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COGEAR

MODULE 3:

H/V - measurements in the area of Visp and St. Niklaus

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H/V - measurements in the area of Visp and St. Niklaus

COGEAR Report Task 3.2
Deliverable: Map of the fundamental frequencies of resonance of the sediments

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1. Introduction

In Summer 2007 and 2008, more then 200 single station measurements were done in the areas around Visp and St. Niklaus/Grächen respectively. Together with single station measurements done the years before and data from array measurements, we have a very good data coverage for both areas. The single station measurements were conducted with a Mars88 datalogger and a three-component velocity sensor (Lennartz, LE3D-5s), the array measurements with Quanterra Q330 dataloggers. To ensure a good coupling to the ground, small holes of about 20 cm depth were dug, whenever possible, to set up the sensor. At each location, ambient noise was recorded for 20-30 minutes with a sampling-frequency of 62.5 Hz (200 Hz for array-data).
In this report we will provide maps showing the eigenfrequencies for the areas of Visp and St.Niklaus/Grächen as well as tables containing the important parameters (Coordinates, f_0, Amplitude, Quality) for all measured points. Furthermore we will introduce a new method to derive Ellipticity curves out of ambient noise measurements and show some first results achieved at a site in Visp.

2. Method

H/V: classical polarization analysis and frequency time analysis

To define the H/V-ratio at a certain site we use ambient noise recordings. Ambient noise is produced not only by human activity, such as traffic and machinery, but also by natural sources like ocean waves and surf as well as strong winds. This noise is ubiquitous but cannot be felt. Only highly sensitive instruments are able to record the corresponding wave field.
The shape and frequency content of the recorded seismic ground motion are influenced by the local site condition, including the geometrical and mechanical characteristics of the geological structure. A particular feature of these waves is the polarization around the resonance frequency of the soft layers, where the particles motion is almost horizontal. One possible explanation for this behaviour is based on the assumption that surface waves constitute a major part of ambient noise, and the H/V-ratio is therefore related to the ellipticity of the Rayleigh Waves (e.g. Yamanaka et al., 1994). Thus a significant peak in the H/V-ratio allows us to identify the presence of a layer with soft sediment or weathered rock. At sites with a strong S-wave velocity contrast, the H/V-ratio shows a strong peak. However, at sites with a small velocity contrast between sediments and bedrock, the H/V peak at the fundamental frequency of resonance is still detectable and probably due to vertically propagation S-waves and their constructive interference (S- wave resonance).
Two different methods were applied to compute the H/V-ratios. The first one is the classical polarization analysis in the frequency domain, where the polarization is defined as the ratio between the quadratic mean of the Fourier spectra of the

horizontal components and the spectrum of the vertical component. The second method tries to reduce the SH-wave influence by identifying P-SV-wavelets from the signal and taking the spectral ratio only from these wavelets. This is done by means of a frequency-time analysis of each of the three components of the ambient vibrations. In a frequency-time representation of the vertical signal the most energetic sections are identified in time for each frequency. We assume that this maximum is related to a single P-SV-wavelet, for which the H/V ratio is computed. The average over all wavelets defines the H/V spectral ratio. Both methods are described in more detail in Fäh et al., 2001.

Peak Quality

The quality of a peak is defined as the average value of two quality measures on the H/V curve from frequency-time analysis or the classical method respectively:

$$Q = \frac{(Q_1 + Q_2)}{2}$$

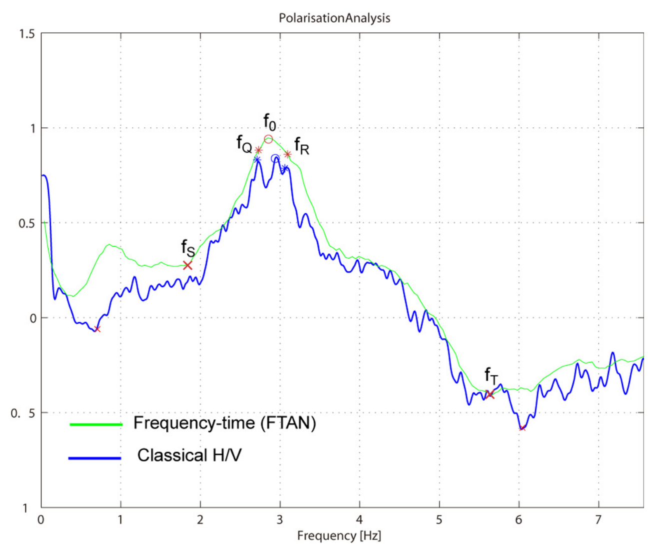
First quality measure of the peak [Q_1]:

