tempo le funzioni H/V ottenute nelle diverse finestre temporali considerate.

Ai fini dell'affidabilità e della chiarezza del massimo della funzione H/V, infine è stata effettuata una analisi secondo i criteri determinati nell'ambito del progetto europeo SESAME per l'eliminazione di massimi spuri della funzione H/V, la cui presenza è frutto delle caratteristiche del campo di onde sismiche e non della struttura locale del sottosuolo.

Infine, un buon indicatore della qualità del picco H/V può essere ottenuto dall'esame degli spettri singoli. Infatti, massimi fisicamente significativi sono generalmente associati a valori di ampiezza spettrale minima sulla componente verticale. Le curve ottenute nell'area d'indagine mostrano picchi H/V chiari e fisicamente significativi.

Firenze, febbraio 2019

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Dr. Geol. Enrico Neroni

STATION INFORMATION

Station code: 1 - (HVSR 777)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Casa Giusti

Address: -

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 0 m s.l.m.

Weather: -

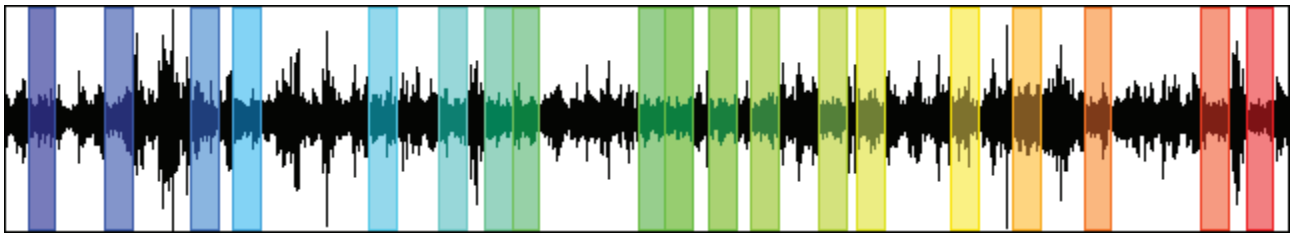
Notes: -

PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

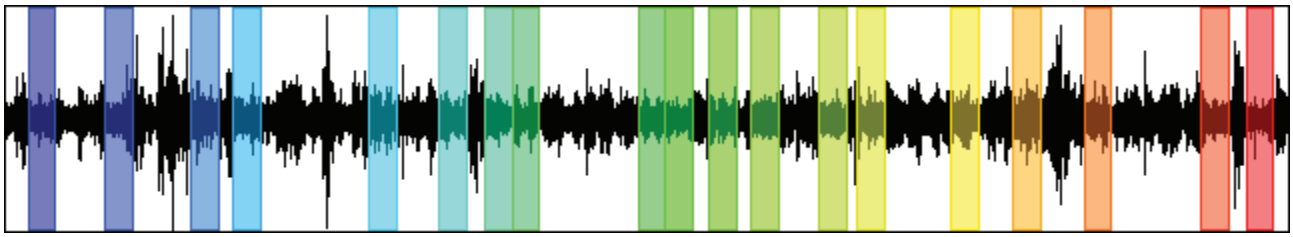
Sampling frequency:	300 Hz
Recording start time:	2015/03/09 10:11:58
Recording length:	31.17 min
Windows count:	19
Average windows length:	40
Signal coverage:	40.64%

49325 Counts **CHANNEL #1 [V]**



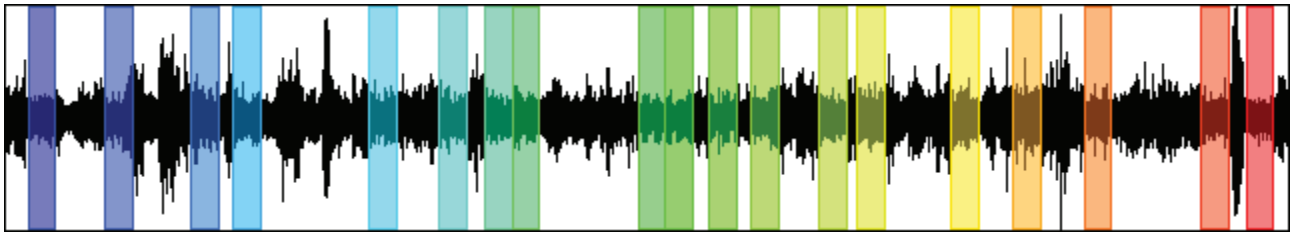
-50372 Counts

42440 Counts **CHANNEL #2 [N]**



-45599 Counts

36963 Counts **CHANNEL #3 [E]**



-36912 Counts

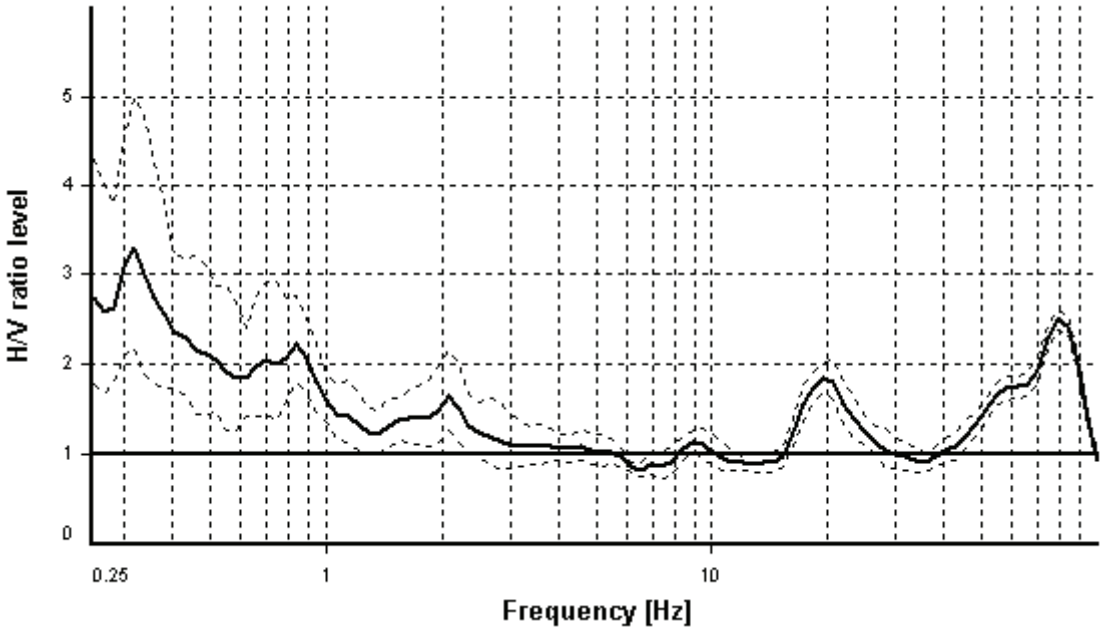
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

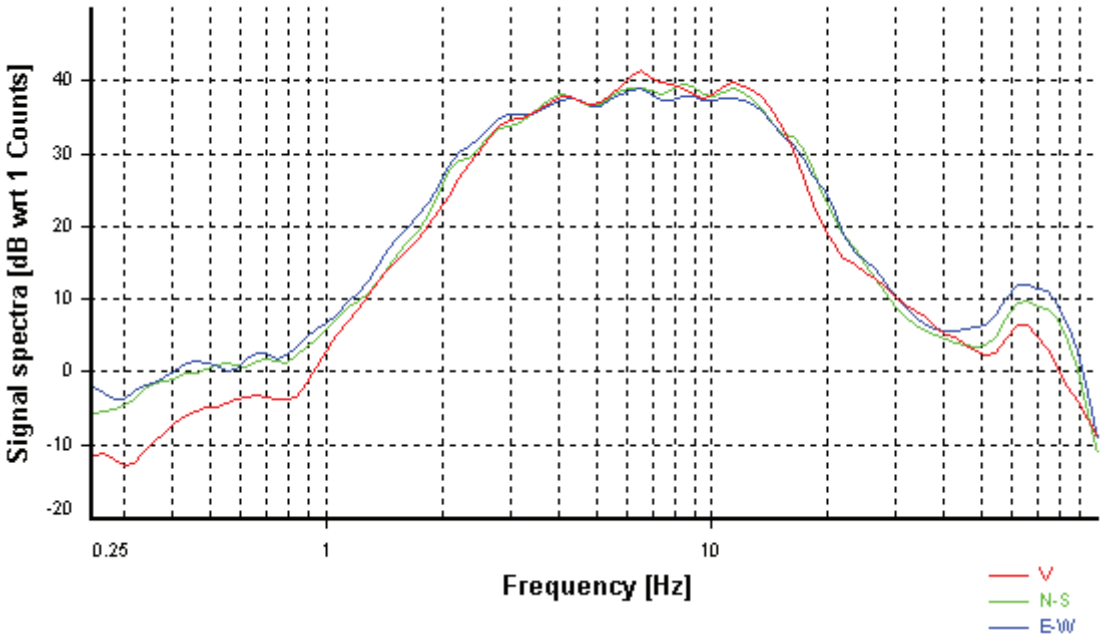
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

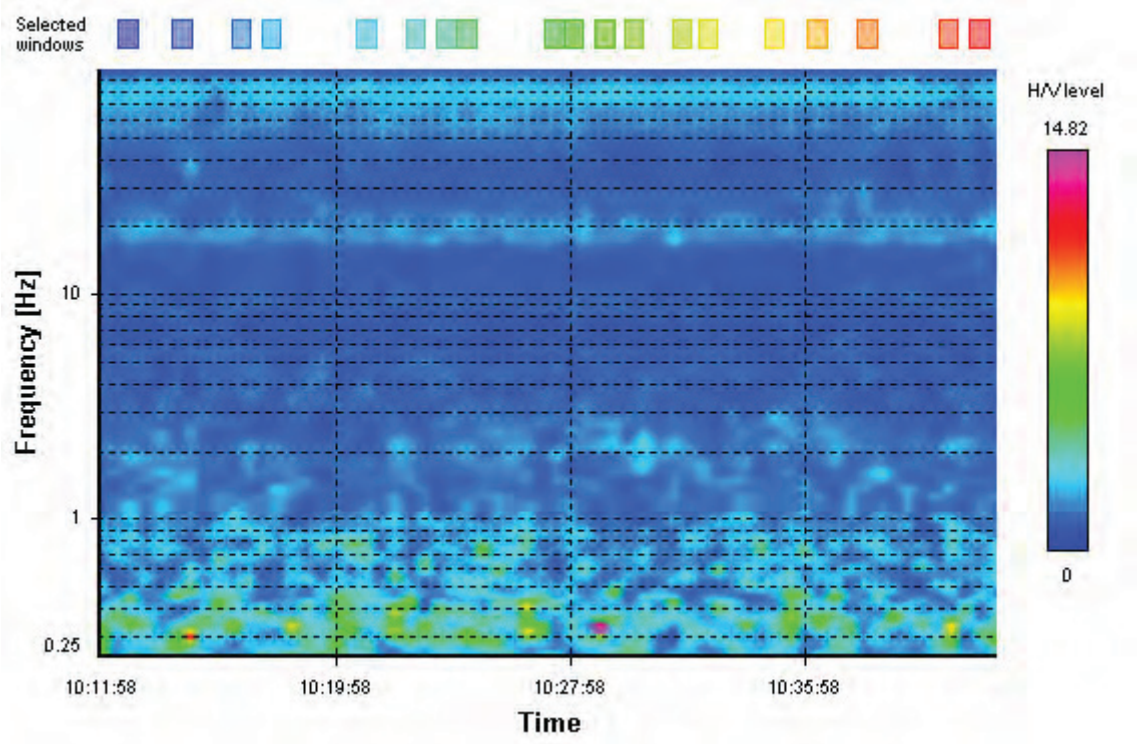
HVSR average



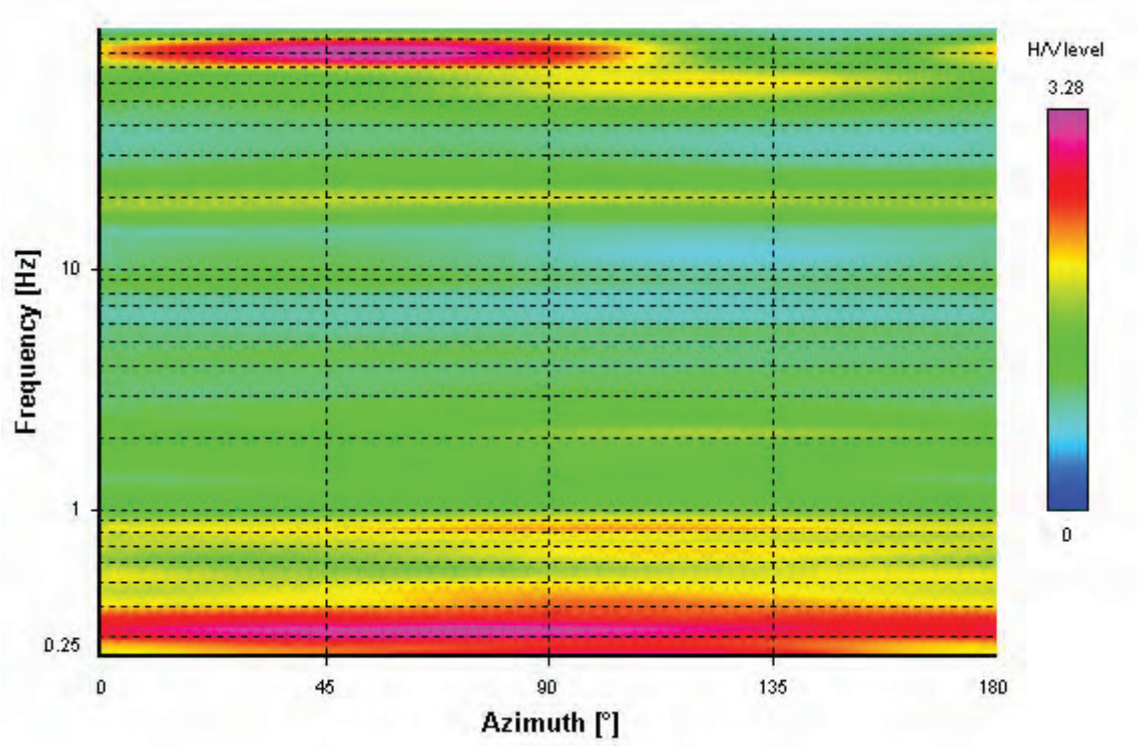
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



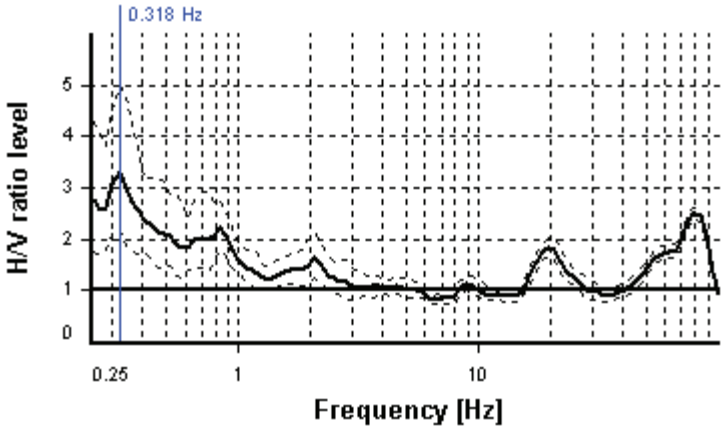
SESAME CRITERIA

Selected f_0 frequency

0.318 Hz

A_0 amplitude = *3.301*

Average f_0 = *0.338 ± 0.055*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	19 valid windows (length > 31.4 s) out of 19	OK
$n_c(f_0) > 200$	242.04 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 16	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	1.00568 Hz	OK
$A_0 > 2$	3.3 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.05462 < 0.06369	OK
$\sigma_A(f_0) < \theta(f_0)$	1.51342 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 2 - (HVSR 778)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Via Cantone

Address: -

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41.0 m s.l.m.

Weather: -

Notes: -

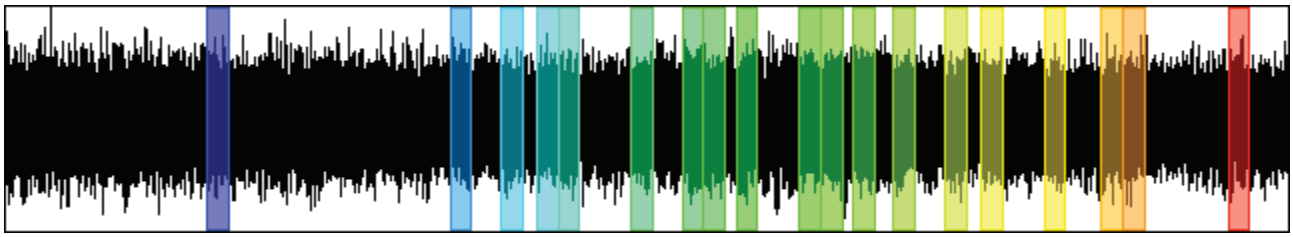
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/11 09:16:13
Recording length:	30 min
Windows count:	19
Average windows length:	30
Signal coverage:	31.67%

14658 Counts

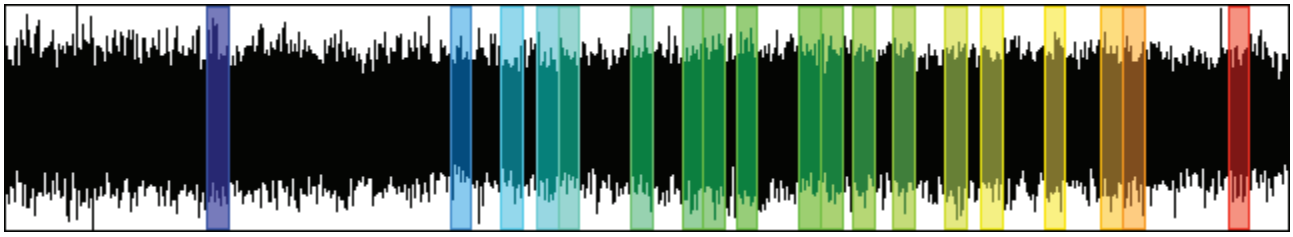
CHANNEL #1 [V]



-13048 Counts

13089 Counts

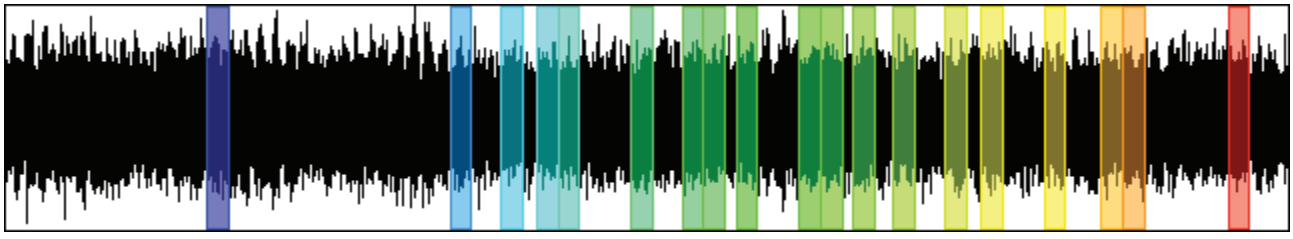
CHANNEL #2 [N]



-13119 Counts

20140 Counts

CHANNEL #3 [E]



-18957 Counts

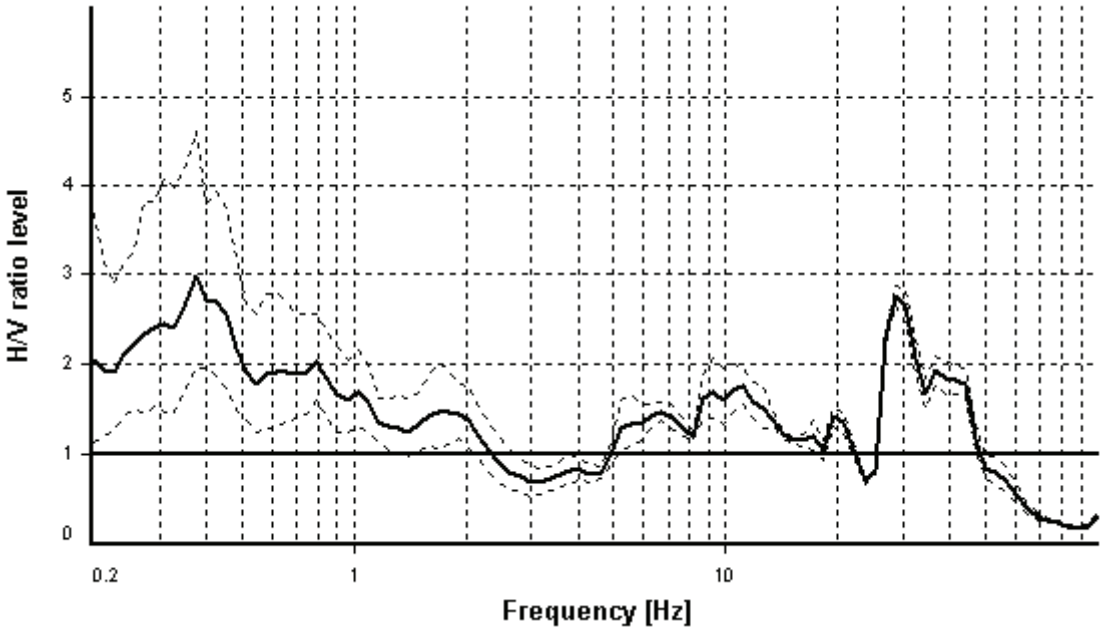
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

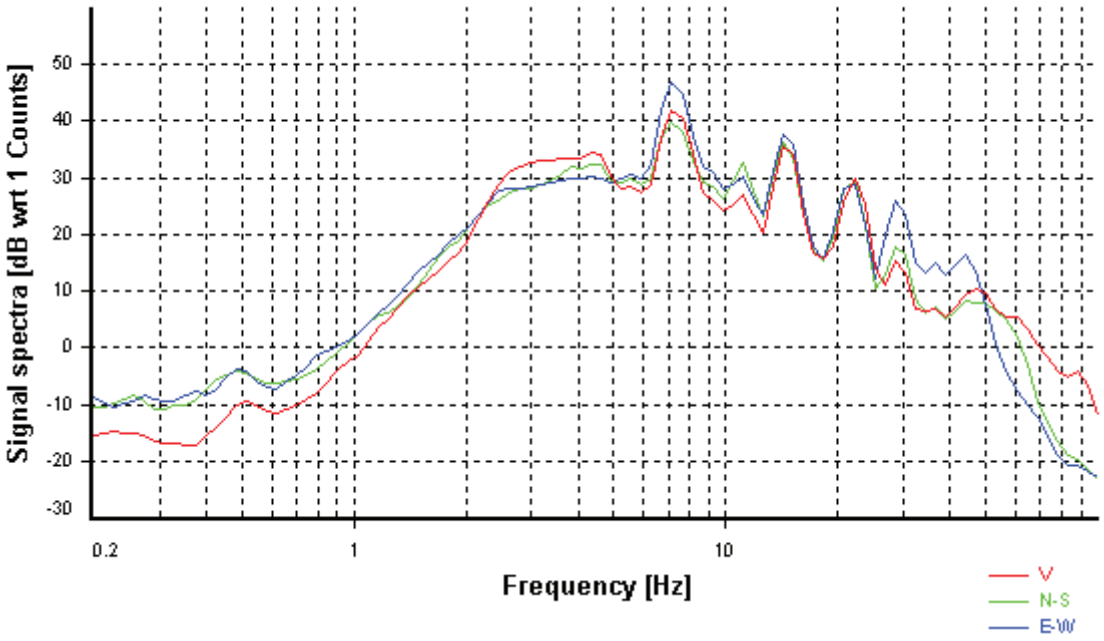
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

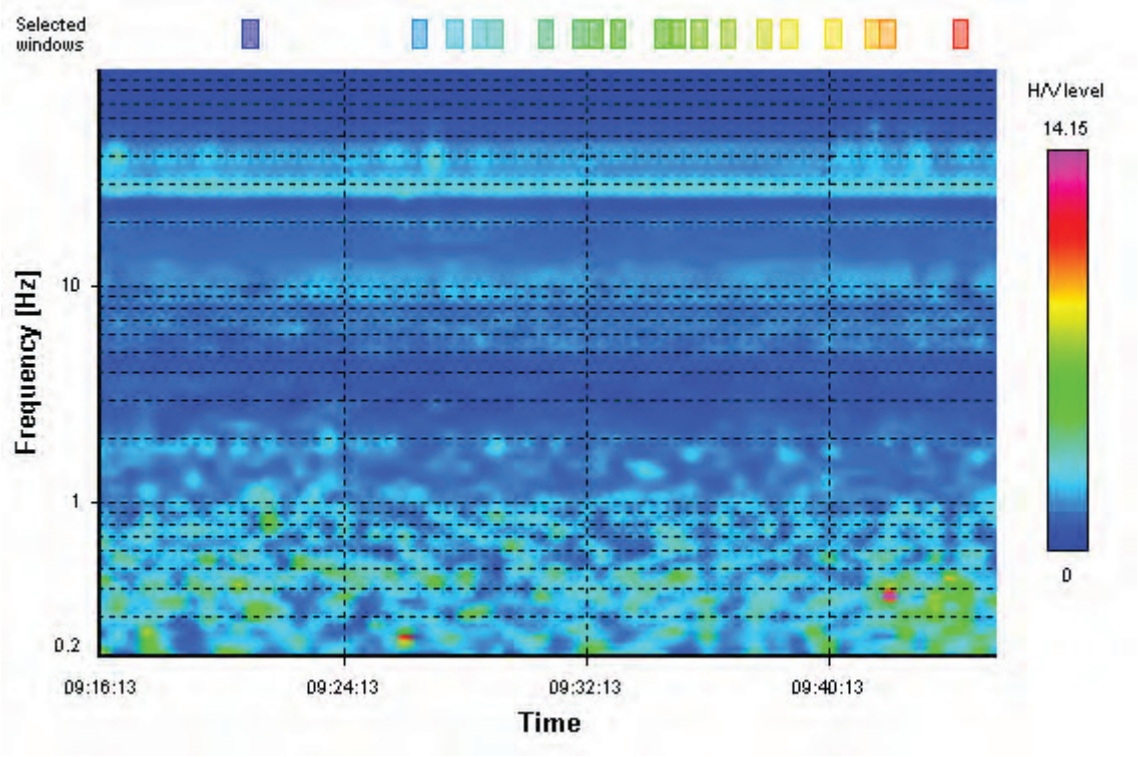
HVSR average



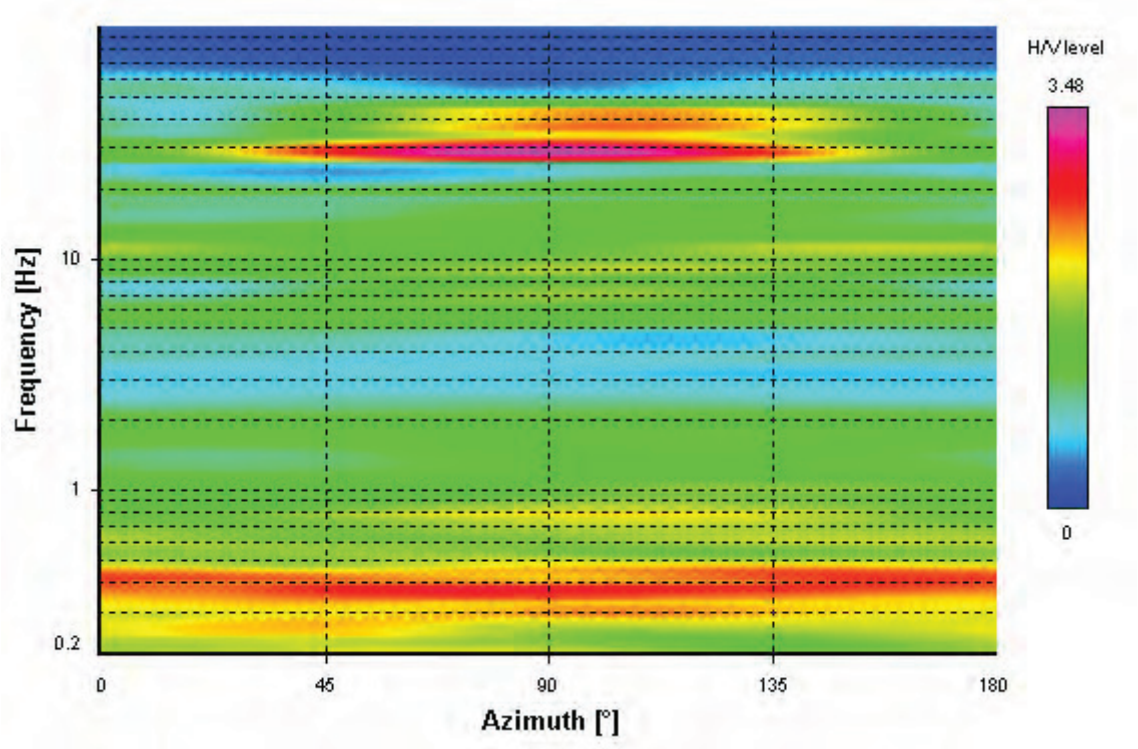
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



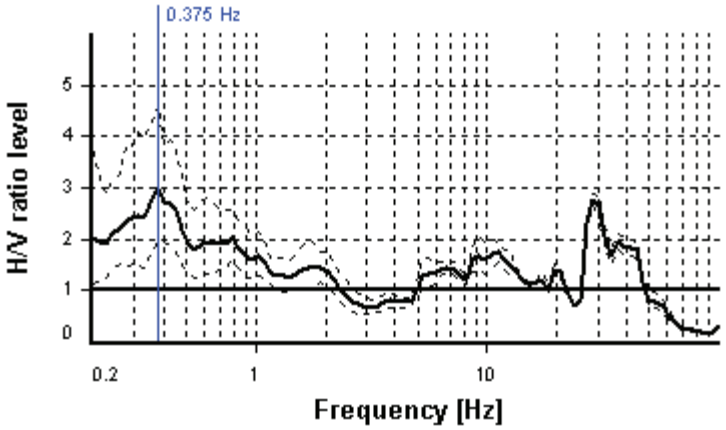
SESAME CRITERIA

Selected f_0 frequency

0.375 Hz

A_0 amplitude = *2.998*

Average f_0 = *0.385 ± 0.068*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	19 valid windows (length > 26.69 s) out of 19	OK
$n_c(f_0) > 200$	213.56 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 22	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	1.15978 Hz	OK
$A_0 > 2$	3 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.06826 < 0.07493	OK
$\sigma_A(f_0) < \theta(f_0)$	1.53834 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 11 - (HVSR 779)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Lago Pesca Sportiva

Address: Via Foscolo

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 40.9 m s.l.m.

Weather: -

Notes: -

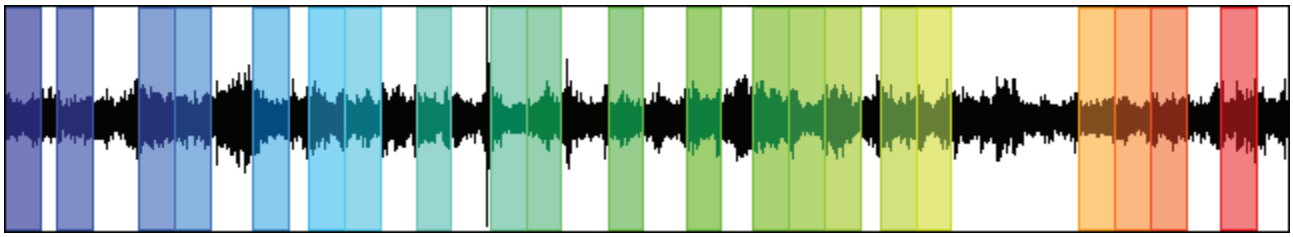
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/09 12:25:02
Recording length:	30 min
Windows count:	21
Average windows length:	50
Signal coverage:	58.33%

14620 Counts

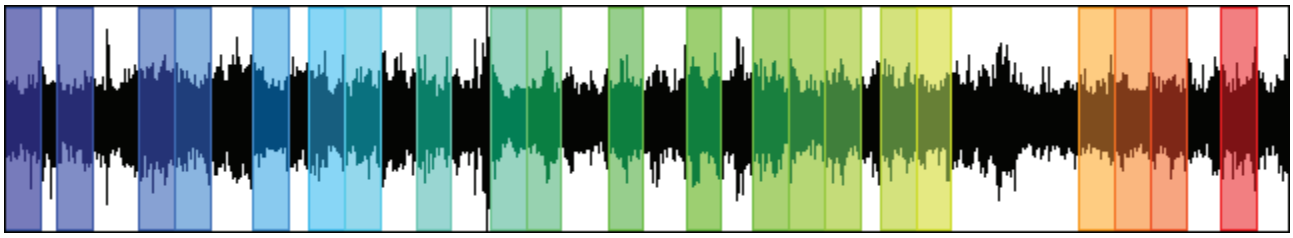
CHANNEL #1 [V]



-14195 Counts

8550 Counts

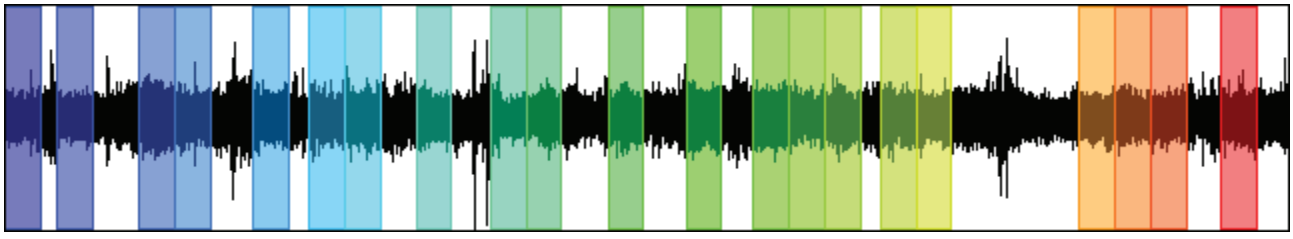
CHANNEL #2 [N]



-8507 Counts

8503 Counts

CHANNEL #3 [E]



-11783 Counts

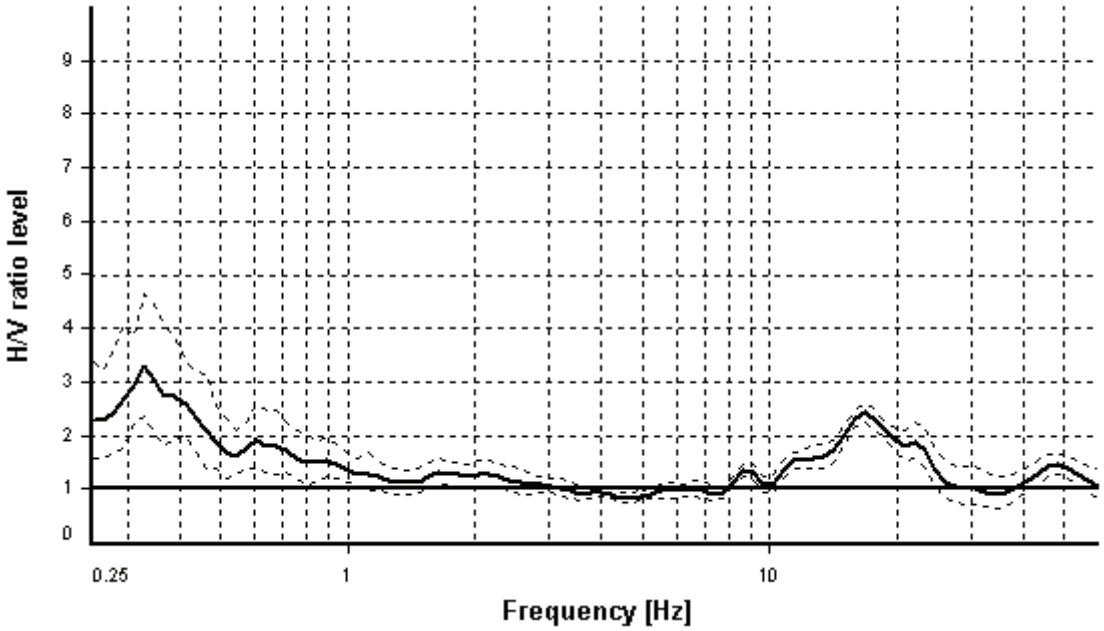
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

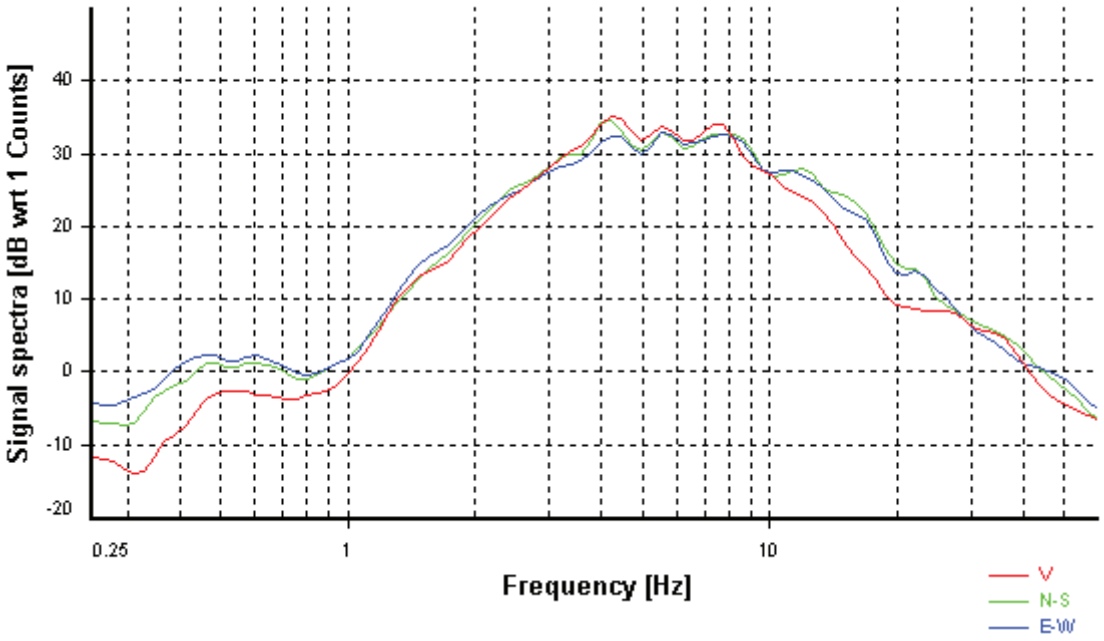
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

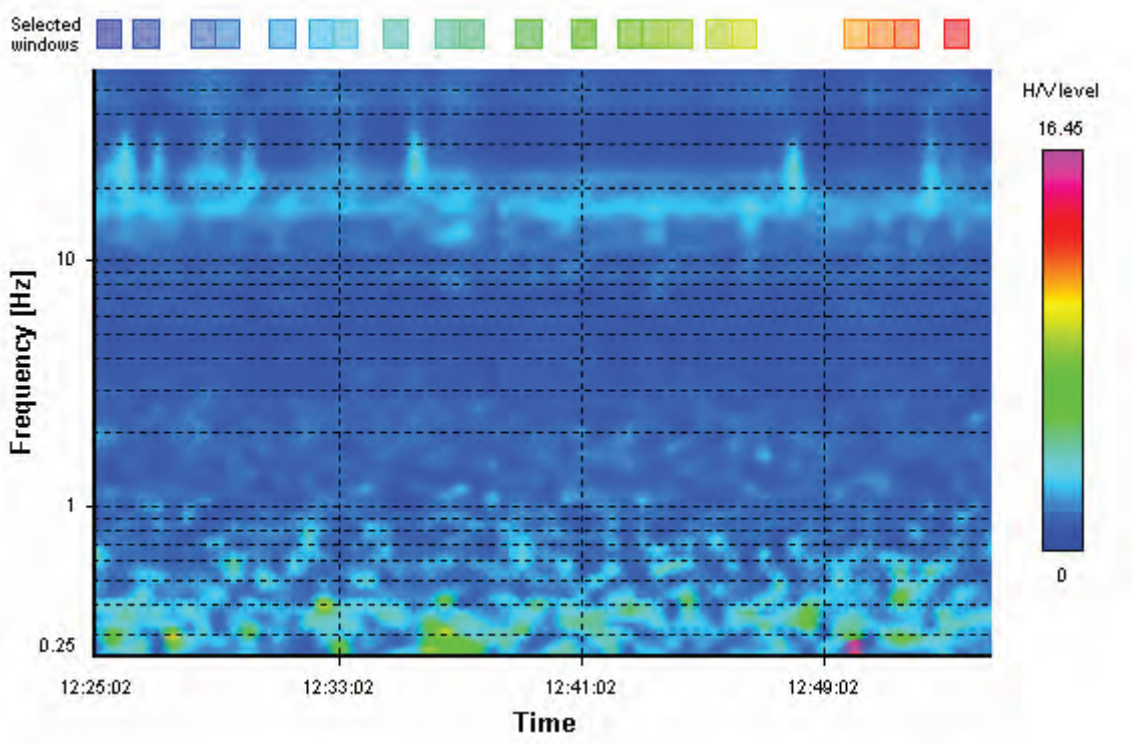
HVSR average



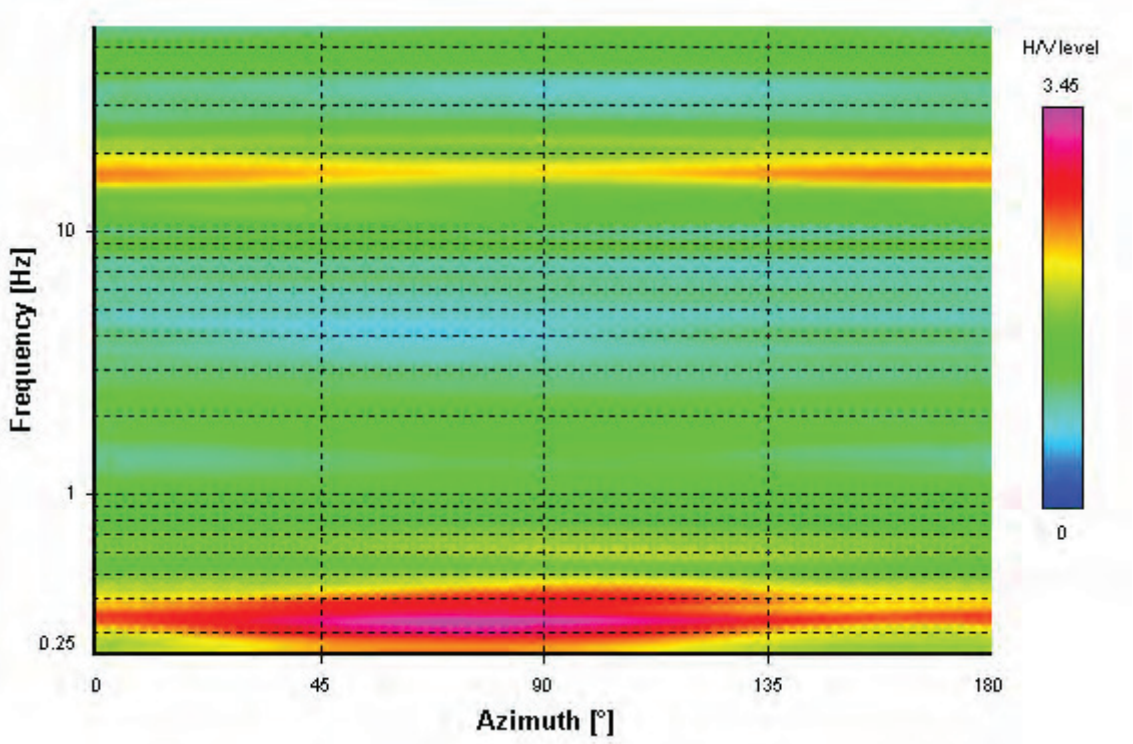
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



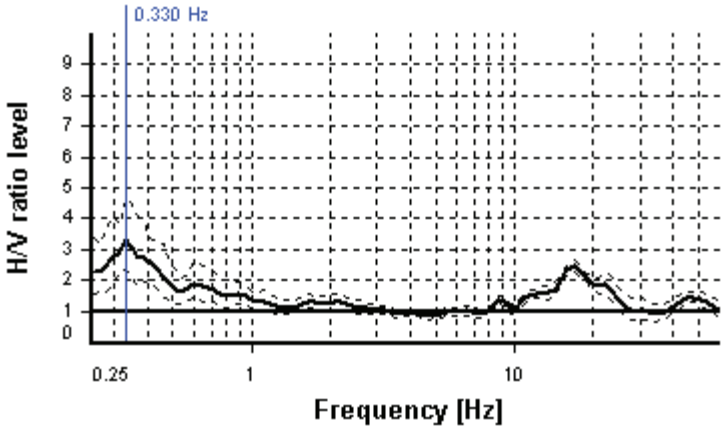
SESAME CRITERIA

Selected f_0 frequency

0.330 Hz

A_0 amplitude = *3.298*

Average f_0 = *0.337 ± 0.043*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	21 valid windows (length > 30.33 s) out of 21	OK
$n_c(f_0) > 200$	346.21 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 18	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	0.54267 Hz	OK
$A_0 > 2$	3.3 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.04278 < 0.06595	OK
$\sigma_A(f_0) < \theta(f_0)$	1.4077 < 2.5	OK
Overall criteria fulfillment		OK

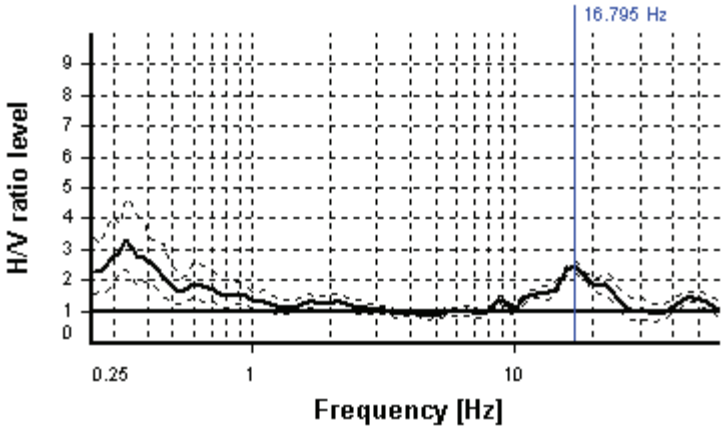
SESAME CRITERIA

Selected f_0 frequency

16.795 Hz

A_0 amplitude = *2.439*

Average f_0 = *17.238 ± 1.904*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	21 valid windows (length > 0.6 s) out of 21	OK
$n_c(f_0) > 200$	17634.46 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	10.20446 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	26.1525 Hz	OK
$A_0 > 2$	2.44 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.90427 >= 0.83974	NO
$\sigma_A(f_0) < \theta(f_0)$	1.08025 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 8 - (HVSR 780)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Lanchione

Address: Via delle lame

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41.5 m s.l.m.