$$Q_1 = \frac{\int_{f_Q}^{f_R} \log 10\left(\frac{H}{V}\right) df}{\left(f_R - \mathrm{f_Q}\right)} - \frac{\log 10\left(\frac{H}{V}(f_S)\right) + \log 10\left(\frac{H}{V}(f_T)\right)}{2}$$

Second quality measure of the peak [Q_2]:

$$Q_2 = 1 + \frac{\int_{f_S}^{f_T} 10^{\left|\log 10\left(\frac{H}{V}\right) - \overline{A}\right|} df}{(f_T - f_S)}$$

$$\overline{A} = \frac{\int_{f_S}^{f_T} \log 10\left(\frac{H}{V}\right) df}{\left(f_T - f_S\right)}$$



f_o: Frequency of the H/V-peak, at the fundamental frequency of resonance

[f_Q, f_R]: Uncertainty range of the fundamental frequency of resonance

f_S: Frequency of the first minimum to the left of the H/V-peak

f_T: Frequency of the first minimum to the right of the H/V-peak

Peak Quality:

Q=[1,1.1]	poor
Q=[1.1,1.3]	medium
Q=[1.3,1.4]	good
Q>1.4	very good

3. Results

***f_0*-map of Visp**

Maps showing the obtained eigenfrequencies for all measured points in the area of Visp are given in figures 1 (classical method) and 2 (FTAN method). Different ranges of H/V-values are plotted in different colours. A difference between the plane part of the Rhone-valley and the valley boarders is clearly visible in both pictures. Whereas at the valley floor values in the range between 1.1 Hz and 2.0 Hz are dominating, the obtained values at the edges are mainly above 3 Hz. White points imply that no peak could be detected. This can be either because of a rock site (for example at the southern part of Visp) or because of bad data quality (for example inside the Lonza-area) due to strong industrial noise.

***f_0*-map of St.Niklaus / Grächen**

Maps showing the obtained eigenfrequencies for all measured points in the area of St.Niklaus/Grächen are given in figures 3 (classical method) and 4 (FTAN method). Also here, different ranges of H/V-values are plotted in different colours. Clear differences between locations inside the Matter-valley and locations on the slope up to Grächen are visible on both pictures. At the valley floor, again values between 1.1 Hz and 2 Hz are dominating. On the slope up to Grächen the values are quite varying. Low resonance frequencies at Grächen indicate the deep reaching landslide in this slope of the Matter valley.