Weather: -

Notes: -

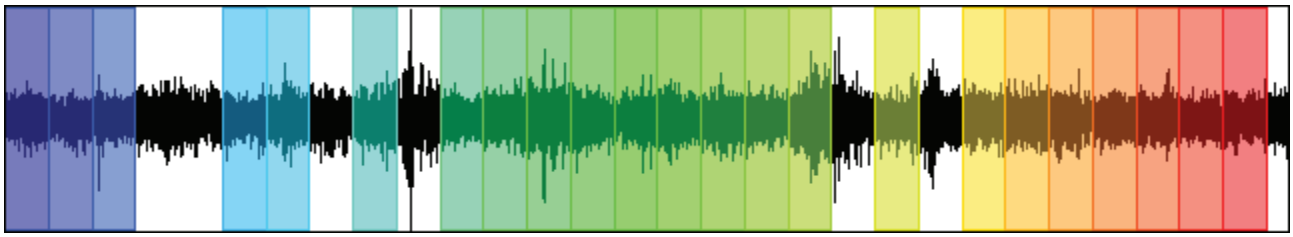
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/09 13:55:02
Recording length:	15.25 min
Windows count:	23
Average windows length:	31
Signal coverage:	77.92%

16681 Counts

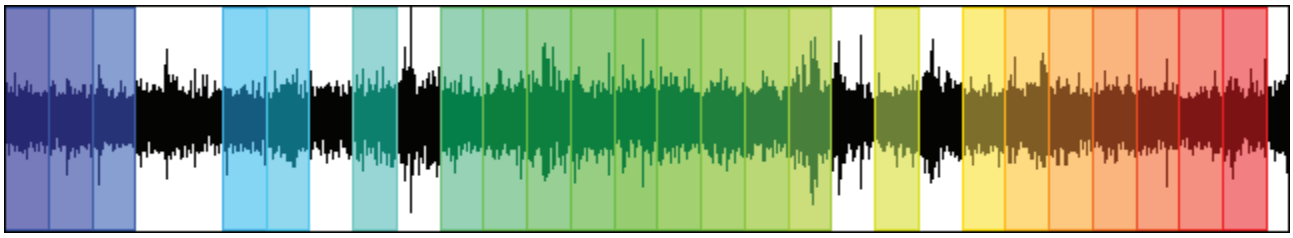
CHANNEL #1 [V]



-16978 Counts

16104 Counts

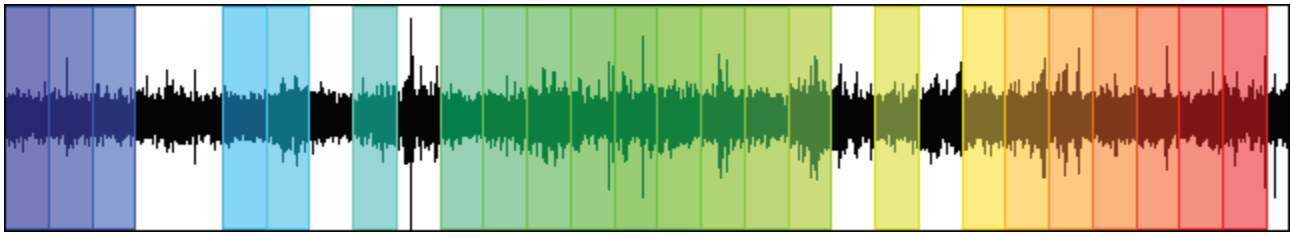
CHANNEL #2 [N]



-13595 Counts

19764 Counts

CHANNEL #3 [E]



-22345 Counts

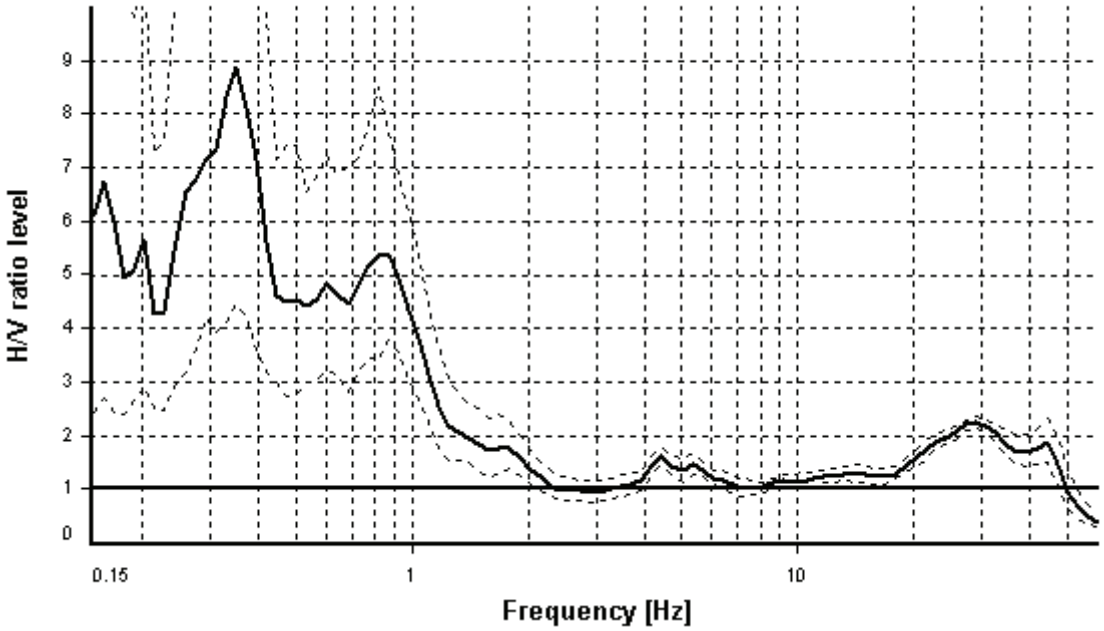
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

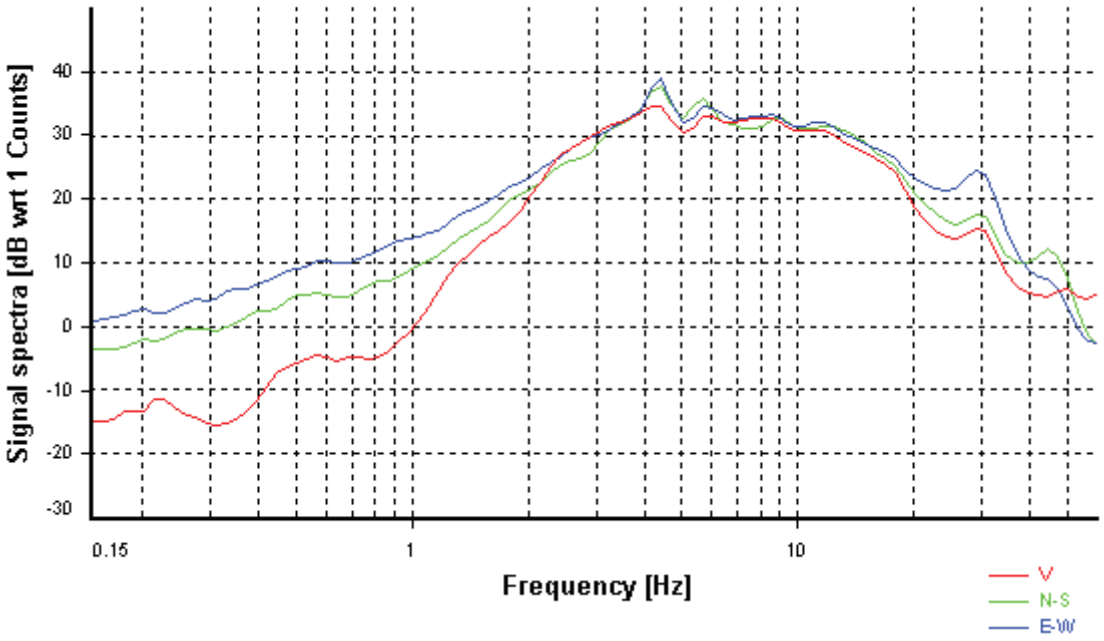
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

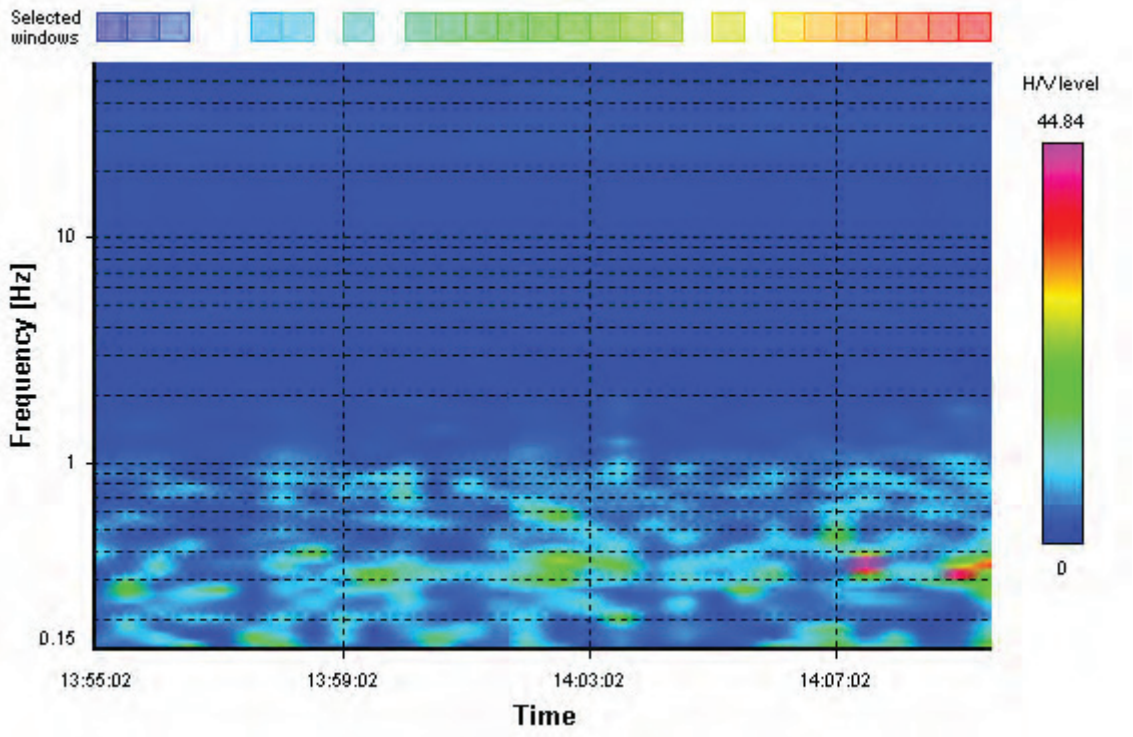
HVSR average



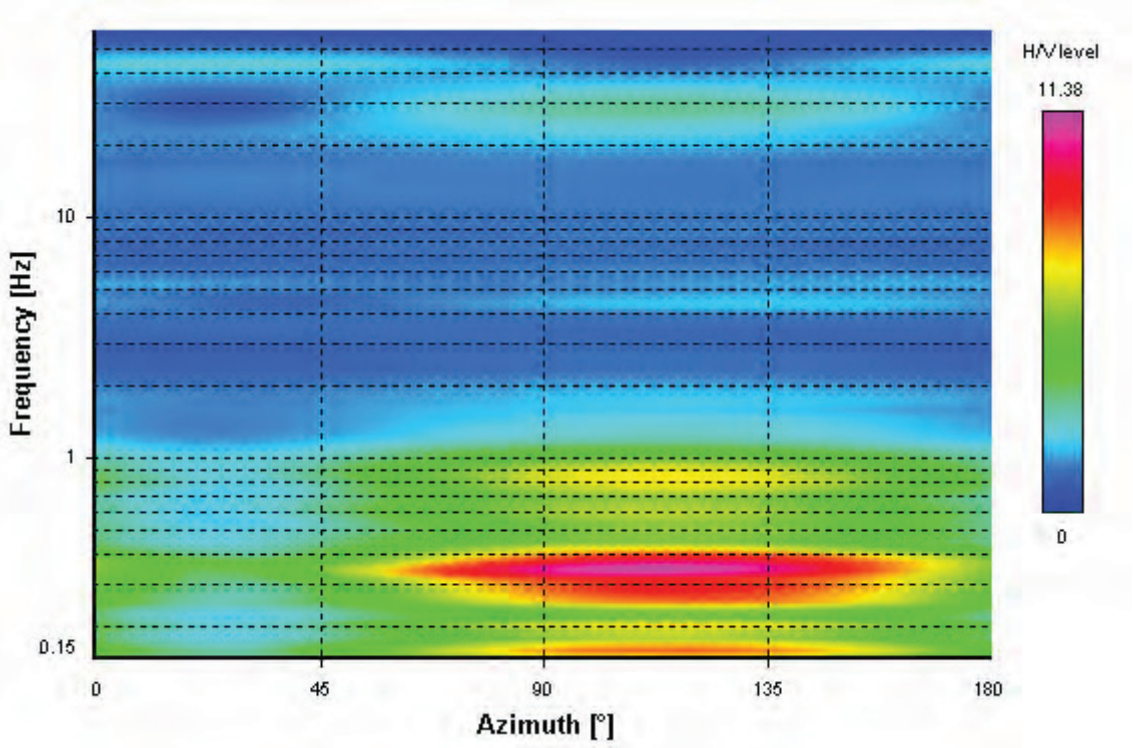
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



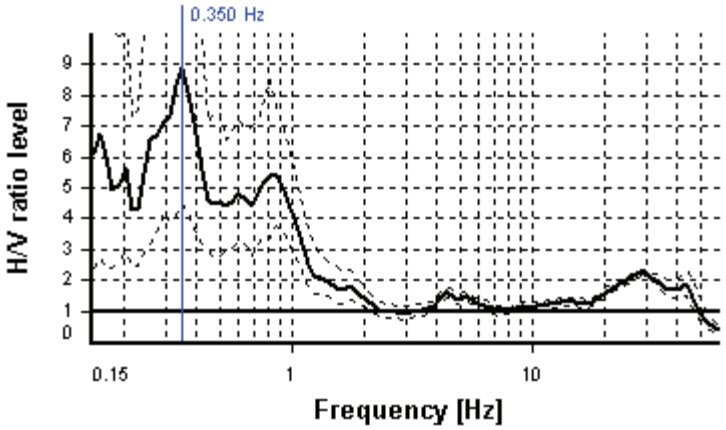
SESAME CRITERIA

Selected f_0 frequency

0.350 Hz

A_0 amplitude = *8.870*

Average f_0 = *0.344 ± 0.069*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	23 valid windows (length > 28.57 s) out of 23	OK
$n_c(f_0) > 200$	249.54 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 23	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	0.22913 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	0.53462 Hz	OK
$A_0 > 2$	8.87 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.06902 < 0.07	OK
$\sigma_A(f_0) < \theta(f_0)$	1.99294 < 2.5	OK
Overall criteria fulfillment		OK

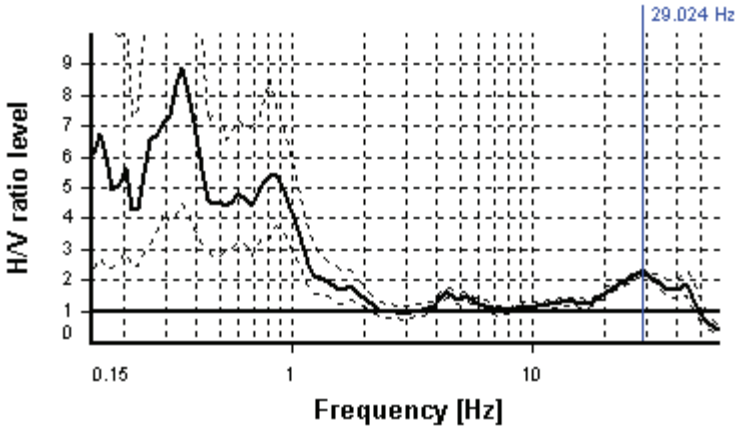
SESAME CRITERIA

Selected f_0 frequency

29.024 Hz

A_0 amplitude = *2.244*

Average f_0 = *28.894 ± 1.194*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	23 valid windows (length > 0.34 s) out of 23	OK
$n_c(f_0) > 200$	20693.77 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 23	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	8.6513 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	50.03812 Hz	OK
$A_0 > 2$	2.24 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.19401 < 1.45118	OK
$\sigma_A(f_0) < \theta(f_0)$	1.04677 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 10 - (HVSR 781)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Fattoria Baldi

Address: Via di Salceto

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41.7 m s.l.m.

Weather: -

Notes: -

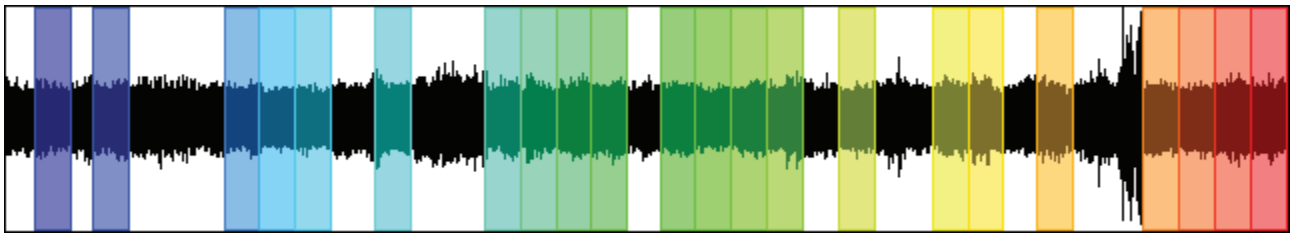
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/09 15:17:21
Recording length:	30 min
Windows count:	22
Average windows length:	50
Signal coverage:	61.11%

17534 Counts

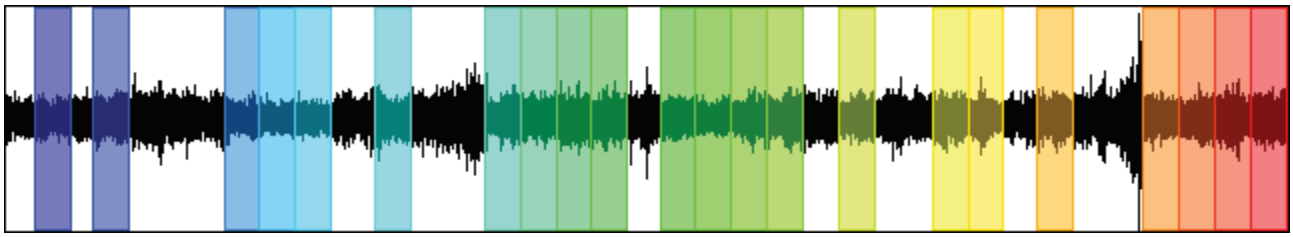
CHANNEL #1 [V]



-16544 Counts

13622 Counts

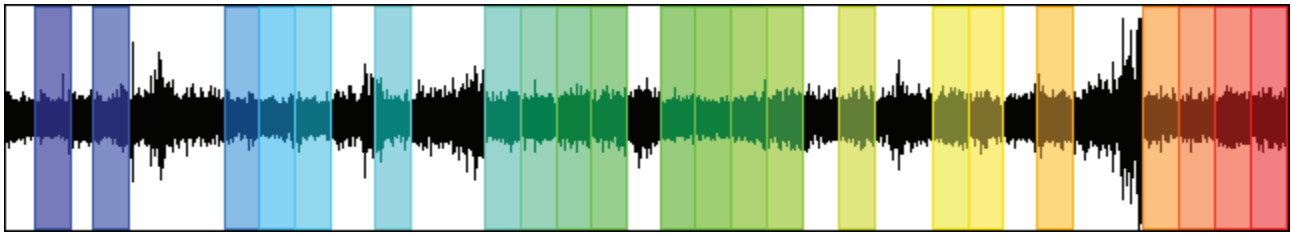
CHANNEL #2 [N]



-14399 Counts

13919 Counts

CHANNEL #3 [E]



-15485 Counts

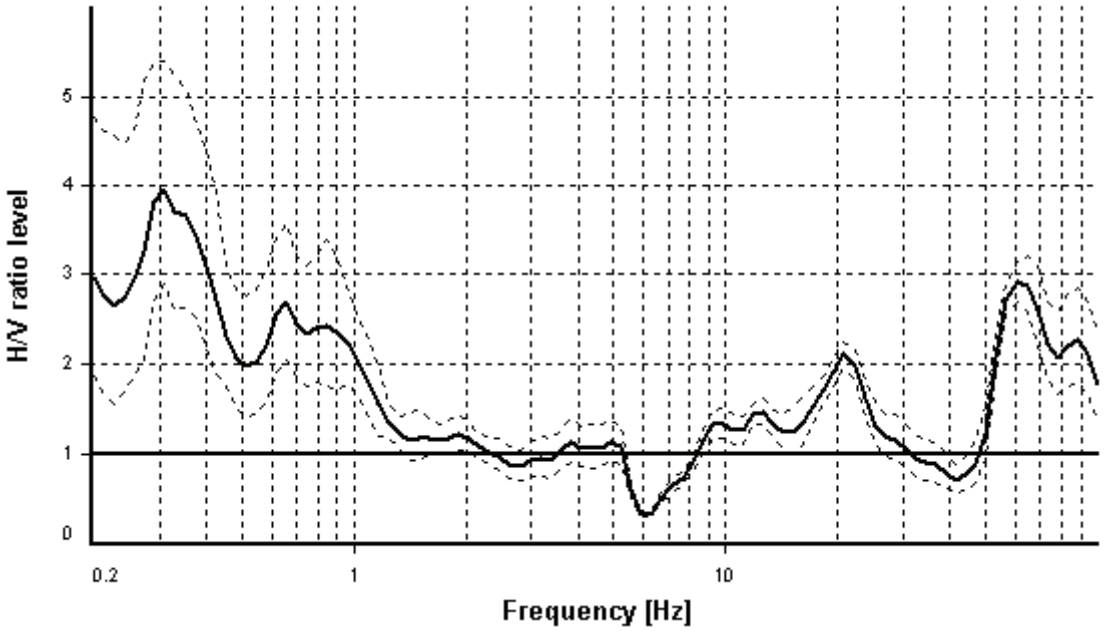
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

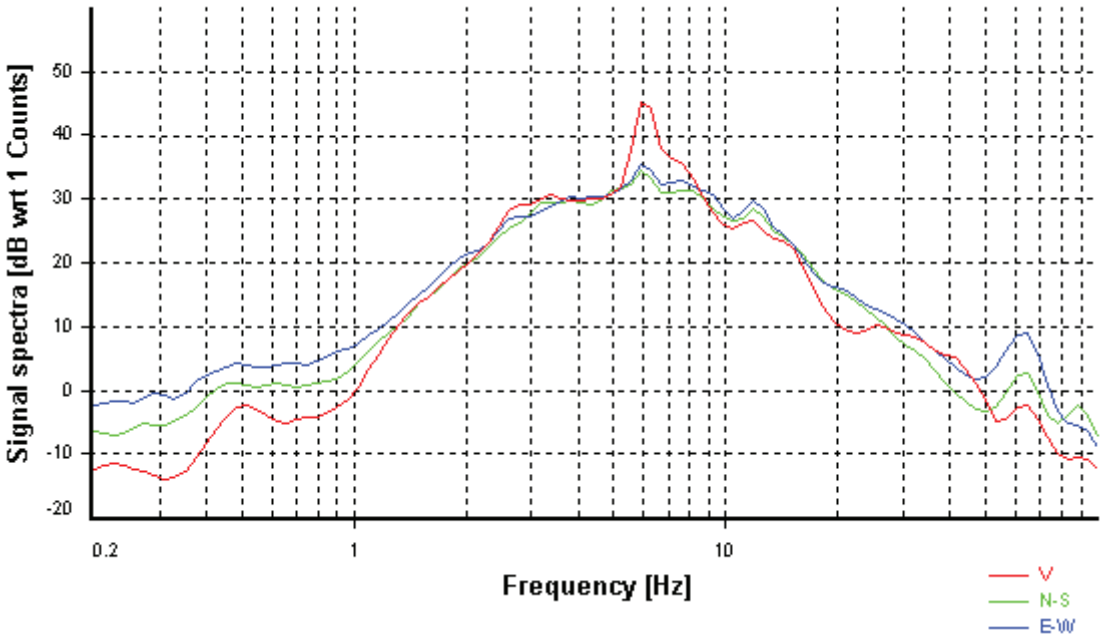
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

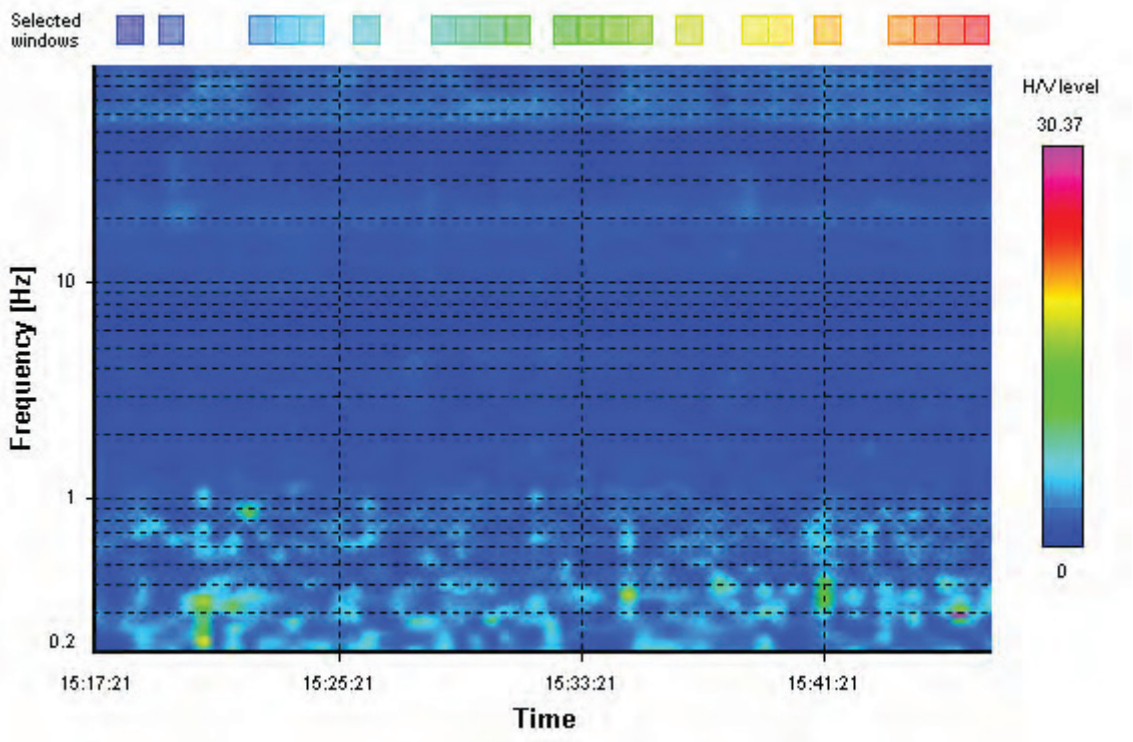
HVSR average



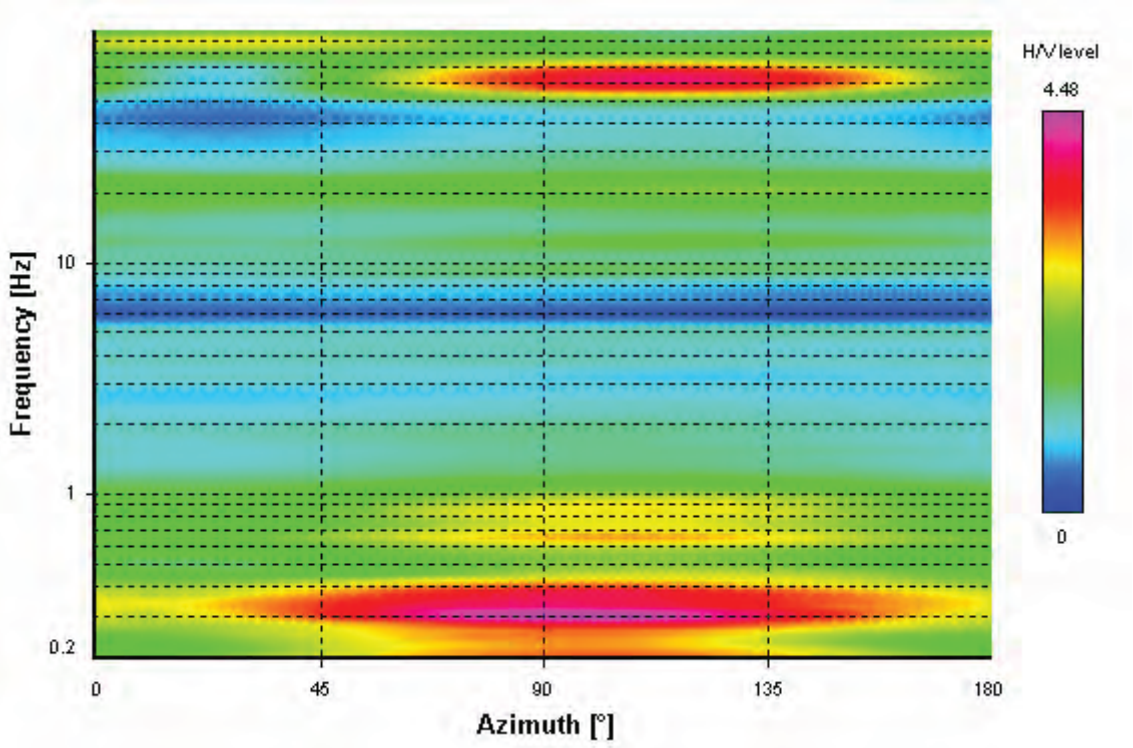
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



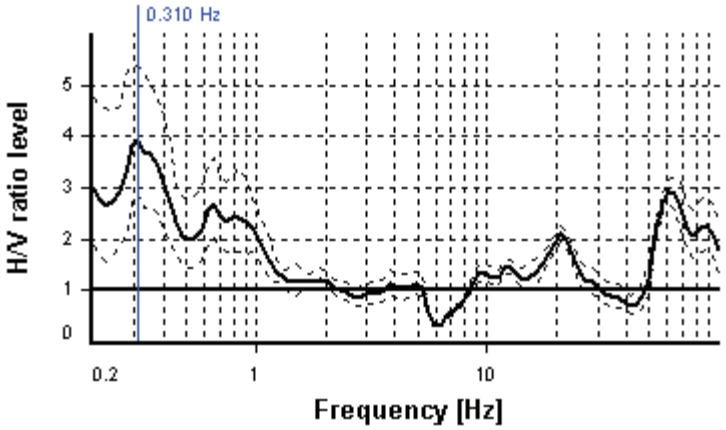
SESAME CRITERIA

Selected f_0 frequency

0.310 Hz

A_0 amplitude = *3.952*

Average f_0 = *0.304 ± 0.050*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	22 valid windows (length > 32.22 s) out of 22	OK
$n_c(f_0) > 200$	341.4 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 19	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	1.08921 Hz	OK
$A_0 > 2$	3.95 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.04981 < 0.06207	OK
$\sigma_A(f_0) < \theta(f_0)$	1.36314 < 2.5	OK
Overall criteria fulfillment		OK

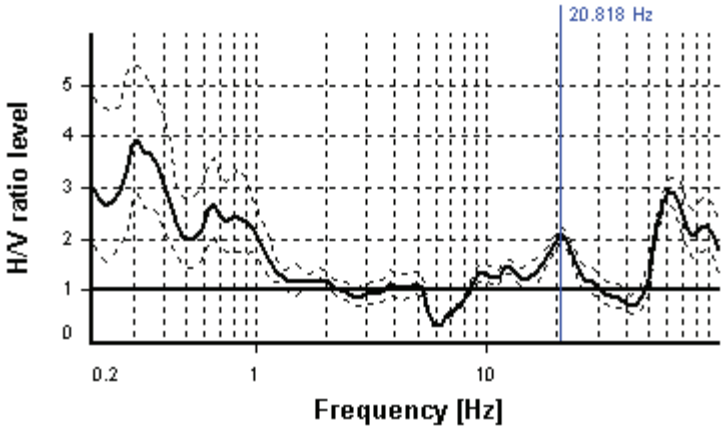
SESAME CRITERIA

Selected f_0 frequency

20.818 Hz

A_0 amplitude = *2.104*

Average f_0 = *21.132 ± 0.830*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	22 valid windows (length > 0.48 s) out of 22	OK
$n_c(f_0) > 200$	22899.95 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 23	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	8.11908 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	32.30563 Hz	OK
$A_0 > 2$	2.1 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.82991 < 1.04091	OK
$\sigma_A(f_0) < \theta(f_0)$	1.07172 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 15 - (HVSR 782)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Berlicche

Address: Via Chiusa

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 40.9 m s.l.m.

Weather: -

Notes: -

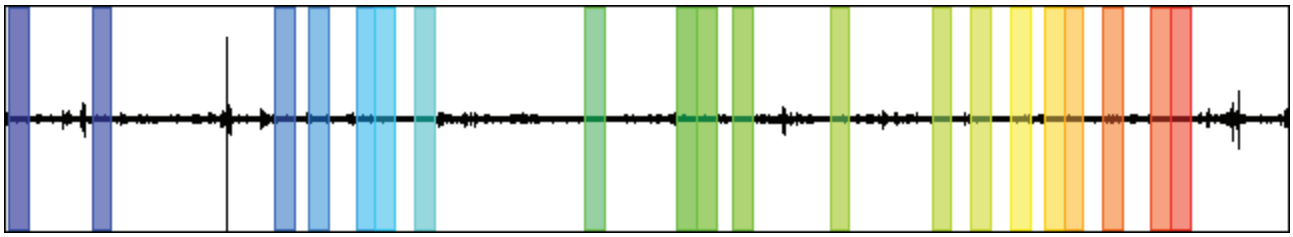
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/11 11:07:35
Recording length:	32.9 min
Windows count:	20
Average windows length:	30
Signal coverage:	30.4%

250744 Counts

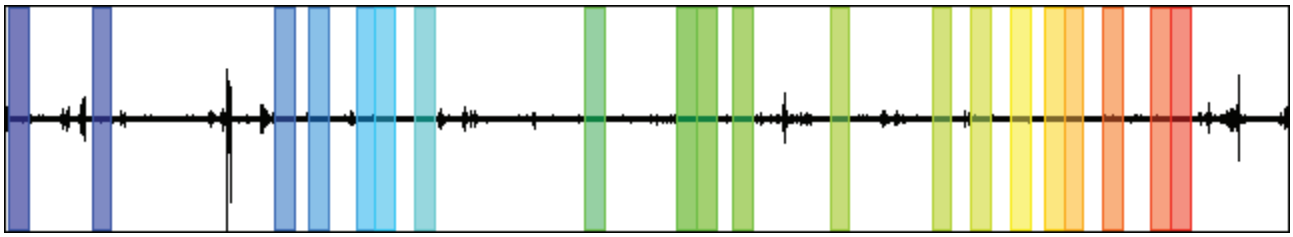
CHANNEL #1 [V]



-341435 Counts

153977 Counts

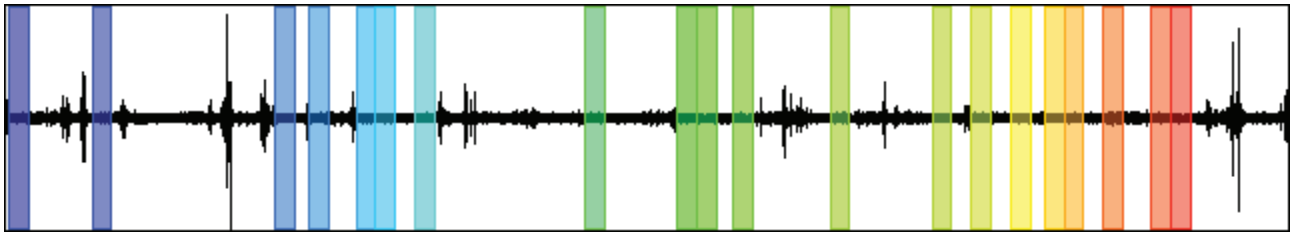
CHANNEL #2 [N]



-346538 Counts

157327 Counts

CHANNEL #3 [E]



-170635 Counts

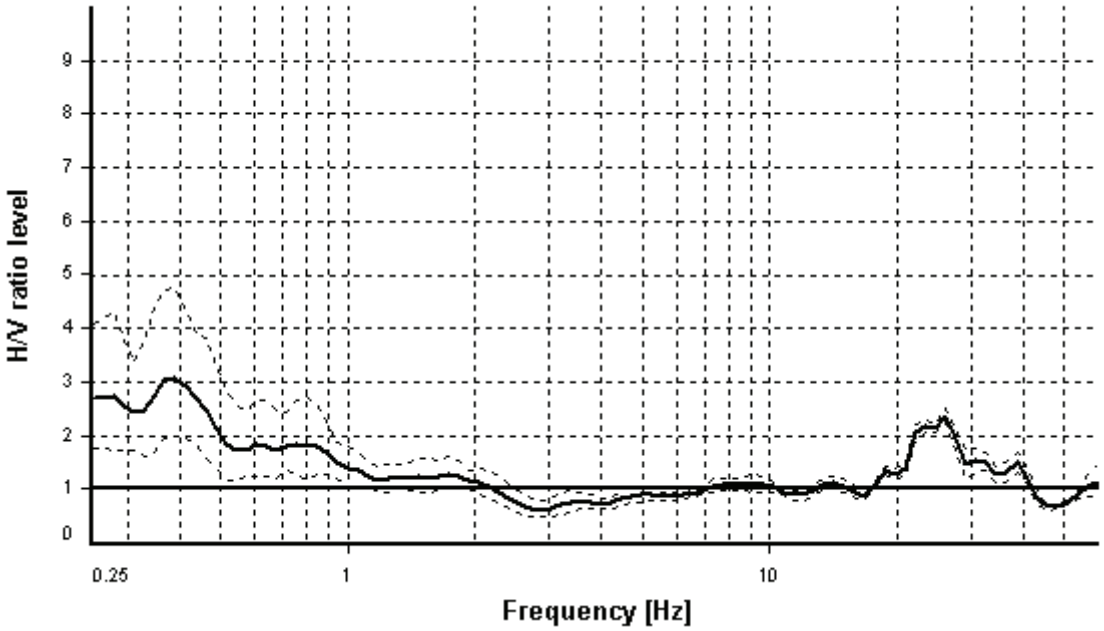
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

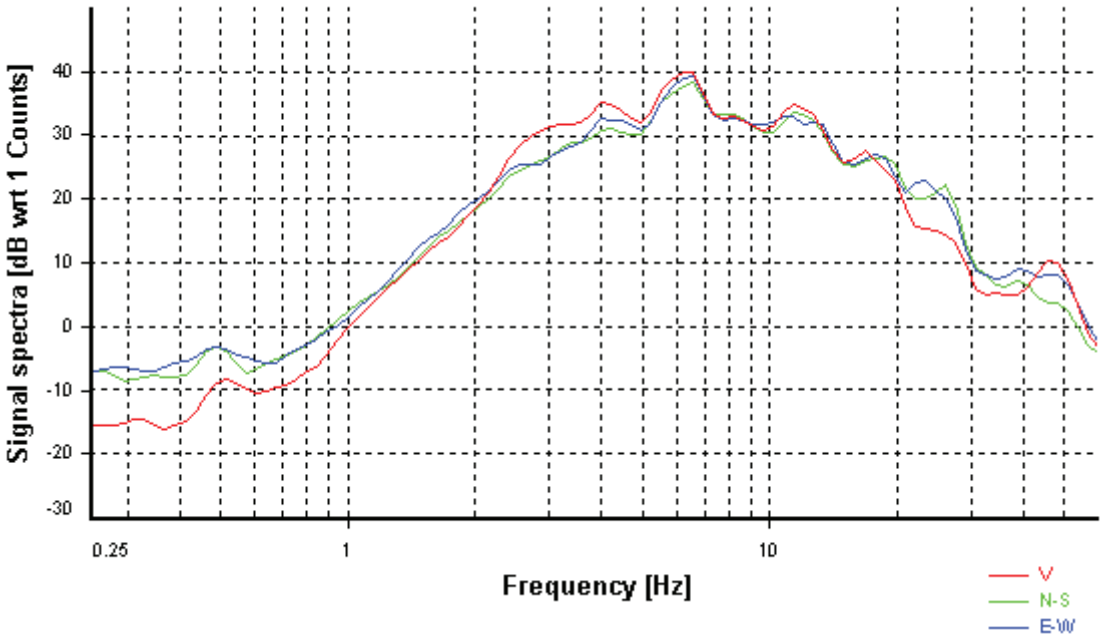
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

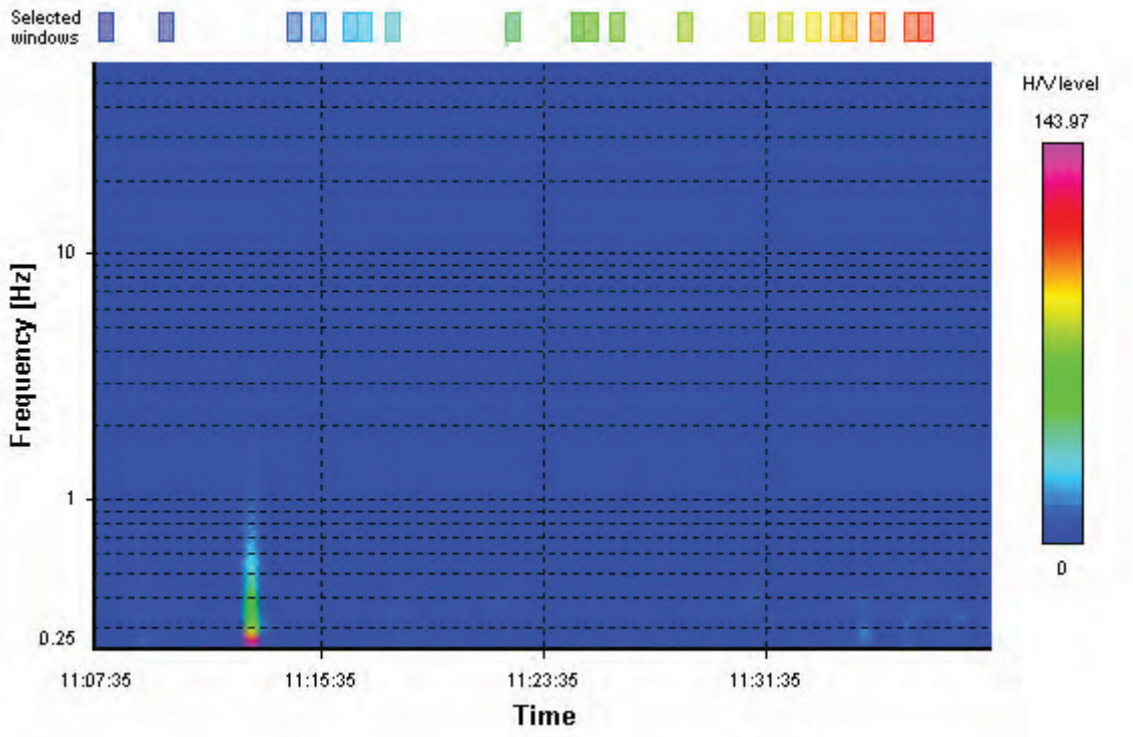
HVSR average



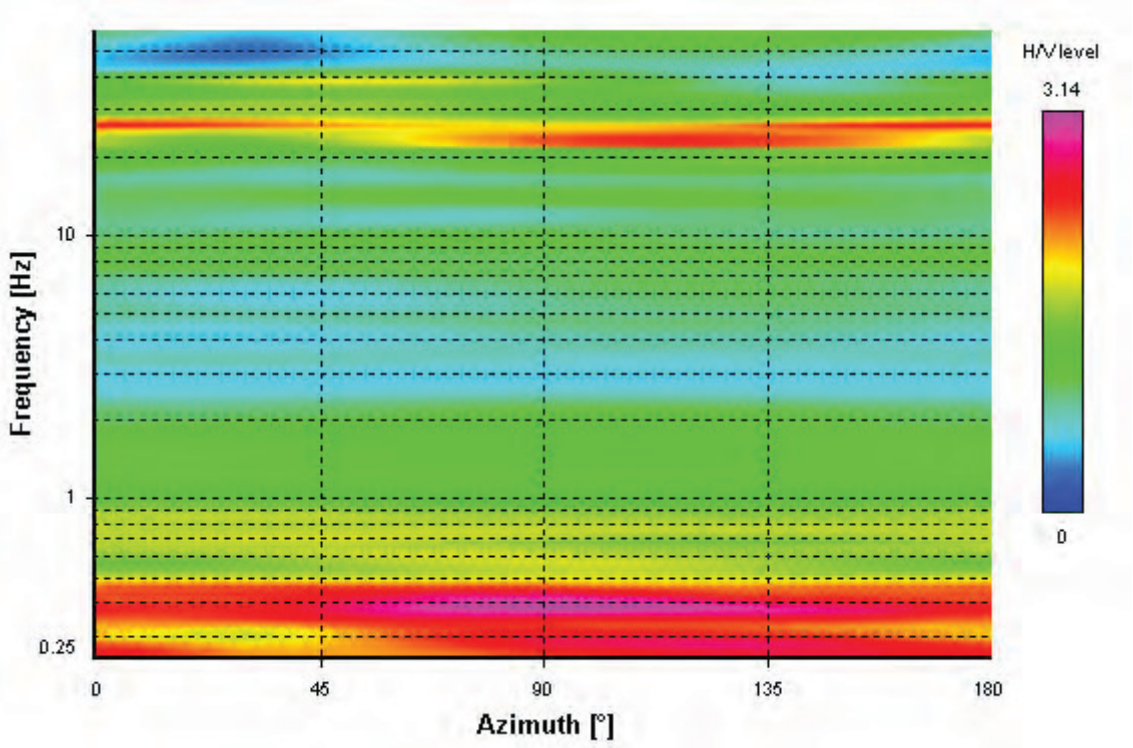
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



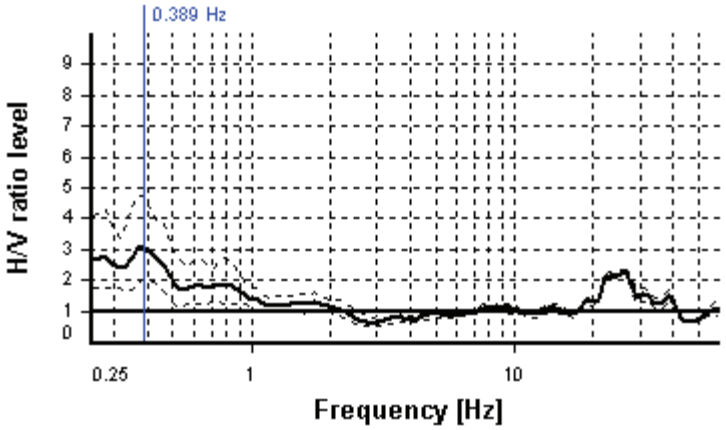
SESAME CRITERIA

Selected f_0 frequency

0.389 Hz

A_0 amplitude = *3.079*

Average f_0 = *0.396 ± 0.078*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	20 valid windows (length > 25.69 s) out of 20	OK
$n_c(f_0) > 200$	233.58 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 21	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	0.94398 Hz	OK
$A_0 > 2$	3.08 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.07752 < 0.07786	OK
$\sigma_A(f_0) < \theta(f_0)$	1.53956 < 2.5	OK
Overall criteria fulfillment		OK

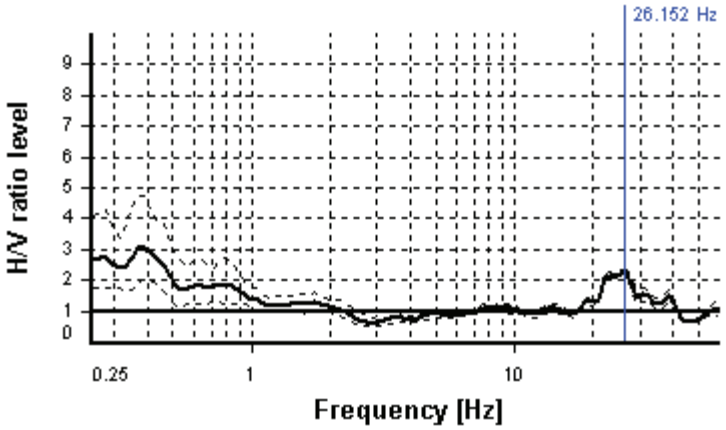
SESAME CRITERIA

Selected f_0 frequency

26.152 Hz

A_0 amplitude = *2.363*

Average f_0 = *25.816 ± 1.088*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	20 valid windows (length > 0.38 s) out of 20	OK
$n_c(f_0) > 200$	15691.5 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	17.7507 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	43.04235 Hz	OK
$A_0 > 2$	2.36 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.08794 < 1.30762	OK
$\sigma_A(f_0) < \theta(f_0)$	1.05474 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 13 - (HVSR 783)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Villa Palandri

Address: Via Palaia

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 43.0 m s.l.m.