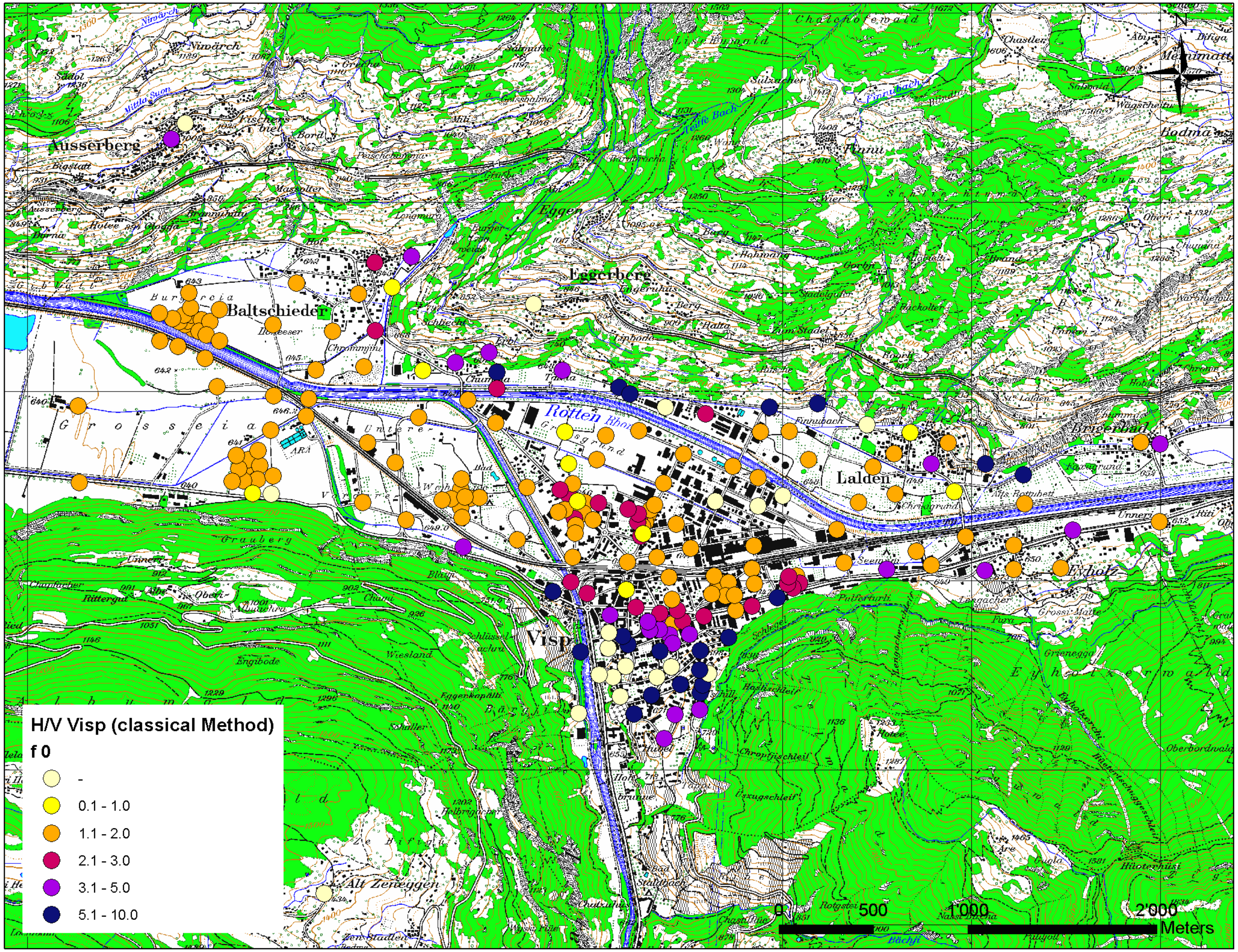


Figure 1: *Map with obtained f_0-values for the area of Visp (classical method).*

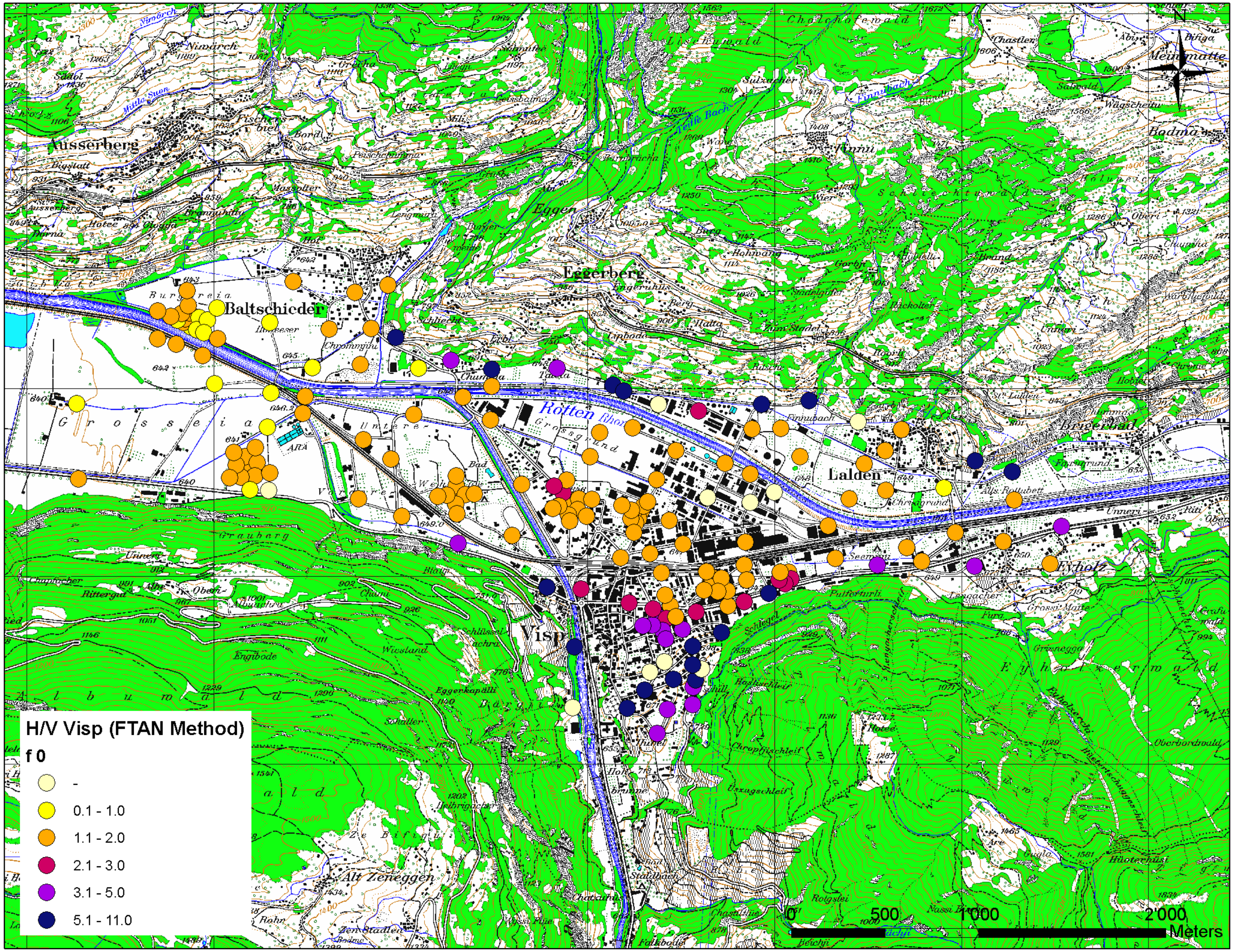


Figure 2: *Map with obtained f_0-values for the area of Visp (FTAN method).*