Weather: -

Notes: -

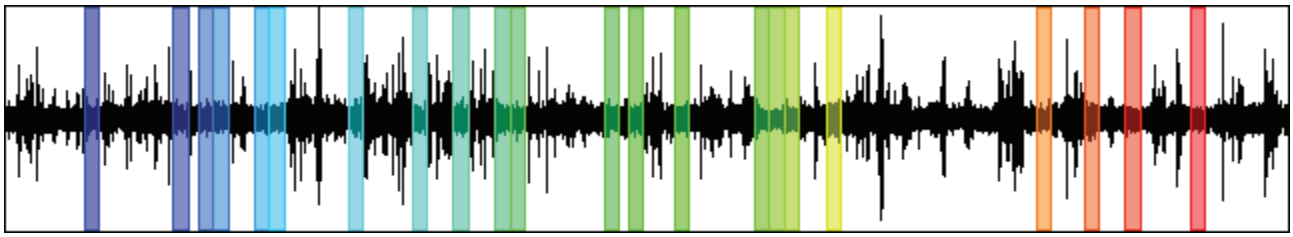
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/11 16:21:46
Recording length:	44.67 min
Windows count:	22
Average windows length:	30
Signal coverage:	24.63%

33025 Counts

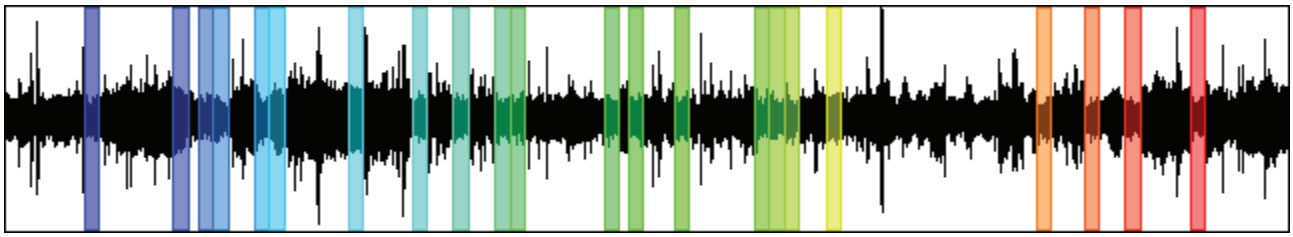
CHANNEL #1 [V]



-29938 Counts

29333 Counts

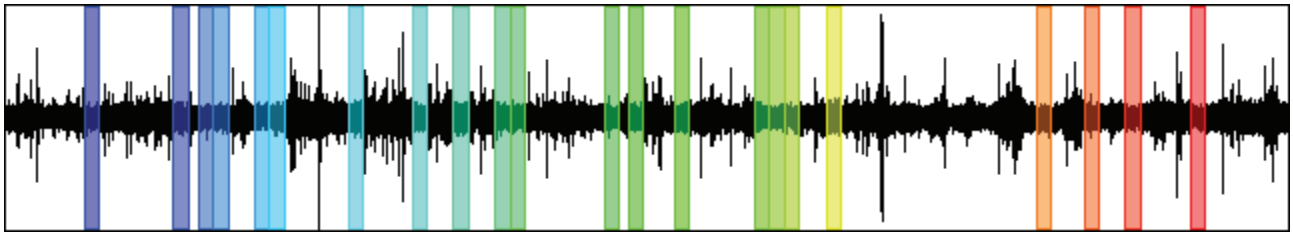
CHANNEL #2 [N]



-27648 Counts

37585 Counts

CHANNEL #3 [E]



-37851 Counts

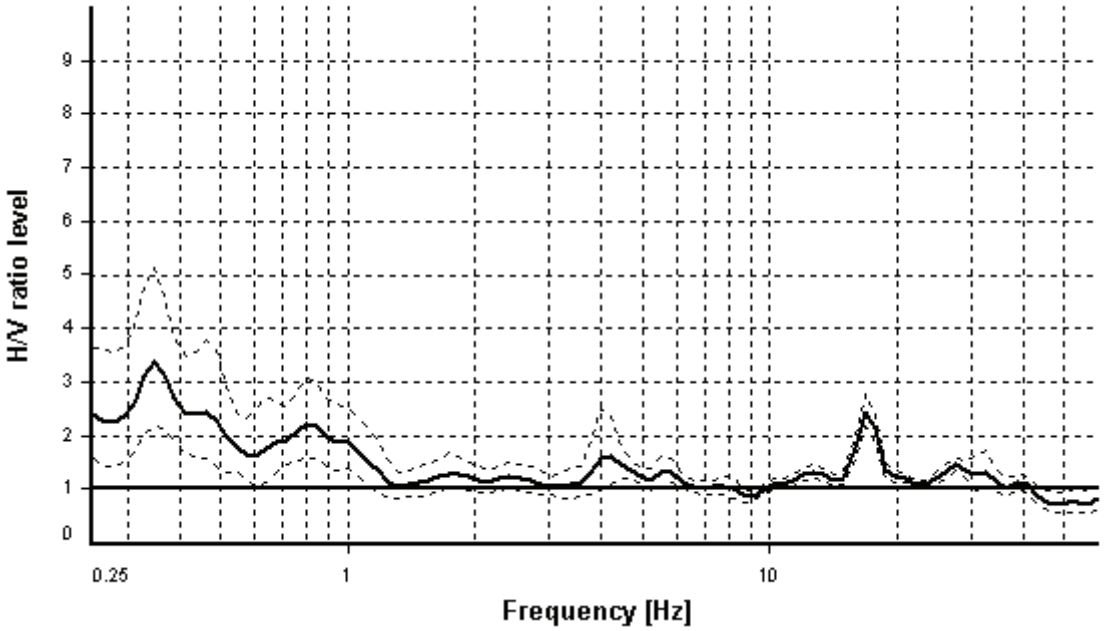
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

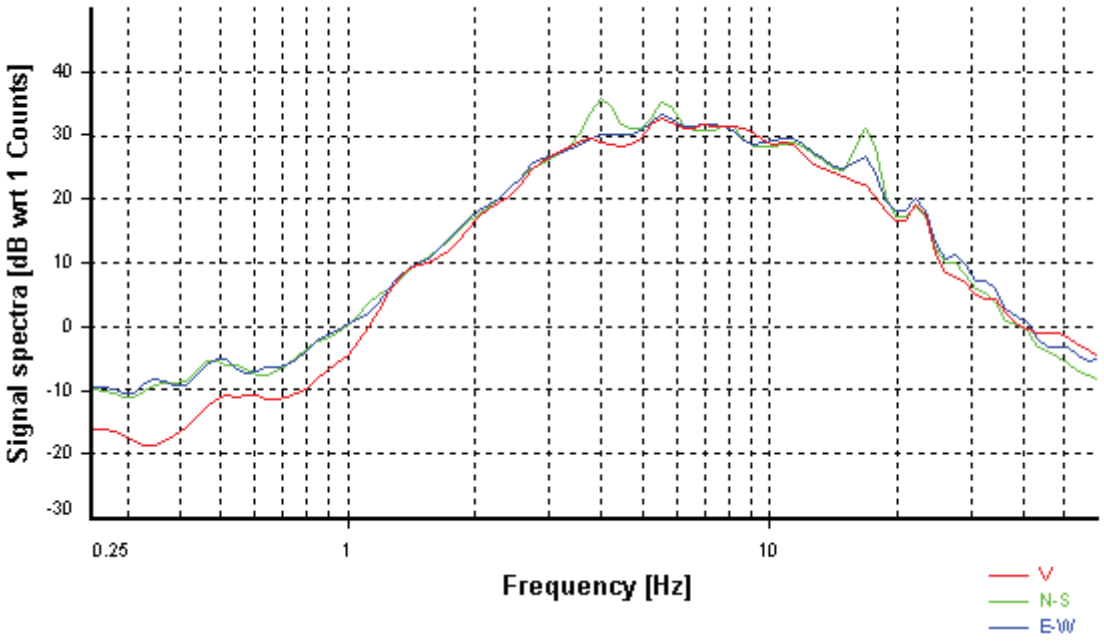
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

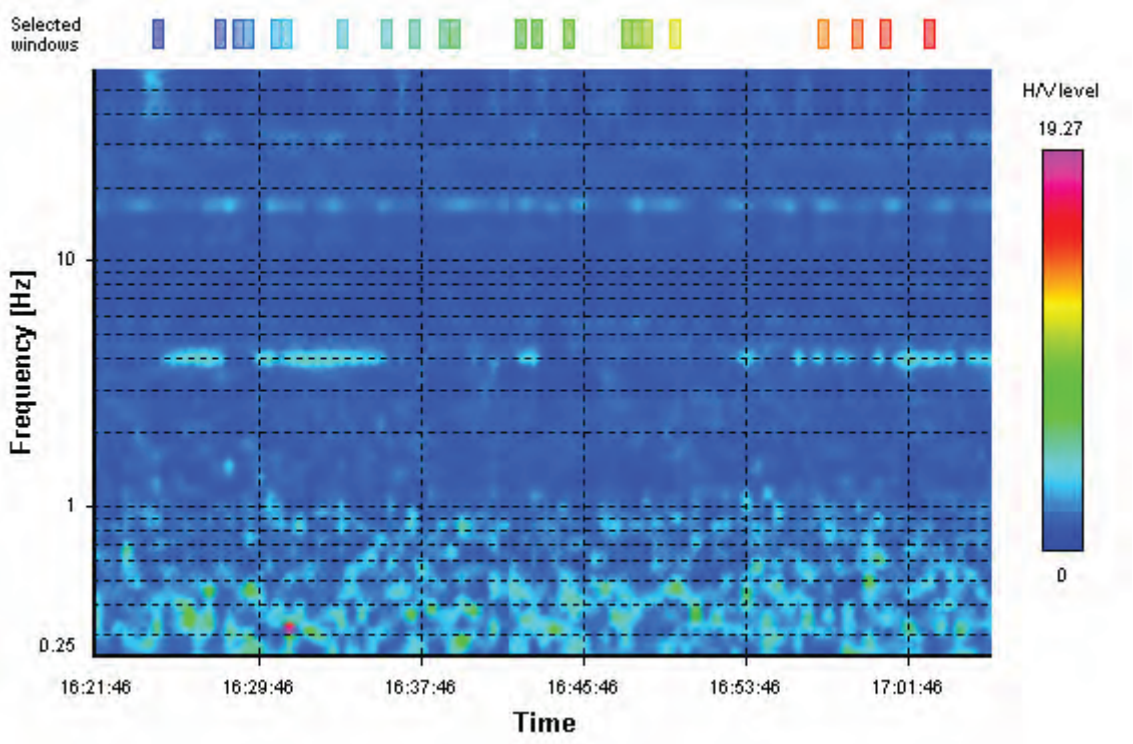
HVSR average



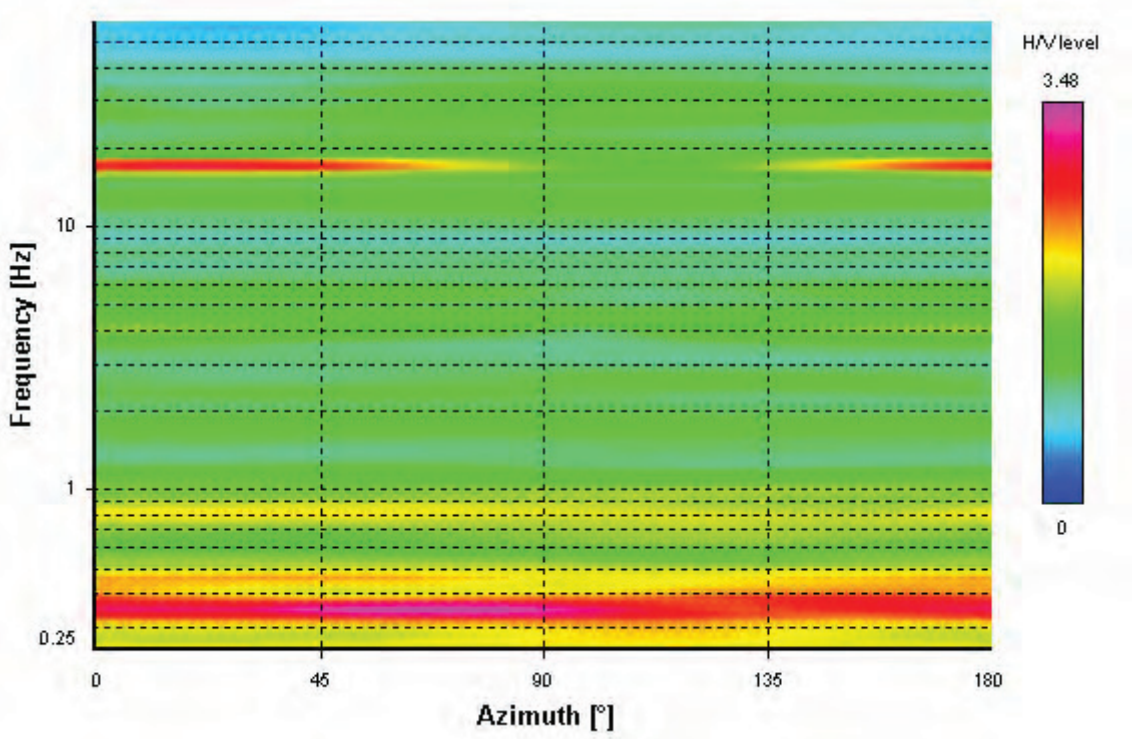
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



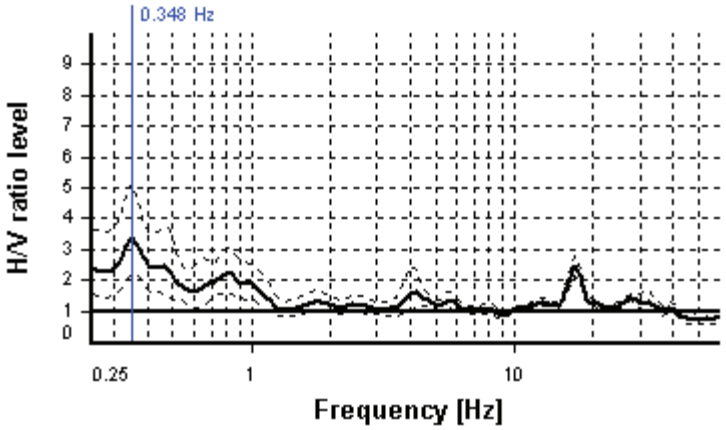
SESAME CRITERIA

Selected f_0 frequency

0.348 Hz

A_0 amplitude = *3.353*

Average f_0 = *0.353 ± 0.068*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	22 valid windows (length > 28.69 s) out of 22	OK
$n_c(f_0) > 200$	230.01 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 19	OK
HVSR peak clarity criteria		
$\exists f^- \text{ in } [f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+ \text{ in } [f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	0.57356 Hz	OK
$A_0 > 2$	3.35 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.06776 < 0.0697	OK
$\sigma_A(f_0) < \theta(f_0)$	1.53067 < 2.5	OK
Overall criteria fulfillment		OK

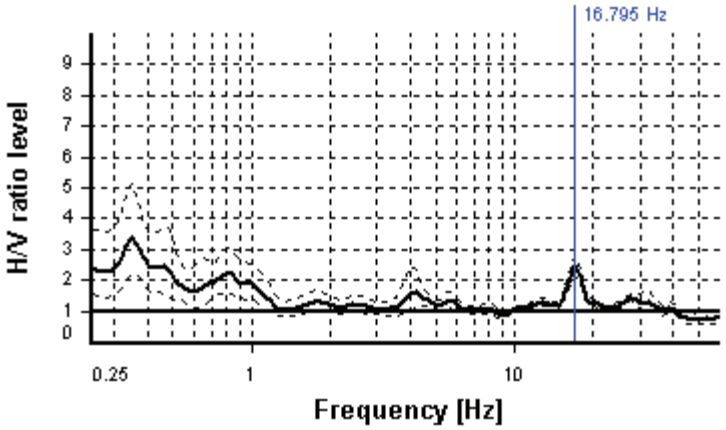
SESAME CRITERIA

Selected f_0 frequency

16.795 Hz

A_0 amplitude = *2.449*

Average f_0 = *16.795 ± 0.000*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	22 valid windows (length > 0.6 s) out of 22	OK
$n_c(f_0) > 200$	11084.52 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	15.03446 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	20.95767 Hz	OK
$A_0 > 2$	2.45 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0 < 0.83974	OK
$\sigma_A(f_0) < \theta(f_0)$	1.13292 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 4 - (HVSR 784)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Castello delle Case

Address: -

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 42.8 m s.l.m.

Weather: -

Notes: -

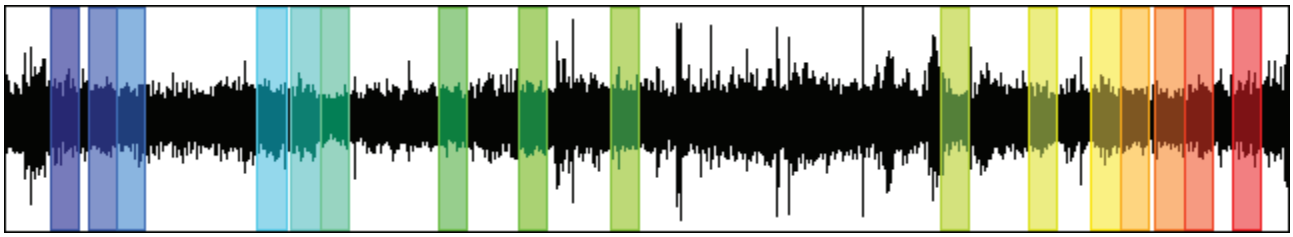
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/11 14:07:13
Recording length:	30 min
Windows count:	16
Average windows length:	40
Signal coverage:	35.56%

10263 Counts

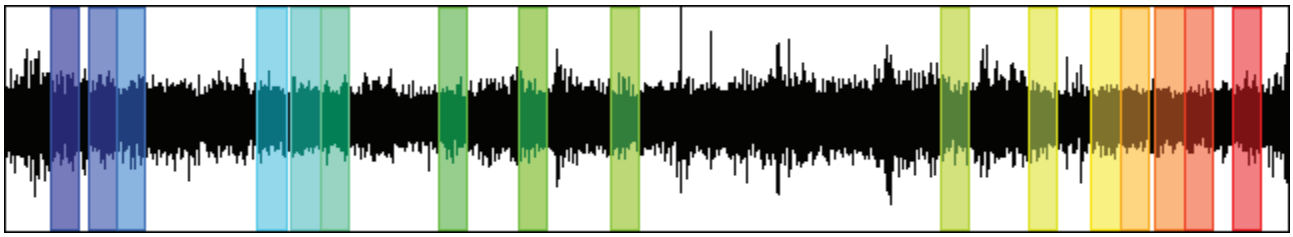
CHANNEL #1 [V]



-9321 Counts

11501 Counts

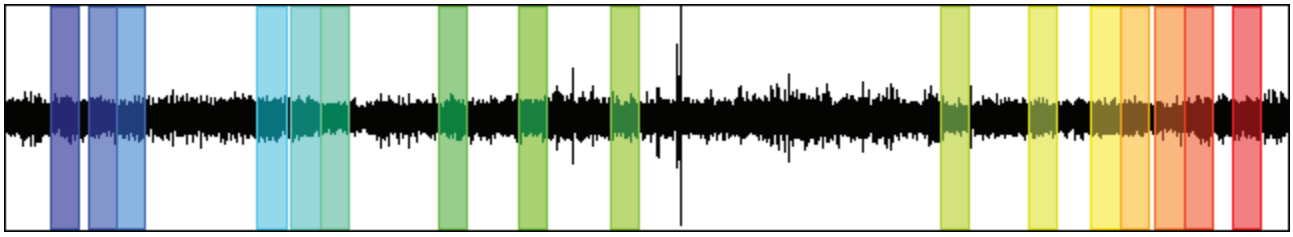
CHANNEL #2 [N]



-8774 Counts

26231 Counts

CHANNEL #3 [E]



-25380 Counts

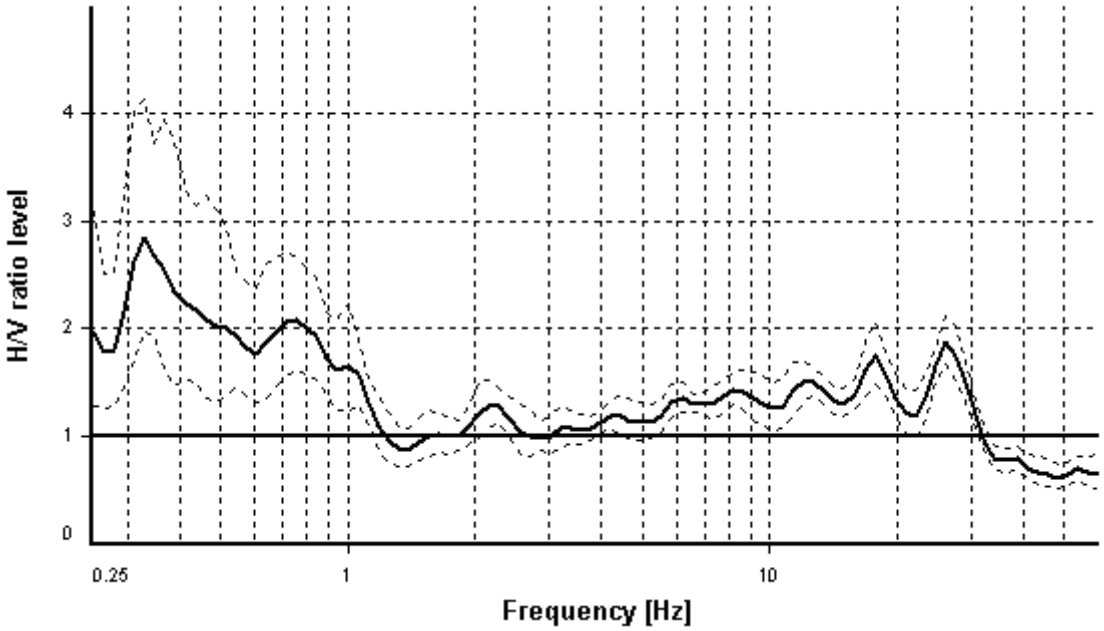
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

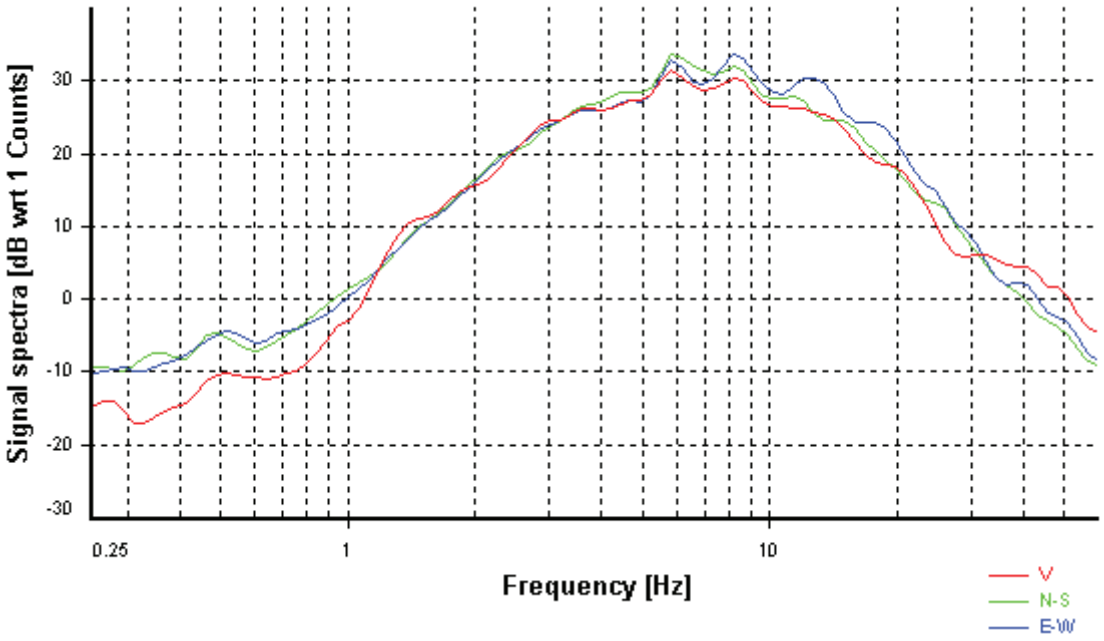
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

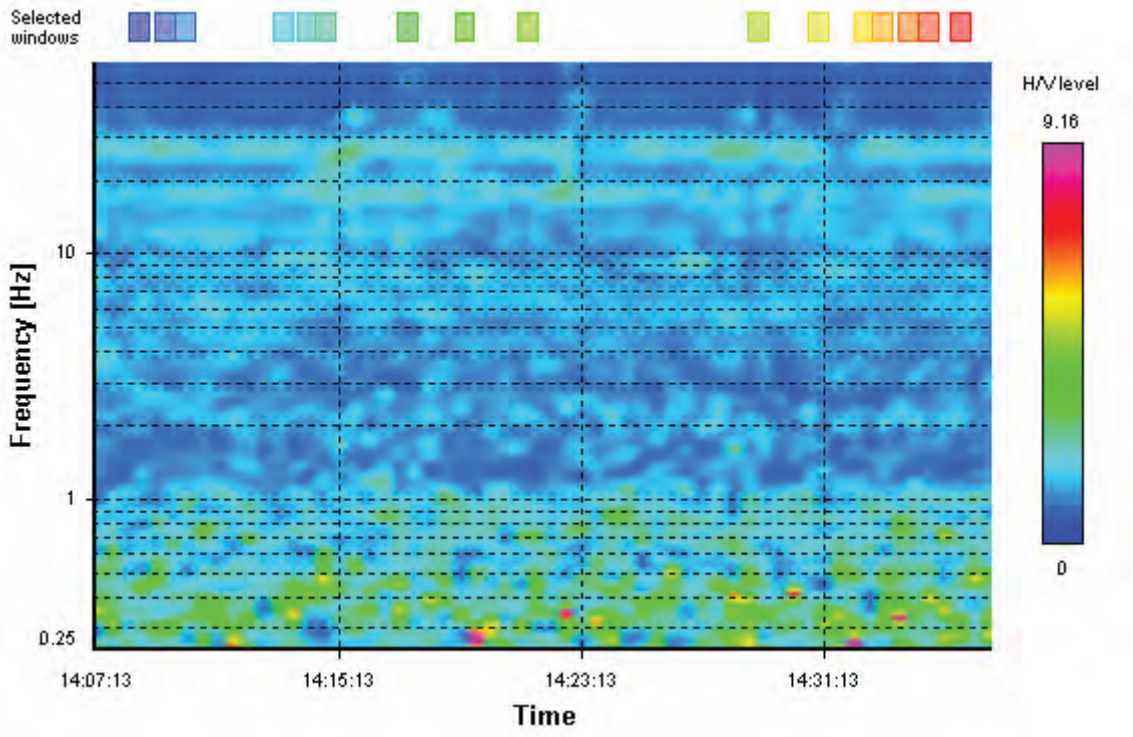
HVSR average



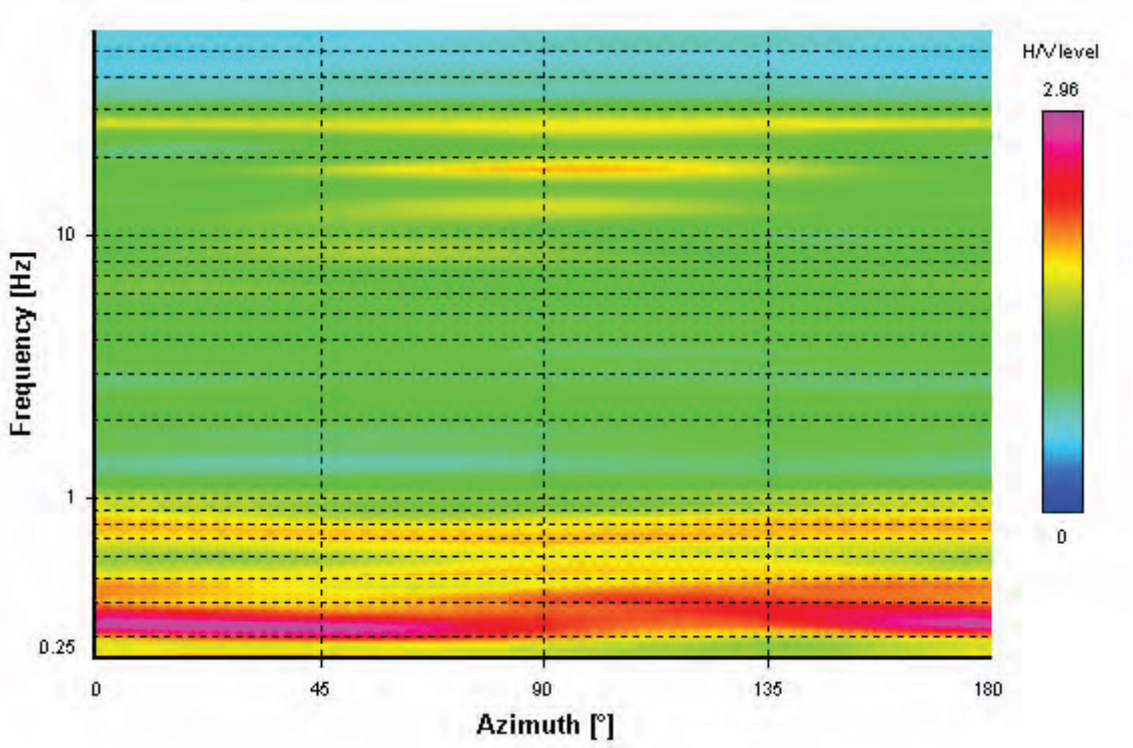
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



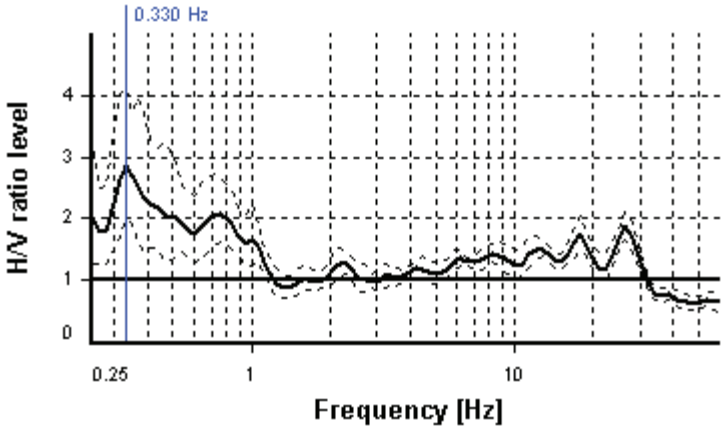
SESAME CRITERIA

Selected f_0 frequency

0.330 Hz

A_0 amplitude = *2.849*

Average f_0 = *0.356 ± 0.065*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	16 valid windows (length > 30.33 s) out of 16	OK
$n_c(f_0) > 200$	211.02 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 18	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	1.11452 Hz	OK
$A_0 > 2$	2.85 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.06477 < 0.06595	OK
$\sigma_A(f_0) < \theta(f_0)$	1.44953 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 3 - (HVSR 785)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Pacciano

Address: -

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 42.5 m s.l.m.

Weather: -

Notes: -

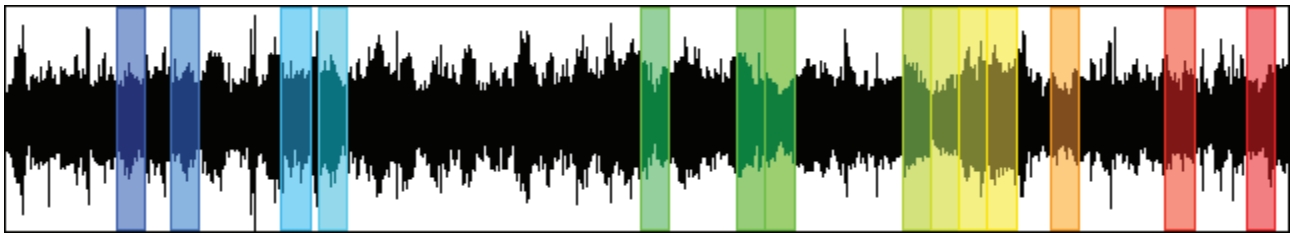
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/11 12:30:14
Recording length:	30.17 min
Windows count:	14
Average windows length:	40
Signal coverage:	30.94%

5966 Counts

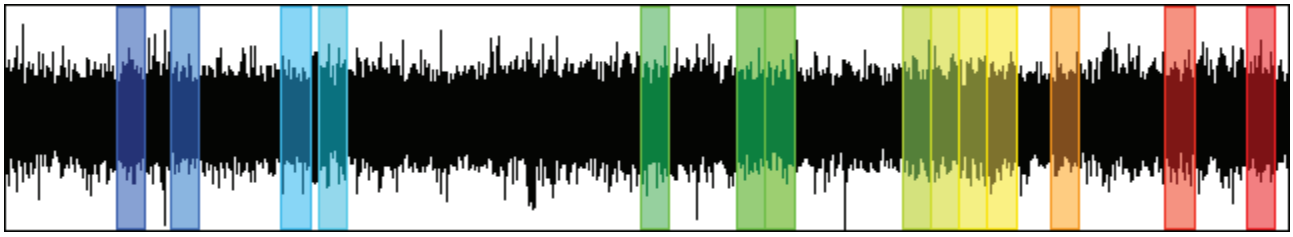
CHANNEL #1 [V]



-6141 Counts

4764 Counts

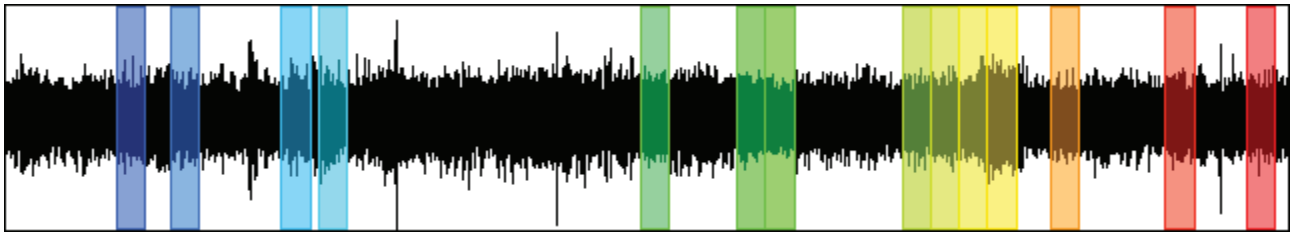
CHANNEL #2 [N]



-5706 Counts

7149 Counts

CHANNEL #3 [E]



-8218 Counts

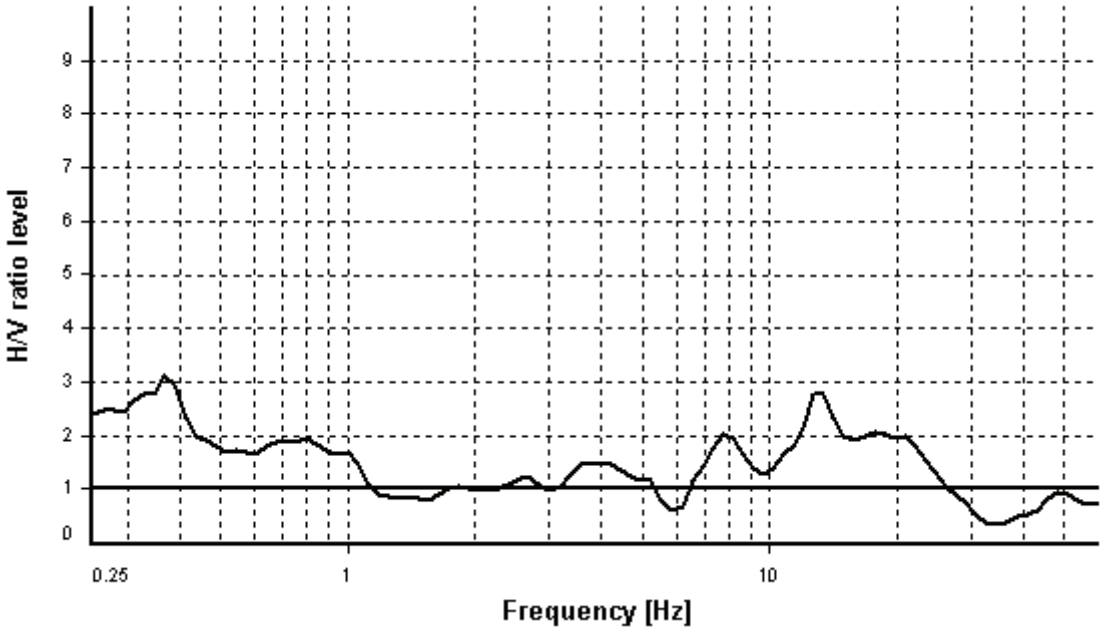
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

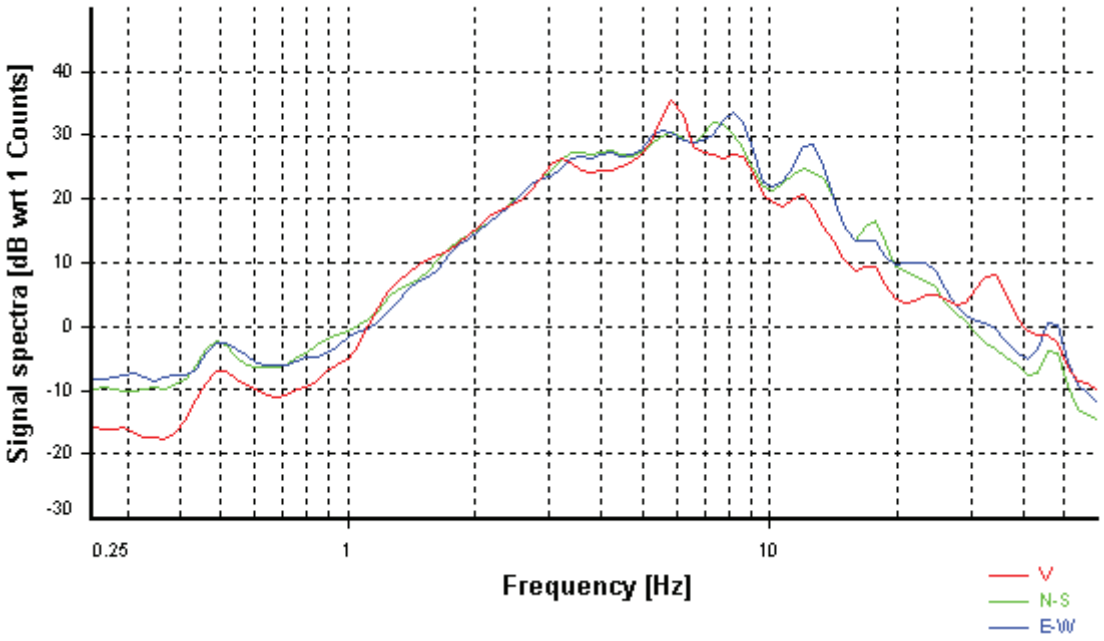
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

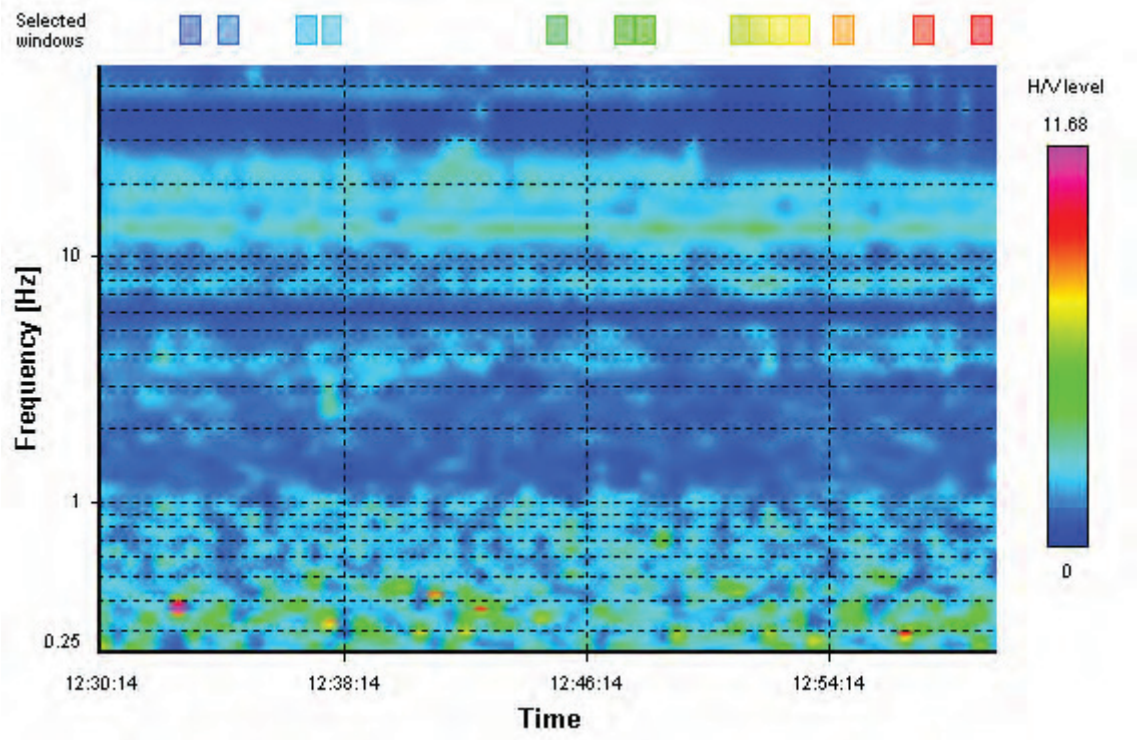
HVSR average



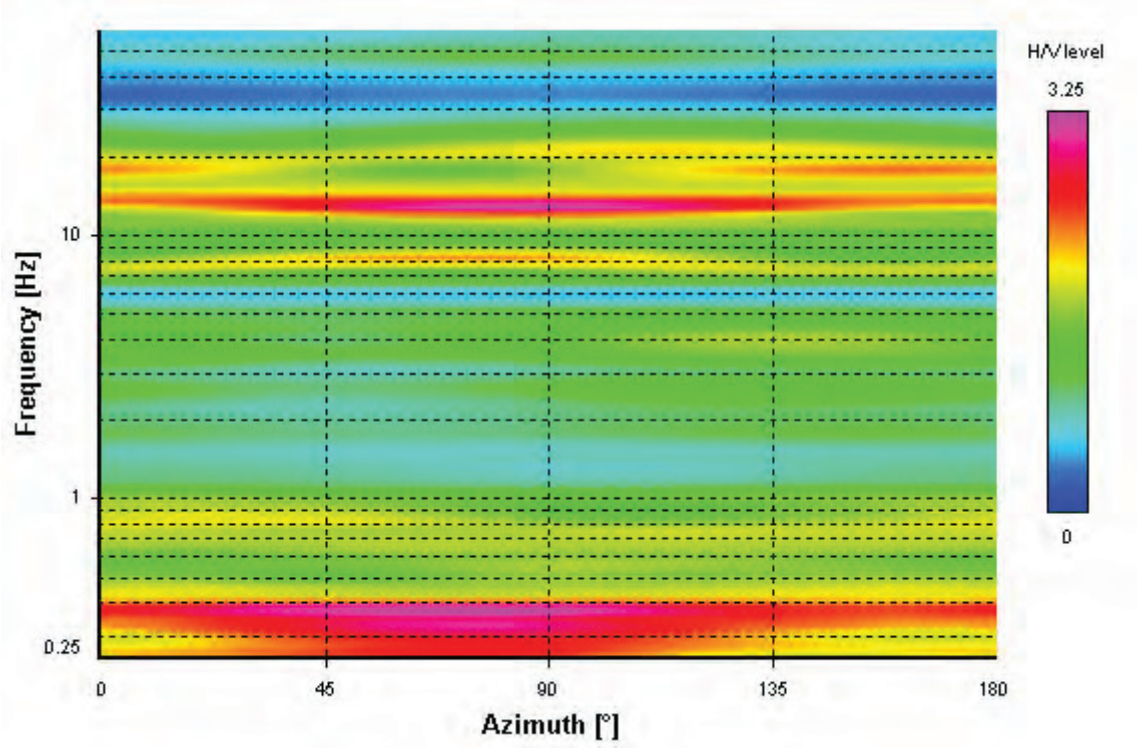
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



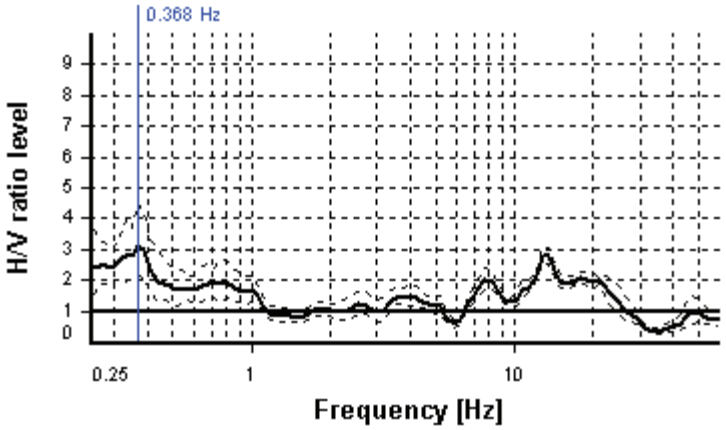
SESAME CRITERIA

Selected f_0 frequency

0.368 Hz

A_0 amplitude = *3.100*

Average f_0 = *0.351 ± 0.052*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	14 valid windows (length > 27.15 s) out of 14	OK
$n_c(f_0) > 200$	206.27 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 20	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	1.0545 Hz	OK
$A_0 > 2$	3.1 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.05222 < 0.07367	OK
$\sigma_A(f_0) < \theta(f_0)$	1.45408 < 2.5	OK
Overall criteria fulfillment		OK

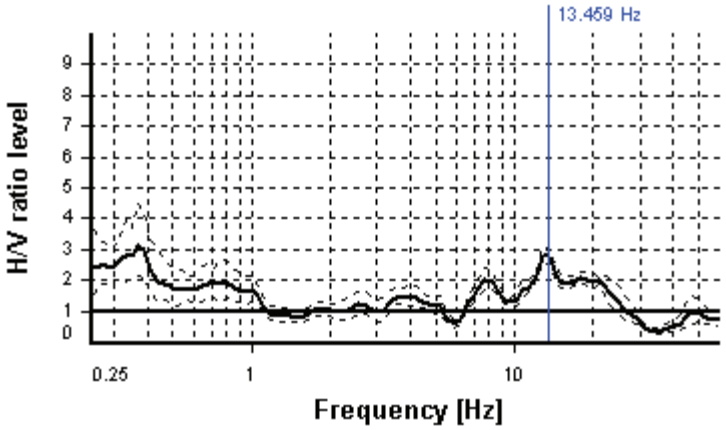
SESAME CRITERIA

Selected f_0 frequency

13.459 Hz

A_0 amplitude = *2.786*

Average f_0 = *13.148 ± 0.372*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	14 valid windows (length > 0.74 s) out of 14	OK
$n_c(f_0) > 200$	7536.87 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	9.65489 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	24.74404 Hz	OK
$A_0 > 2$	2.79 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.37224 < 0.67293	OK
$\sigma_A(f_0) < \theta(f_0)$	1.08899 < 1.58	OK
Overall criteria fulfillment		OK

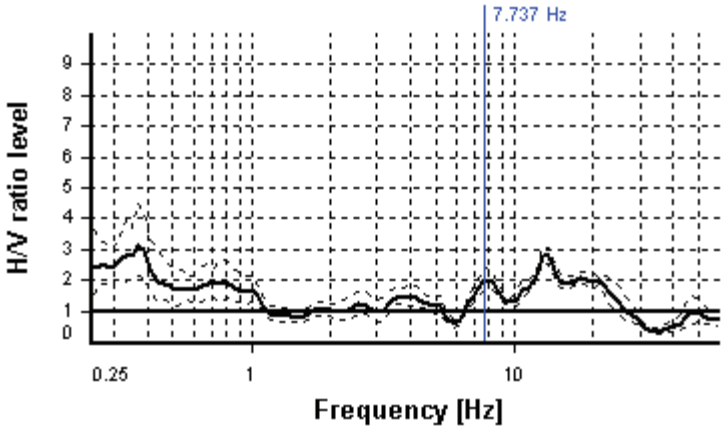
SESAME CRITERIA

Selected f_0 frequency

7.737 Hz

A_0 amplitude = *2.020*

Average f_0 = *8.239 ± 1.116*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	14 valid windows (length > 1.29 s) out of 14	OK
$n_c(f_0) > 200$	4332.77 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	6.20022 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	27.64113 Hz	OK
$A_0 > 2$	2.02 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.11568 >= 0.38685	NO
$\sigma_A(f_0) < \theta(f_0)$	1.20131 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 9 - (HVSR 786)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Ponte al Moso

Address: Via Moso

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 42.2 m s.l.m.