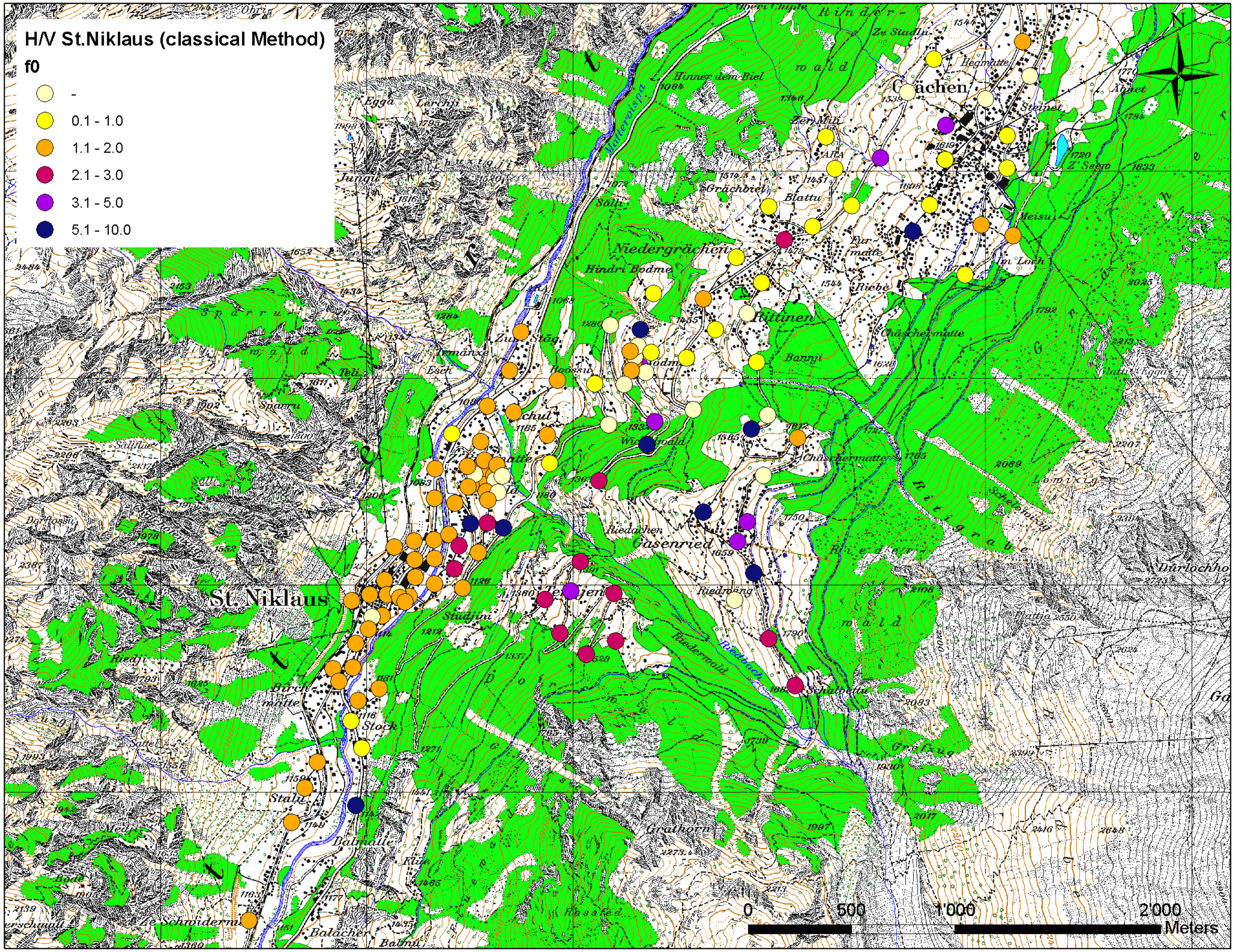


Figure 3: *Map with obtained f_0-values for the area of St.Niklaus (classical method).*