Weather: -

Notes: -

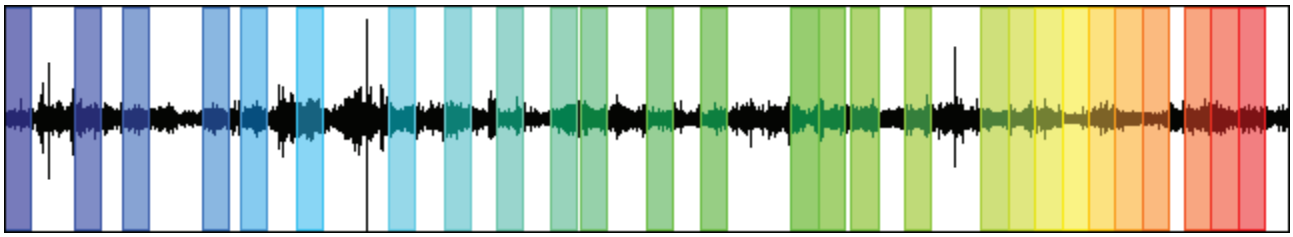
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/11 15:28:14
Recording length:	32 min
Windows count:	27
Average windows length:	40
Signal coverage:	56.25%

21261 Counts

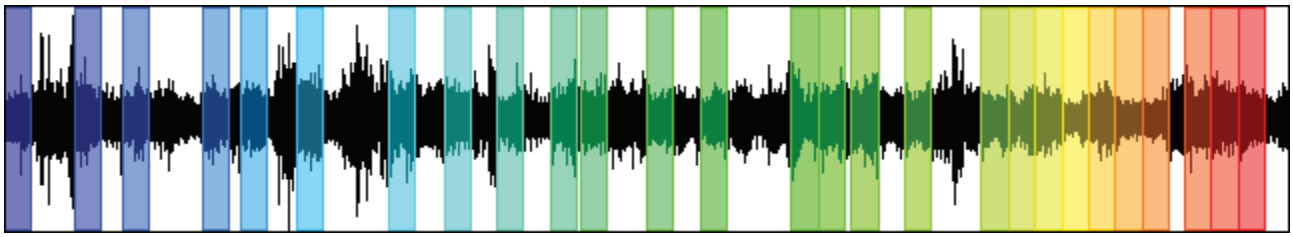
CHANNEL #1 [V]



-23986 Counts

7888 Counts

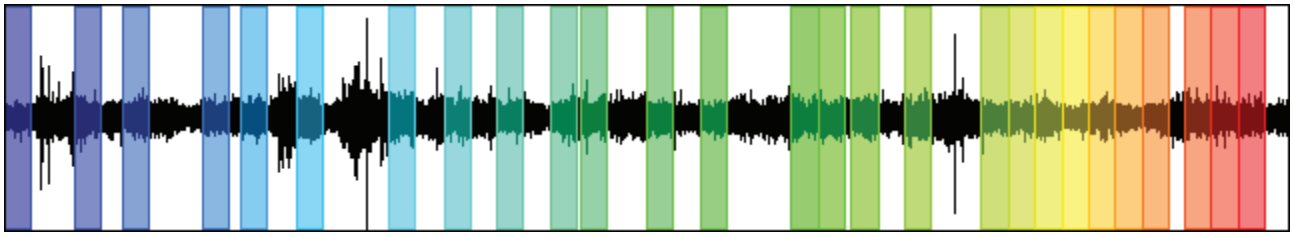
CHANNEL #2 [N]



-8437 Counts

12972 Counts

CHANNEL #3 [E]



-14470 Counts

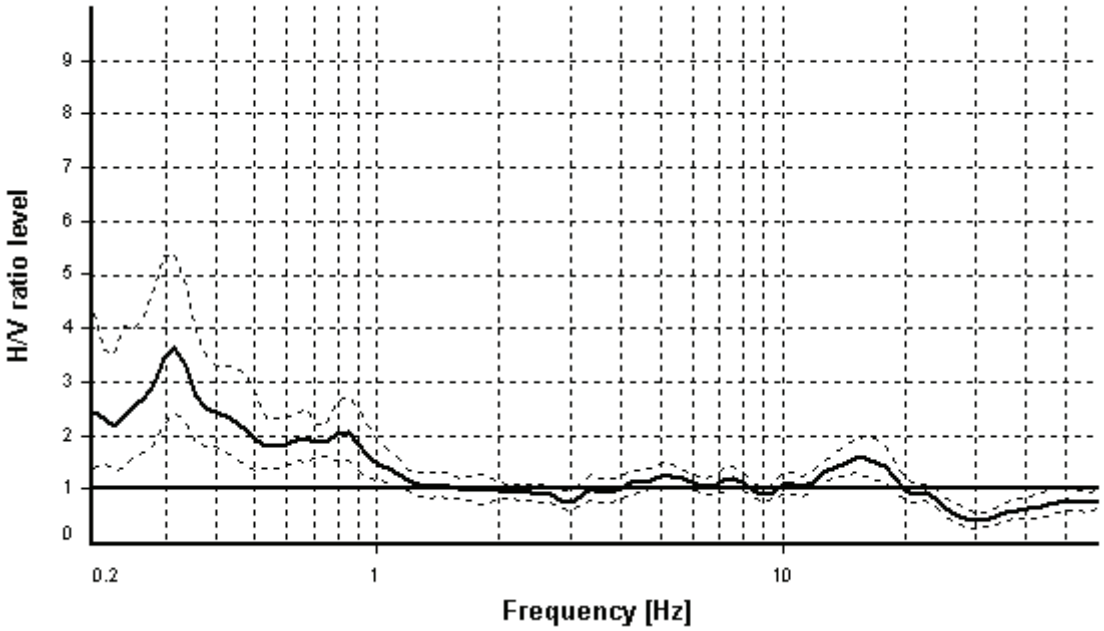
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

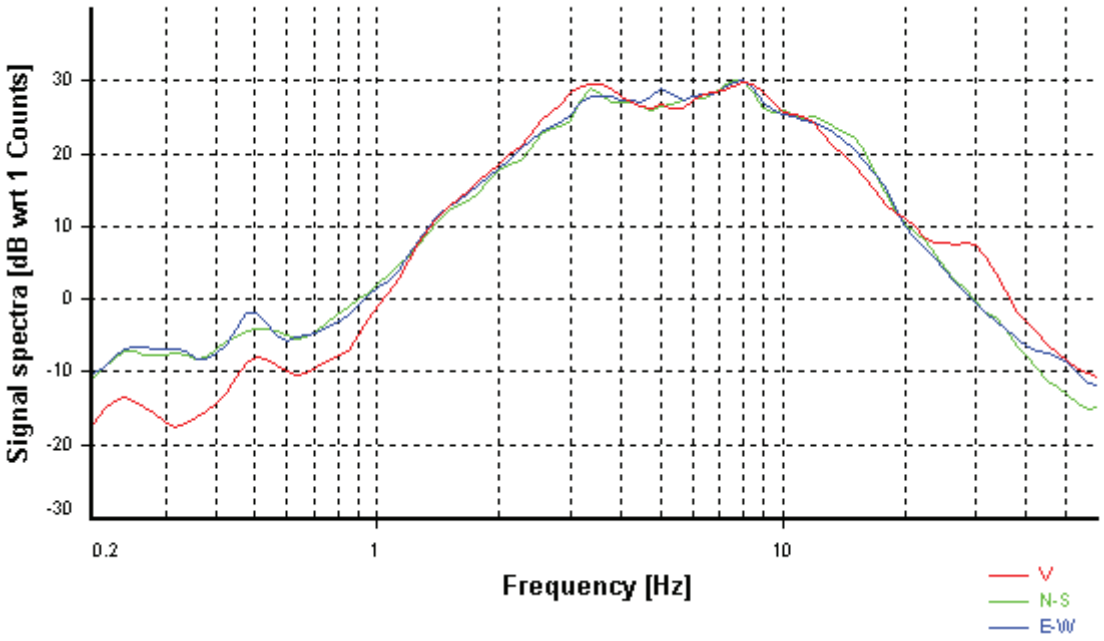
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

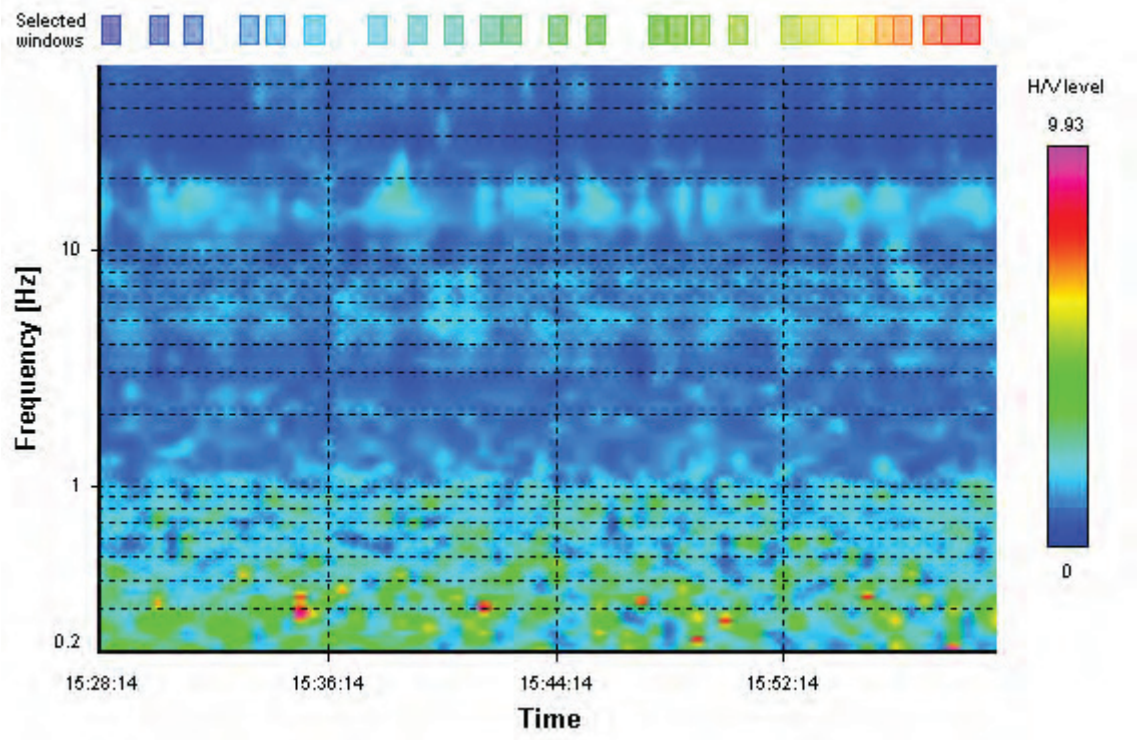
HVSR average



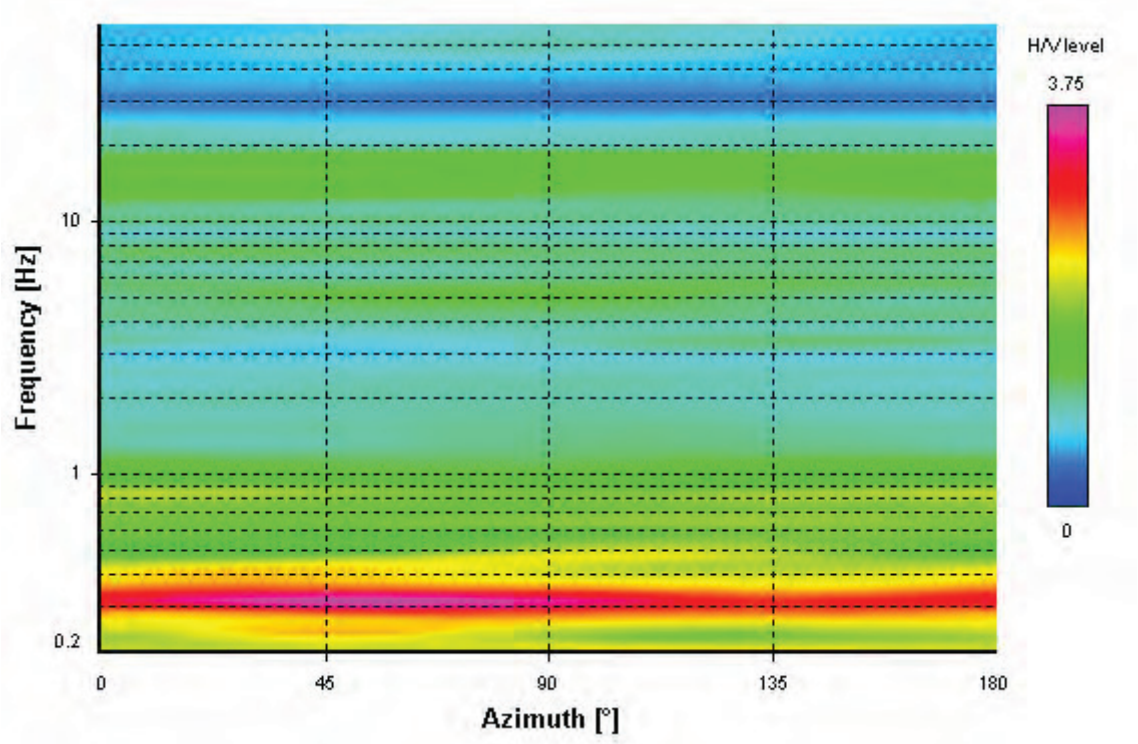
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



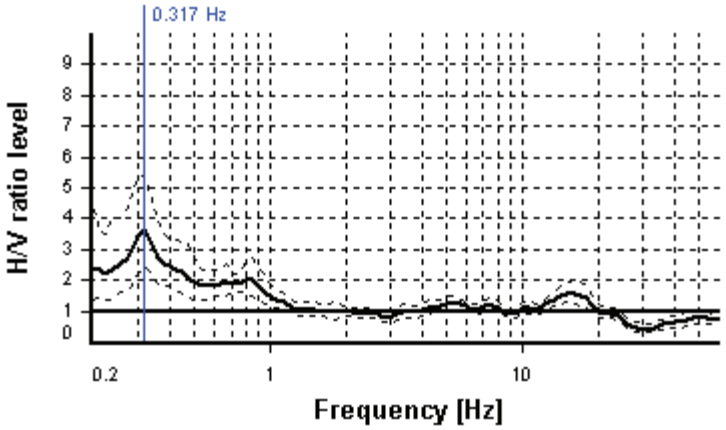
SESAME CRITERIA

Selected f_0 frequency

0.317 Hz

A_0 amplitude = *3.636*

Average f_0 = *0.325 ± 0.062*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	27 valid windows (length > 31.54 s) out of 27	OK
$n_c(f_0) > 200$	342.47 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 21	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	0.53259 Hz	OK
$A_0 > 2$	3.64 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.062 < 0.06342	OK
$\sigma_A(f_0) < \theta(f_0)$	1.48545 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 7 - (HVSR 787)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Asnelli

Address: -

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 48.0 m s.l.m.

Weather: -

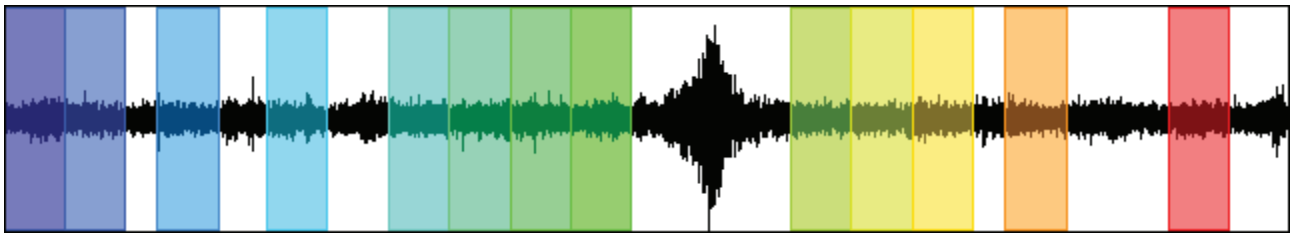
Notes: -

PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

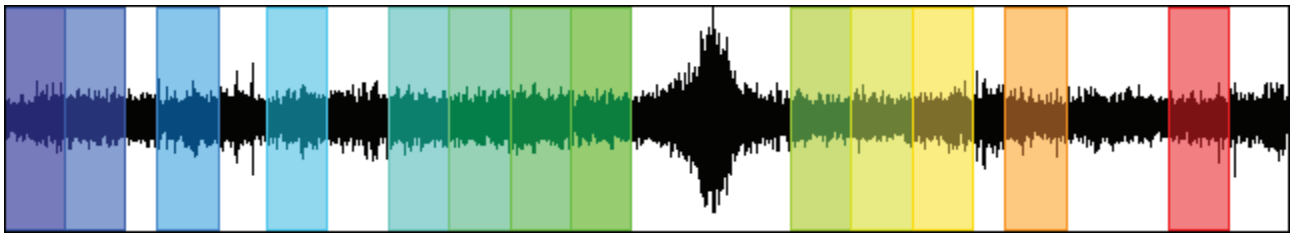
Sampling frequency:	300 Hz
Recording start time:	2015/03/18 14:40:45
Recording length:	14.15 min
Windows count:	13
Average windows length:	40
Signal coverage:	61.25%

5560 Counts **CHANNEL #1 [V]**



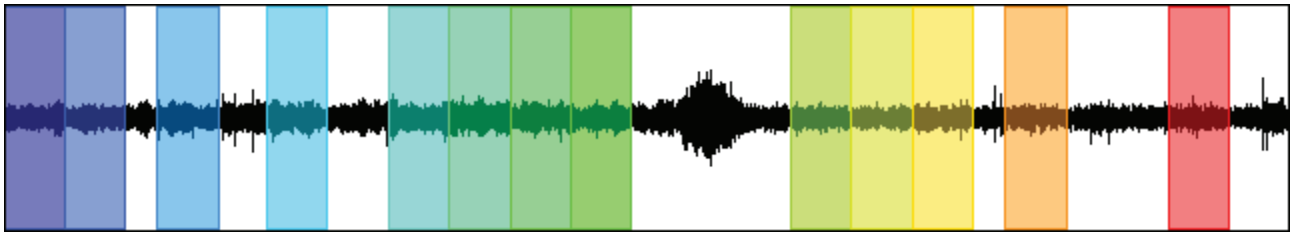
-6631 Counts

5506 Counts **CHANNEL #2 [N]**



-4657 Counts

13400 Counts **CHANNEL #3 [E]**



-12528 Counts

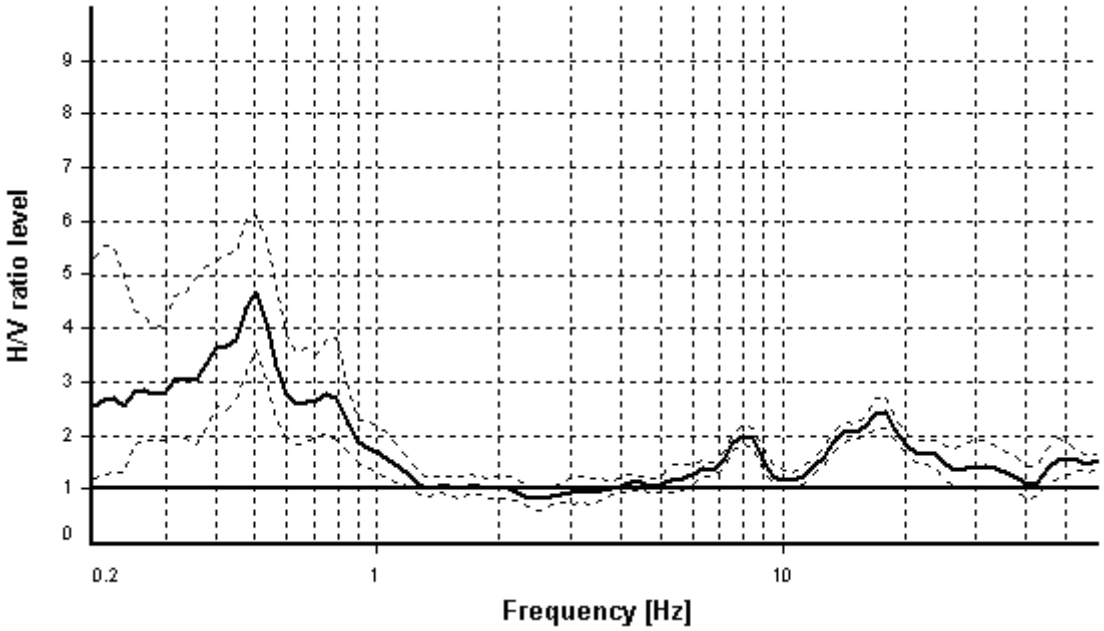
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

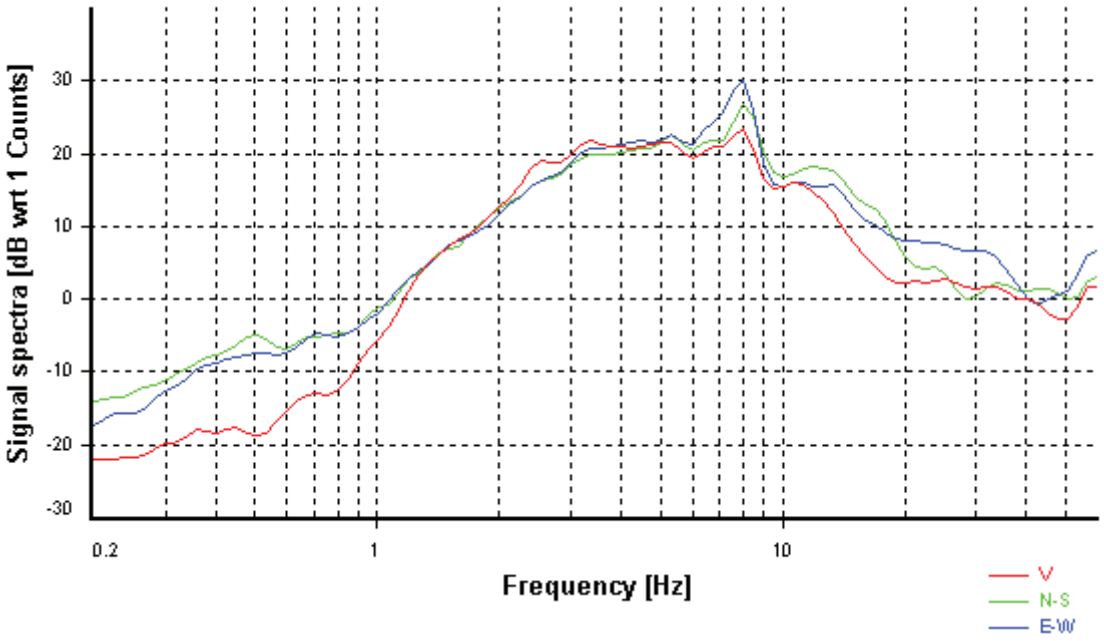
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

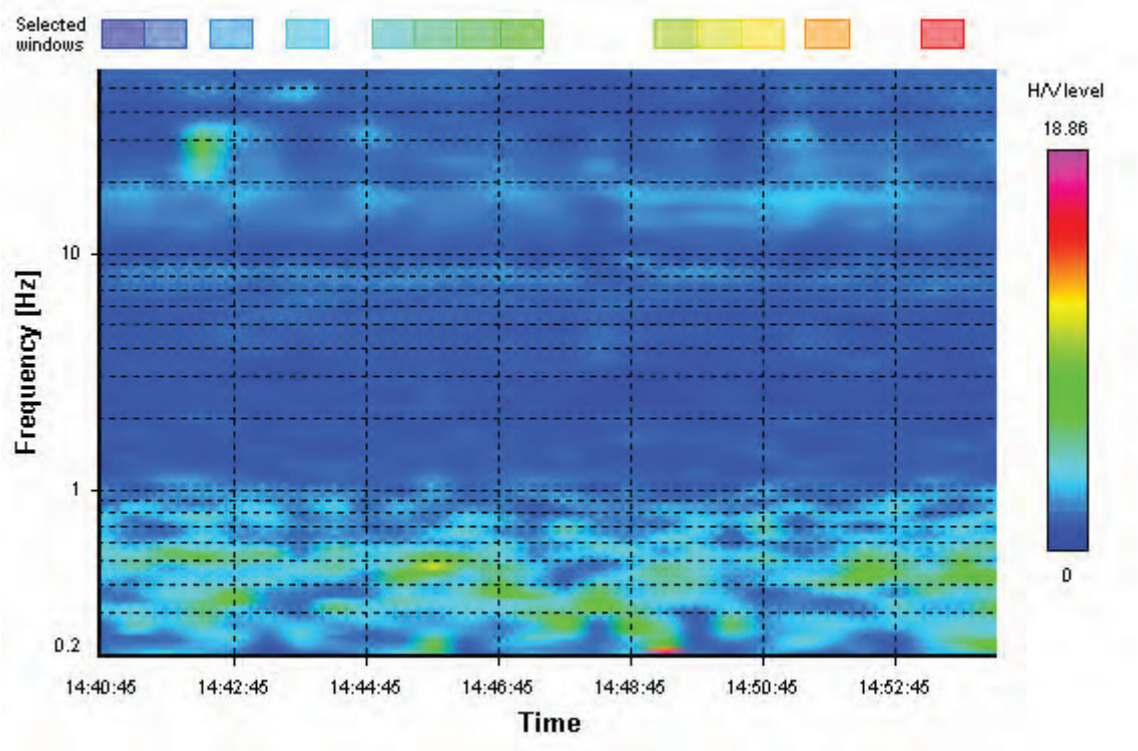
HVSR average



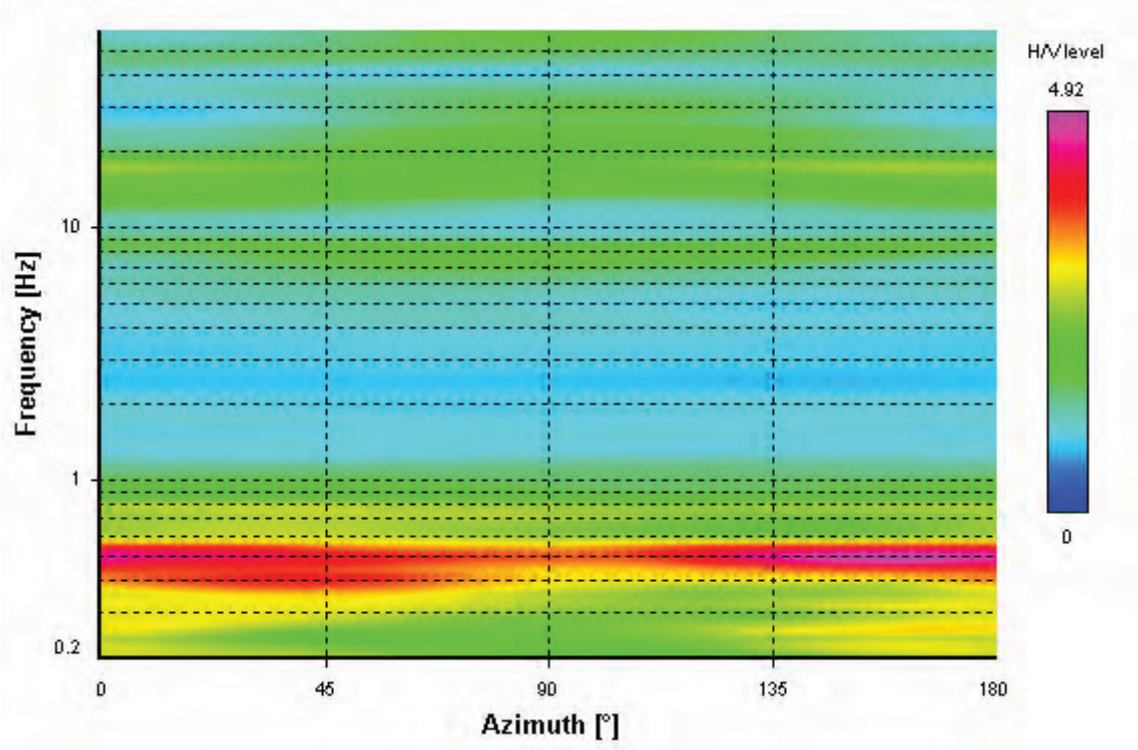
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



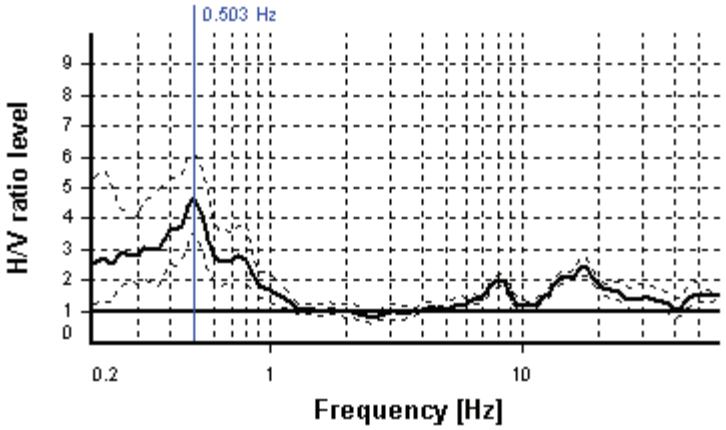
SESAME CRITERIA

Selected f_0 frequency

0.503 Hz

A_0 amplitude = *4.679*

Average f_0 = *0.454 ± 0.073*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	13 valid windows (length > 19.89 s) out of 13	OK
$n_c(f_0) > 200$	261.44 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	0.84443 Hz	OK
$A_0 > 2$	4.68 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.07334 < 0.07542	OK
$\sigma_A(f_0) < \theta(f_0)$	1.3081 < 2	OK
Overall criteria fulfillment		OK

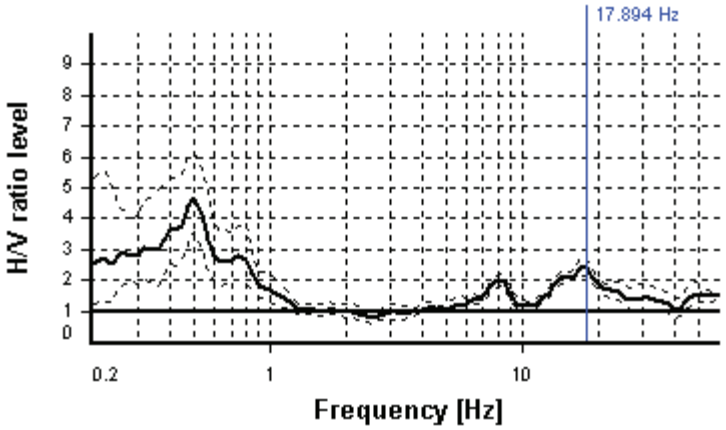
SESAME CRITERIA

Selected f_0 frequency

17.894 Hz

A_0 amplitude = *2.432*

Average f_0 = *17.968 ± 1.840*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	13 valid windows (length > 0.56 s) out of 13	OK
$n_c(f_0) > 200$	9304.75 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	10.6539 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	37.8425 Hz	OK
$A_0 > 2$	2.43 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.84013 >= 0.89469	NO
$\sigma_A(f_0) < \theta(f_0)$	1.12937 < 1.58	OK
Overall criteria fulfillment		OK

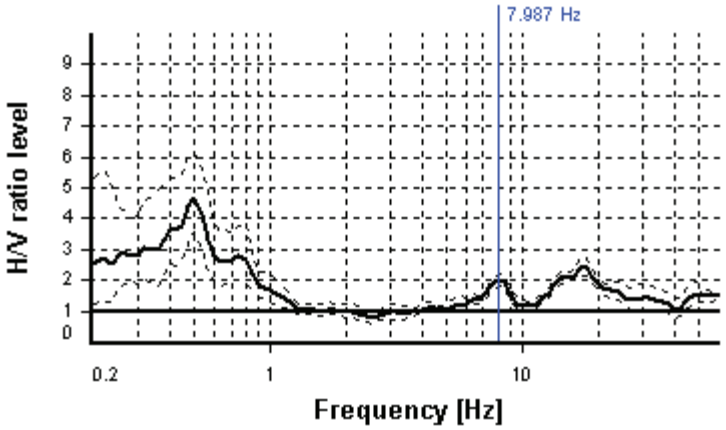
SESAME CRITERIA

Selected f_0 frequency

7.987 Hz

A_0 amplitude = *2.002*

Average f_0 = *8.062 ± 0.258*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	13 valid windows (length > 1.25 s) out of 13	OK
$n_c(f_0) > 200$	4153.41 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	3.56534 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	0 Hz	NO
$A_0 > 2$	2 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.25823 < 0.39937	OK
$\sigma_A(f_0) < \theta(f_0)$	1.09828 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 6 - (HVSR 788)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Spedalino

Address: Via Giovannella

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 44.4 m s.l.m.

Weather: -

Notes: -

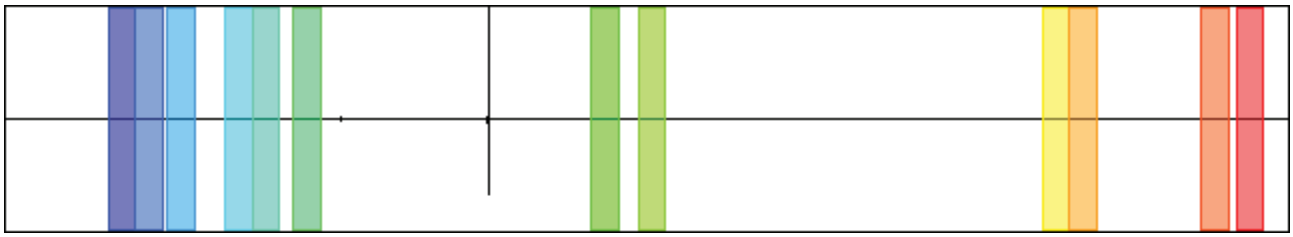
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/18 15:21:50
Recording length:	31.68 min
Windows count:	12
Average windows length:	40
Signal coverage:	25.25%

5494588 Counts

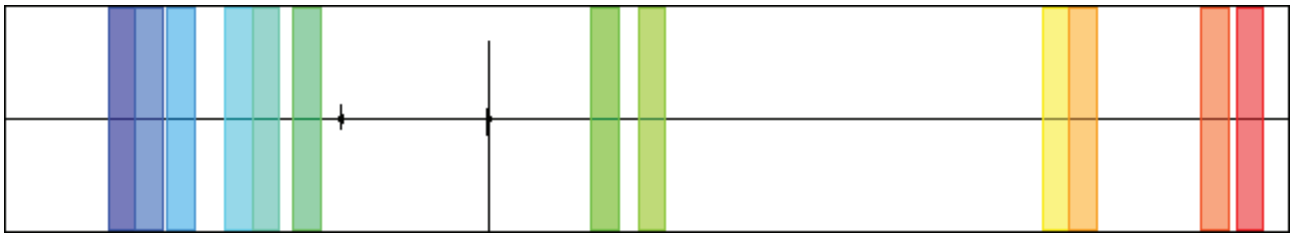
CHANNEL #1 [V]



-3715105 Counts

2565764 Counts

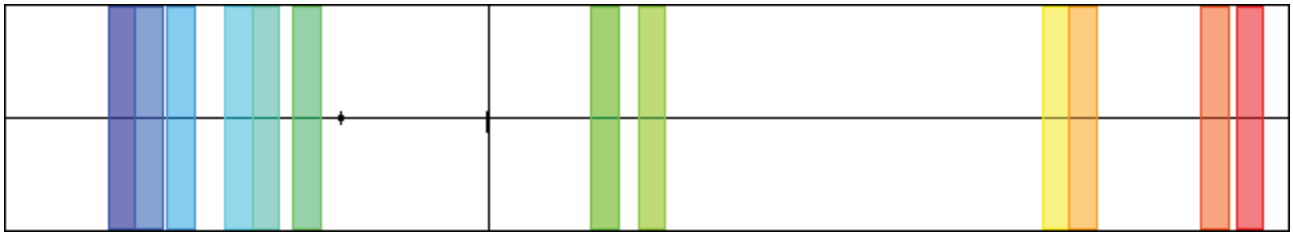
CHANNEL #2 [N]



-3699992 Counts

8385278 Counts

CHANNEL #3 [E]



-8399541 Counts

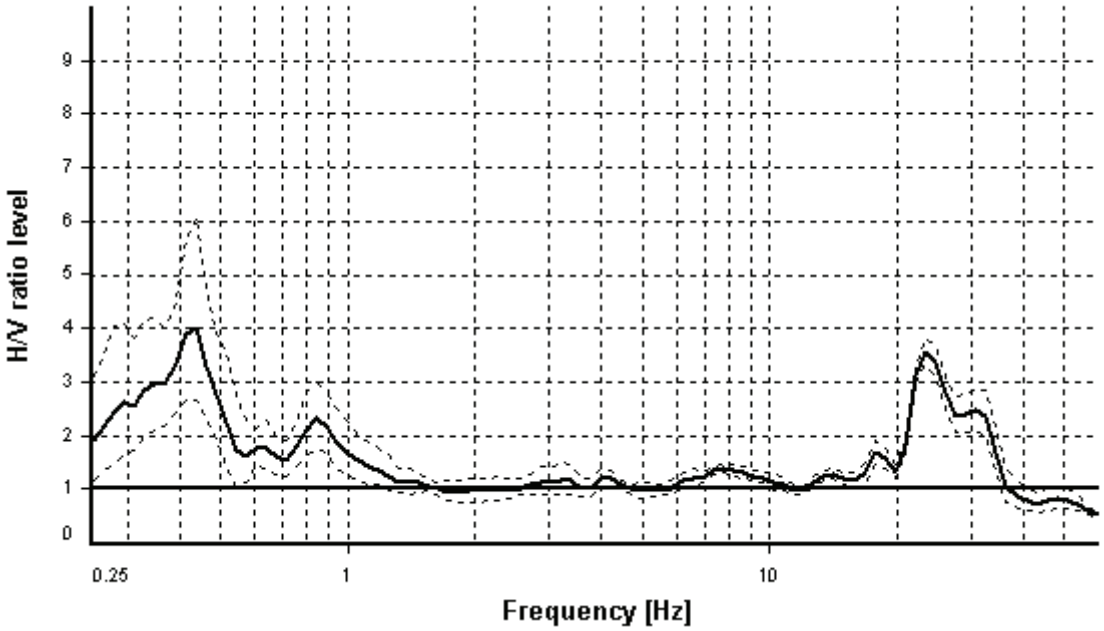
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

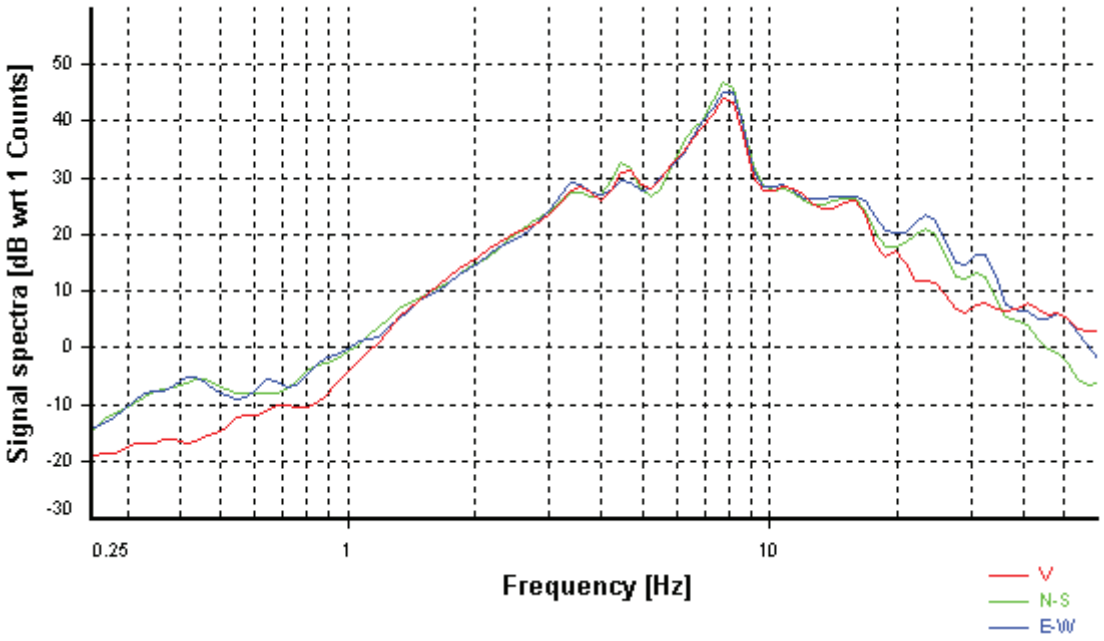
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

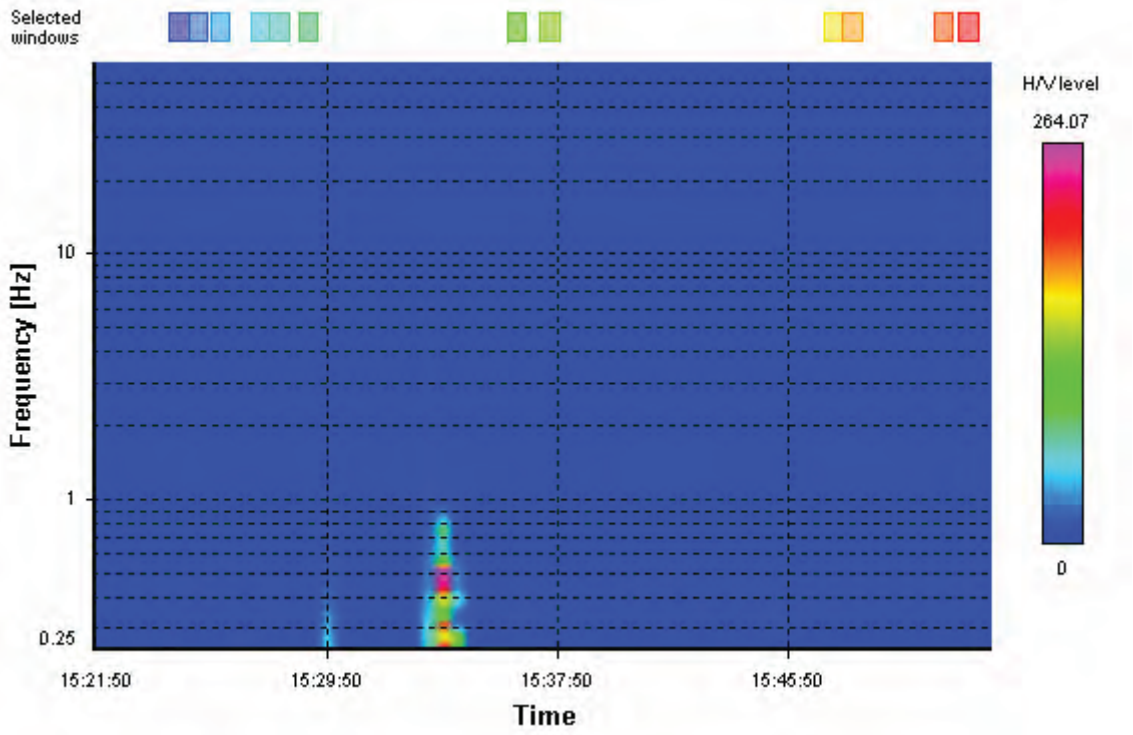
HVSR average



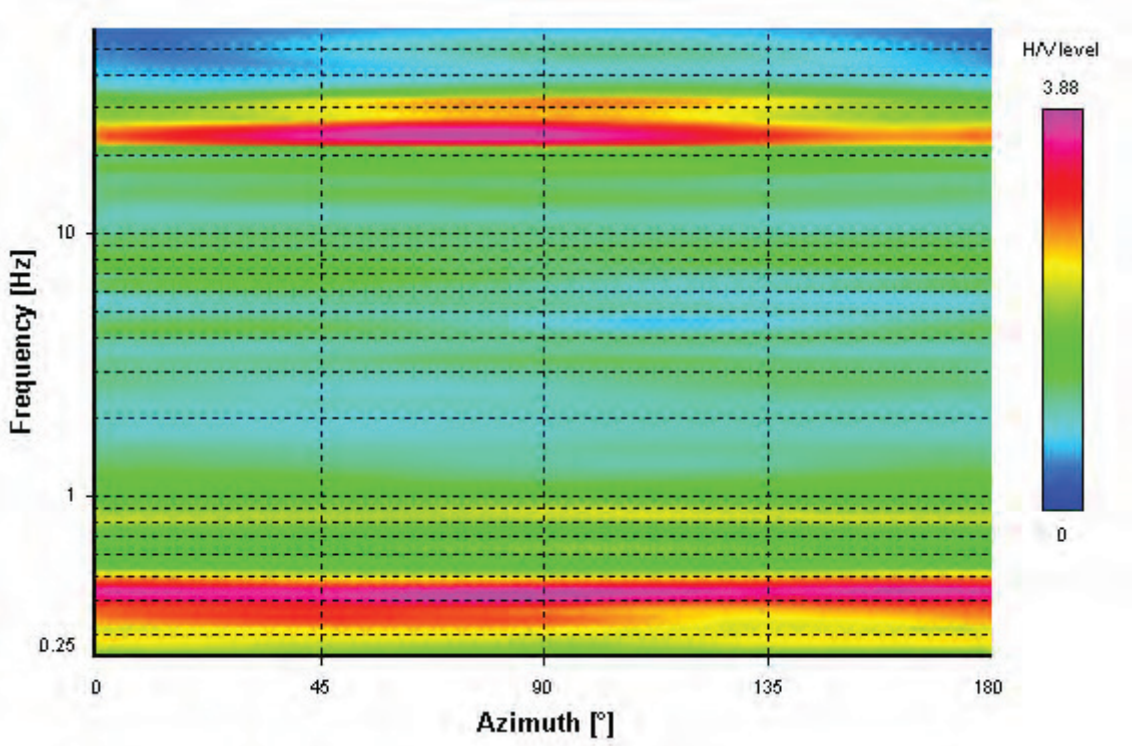
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



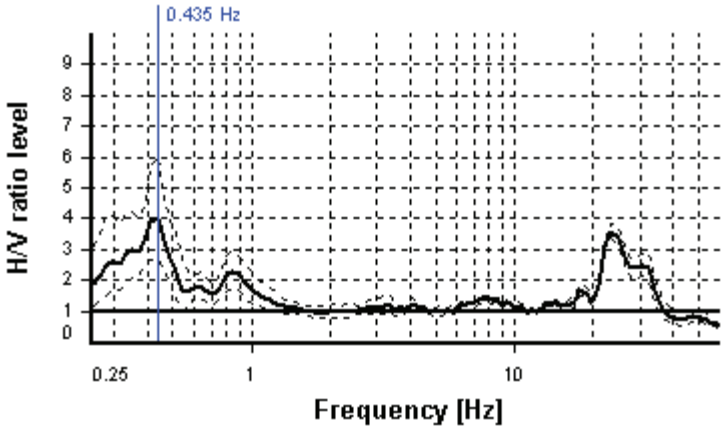
SESAME CRITERIA

Selected f_0 frequency

0.435 Hz

A_0 amplitude = *4.019*

Average f_0 = *0.410 ± 0.045*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	12 valid windows (length > 23 s) out of 12	OK
$n_c(f_0) > 200$	208.74 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 23	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0.25 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	0.54267 Hz	OK
$A_0 > 2$	4.02 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.04519 < 0.08698	OK
$\sigma_A(f_0) < \theta(f_0)$	1.50786 < 2.5	OK
Overall criteria fulfillment		OK

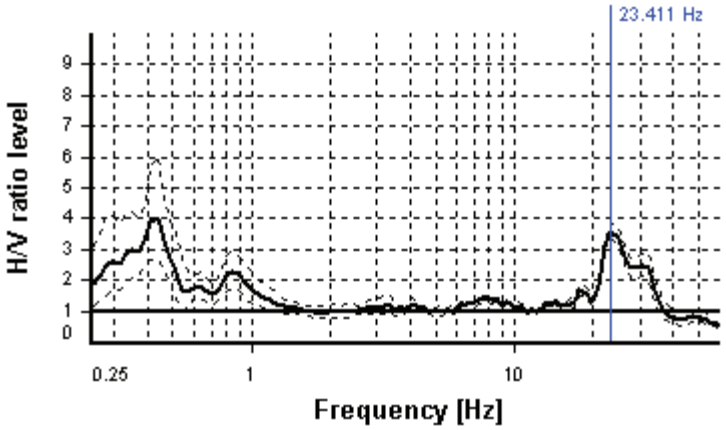
SESAME CRITERIA

Selected f_0 frequency

23.411 Hz

A_0 amplitude = *3.566*

Average f_0 = *23.411 ± 0.000*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	12 valid windows (length > 0.43 s) out of 12	OK
$n_c(f_0) > 200$	11237.49 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	19.82899 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	34.4926 Hz	OK
$A_0 > 2$	3.57 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0 < 1.17057	OK
$\sigma_A(f_0) < \theta(f_0)$	1.06632 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 14 - (HVSR 789)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Agliana centro

Address: Via Livorno

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41,0 m s.l.m.

Weather: -

Notes: -

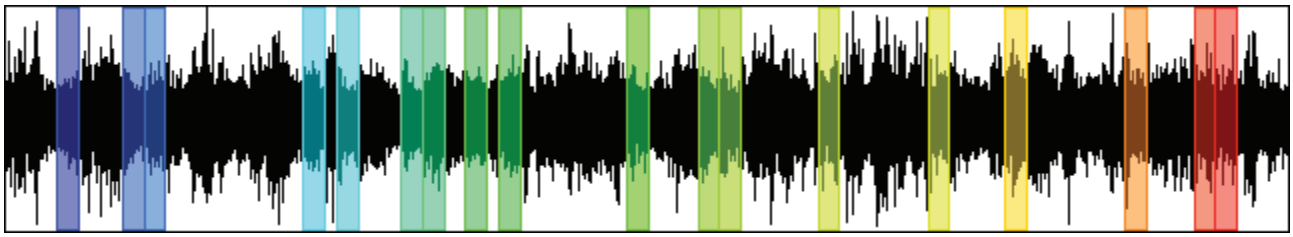
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/03/18 10:55:08
Recording length:	30 min
Windows count:	18
Average windows length:	30
Signal coverage:	30%

9855 Counts

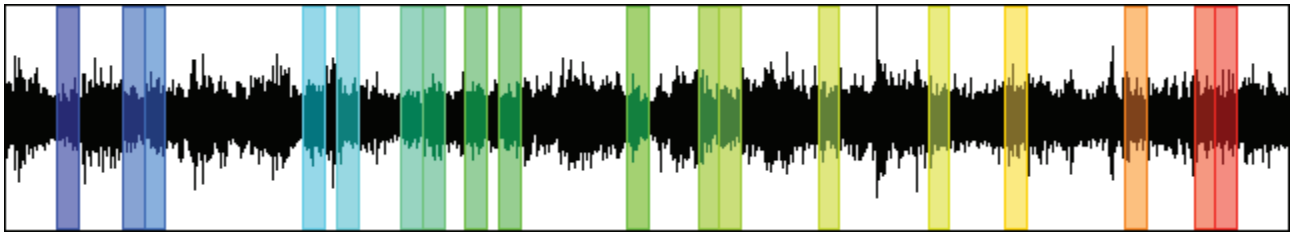
CHANNEL #1 [V]



-9434 Counts

16346 Counts

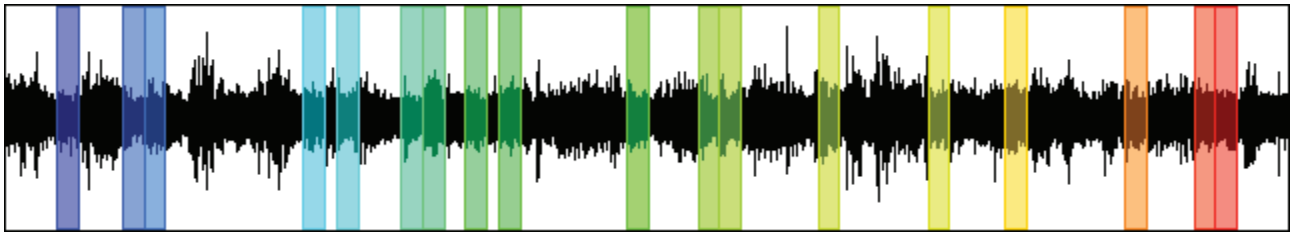
CHANNEL #2 [N]



-11543 Counts

13817 Counts

CHANNEL #3 [E]



-16769 Counts

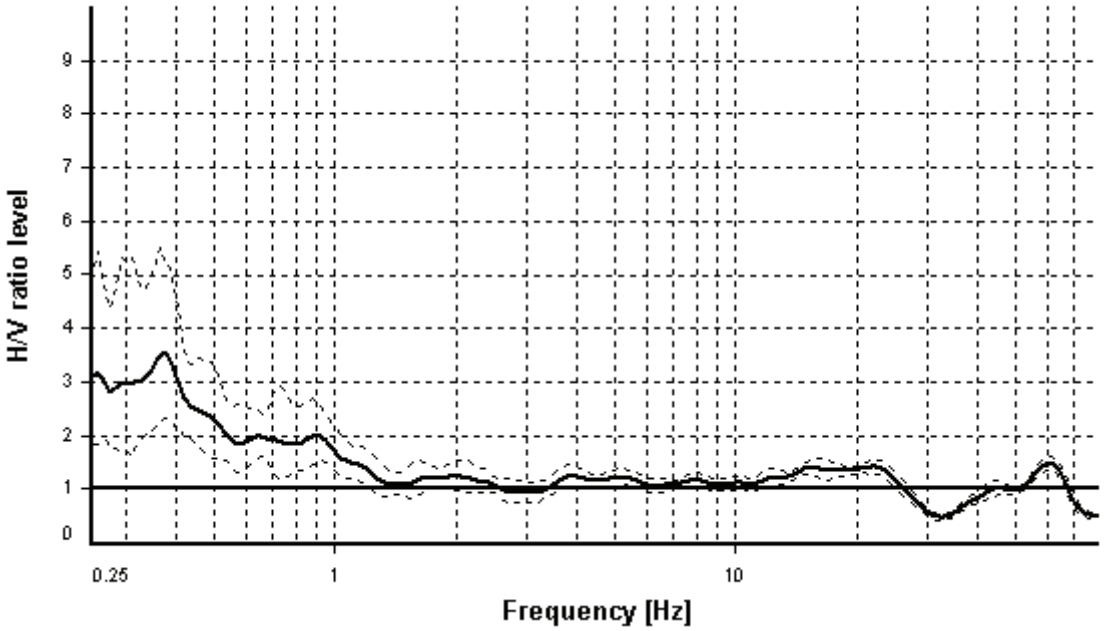
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

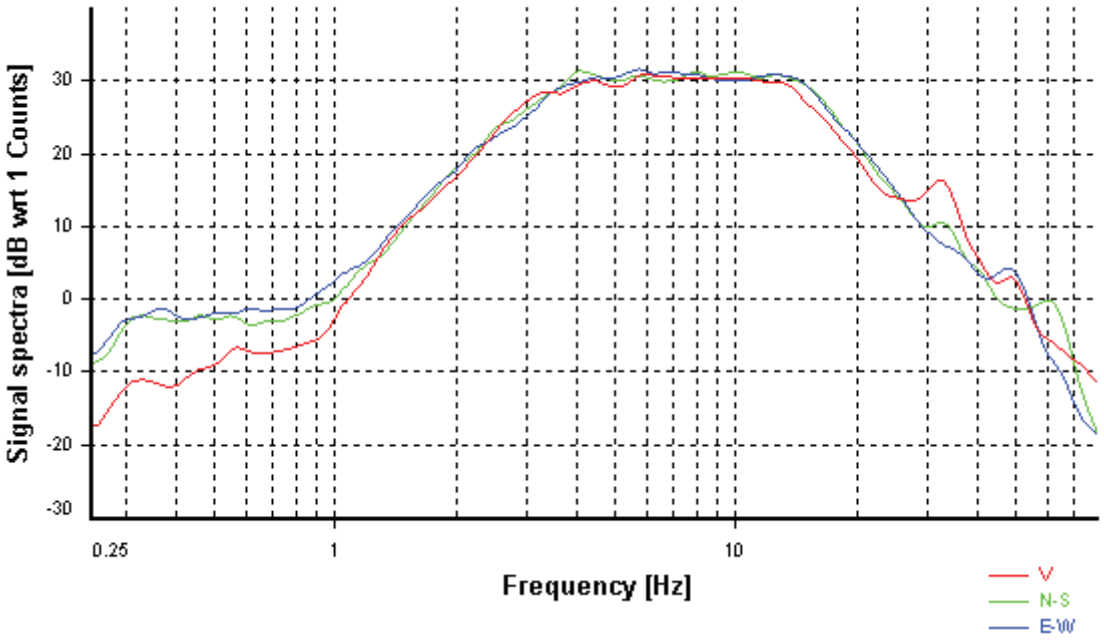
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

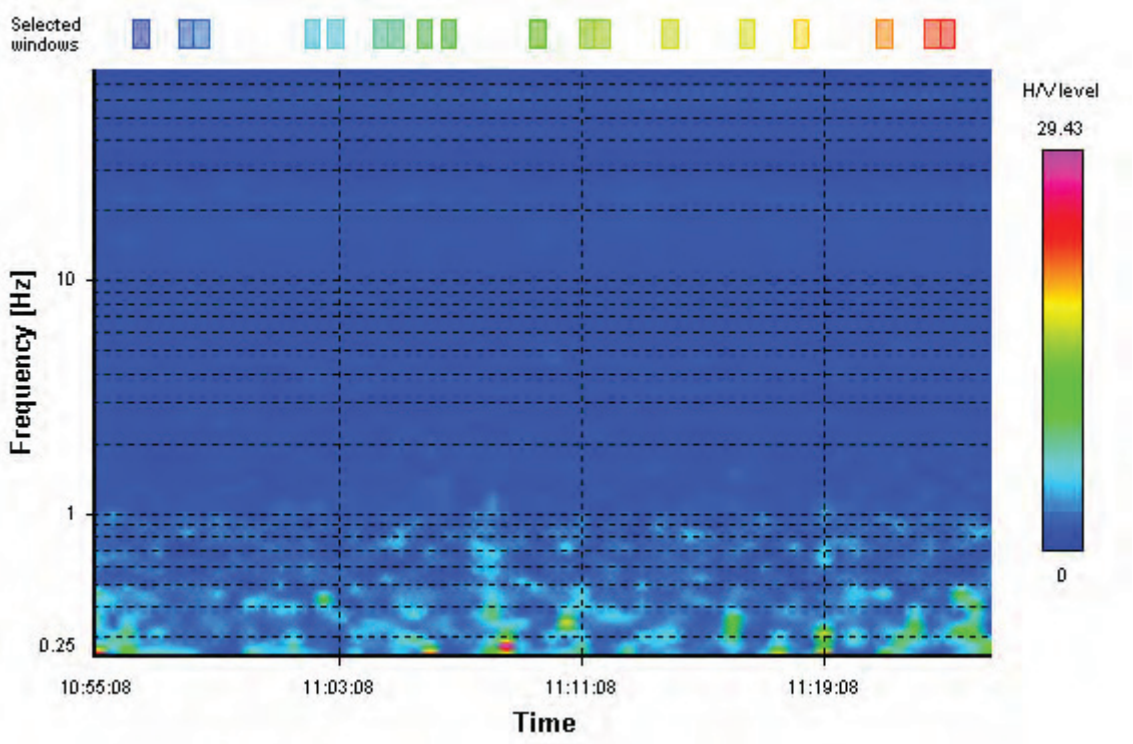
HVSR average



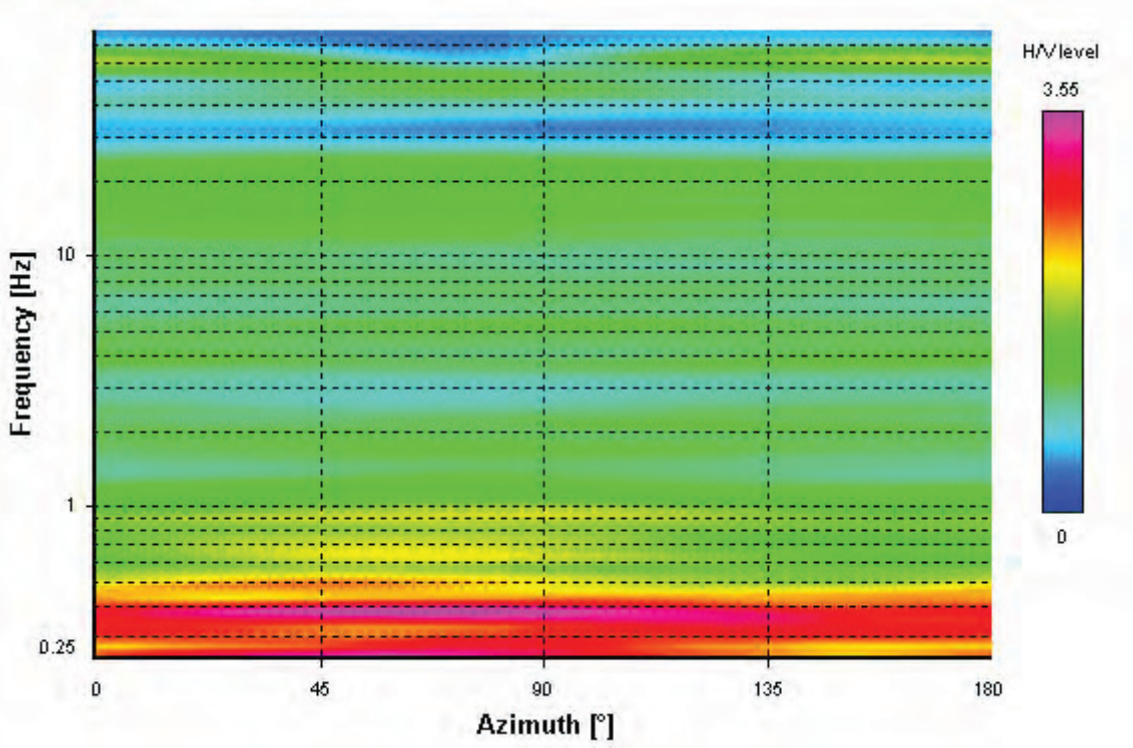
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



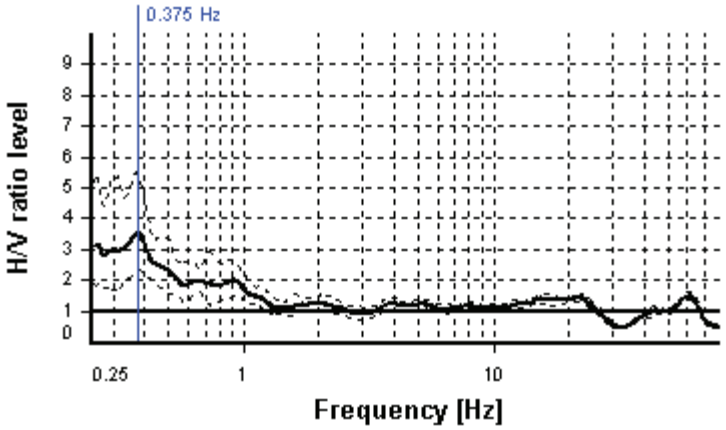
SESAME CRITERIA

Selected f_0 frequency

0.375 Hz

A_0 amplitude = *3.512*

Average f_0 = *0.339 ± 0.072*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	18 valid windows (length > 26.69 s) out of 18	OK
$n_c(f_0) > 200$	202.32 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 95	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	1.00088 Hz	OK
$A_0 > 2$	3.51 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	2.29% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.0718 < 0.07493	OK
$\sigma_A(f_0) < \theta(f_0)$	1.50979 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 5 - (HVSR 790)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Parco Pertini

Address: Via Serragliolo

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 44.0 m s.l.m.

Weather: -

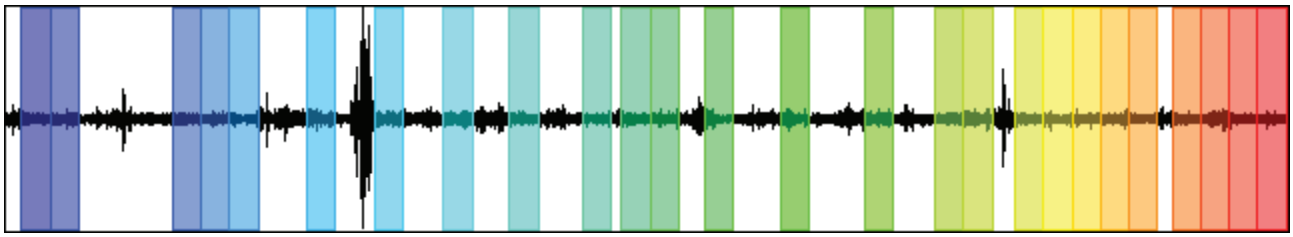
Notes: -

PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

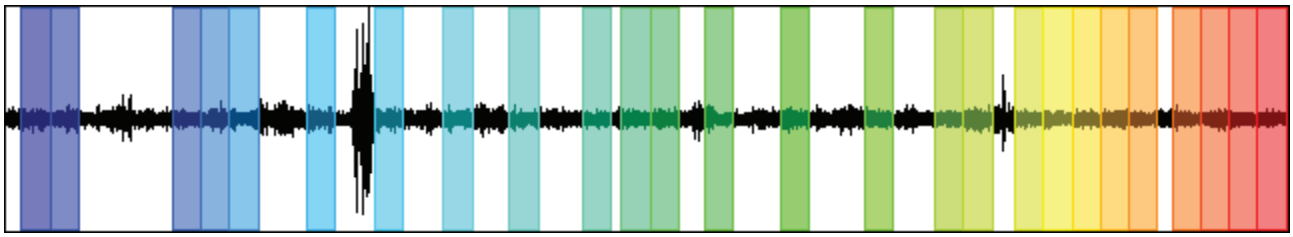
Sampling frequency:	300 Hz
Recording start time:	2015/03/18 11:47:50
Recording length:	30 min
Windows count:	26
Average windows length:	40
Signal coverage:	57.78%

47070 Counts **CHANNEL #1 [V]**



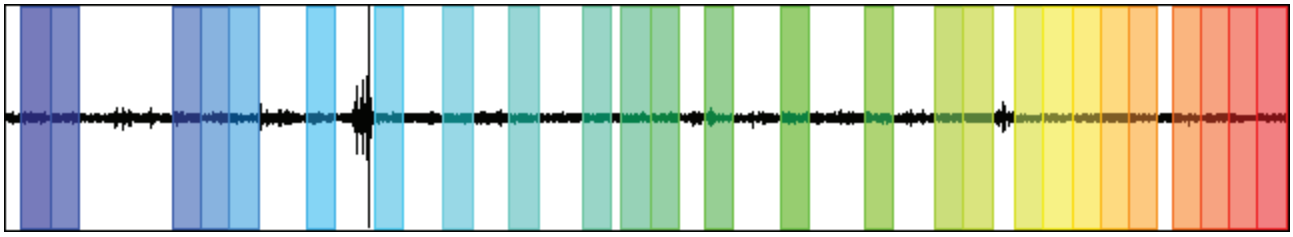
-46104 Counts

30693 Counts **CHANNEL #2 [N]**



-26567 Counts

56720 Counts **CHANNEL #3 [E]**



-55526 Counts

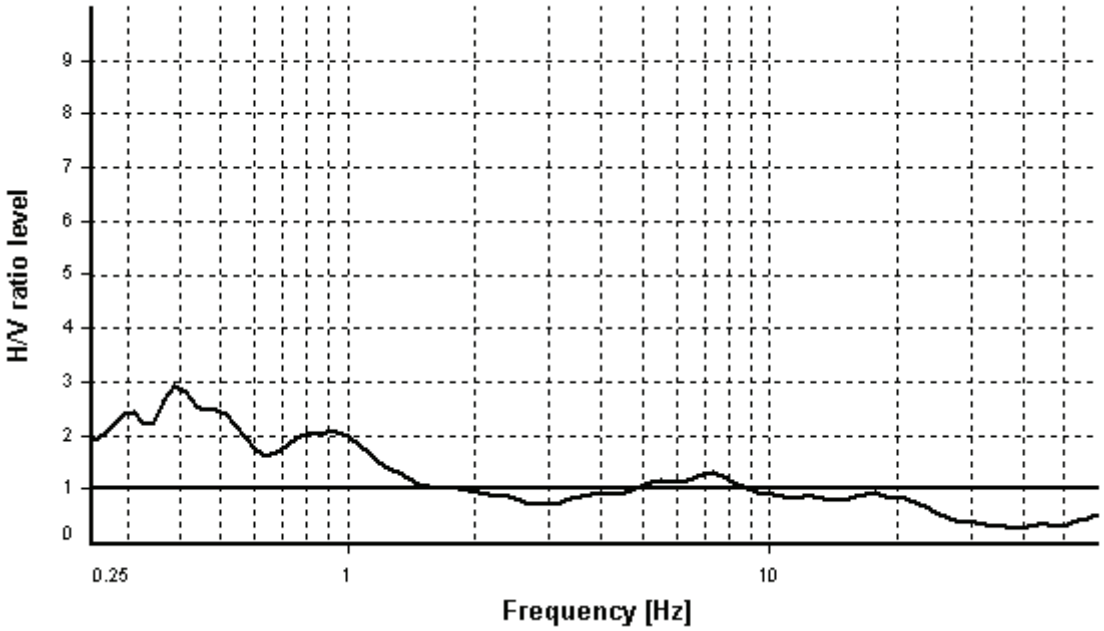
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

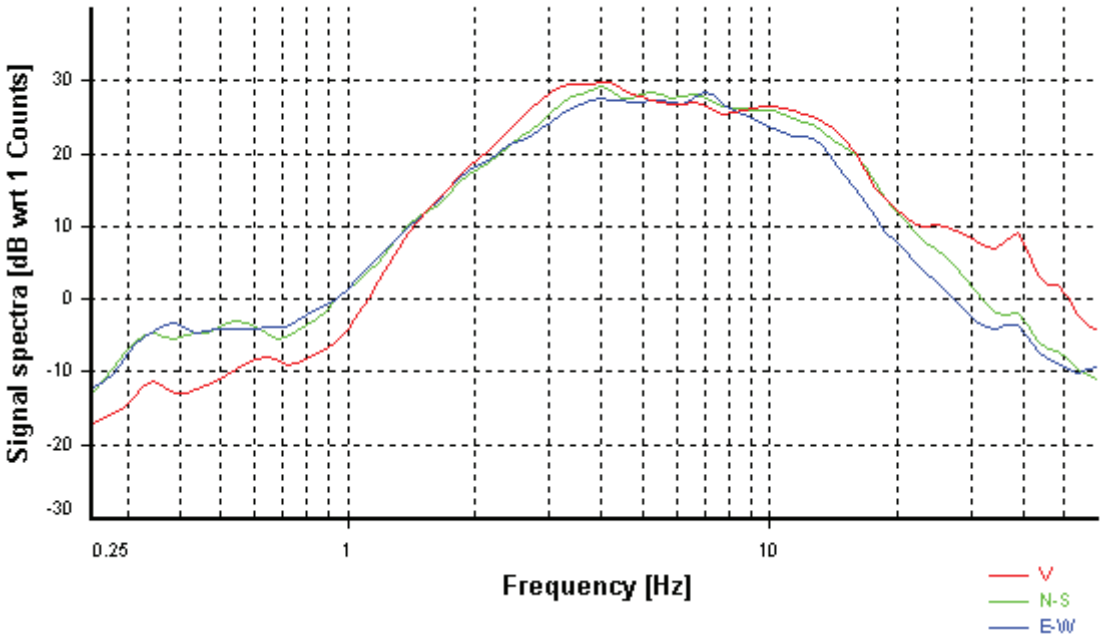
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

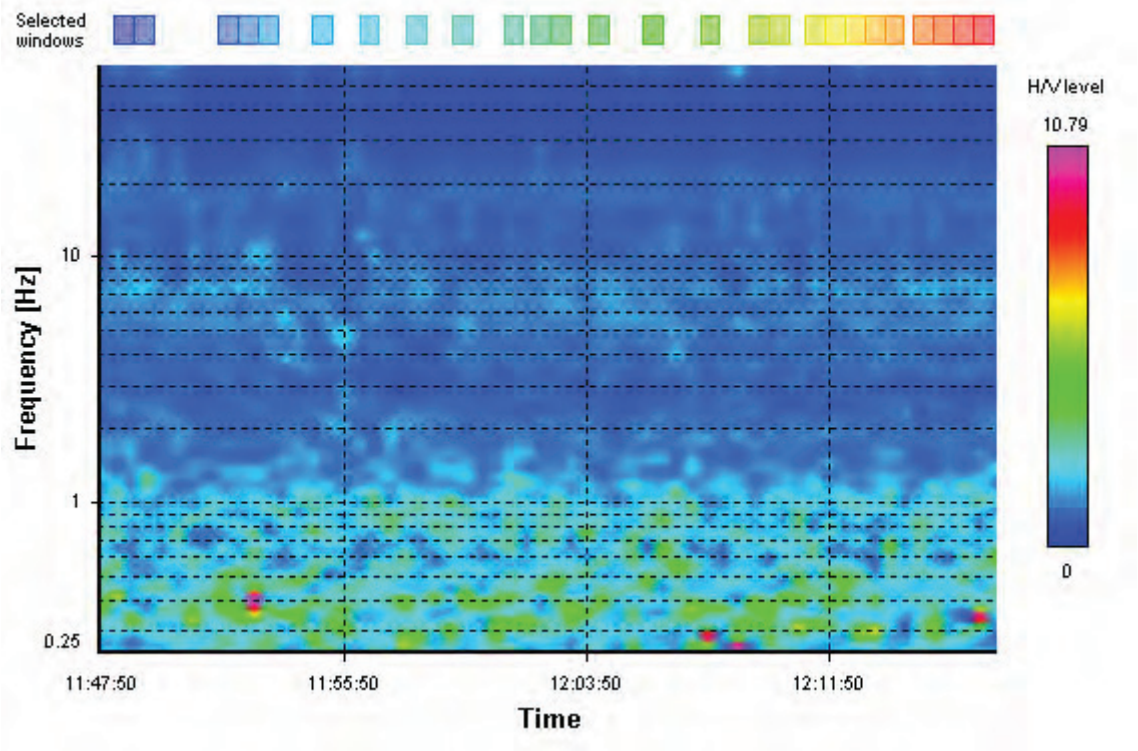
HVSR average



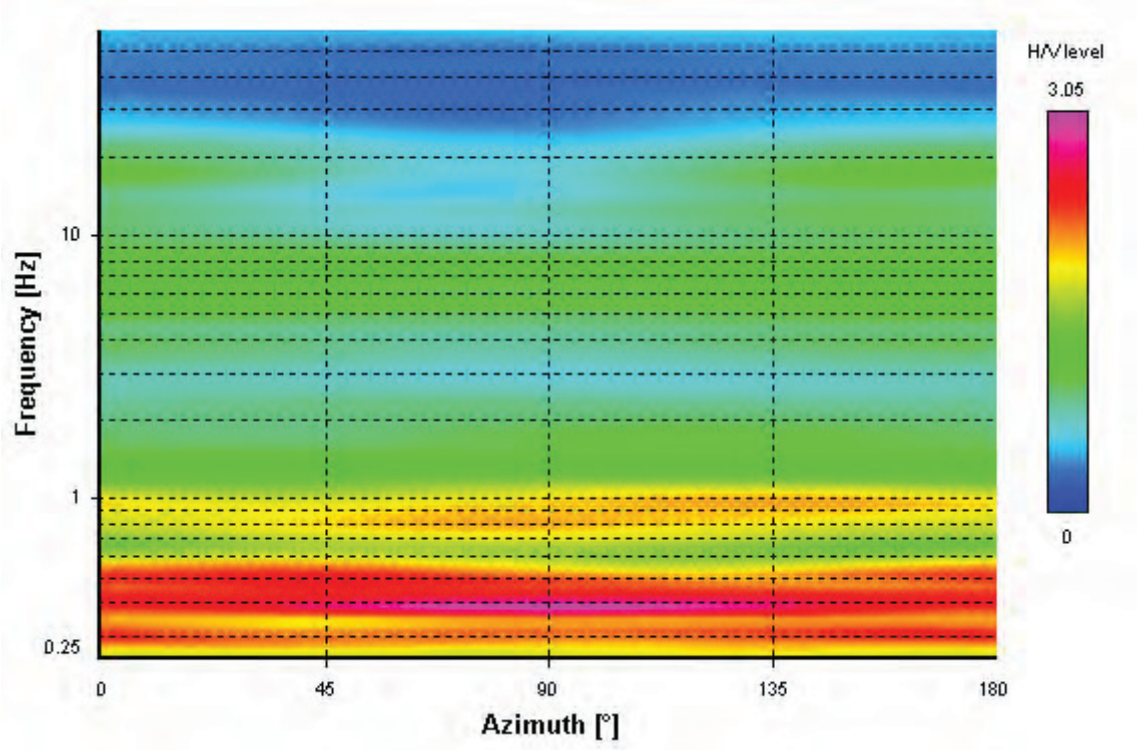
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



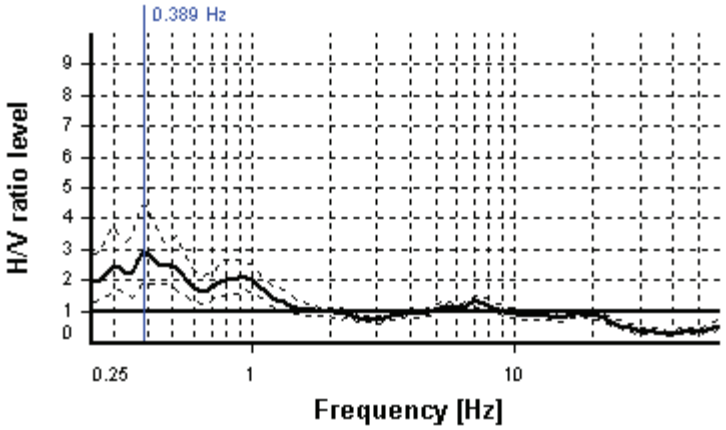
SESAME CRITERIA

Selected f_0 frequency

0.389 Hz

A_0 amplitude = *2.932*

Average f_0 = *0.389 ± 0.074*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	26 valid windows (length > 25.69 s) out of 26	OK
$n_c(f_0) > 200$	404.87 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 21	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	1.24501 Hz	OK
$A_0 > 2$	2.93 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.07448 < 0.07786	OK
$\sigma_A(f_0) < \theta(f_0)$	1.52147 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 12 - (HVSR 791)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: San Niccolò

Address: Via della Costituzione

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41.5 m s.l.m.

Weather: -

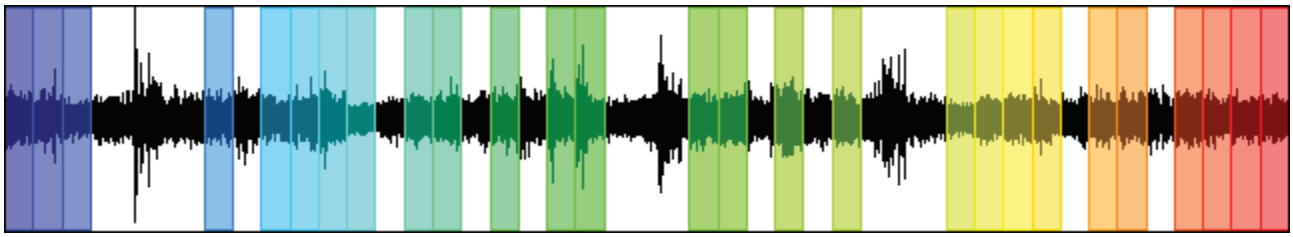
Notes: -

PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

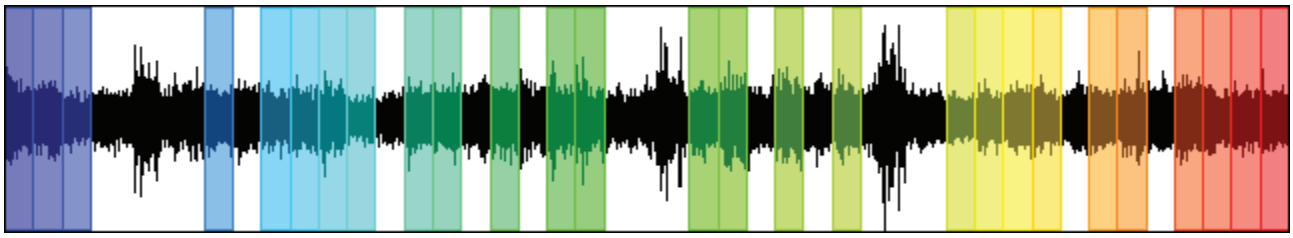
Sampling frequency:	300 Hz
Recording start time:	2015/03/18 12:33:53
Recording length:	30 min
Windows count:	27
Average windows length:	40
Signal coverage:	60%

21634 Counts **CHANNEL #1 [V]**



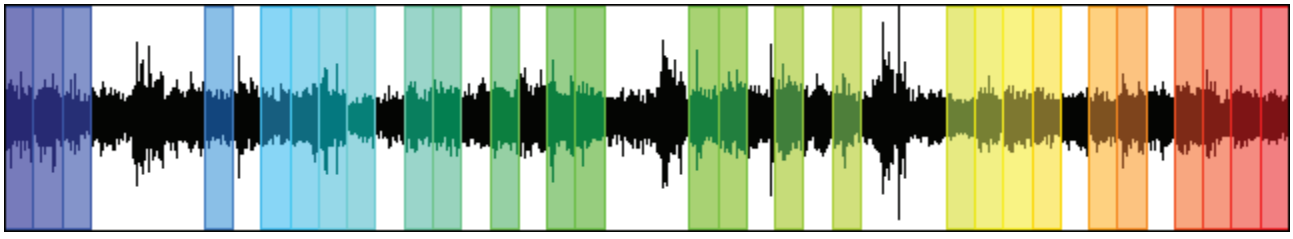
-20219 Counts

15681 Counts **CHANNEL #2 [N]**



-18682 Counts

23962 Counts **CHANNEL #3 [E]**



-21864 Counts

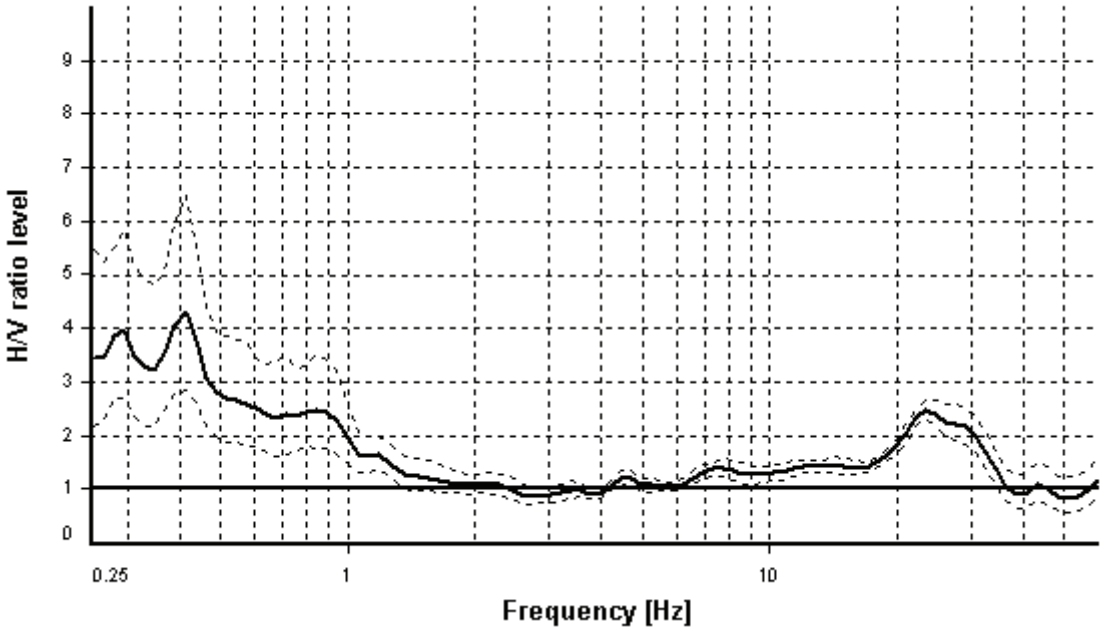
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

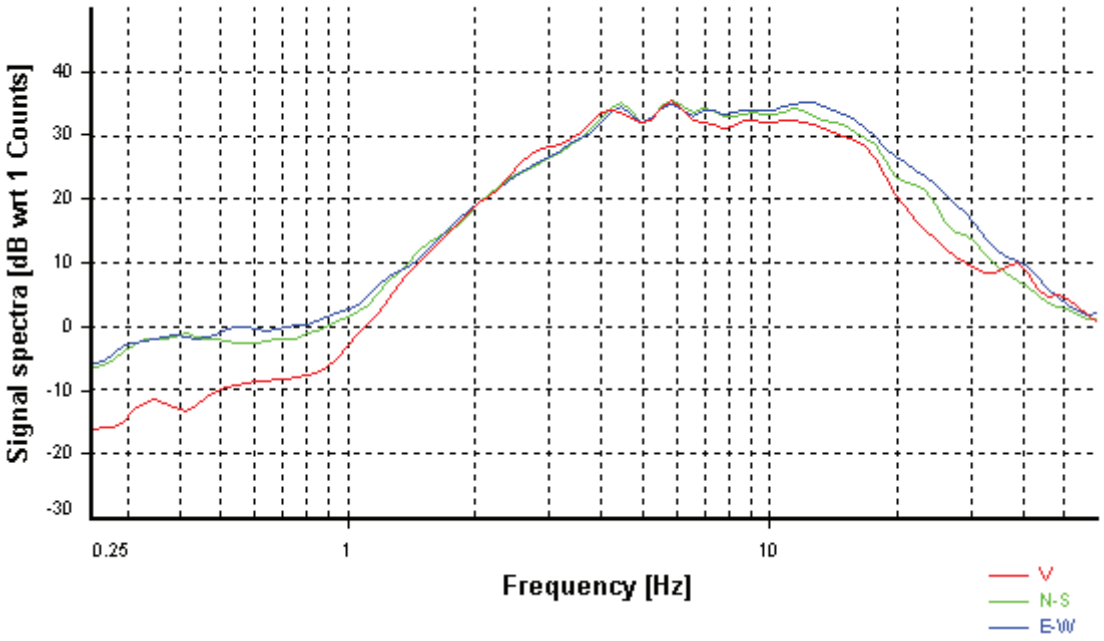
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

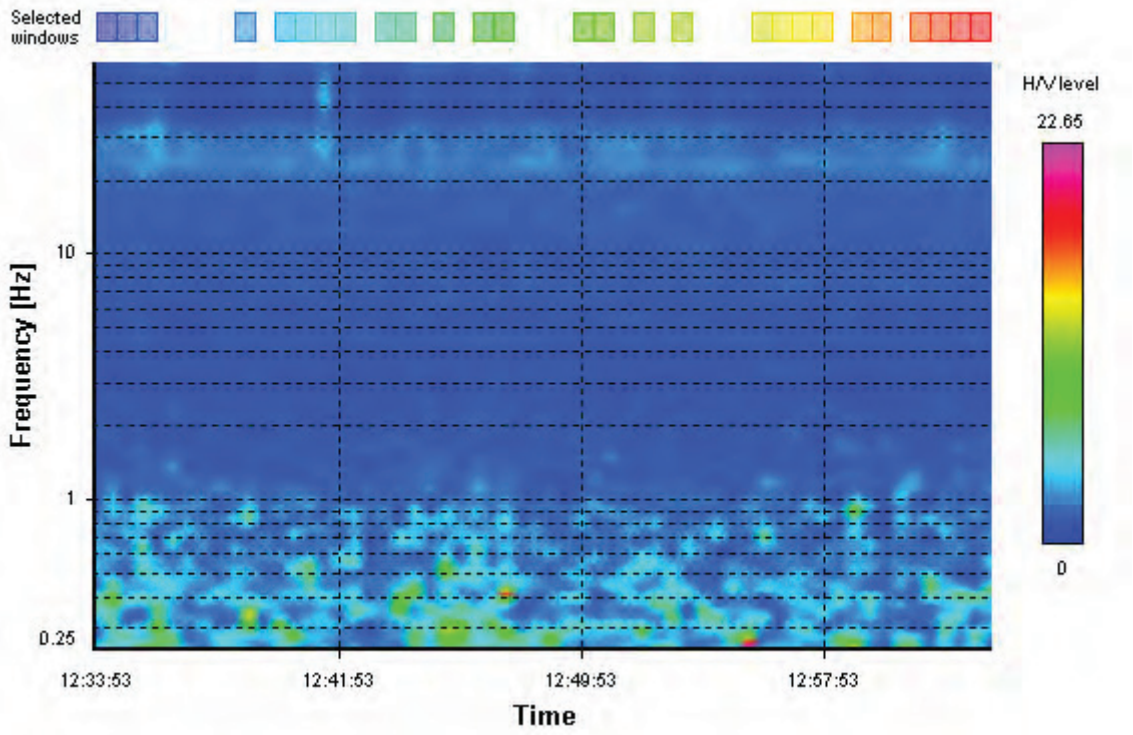
HVSR average



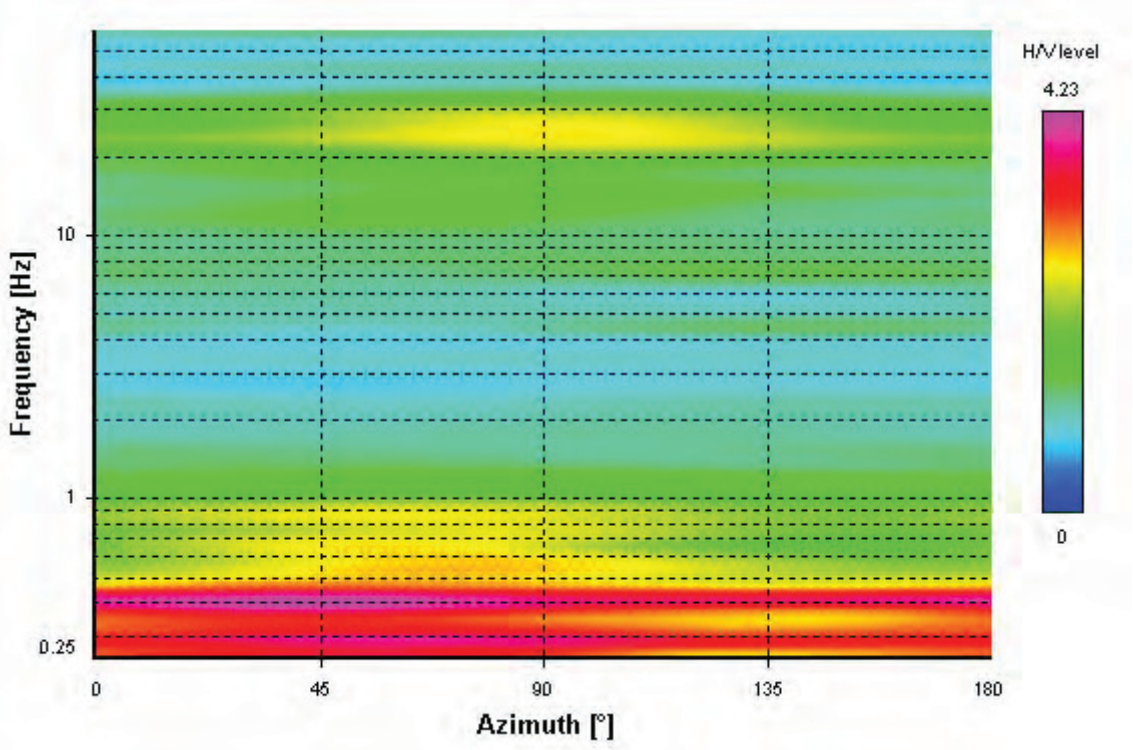
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



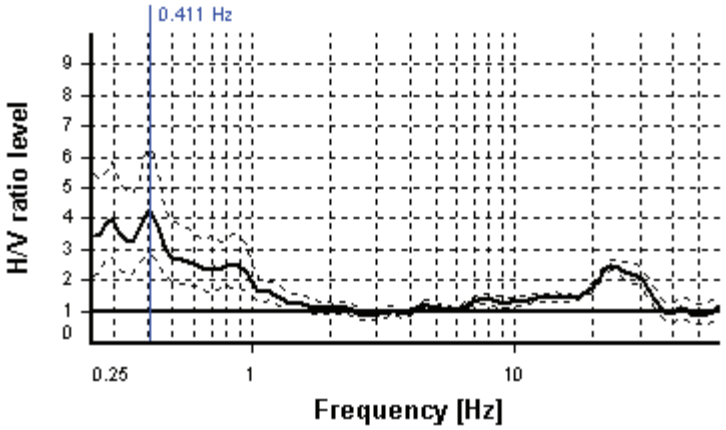
SESAME CRITERIA

Selected f_0 frequency

0.411 Hz

A_0 amplitude = *4.296*

Average f_0 = *0.385 ± 0.073*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	27 valid windows (length > 24.3 s) out of 27	OK
$n_c(f_0) > 200$	444.37 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 22	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0$	0 Hz	NO
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0$	0.99771 Hz	OK
$A_0 > 2$	4.3 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.07327 < 0.08229	OK
$\sigma_A(f_0) < \theta(f_0)$	1.50966 < 2.5	OK
Overall criteria fulfillment		OK

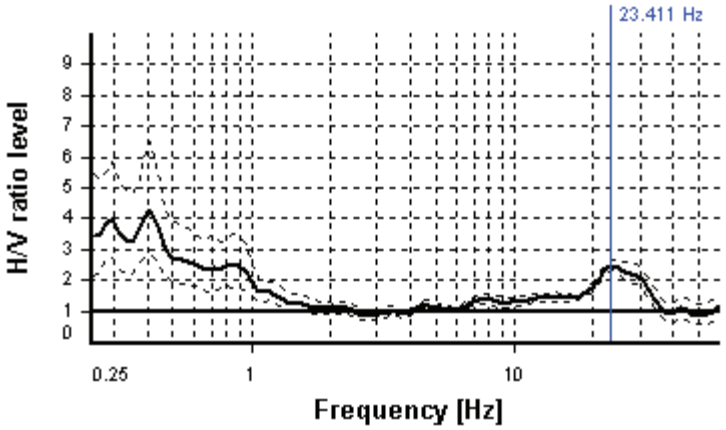
SESAME CRITERIA

Selected f_0 frequency

23.411 Hz

A_0 amplitude = *2.487*

Average f_0 = *24.361 ± 1.956*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	27 valid windows (length > 0.43 s) out of 27	OK
$n_c(f_0) > 200$	25284.35 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 25	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0$	6.55314 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0$	36.45595 Hz	OK
$A_0 > 2$	2.49 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.95632 >= 1.17057	NO
$\sigma_A(f_0) < \theta(f_0)$	1.06447 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 804 - (1 Bis)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Berlicche

Address: Via di Berlicche

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 39.8 m s.l.m.

Weather: -

Notes: -

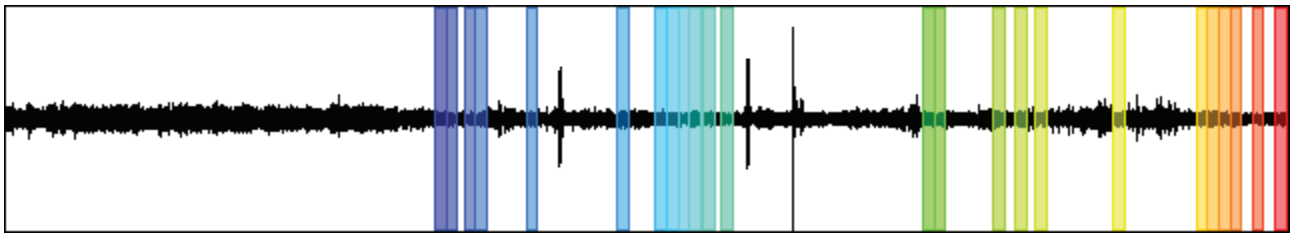
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/15 15:25:43
Recording length:	96 min
Windows count:	24
Average windows length:	50
Signal coverage:	20.83%

32720 Counts

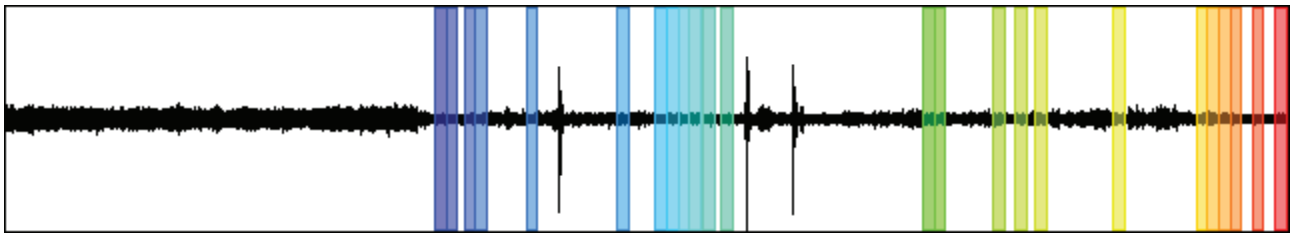
CHANNEL #1 [V]



-40001 Counts

29457 Counts

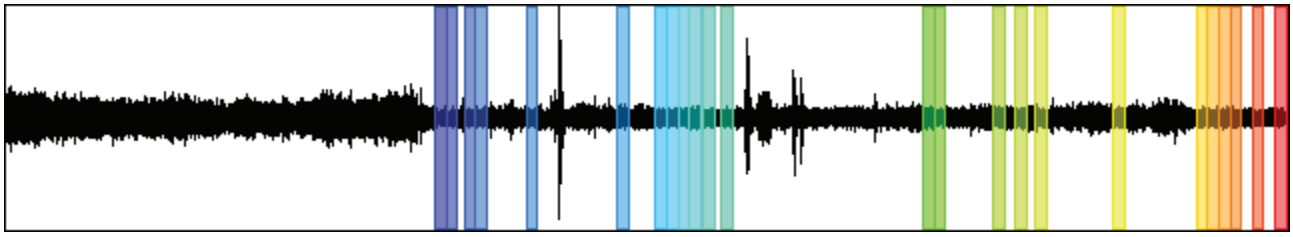
CHANNEL #2 [N]



-52519 Counts

27837 Counts

CHANNEL #3 [E]



-25582 Counts

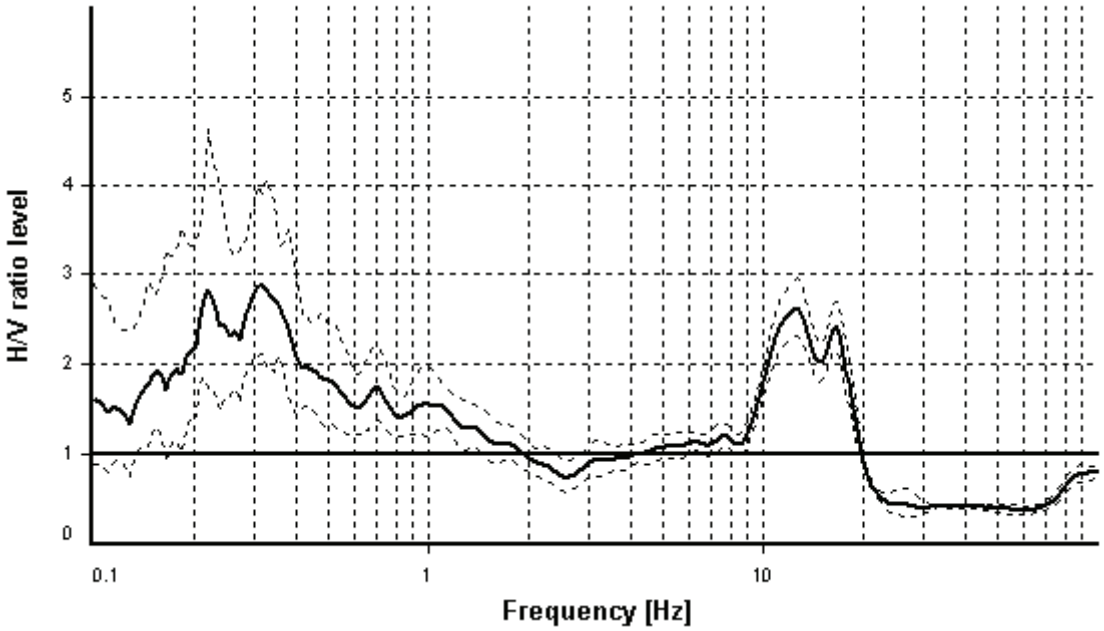
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

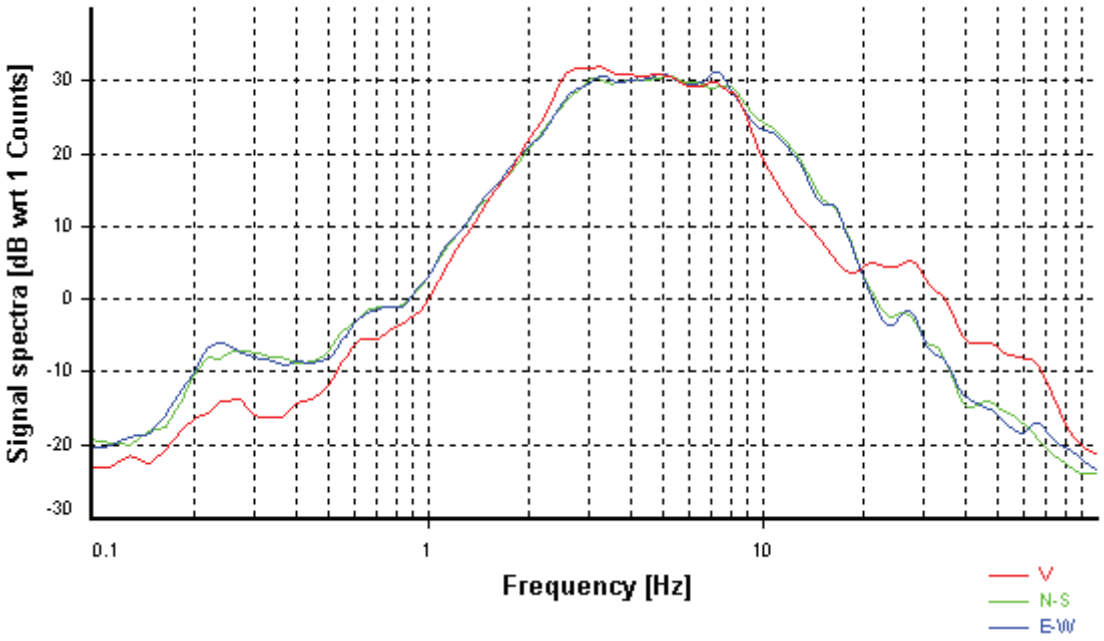
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

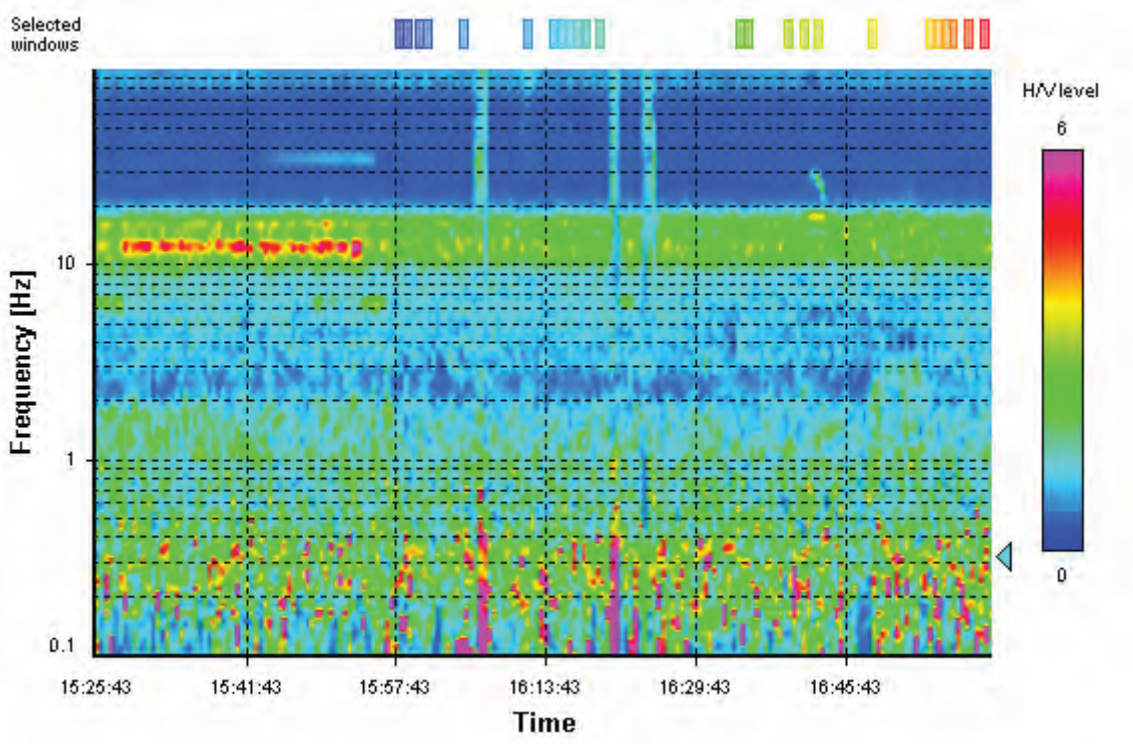
HVSR average



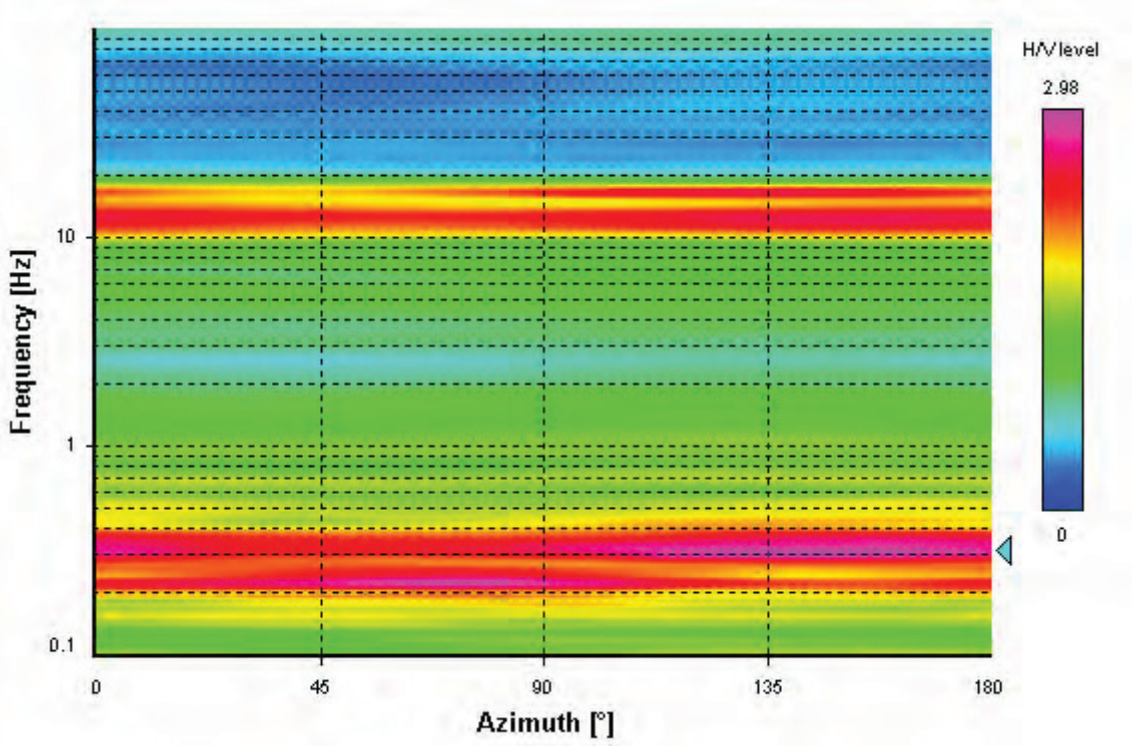
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



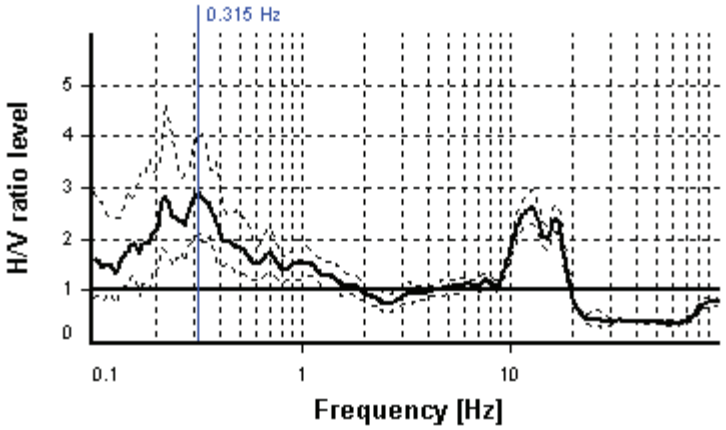
SESAME CRITERIA

Selected f_0 frequency

0.315 Hz

A_0 amplitude = *2.886*

Average f_0 = *0.290 ± 0.056*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	24 valid windows (length > 31.7 s) out of 24	OK
$n_c(f_0) > 200$	378.6 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	0.13009 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	0.79763 Hz	OK
$A_0 > 2$	2.89 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	30.23% > 5%	NO
$\sigma_f < \varepsilon(f_0)$	0.05608 < 0.0631	OK
$\sigma_A(f_0) < \theta(f_0)$	1.35951 < 2.5	OK
Overall criteria fulfillment		OK

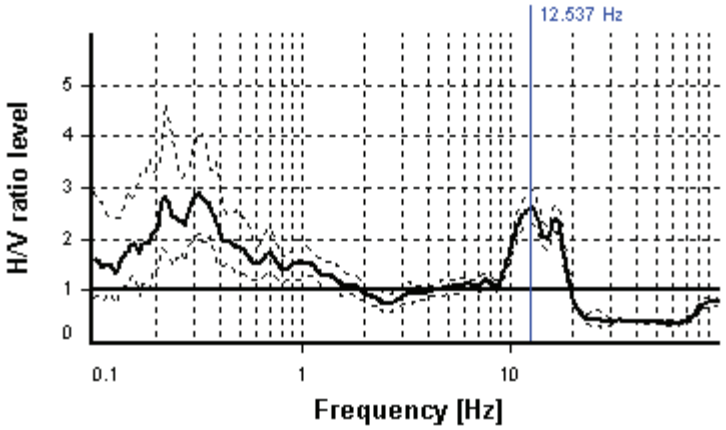
SESAME CRITERIA

Selected f_0 frequency

12.537 Hz

A_0 amplitude = *2.615*

Average f_0 = *13.510 ± 2.037*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	24 valid windows (length > 0.8 s) out of 24	OK
$n_c(f_0) > 200$	15044.5 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	9.11843 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	18.99141 Hz	OK
$A_0 > 2$	2.62 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	1.39% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	2.03738 >= 0.62685	NO
$\sigma_A(f_0) < \theta(f_0)$	1.12964 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 805 - (2)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Ponte dei Bini

Address: Via di Berlicche

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 39.3 m s.l.m.

Weather: -

Notes: -

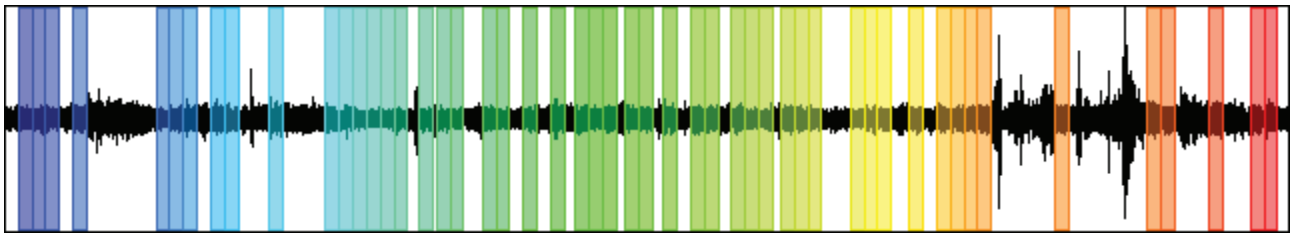
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/04 10:43:50
Recording length:	62.67 min
Windows count:	51
Average windows length:	40
Signal coverage:	54.26%

12508 Counts

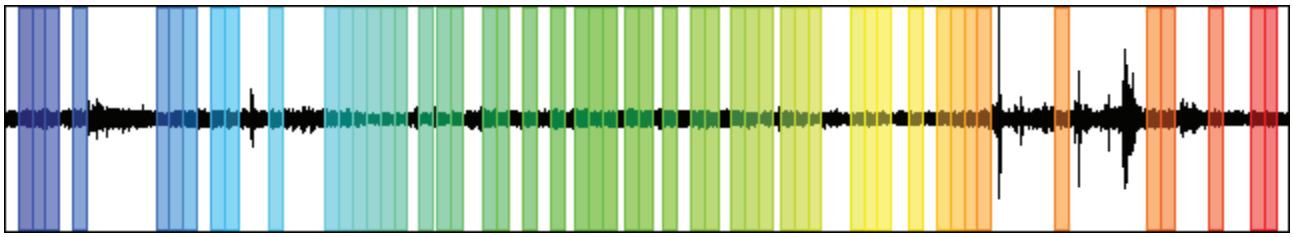
CHANNEL #1 [V]



-11197 Counts

25887 Counts

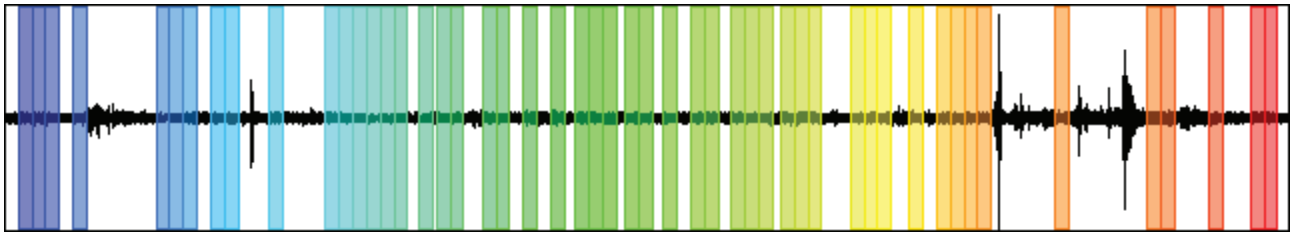
CHANNEL #2 [N]



-18420 Counts

33269 Counts

CHANNEL #3 [E]



-35686 Counts

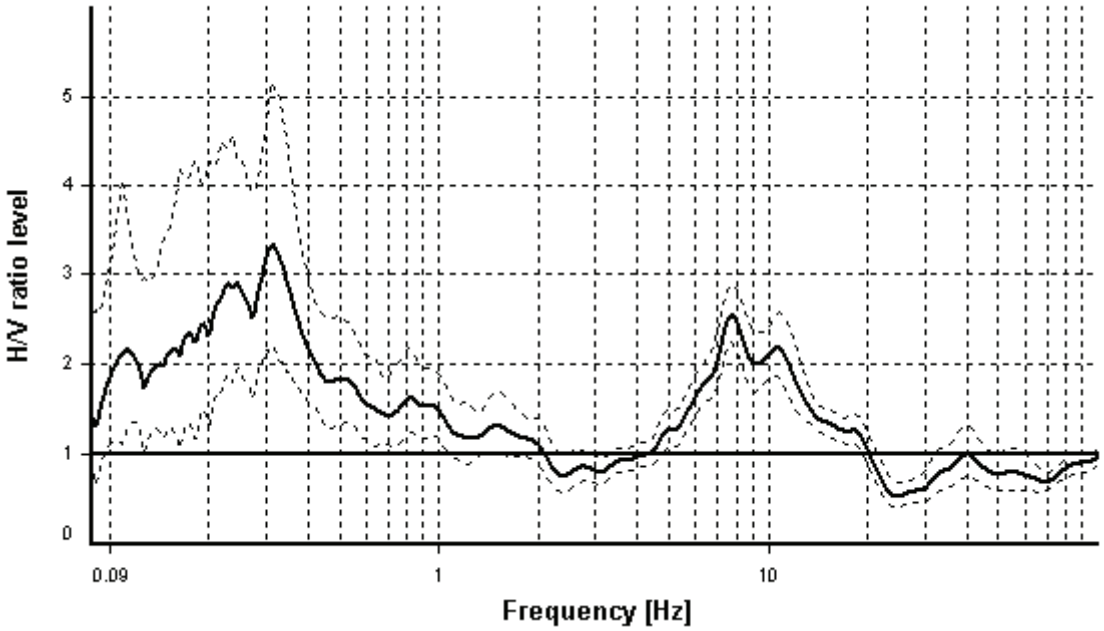
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

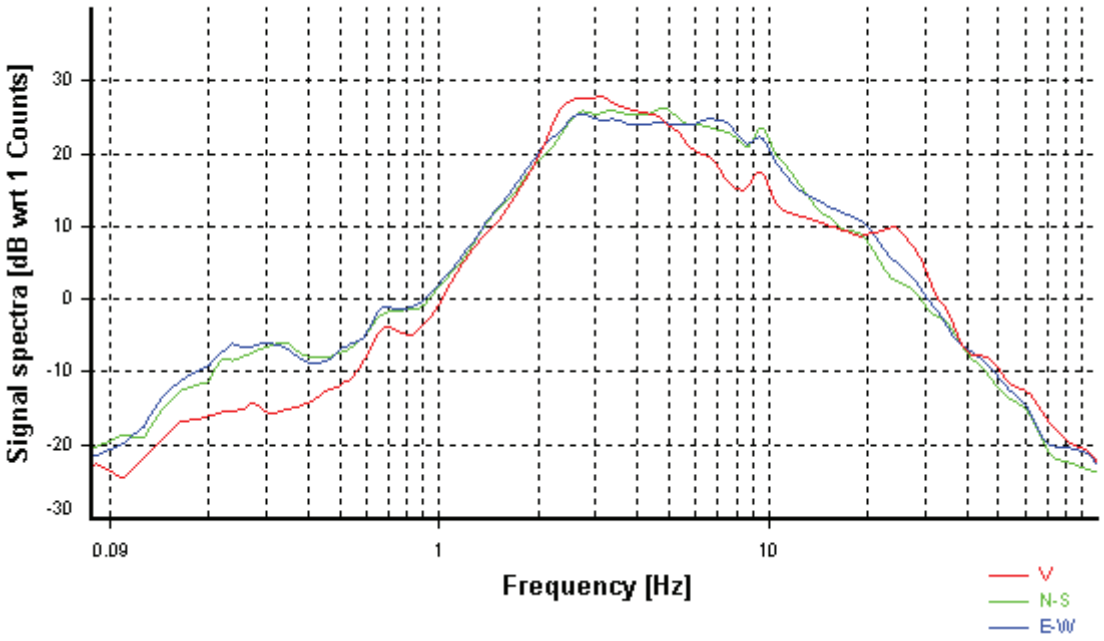
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

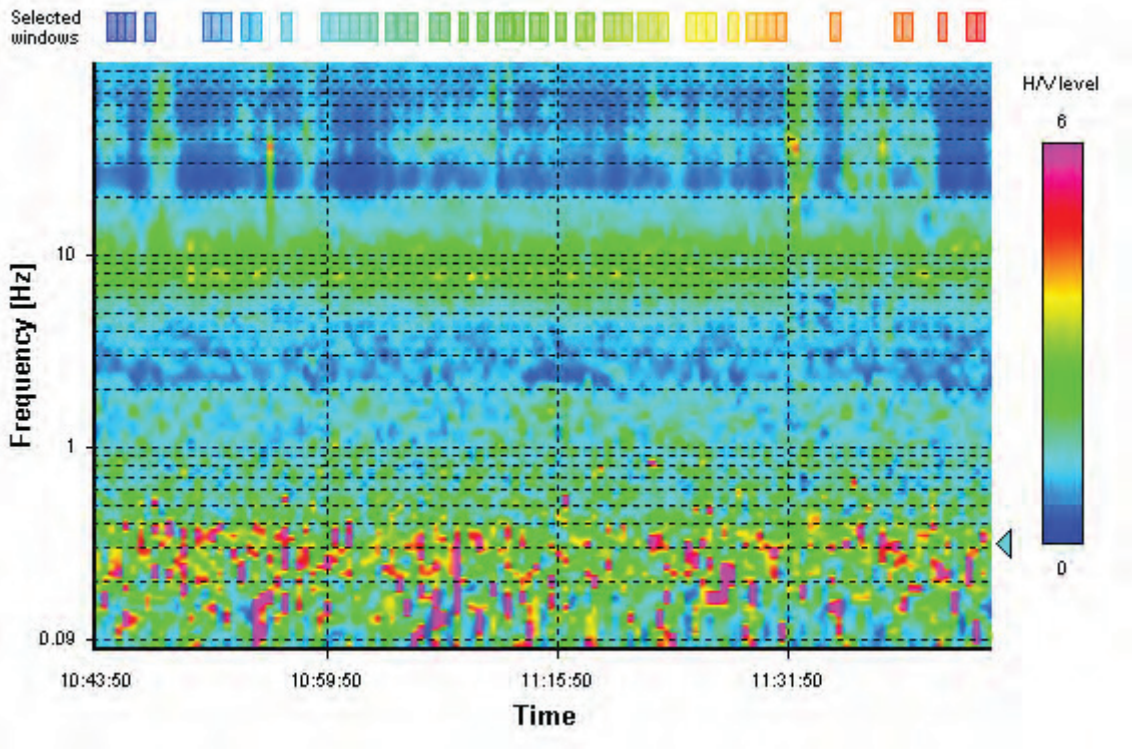
HVSR average



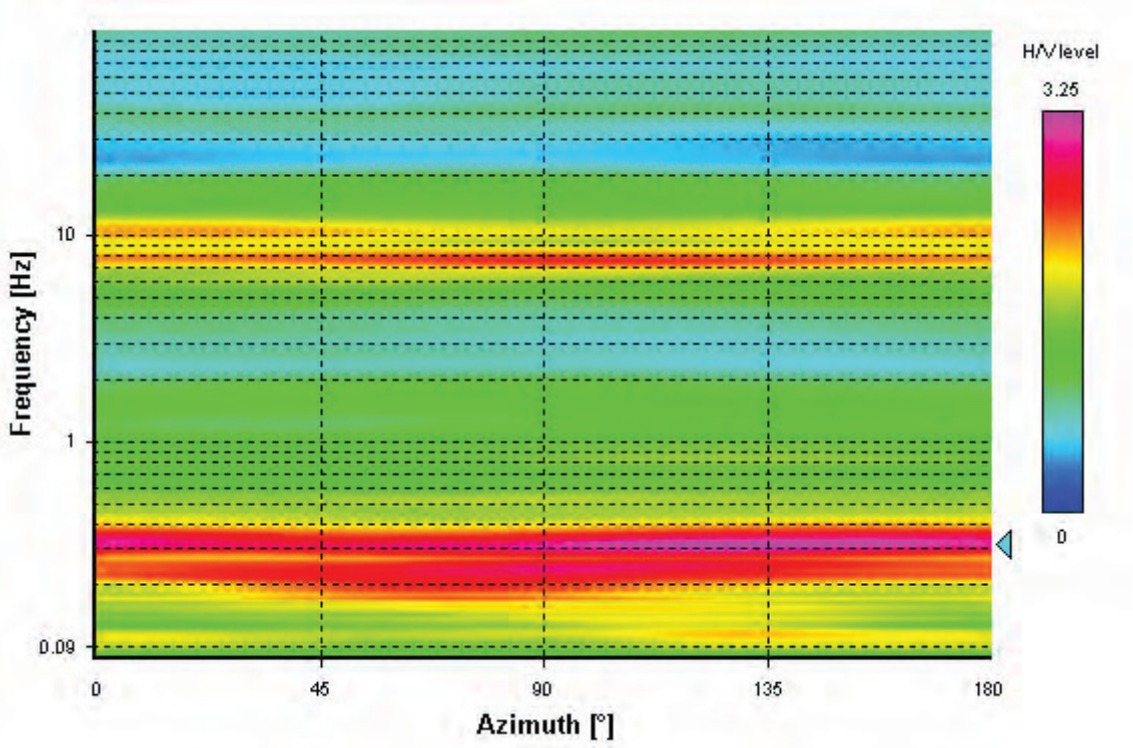
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



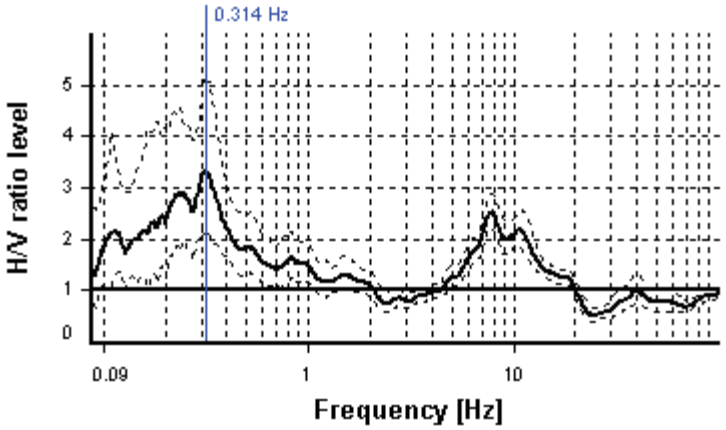
SESAME CRITERIA

Selected f_0 frequency

0.314 Hz

A_0 amplitude = *3.326*

Average f_0 = *0.285 ± 0.052*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	51 valid windows (length > 31.81 s) out of 51	OK
$n_c(f_0) > 200$	641.36 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 99	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	0.09655 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	0.57535 Hz	OK
$A_0 > 2$	3.33 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	1.42% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.05168 < 0.06288	OK
$\sigma_A(f_0) < \theta(f_0)$	1.54975 < 2.5	OK
Overall criteria fulfillment		OK

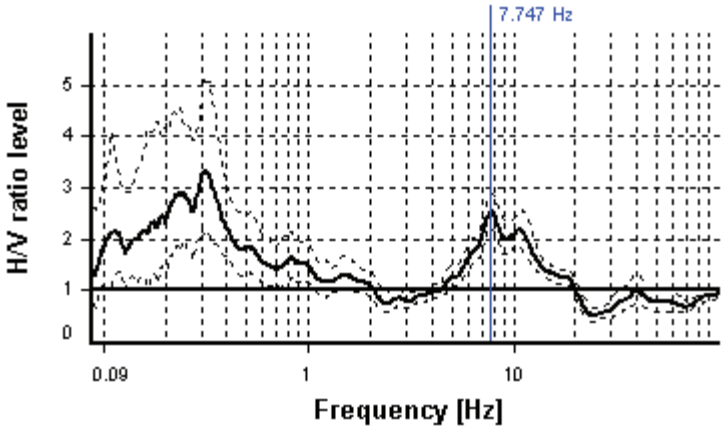
SESAME CRITERIA

Selected f_0 frequency

7.747 Hz

A_0 amplitude = *2.540*

Average f_0 = *8.185 ± 1.062*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	51 valid windows (length > 1.29 s) out of 51	OK
$n_c(f_0) > 200$	15803.48 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 99	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	5.22659 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	16.54716 Hz	OK
$A_0 > 2$	2.54 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	1.42% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.06244 >= 0.38734	NO
$\sigma_A(f_0) < \theta(f_0)$	1.13424 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 806 - (3)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Castello dei Mati

Address: Via Arginone

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41.7 m s.l.m.

Weather: -

Notes: -

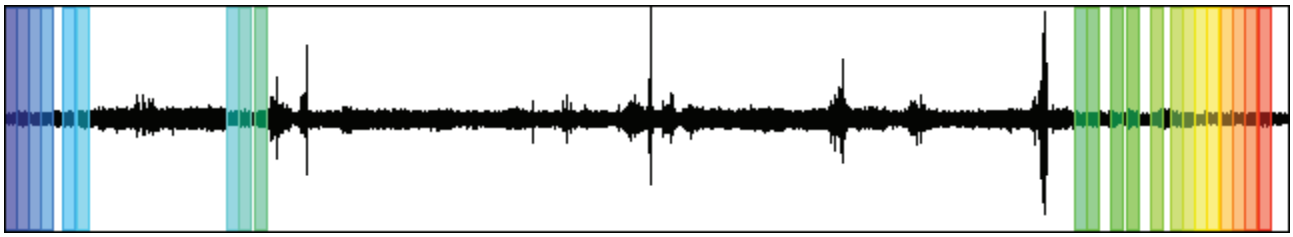
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/04 12:27:05
Recording length:	71.67 min
Windows count:	22
Average windows length:	40
Signal coverage:	20.47%

12884 Counts

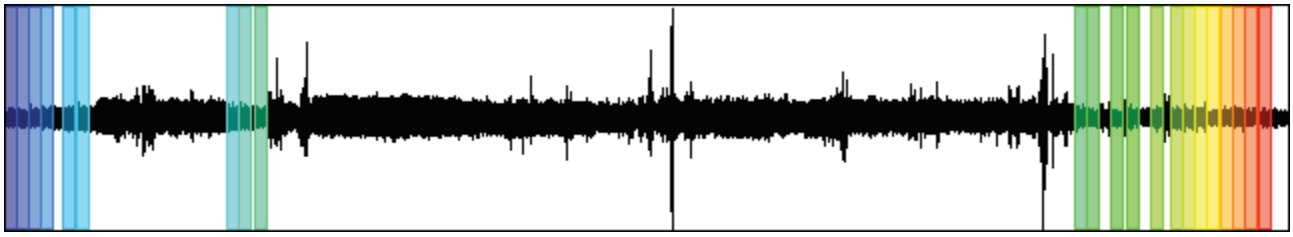
CHANNEL #1 [V]



-11065 Counts

9118 Counts

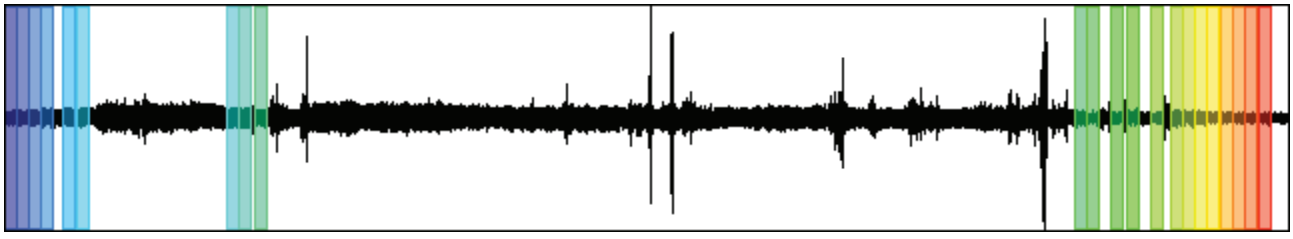
CHANNEL #2 [N]



-9294 Counts

13702 Counts

CHANNEL #3 [E]



-13738 Counts

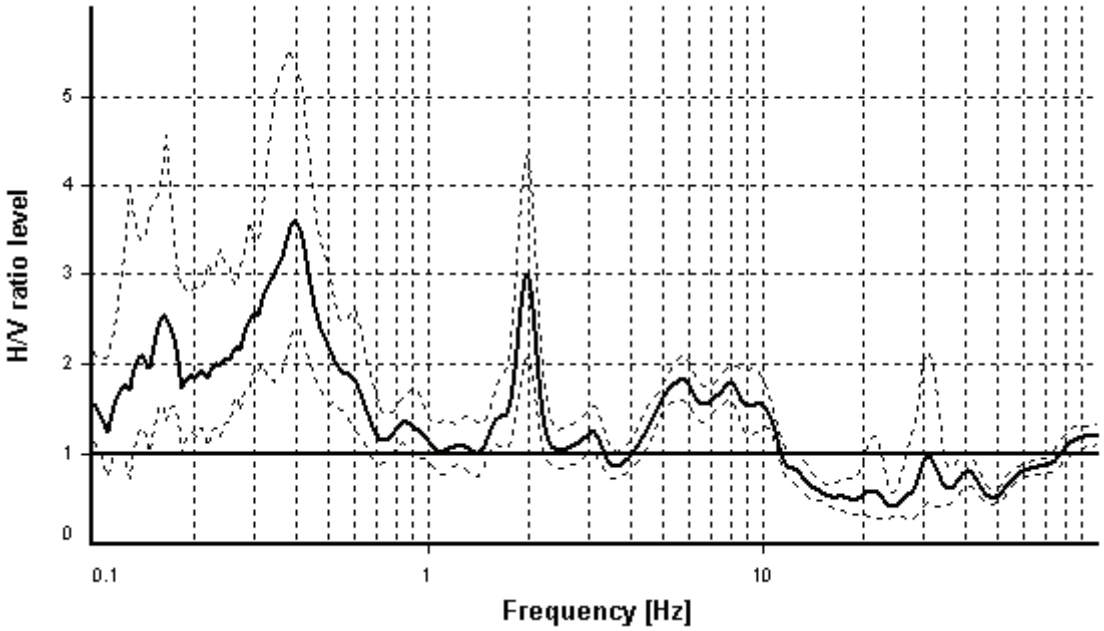
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

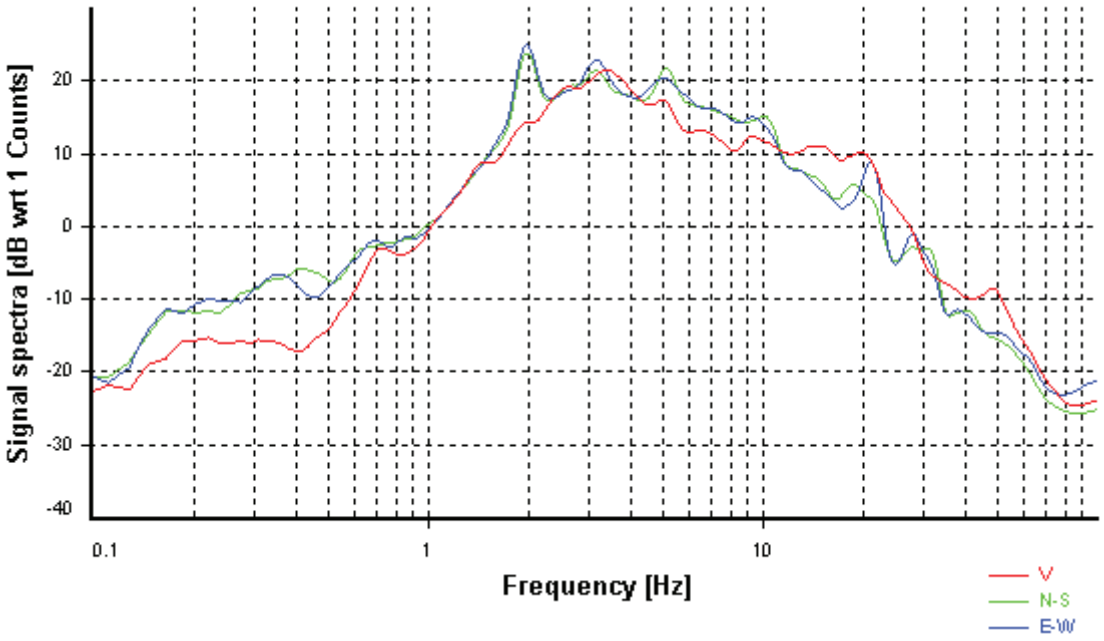
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

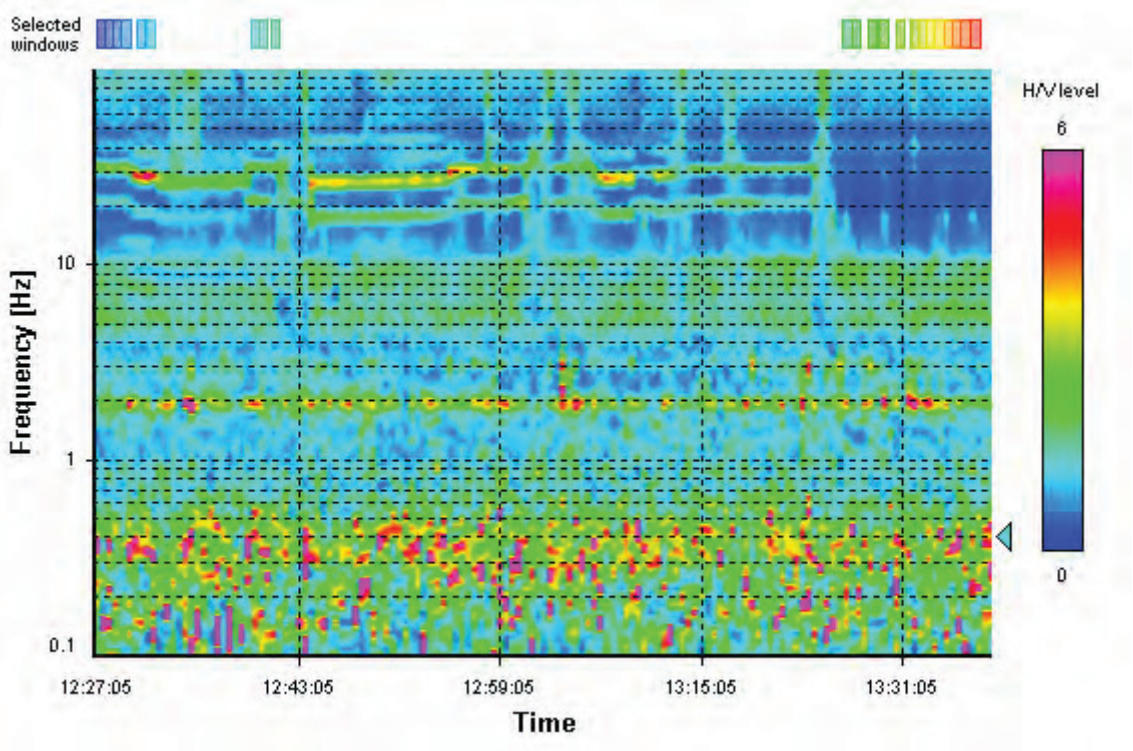
HVSR average



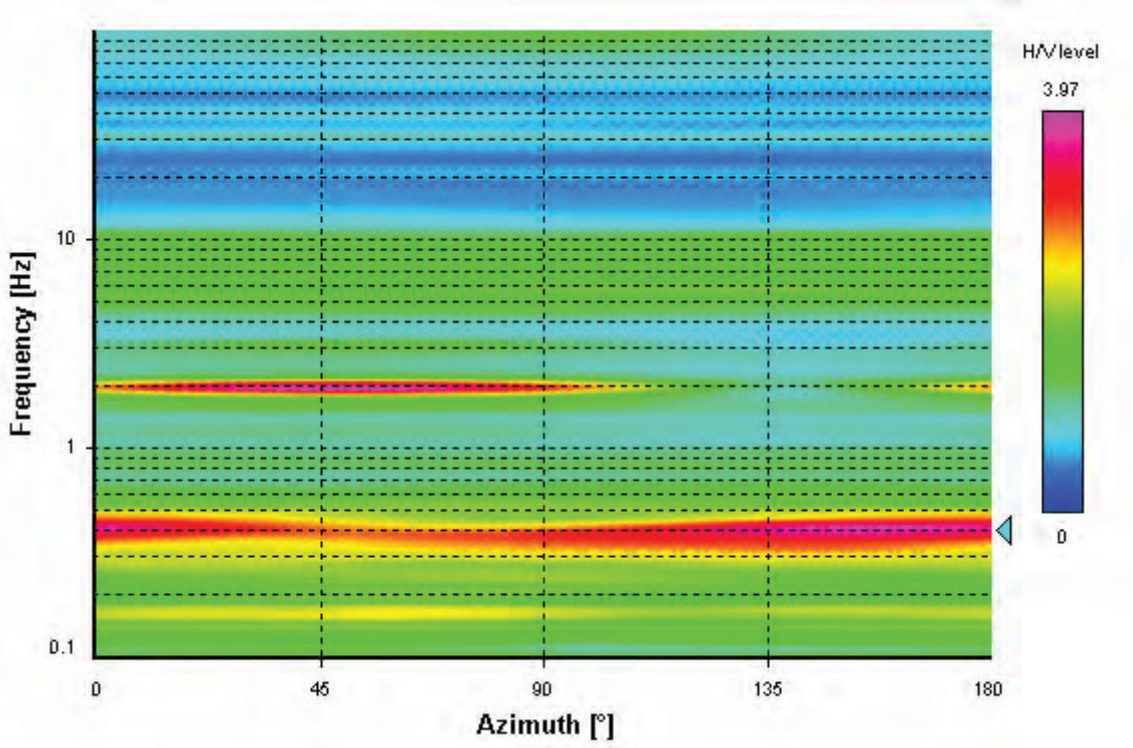
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



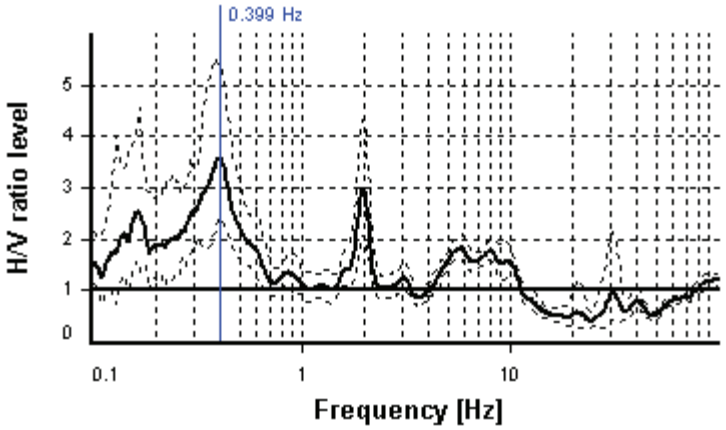
SESAME CRITERIA

Selected f_0 frequency

0.399 Hz

A_0 amplitude = *3.600*

Average f_0 = *0.363 ± 0.056*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	22 valid windows (length > 25.05 s) out of 22	OK
$n_c(f_0) > 200$	351.31 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0/2$	0.18644 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0/2$	0.60473 Hz	OK
$A_0 > 2$	3.6 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	4.07% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.05554 < 0.07984	OK
$\sigma_A(f_0) < \theta(f_0)$	1.50458 < 2.5	OK
Overall criteria fulfillment		OK

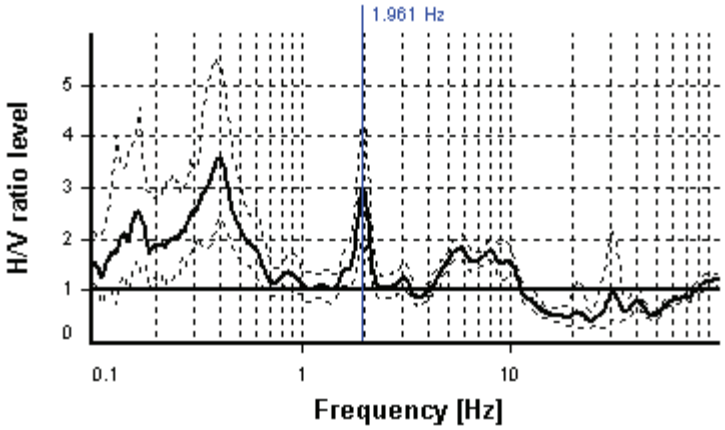
SESAME CRITERIA

Selected f_0 frequency

1.961 Hz

A_0 amplitude = *2.999*

Average f_0 = *1.963 ± 0.032*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	22 valid windows (length > 5.1 s) out of 22	OK
$n_c(f_0) > 200$	1726.11 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	1.70791 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	2.1912 Hz	OK
$A_0 > 2$	3 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.0317 < 0.19615	OK
$\sigma_A(f_0) < \theta(f_0)$	1.44309 < 1.78	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 807 - (4)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Ponte Berlicche

Address: Via Ponte dei Baldi

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 39.5 m s.l.m.

Weather: -

Notes: -

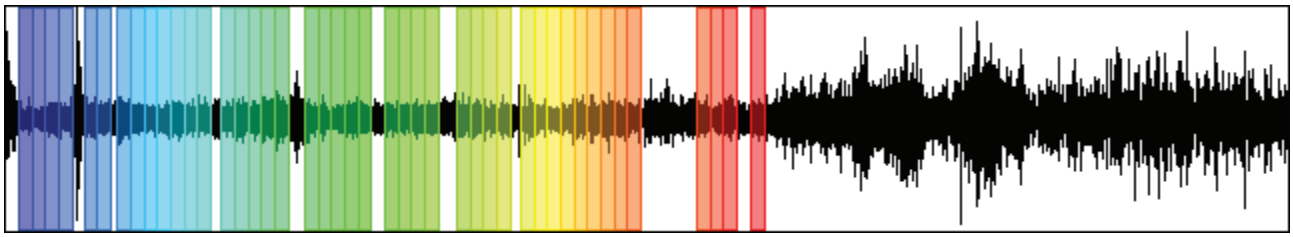
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/04 14:43:50
Recording length:	64.03 min
Windows count:	44
Average windows length:	40
Signal coverage:	45.81%

9507 Counts

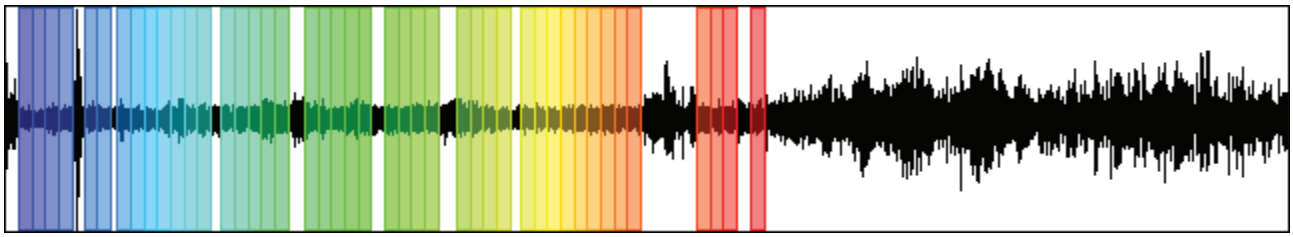
CHANNEL #1 [V]



-9033 Counts

13240 Counts

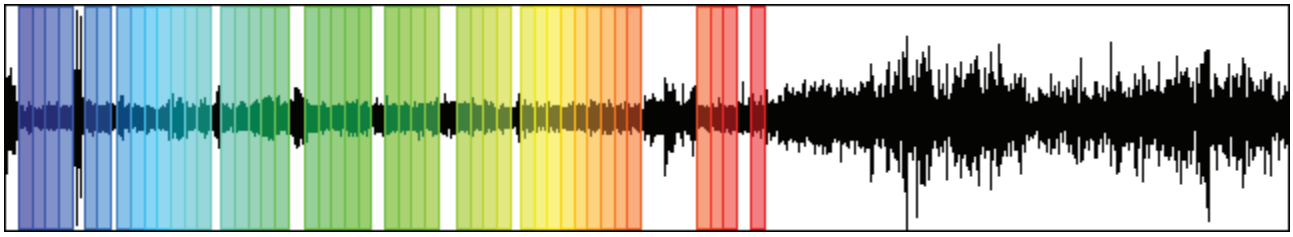
CHANNEL #2 [N]



-13567 Counts

12180 Counts

CHANNEL #3 [E]



-12692 Counts

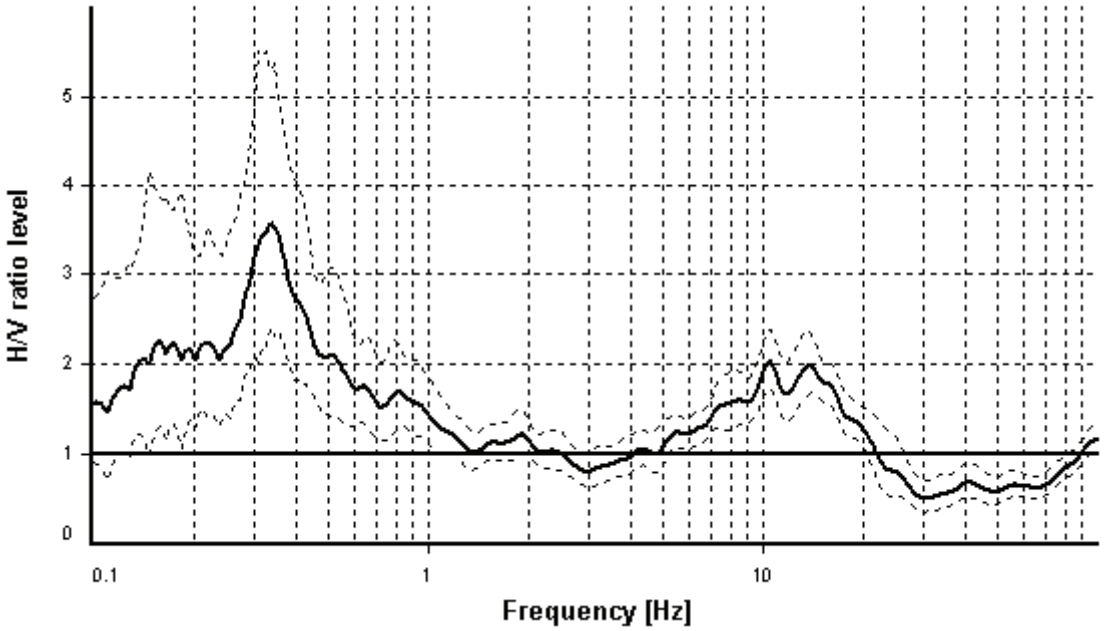
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

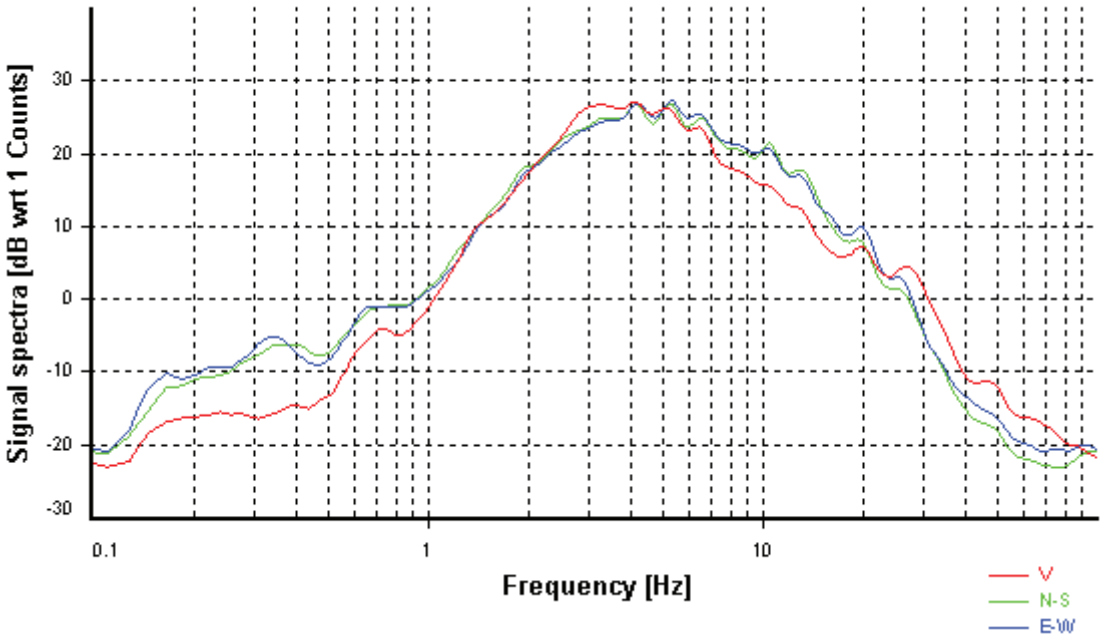
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

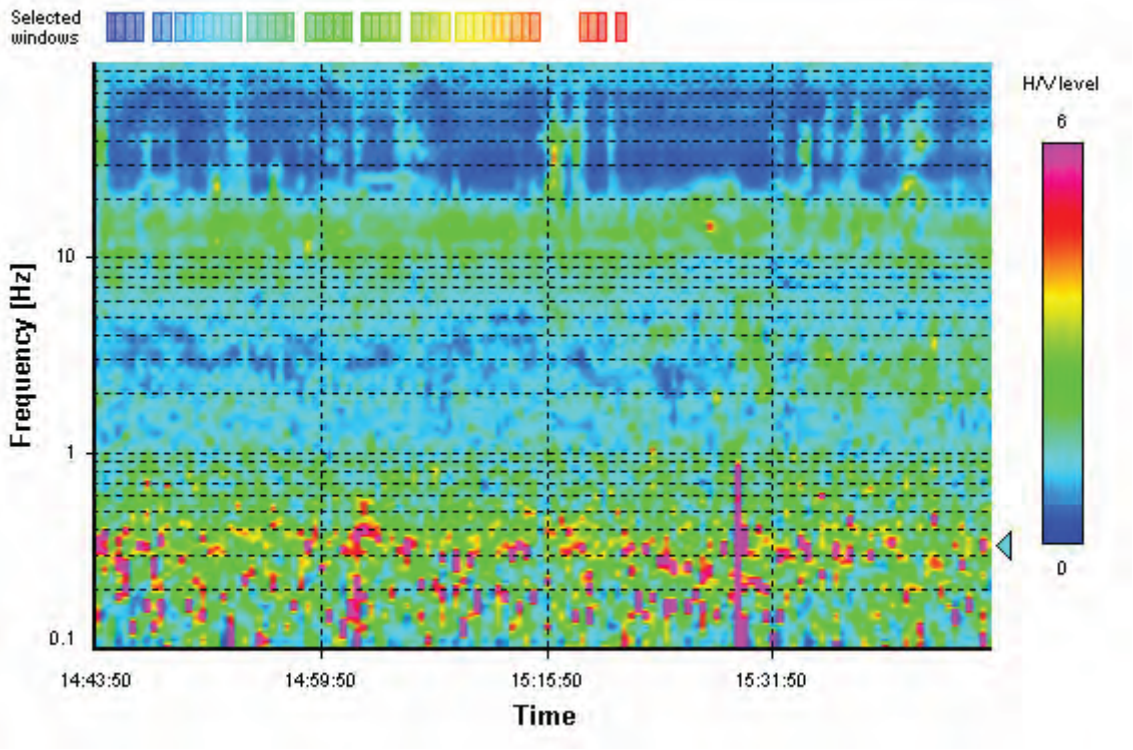
HVSR average



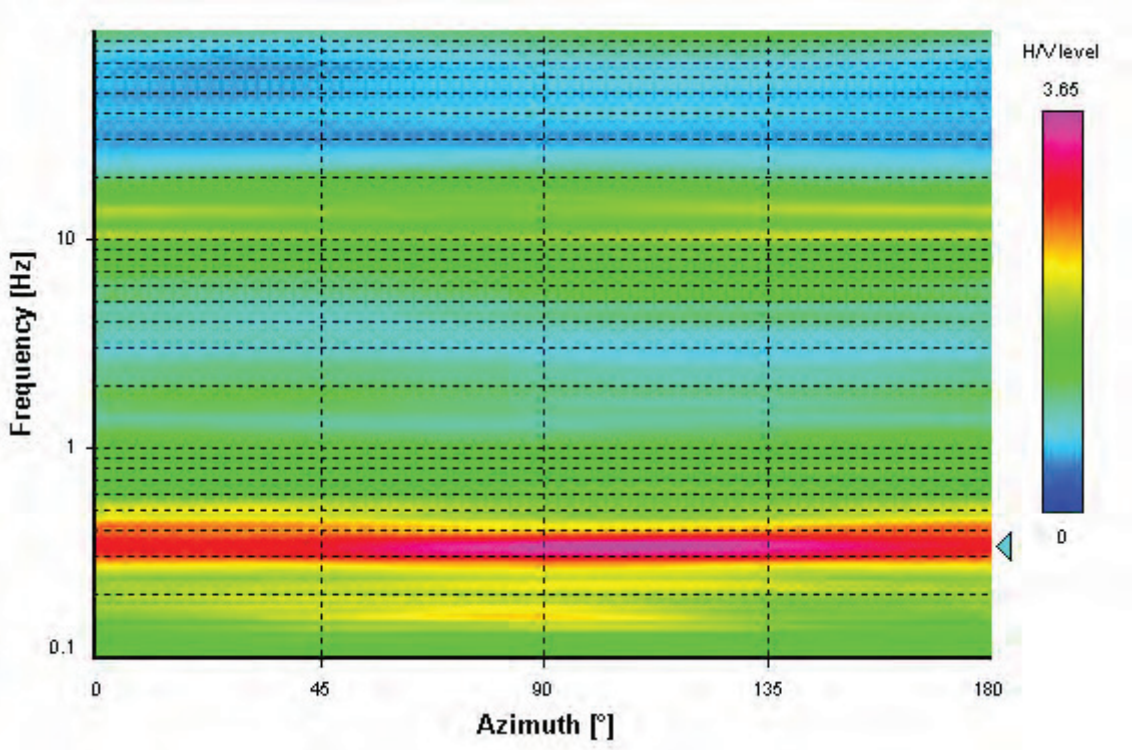
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



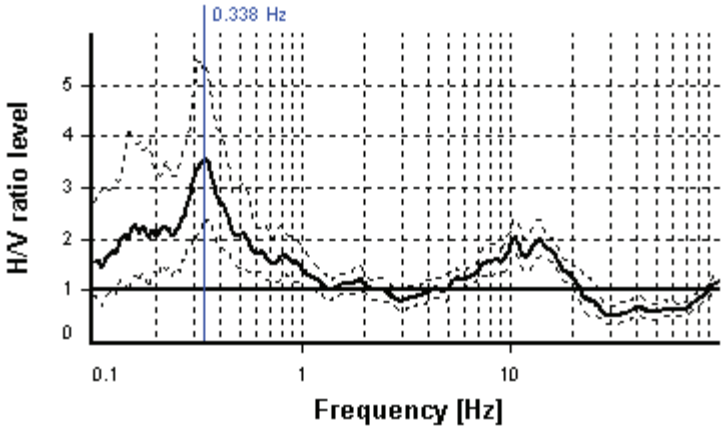
SESAME CRITERIA

Selected f_0 frequency

0.338 Hz

A_0 amplitude = *3.563*

Average f_0 = *0.332 ± 0.064*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	44 valid windows (length > 29.58 s) out of 44	OK
$n_c(f_0) > 200$	595.07 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	0.1283 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	0.58822 Hz	OK
$A_0 > 2$	3.56 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	2.73% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.06438 < 0.06762	OK
$\sigma_A(f_0) < \theta(f_0)$	1.49034 < 2.5	OK
Overall criteria fulfillment		OK

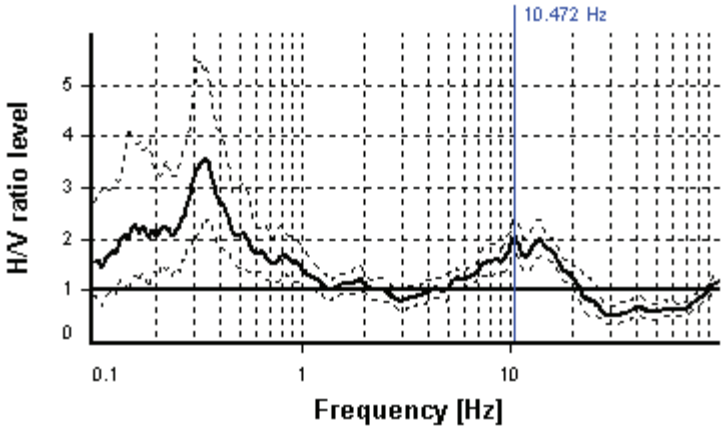
SESAME CRITERIA

Selected f_0 frequency

10.472 Hz

A_0 amplitude = *2.027*

Average f_0 = *12.118 ± 1.975*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	44 valid windows (length > 0.95 s) out of 44	OK
$n_c(f_0) > 200$	18431.16 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	4.89079 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	21.81109 Hz	OK
$A_0 > 2$	2.03 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.97497 >= 0.52361	NO
$\sigma_A(f_0) < \theta(f_0)$	1.17536 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 808 - (5)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Ponte dei Gelli

Address: Via Selva

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 40.6 m s.l.m.

Weather: -

Notes: -

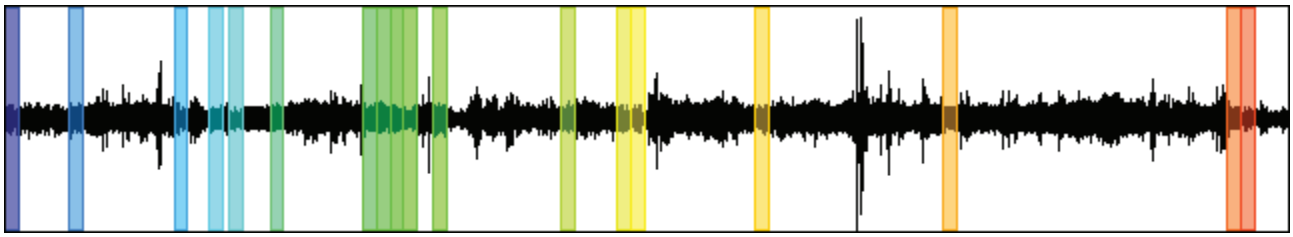
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/11 09:50:28
Recording length:	62.17 min
Windows count:	18
Average windows length:	40
Signal coverage:	19.3%

25375 Counts

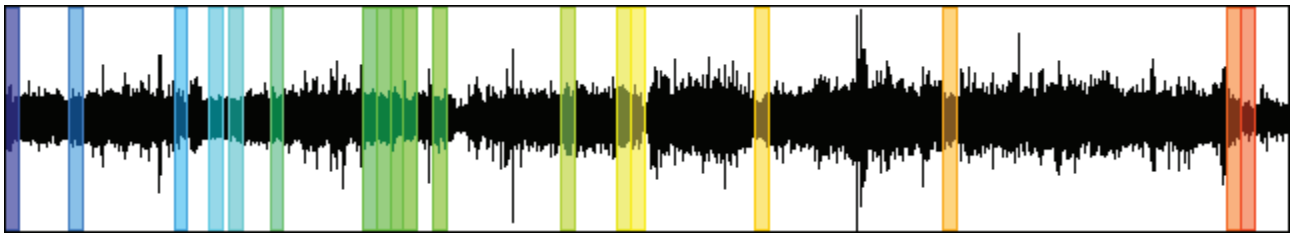
CHANNEL #1 [V]



-27809 Counts

14357 Counts

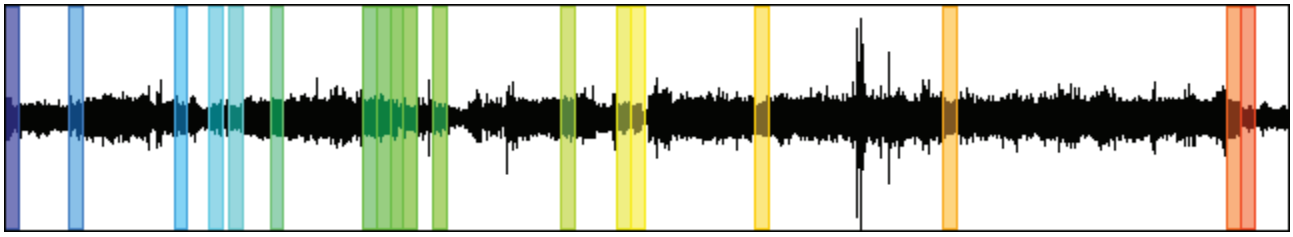
CHANNEL #2 [N]



-14638 Counts

21449 Counts

CHANNEL #3 [E]



-24117 Counts

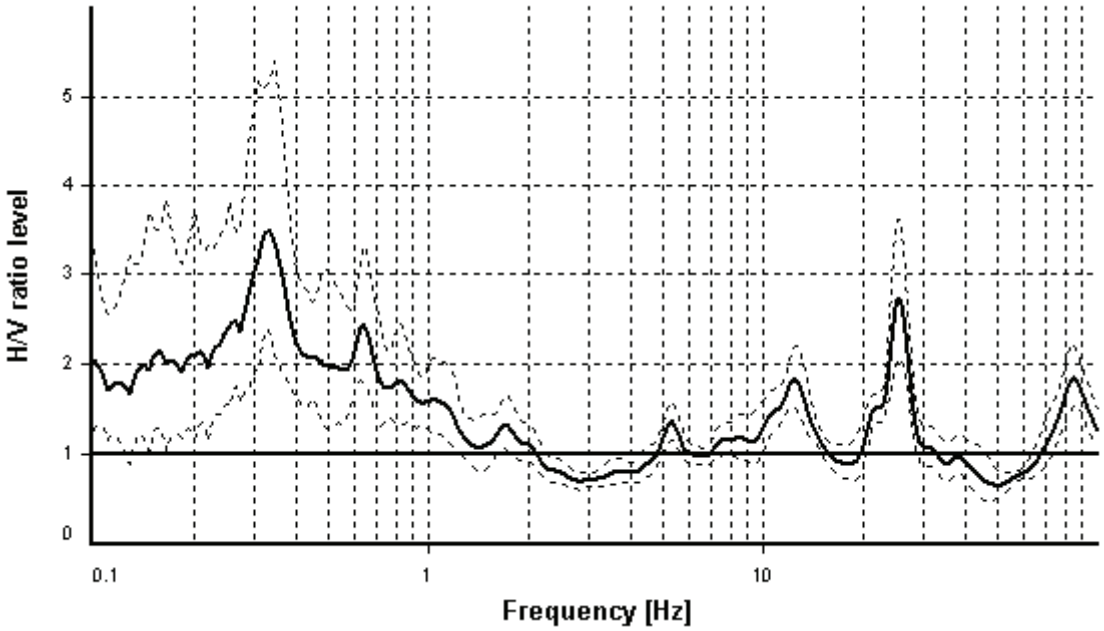
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

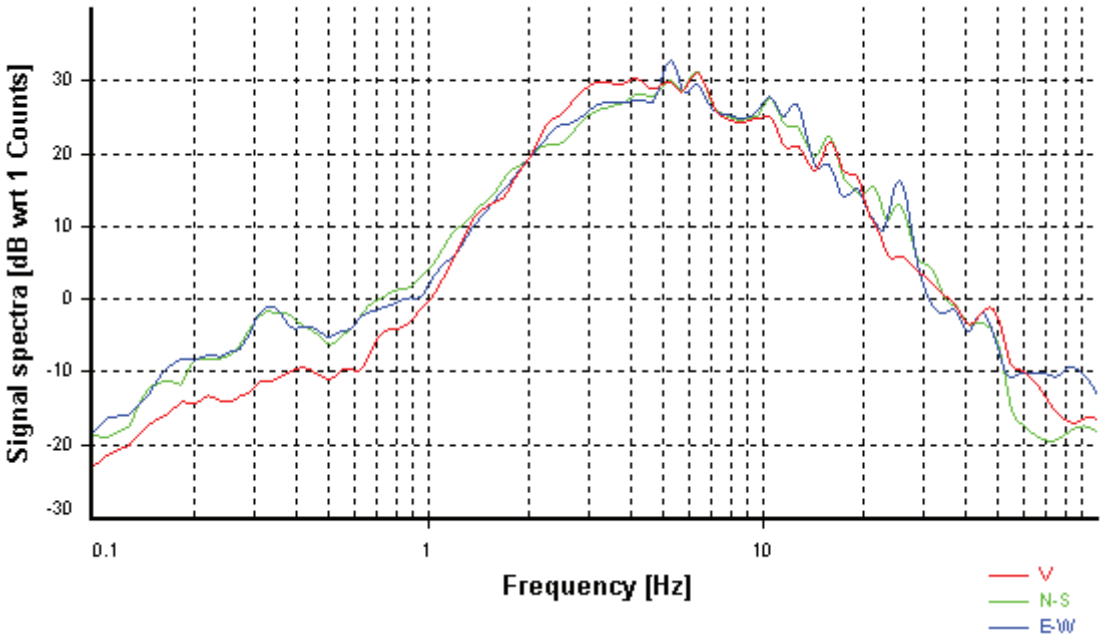
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

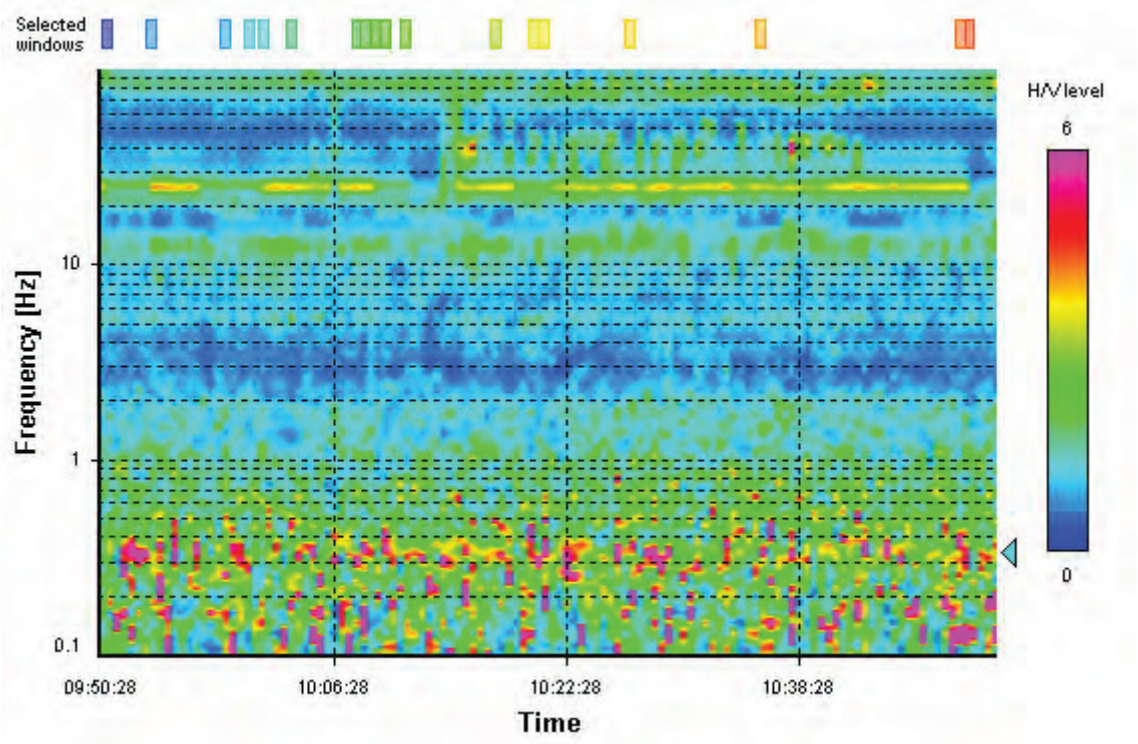
HVSR average



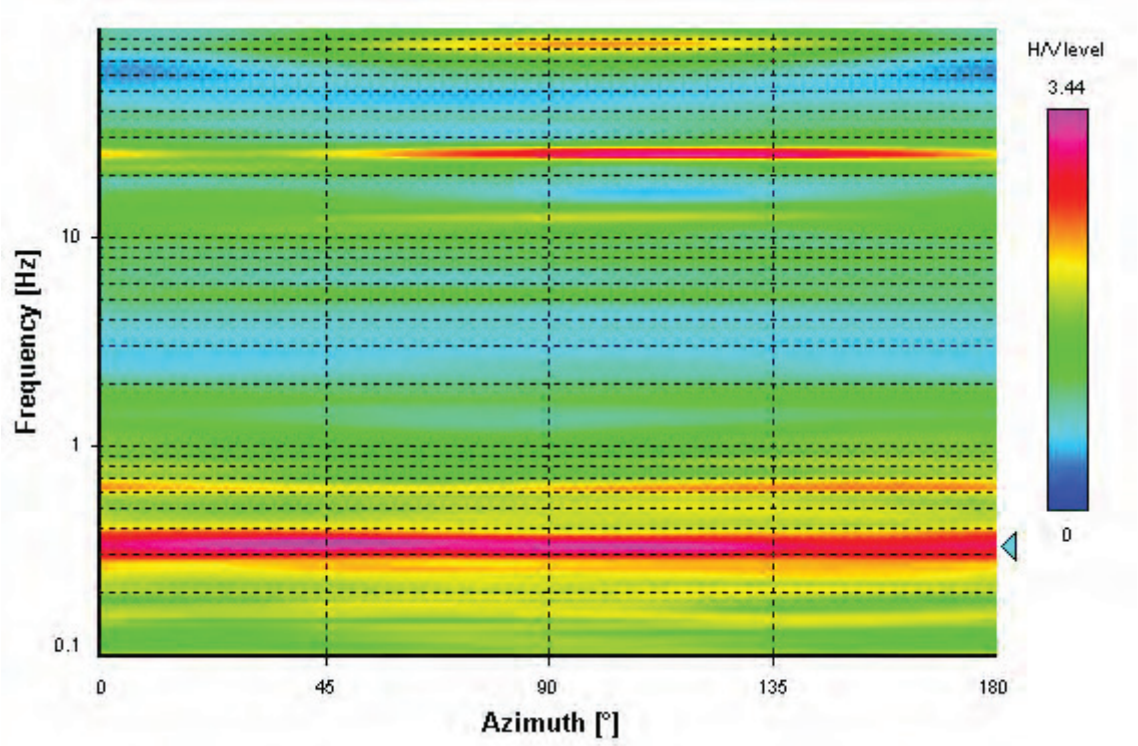
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



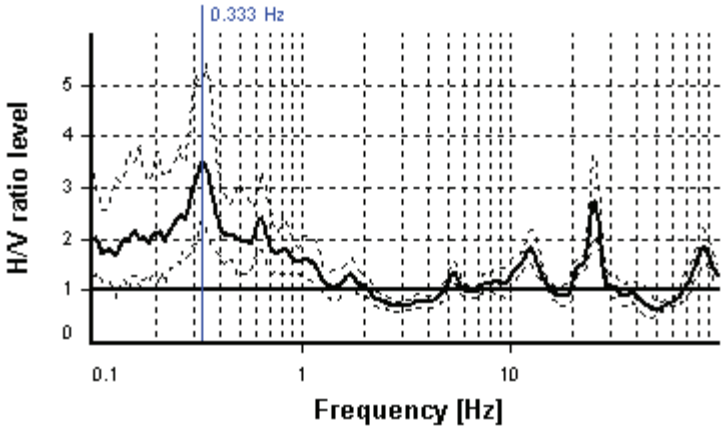
SESAME CRITERIA

Selected f_0 frequency

0.333 Hz

A_0 amplitude = *3.493*

Average f_0 = *0.318 ± 0.057*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	18 valid windows (length > 29.99 s) out of 18	OK
$n_c(f_0) > 200$	240.09 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	0.1283 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	0.73406 Hz	OK
$A_0 > 2$	3.49 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	4.24% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.05705 < 0.06669	OK
$\sigma_A(f_0) < \theta(f_0)$	1.47194 < 2.5	OK
Overall criteria fulfillment		OK

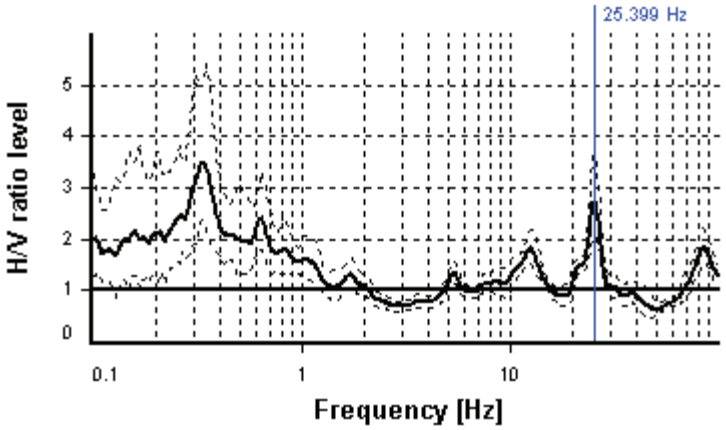
SESAME CRITERIA

Selected f_0 frequency

25.399 Hz

A_0 amplitude = *2.731*

Average f_0 = *25.381 ± 0.281*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	18 valid windows (length > 0.39 s) out of 18	OK
$n_c(f_0) > 200$	18286.99 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	20.63618 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	28.37304 Hz	OK
$A_0 > 2$	2.73 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	1.37% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.281 < 1.26993	OK
$\sigma_A(f_0) < \theta(f_0)$	1.32583 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 809 - (6)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Casa Giacomelli

Address: Via Berlicche

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 40.3 m s.l.m.

Weather: -

Notes: -

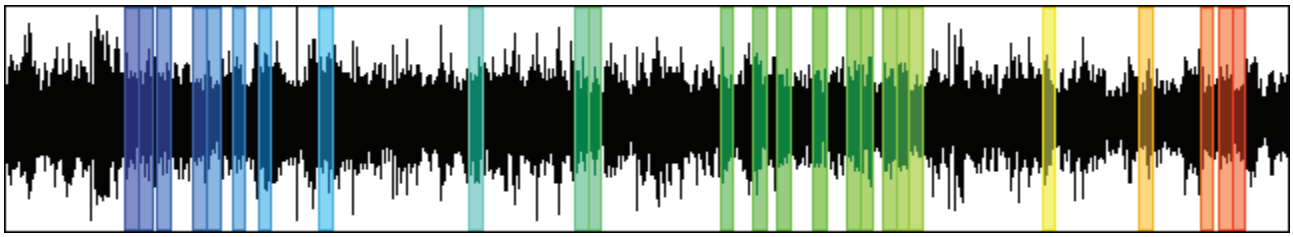
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/11 11:24:09
Recording length:	65.5 min
Windows count:	25
Average windows length:	40
Signal coverage:	25.45%

13063 Counts

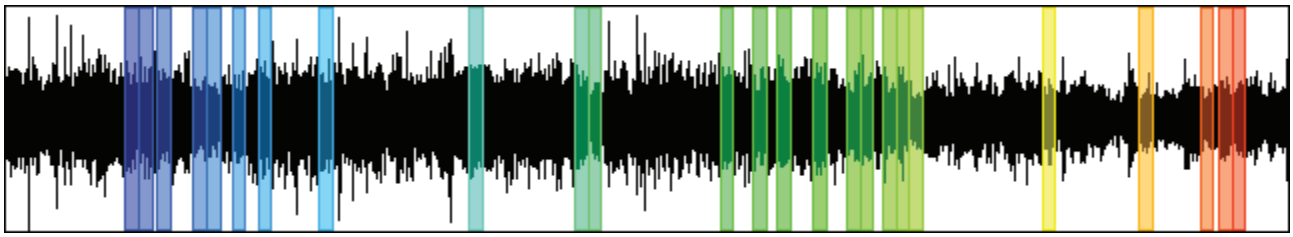
CHANNEL #1 [V]



-11840 Counts

13899 Counts

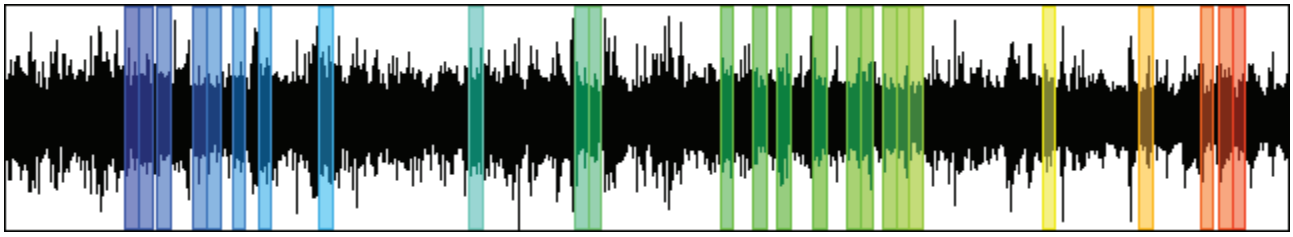
CHANNEL #2 [N]



-14937 Counts

12942 Counts

CHANNEL #3 [E]



-13185 Counts

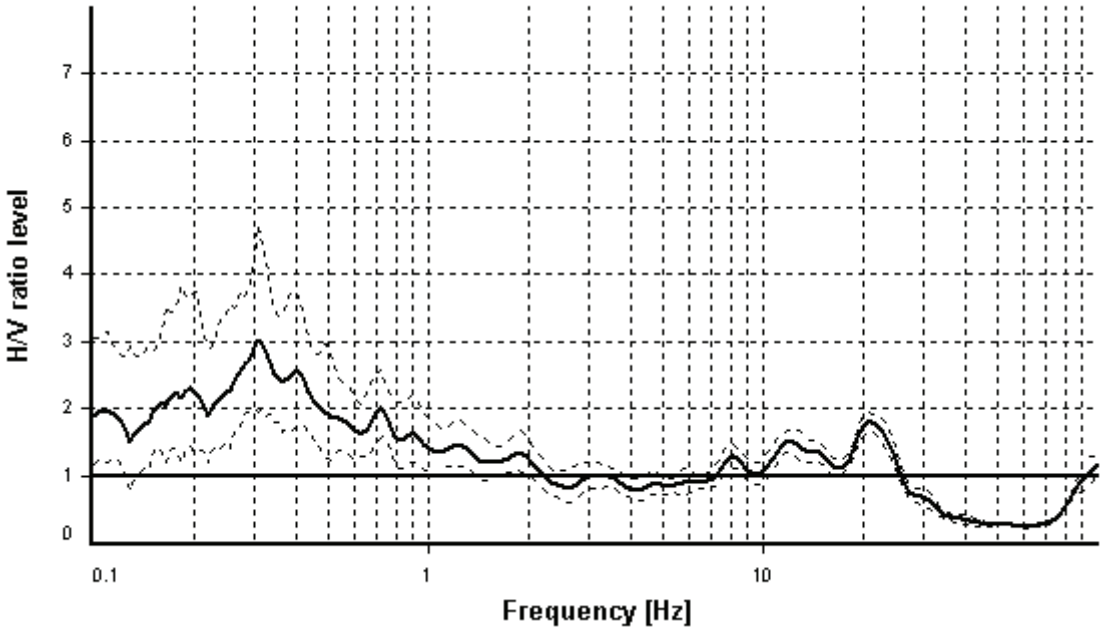
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

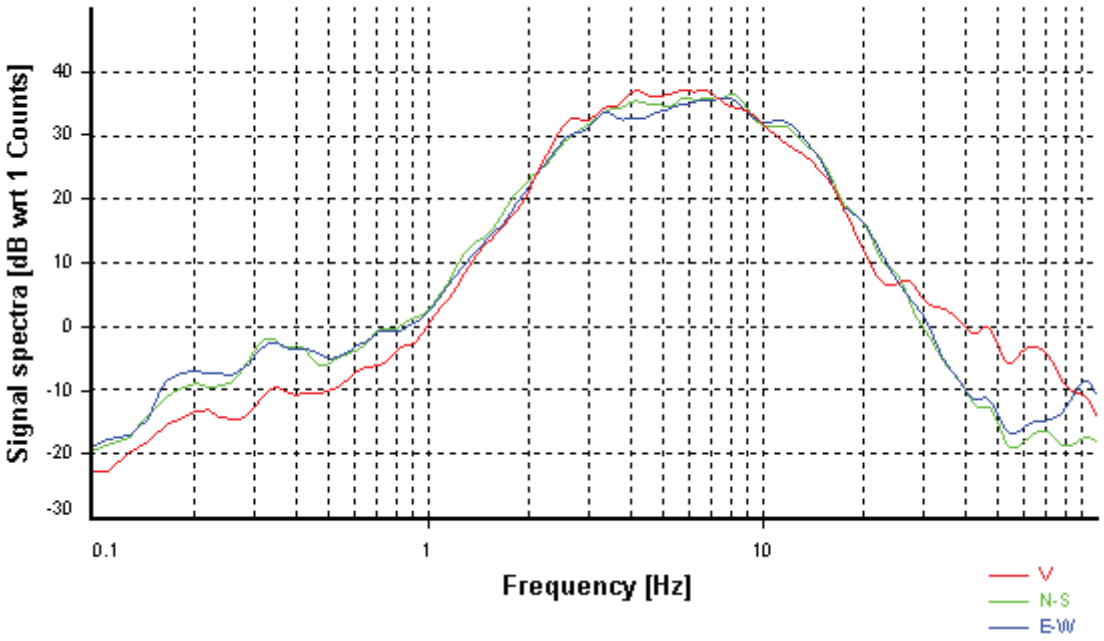
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

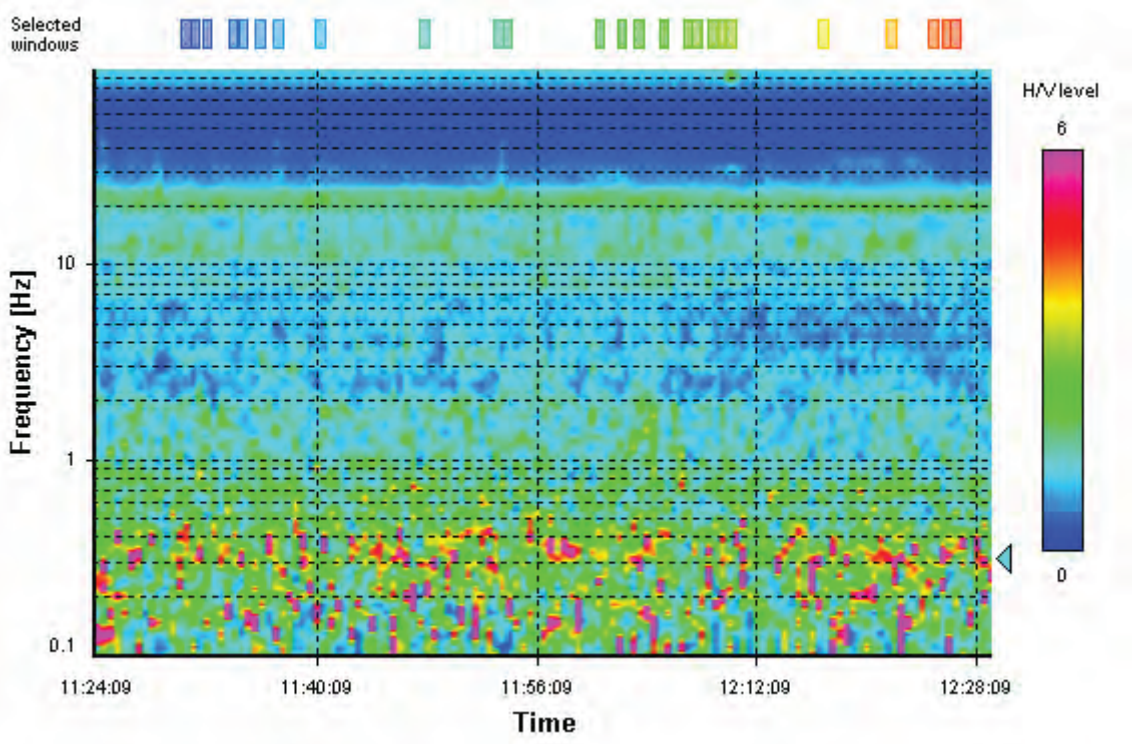
HVSR average



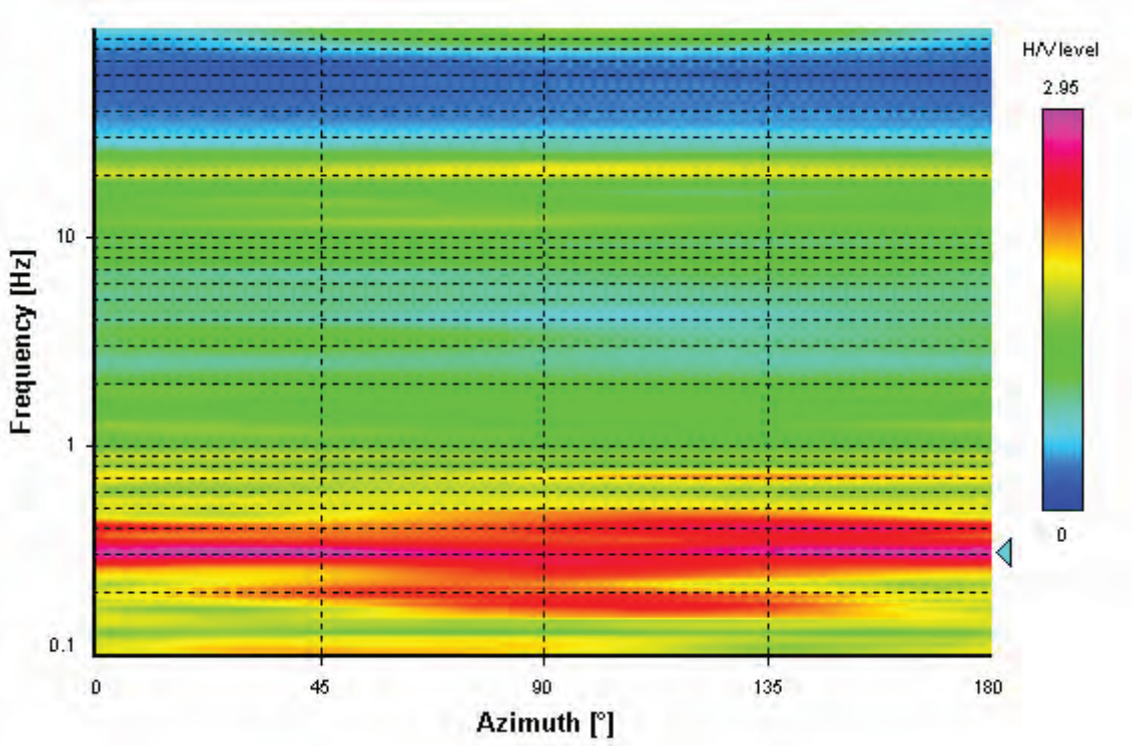
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



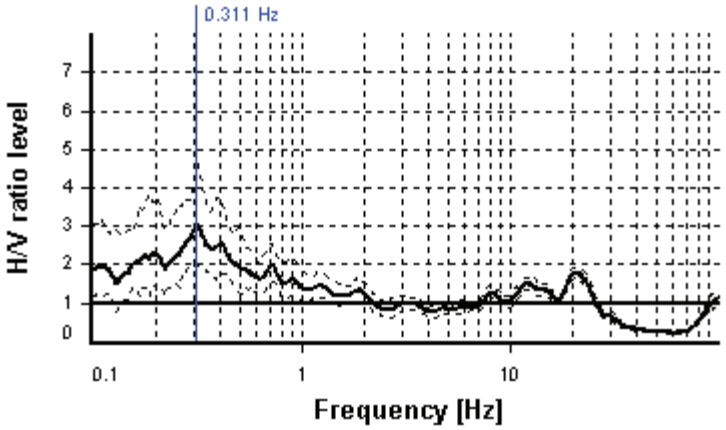
SESAME CRITERIA

Selected f_0 frequency

0.311 Hz

A_0 amplitude = *3.037*

Average f_0 = *0.296 ± 0.060*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	25 valid windows (length > 32.14 s) out of 25	OK
$n_c(f_0) > 200$	311.16 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	0.1283 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	0.9549 Hz	OK
$A_0 > 2$	3.04 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	2.73% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.05953 < 0.06223	OK
$\sigma_A(f_0) < \theta(f_0)$	1.55449 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 810 - (7)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: La Muccaia

Address: Via Brana

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41.3 m s.l.m.

Weather: -

Notes: -

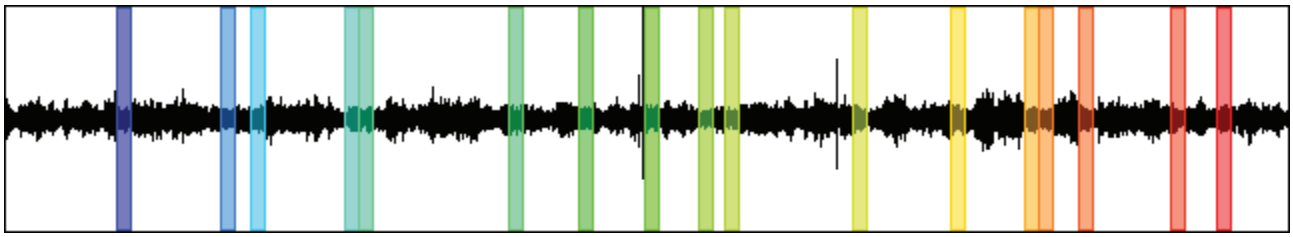
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/11 13:35:08
Recording length:	60 min
Windows count:	17
Average windows length:	40
Signal coverage:	18.89%

21394 Counts

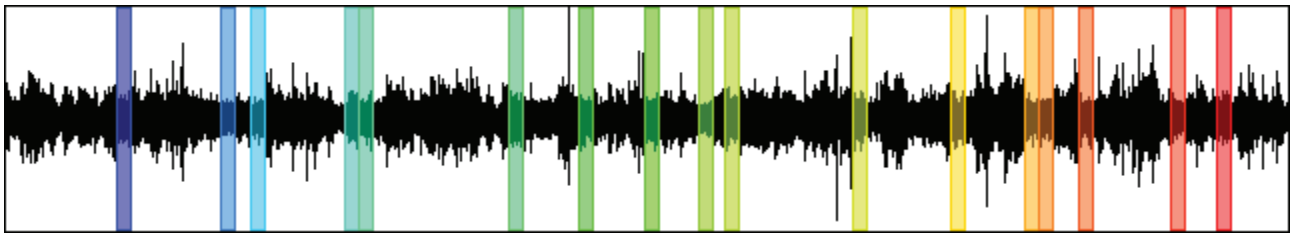
CHANNEL #1 [V]



-11342 Counts

10212 Counts

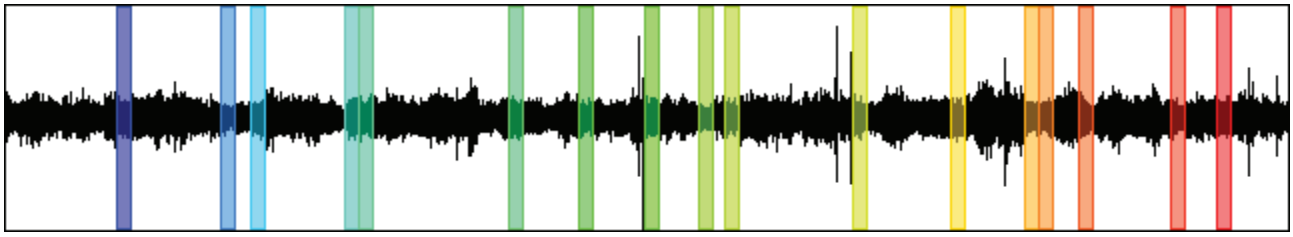
CHANNEL #2 [N]



-9235 Counts

10938 Counts

CHANNEL #3 [E]



-13317 Counts

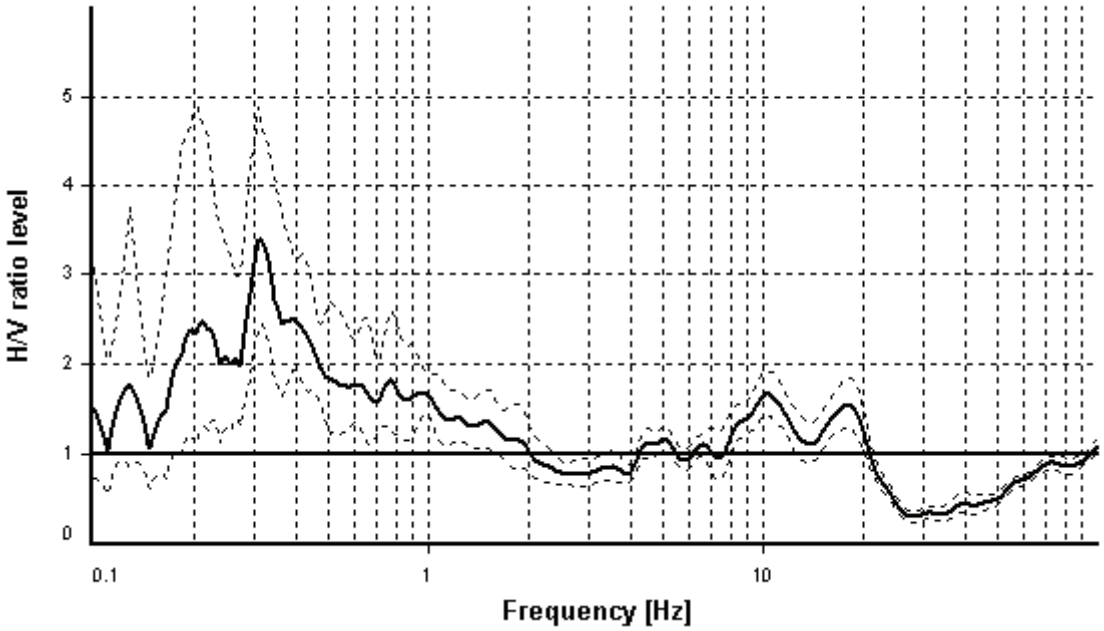
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

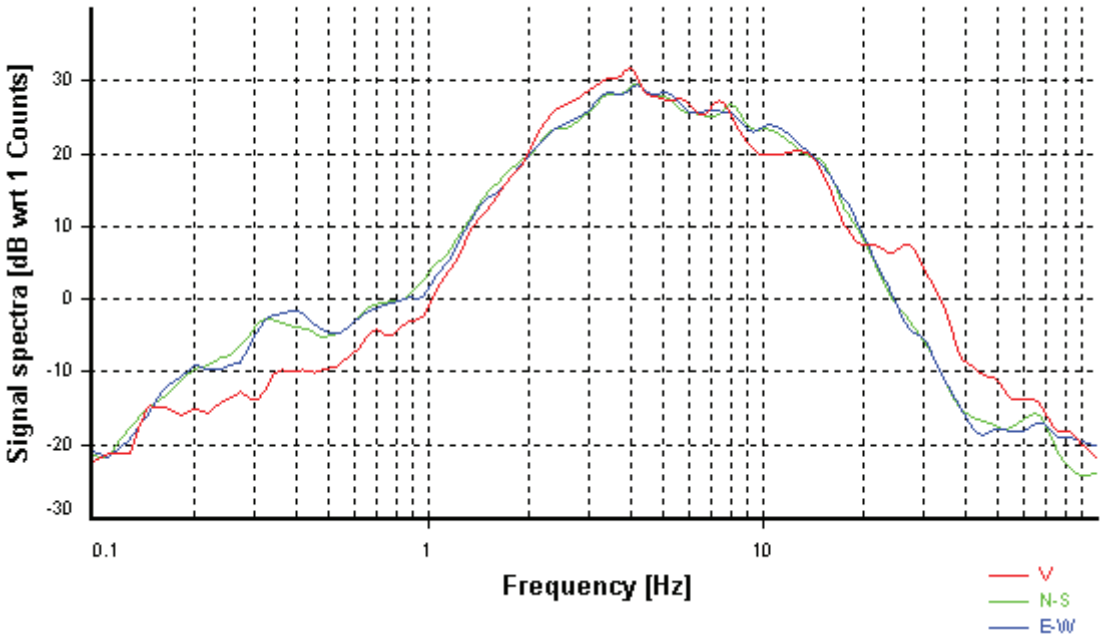
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

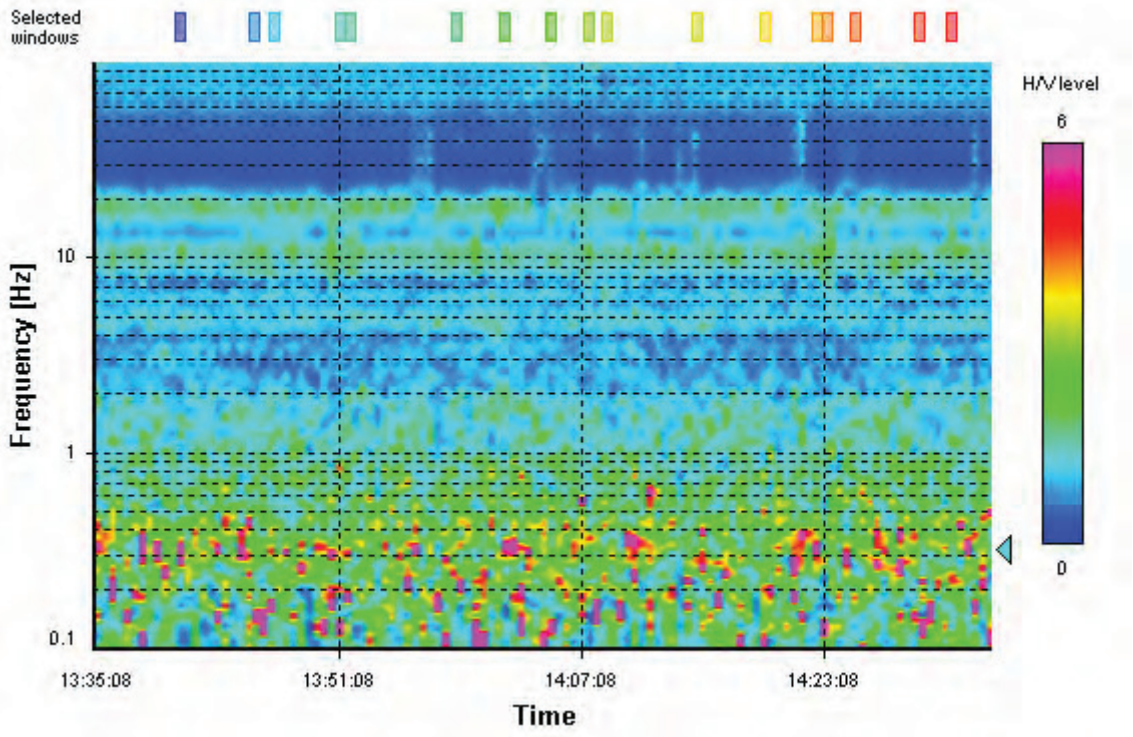
HVSR average



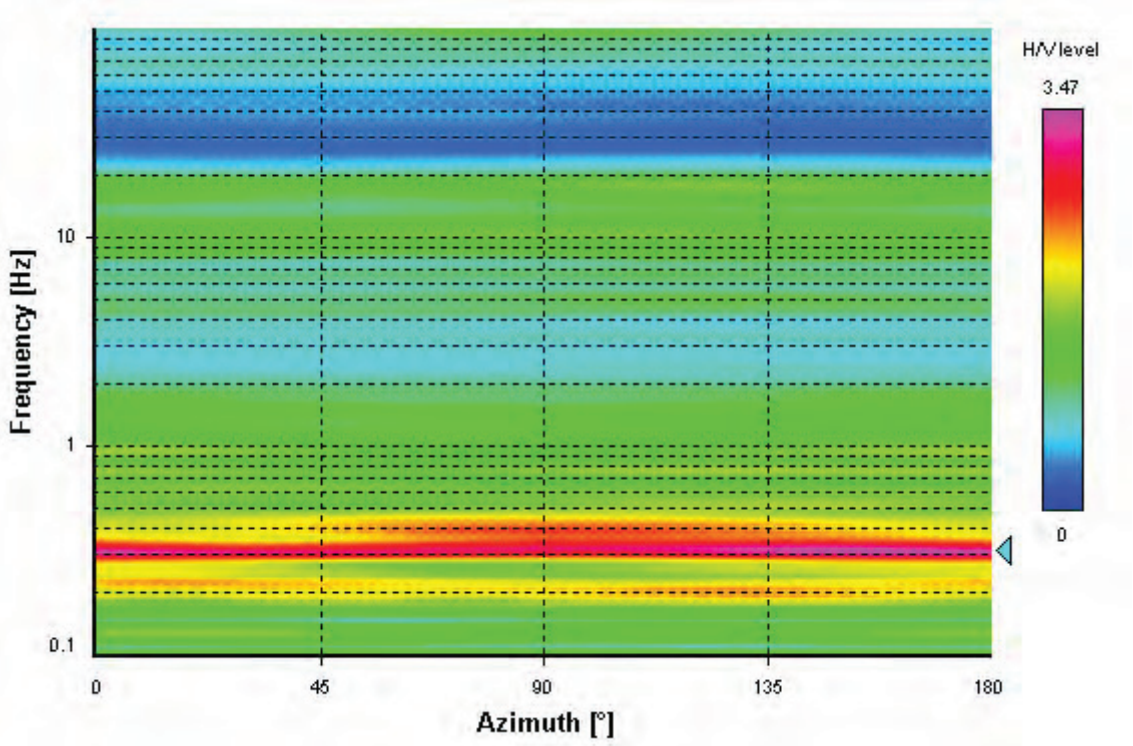
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



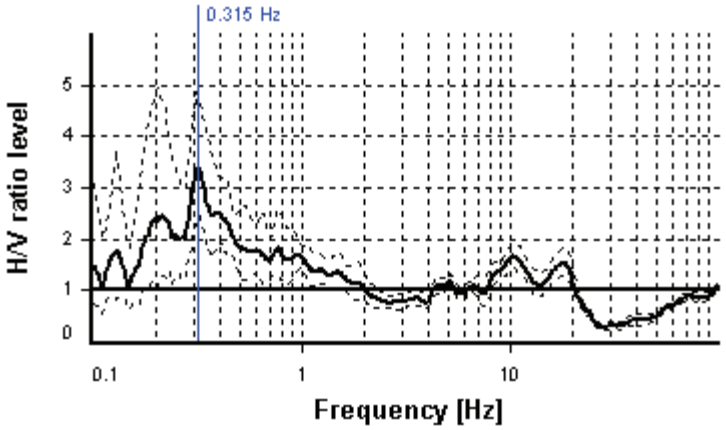
SESAME CRITERIA

Selected f_0 frequency

0.315 Hz

A_0 amplitude = *3.392*

Average f_0 = *0.284 ± 0.057*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	17 valid windows (length > 31.7 s) out of 17	OK
$n_c(f_0) > 200$	214.54 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	0.1669 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	0.64807 Hz	OK
$A_0 > 2$	3.39 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	1.39% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.0571 < 0.0631	OK
$\sigma_A(f_0) < \theta(f_0)$	1.39642 < 2.5	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 811 - (8)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: -

Address: Via Branaccia

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 40.6 m s.l.m.

Weather: -

Notes: -

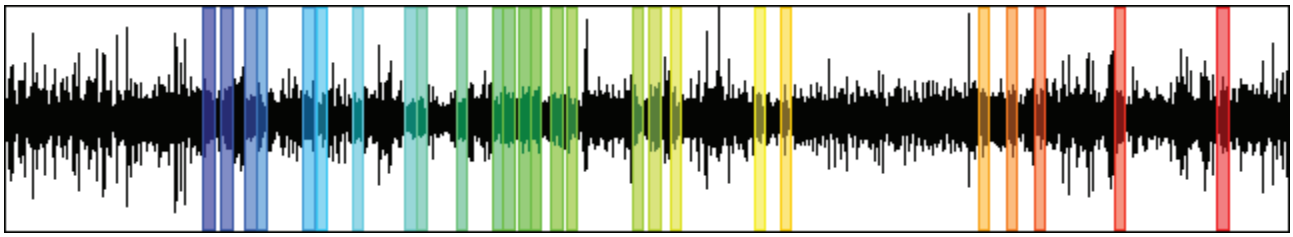
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/11 15:00:09
Recording length:	60 min
Windows count:	26
Average windows length:	30
Signal coverage:	21.67%

23819 Counts

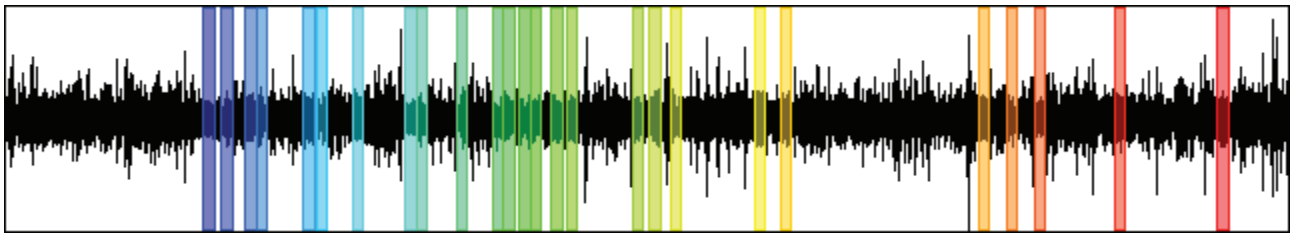
CHANNEL #1 [V]



-20090 Counts

26499 Counts

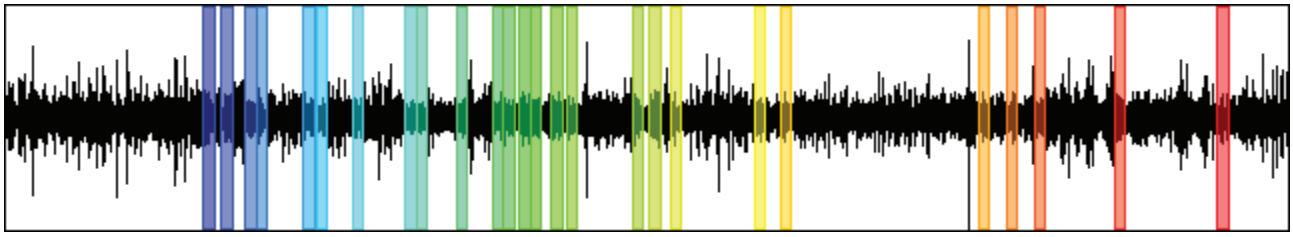
CHANNEL #2 [N]



-29896 Counts

23000 Counts

CHANNEL #3 [E]



-33278 Counts

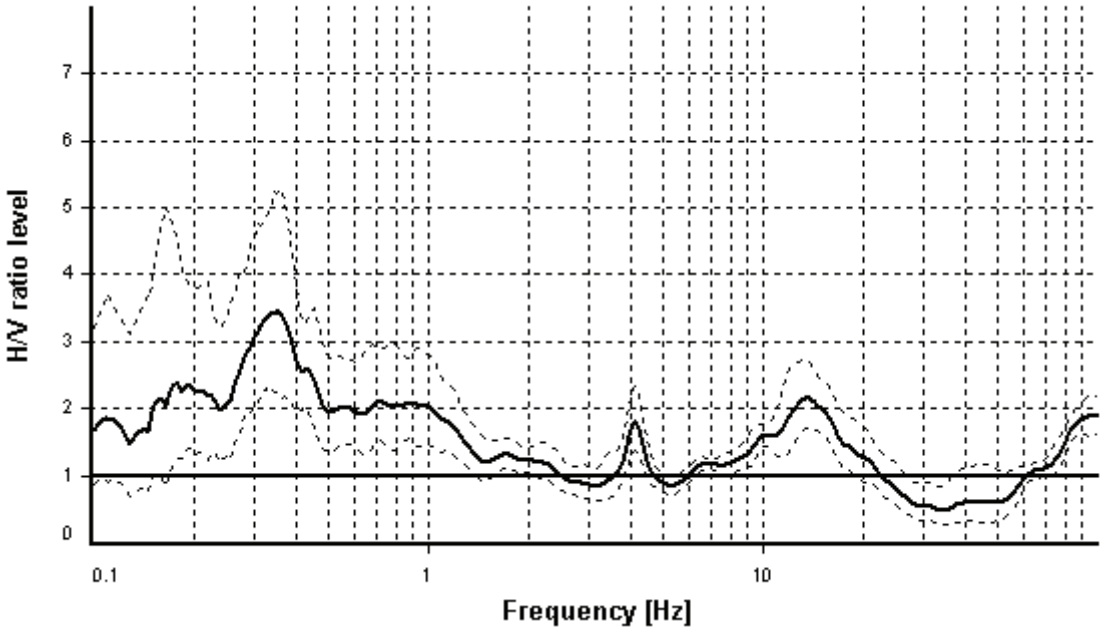
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

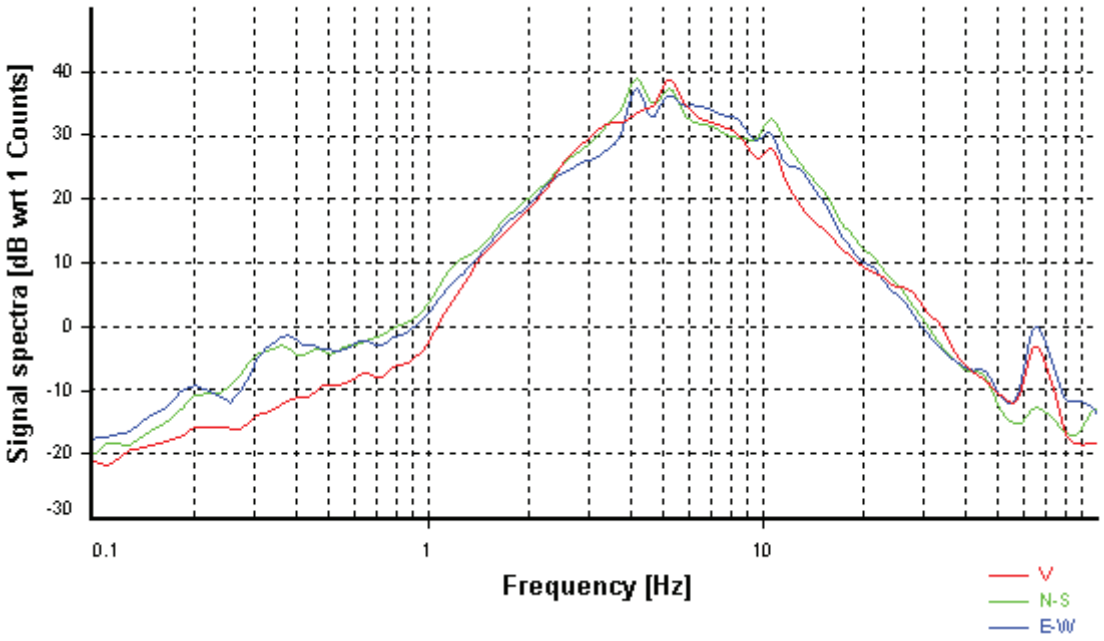
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

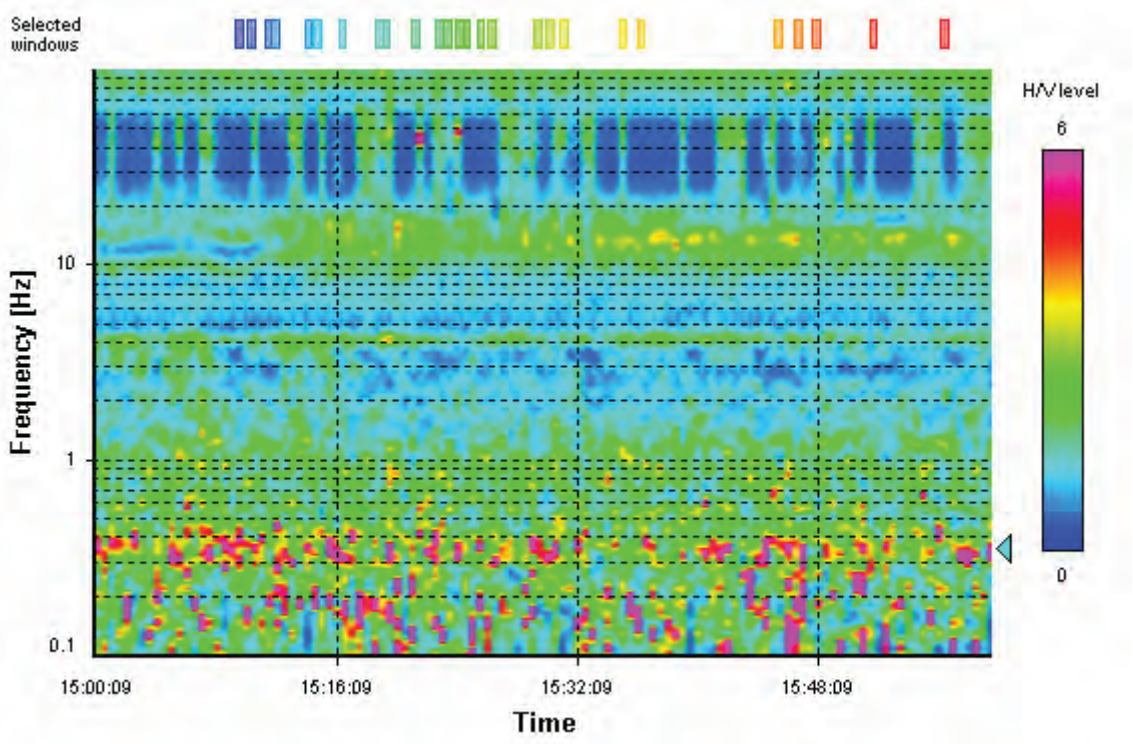
HVSR average



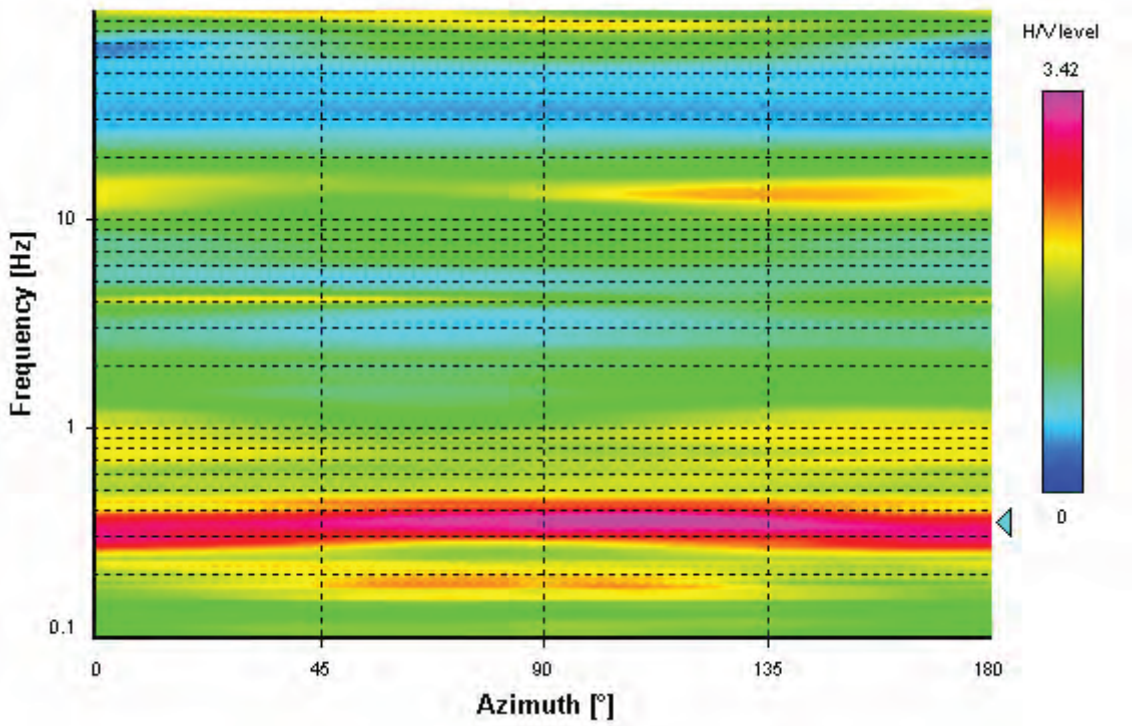
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



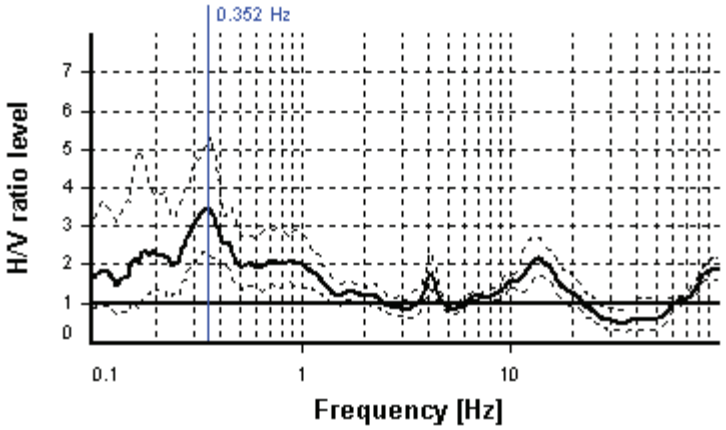
SESAME CRITERIA

Selected f_0 frequency

0.352 Hz

A_0 amplitude = *3.435*

Average f_0 = *0.352 ± 0.063*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	26 valid windows (length > 28.37 s) out of 26	OK
$n_c(f_0) > 200$	274.91 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	0.14532 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	1.20827 Hz	OK
$A_0 > 2$	3.44 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	4.24% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.06318 < 0.07049	OK
$\sigma_A(f_0) < \theta(f_0)$	1.52031 < 2.5	OK
Overall criteria fulfillment		OK

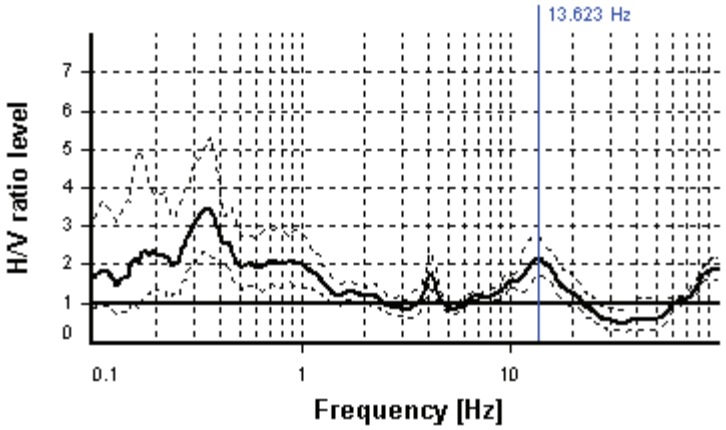
SESAME CRITERIA

Selected f_0 frequency

13.623 Hz

A_0 amplitude = *2.158*

Average f_0 = *13.786 ± 1.353*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	26 valid windows (length > 0.73 s) out of 26	OK
$n_c(f_0) > 200$	10625.84 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0/2$	6.10339 Hz	OK
$\exists f^+$ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0/2$	21.81109 Hz	OK
$A_0 > 2$	2.16 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	1.39% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	1.35337 >= 0.68114	NO
$\sigma_A(f_0) < \theta(f_0)$	1.25836 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 812 - (9)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Casa Baroncelli

Address: Via Carbolinga

Latitude: -

Longitude: -

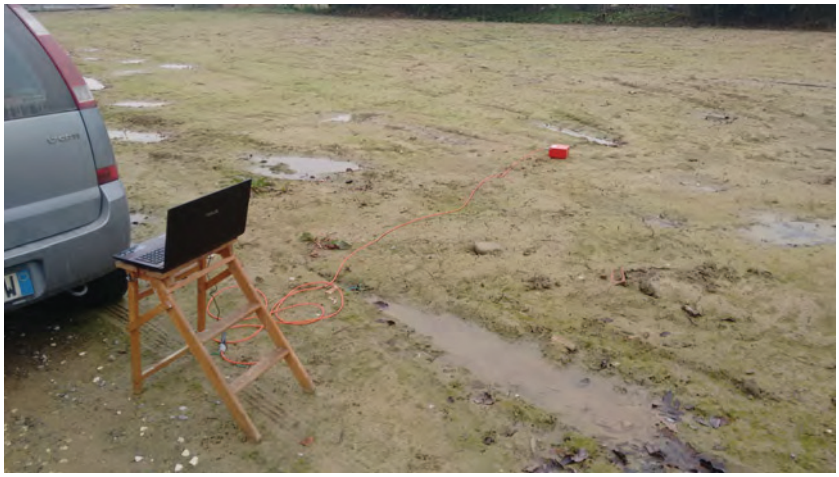
Coordinate system: -

Elevation: 41.0 m s.l.m.

Weather: -

Notes: -

PHOTOGRAPHIC REFERENCES

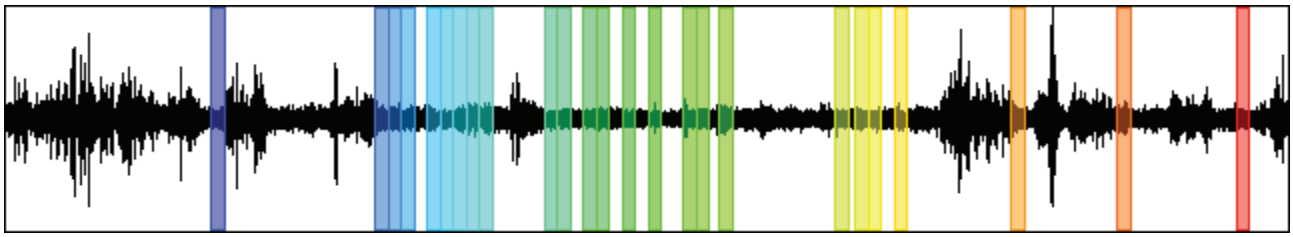


SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/15 11:54:26
Recording length:	65.83 min
Windows count:	25
Average windows length:	40
Signal coverage:	25.32%

11912 Counts

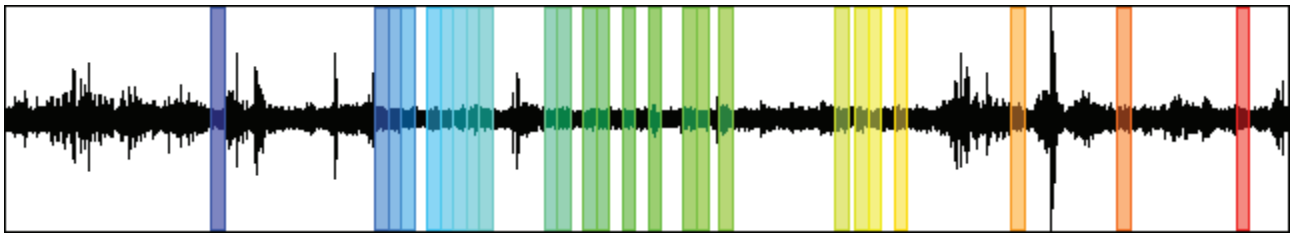
CHANNEL #1 [V]



-9434 Counts

13651 Counts

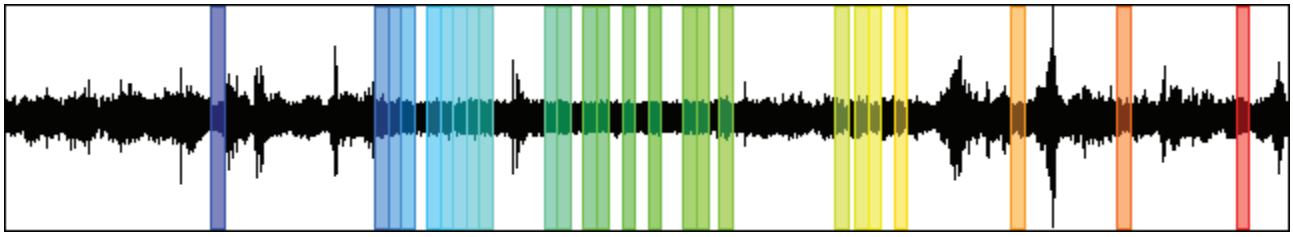
CHANNEL #2 [N]



-13541 Counts

10904 Counts

CHANNEL #3 [E]



-10644 Counts

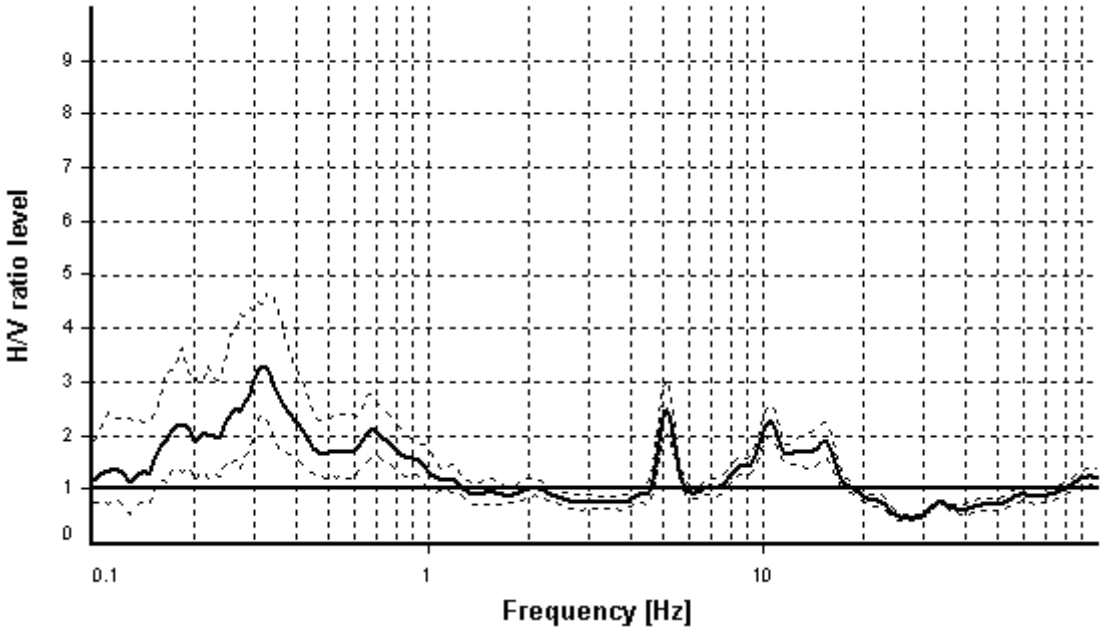
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

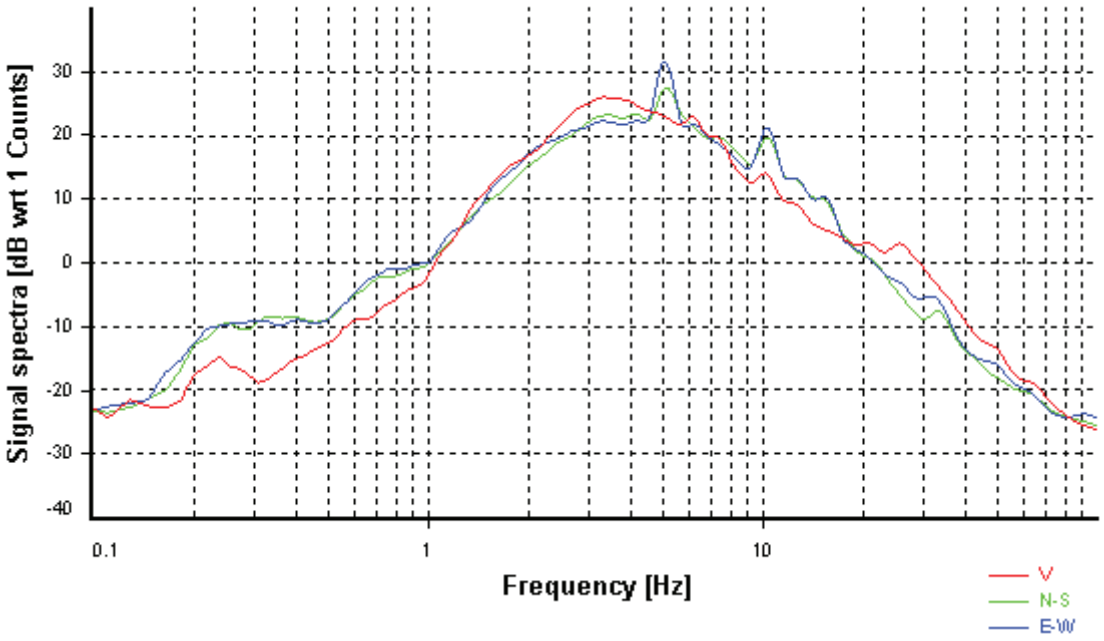
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

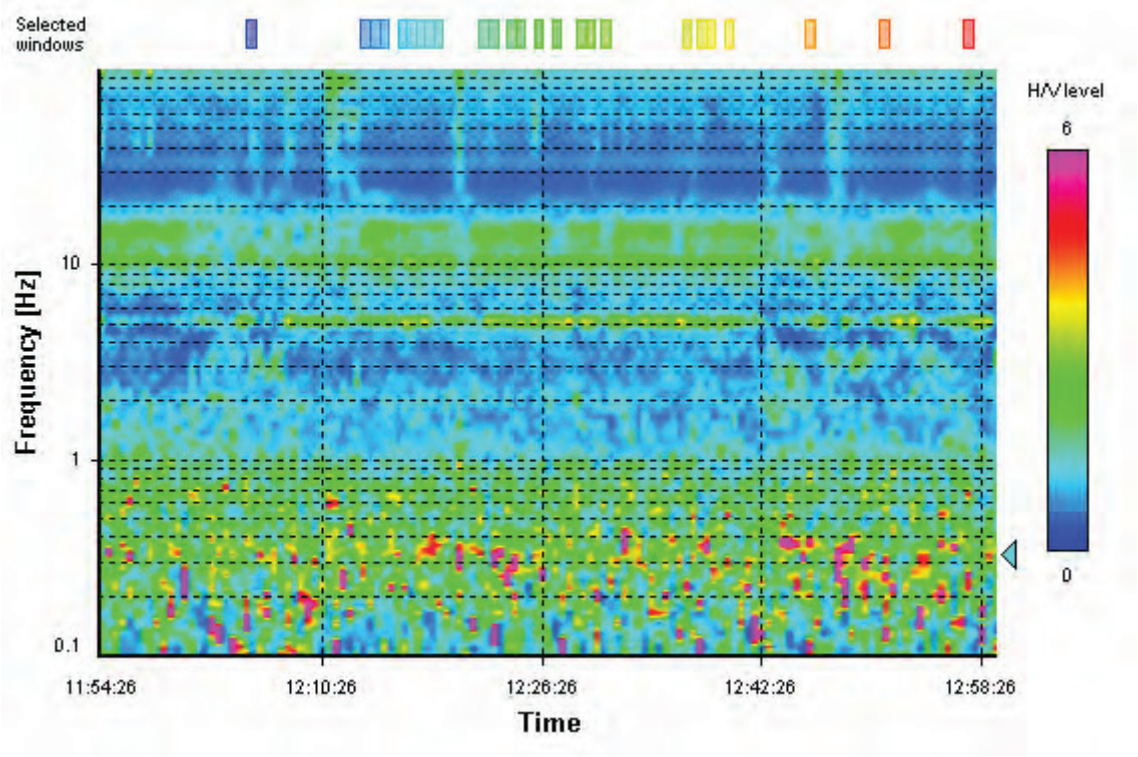
HVSR average



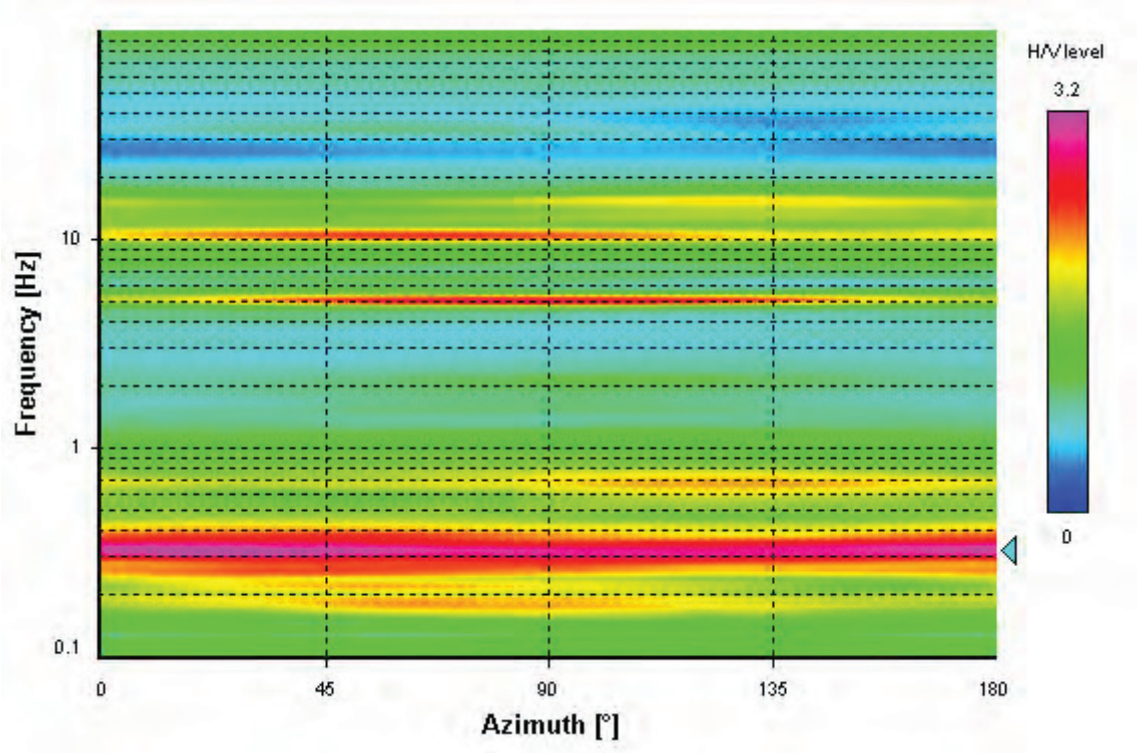
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



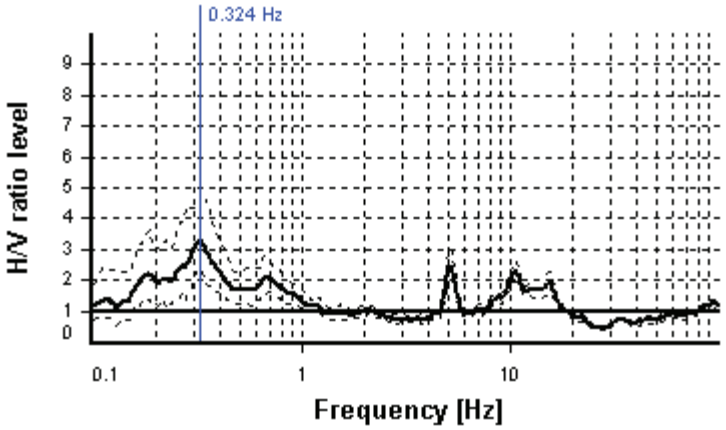
SESAME CRITERIA

Selected f_0 frequency

0.324 Hz

A_0 amplitude = *3.270*

Average f_0 = *0.319 ± 0.060*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	25 valid windows (length > 30.83 s) out of 25	OK
$n_c(f_0) > 200$	324.36 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0/2$	0.15359 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0/2$	0.83146 Hz	OK
$A_0 > 2$	3.27 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	1.39% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.0601 < 0.06487	OK
$\sigma_A(f_0) < \theta(f_0)$	1.38677 < 2.5	OK
Overall criteria fulfillment		OK

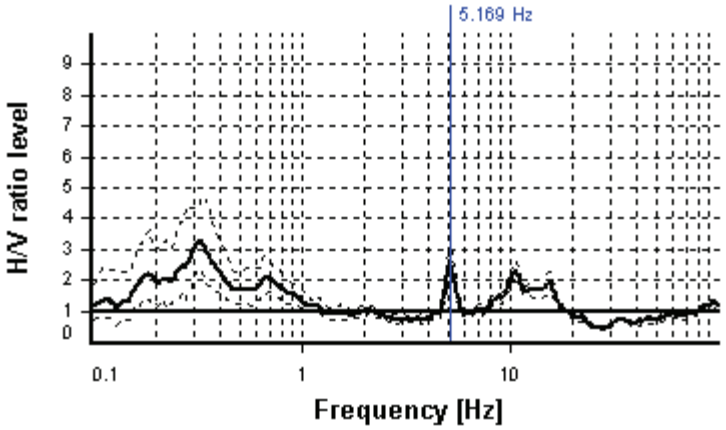
SESAME CRITERIA

Selected f_0 frequency

5.169 Hz

A_0 amplitude = *2.473*

Average f_0 = *5.141 ± 0.046*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	25 valid windows (length > 1.93 s) out of 25	OK
$n_c(f_0) > 200$	5169.24 > 200	OK
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0/2$	4.69183 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0/2$	5.77462 Hz	OK
$A_0 > 2$	2.47 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	0% <= 5%	OK
$\sigma_f < \varepsilon(f_0)$	0.04586 < 0.25846	OK
$\sigma_A(f_0) < \theta(f_0)$	1.22096 < 1.58	OK
Overall criteria fulfillment		OK

STATION INFORMATION

Station code: 813 - (10)

Model: -

Sensor: -

Notes: -

PLACE INFORMATION

Place ID: Casa dell'Opera Pia

Address: Via del Mosino

Latitude: -

Longitude: -

Coordinate system: -

Elevation: 41.6 m s.l.m.

Weather: -

Notes: -

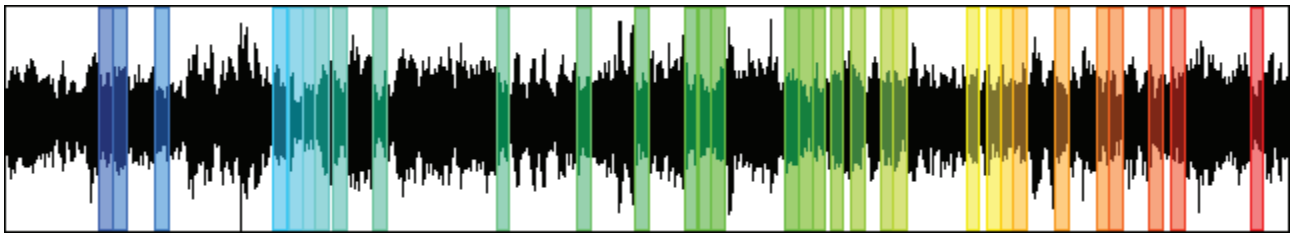
PHOTOGRAPHIC REFERENCES

SIGNAL AND WINDOWING

Sampling frequency:	300 Hz
Recording start time:	2015/12/15 13:24:51
Recording length:	64.5 min
Windows count:	32
Average windows length:	40
Signal coverage:	33.07%

6137 Counts

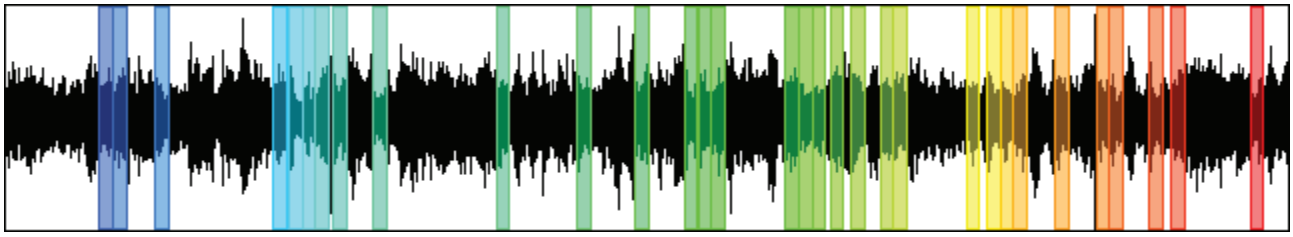
CHANNEL #1 [V]



-6895 Counts

6157 Counts

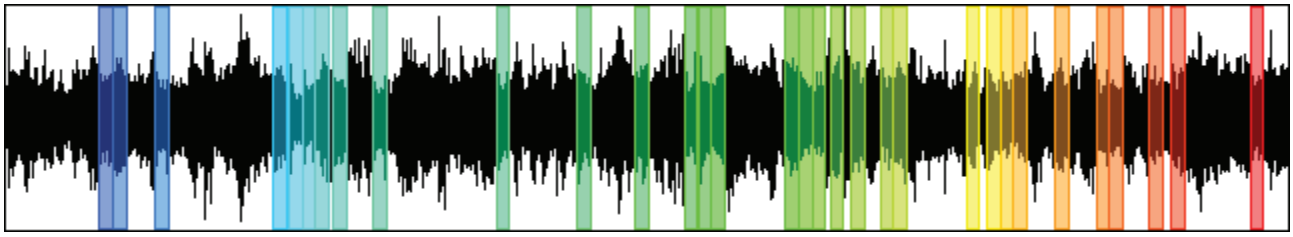
CHANNEL #2 [N]



-6580 Counts

5864 Counts

CHANNEL #3 [E]



-5477 Counts

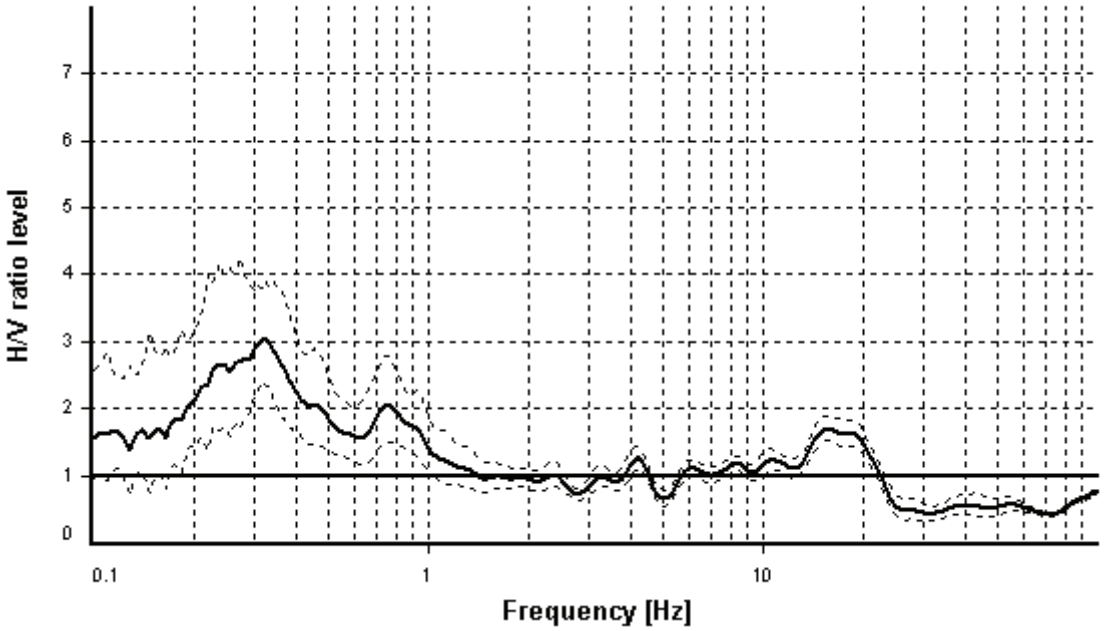
HVSR ANALYSIS

Tapering: Enabled (Bandwidth = 5%)

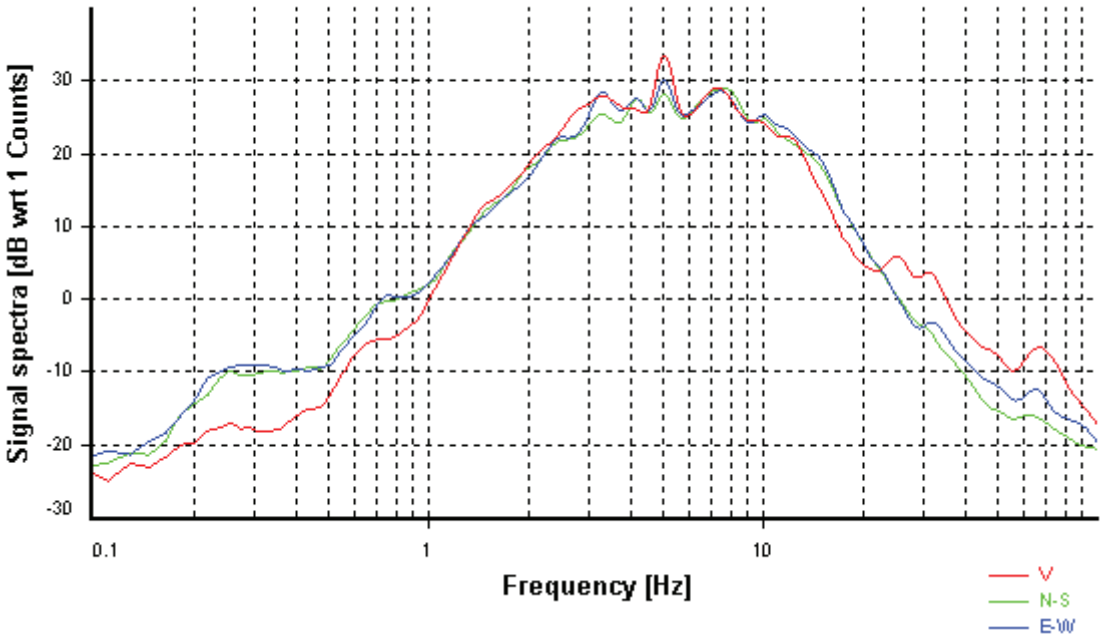
Smoothing: Konno-Ohmachi (Bandwidth coefficient = 40)

Instrumental correction: Disabled

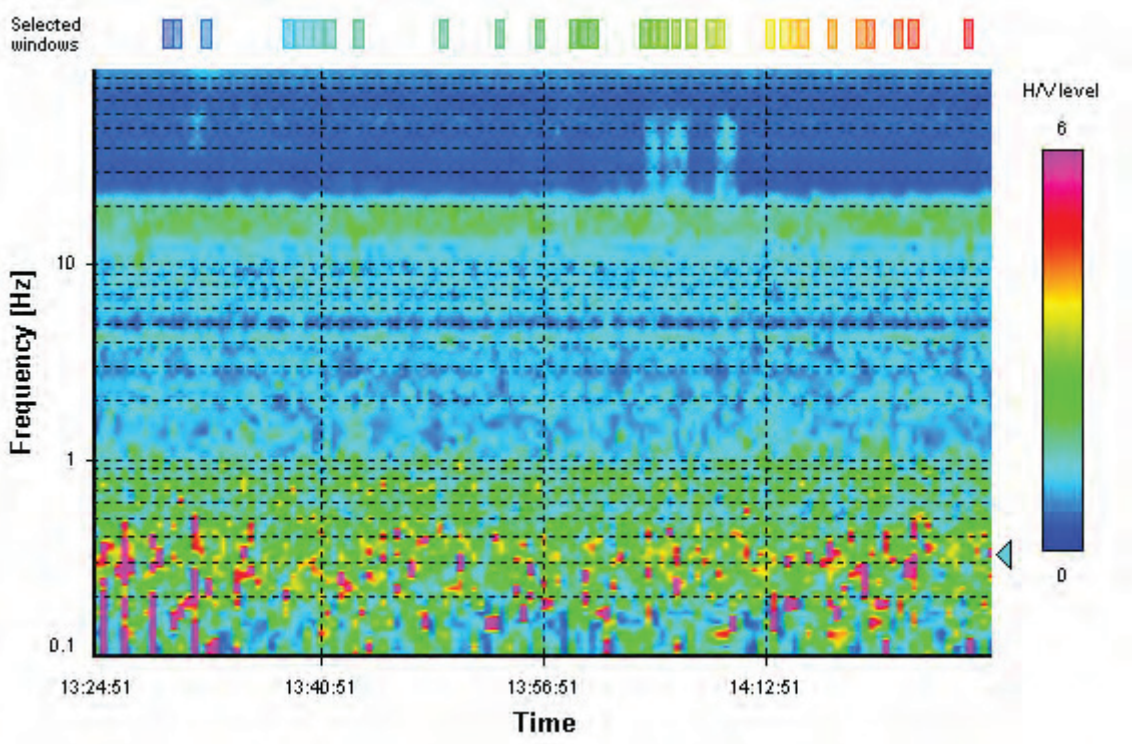
HVSR average



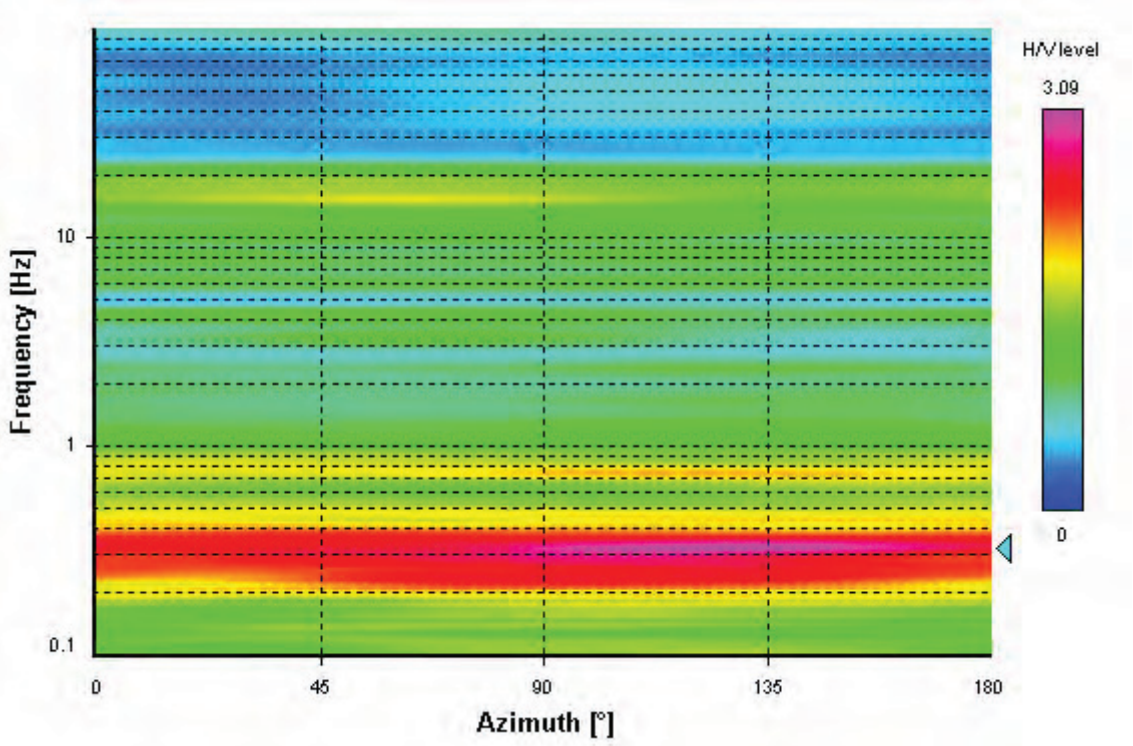
Signal spectra average



HVSR time-frequency analysis (30 seconds windows)



HVSR directional analysis



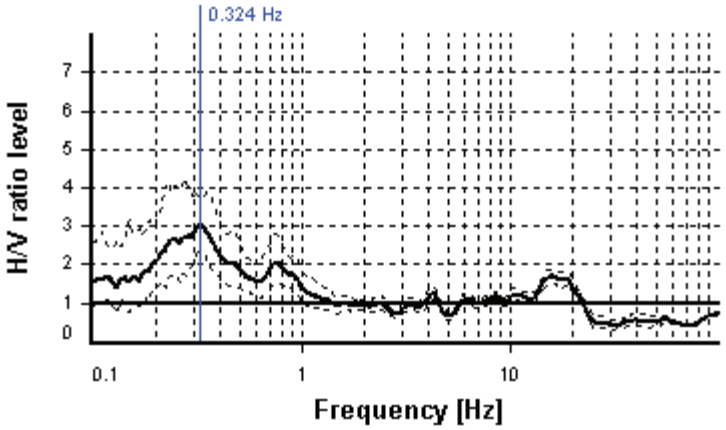
SESAME CRITERIA

Selected f_0 frequency

0.324 Hz

A_0 amplitude = *3.023*

Average f_0 = *0.293 ± 0.064*



HVSR curve reliability criteria		
$f_0 > 10 / L_w$	32 valid windows (length > 30.83 s) out of 32	OK
$n_c(f_0) > 200$	415.18 > 200	OK
$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$	Exceeded 0 times in 101	OK
HVSR peak clarity criteria		
$\exists f^-$ in $[f_0/4, f_0] \mid A_{H/V}(f^-) < A_0/2$	0.13009 Hz	OK
$\exists f^+$ in $[f_0, 4f_0] \mid A_{H/V}(f^+) < A_0/2$	0.98171 Hz	OK
$A_0 > 2$	3.02 > 2	OK
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	15.31% > 5%	NO
$\sigma_f < \varepsilon(f_0)$	0.0644 < 0.06487	OK
$\sigma_A(f_0) < \theta(f_0)$	1.26214 < 2.5	OK
Overall criteria fulfillment		OK