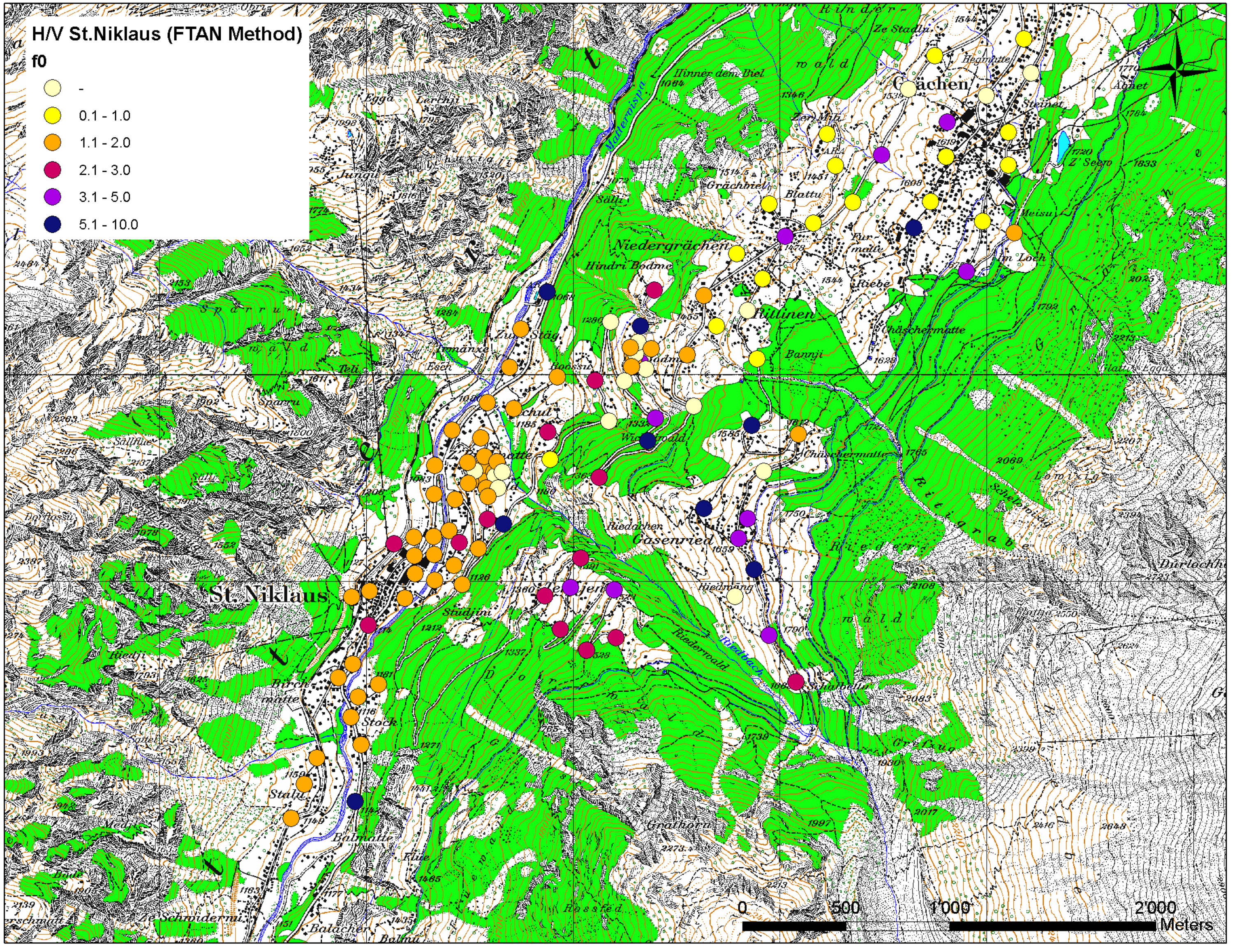


Figure 4: *Map with obtained f_0-values for the area of St.Niklaus (FTAN method).*

4. Testing a new method in Visp: Assessing Rayleigh wave particle motion using hv-fk analysis of ambient vibration

Dispersion curves obtained from array analysis of ambient vibration recordings are not always sufficient to provide reliable S-wave velocity profiles. Complex structures, e.g. those with velocity inversions, may require additional constrains for the inversion in order to avoid solutions to be trapped in a local minimum. Different techniques were developed in the last years with the aim to introduce some “a priori” knowledge, such as thickness of layers or the measured fundamental frequency of resonance of unconsolidated sediments. This type of information allows to reduce the problem of the non-uniqueness of the inversion, especially for the depth of the bedrock. Combined inversions using the information contained in single-station H/V spectral ratio curves were also successfully tested in the past years, being portions of these curves related to the Rayleigh wave fundamental-mode ellipticity (Lachet and Bard 1994; Fäh et al. 2001; Fäh et al. 2003). The principal disadvantage of the method is the impossibility to always identify and separate higher modes contribution, and to correct for the energy of SH and Love waves that are present in the ambient vibration wavefield depending on the particular site.
We introduce a new methodology to retrieve Rayleigh wave ellipticity based on high-resolution frequency-wavenumber array analysis (Capon 1969). The technique is applied to the three components of motion (Fäh et al. 2008). We base on the assumption that a peak in the f-k cross-spectrum obtained from horizontal (radial-polarized) and vertical components of motion must be representative of the signal power of a particular mode (figure 5). Thus the relative frequency-dependent surface displacement ratio can be calculated for each mode separately, once the mode-correspondent dispersion curve is identified on the f-k plane (figure 6).

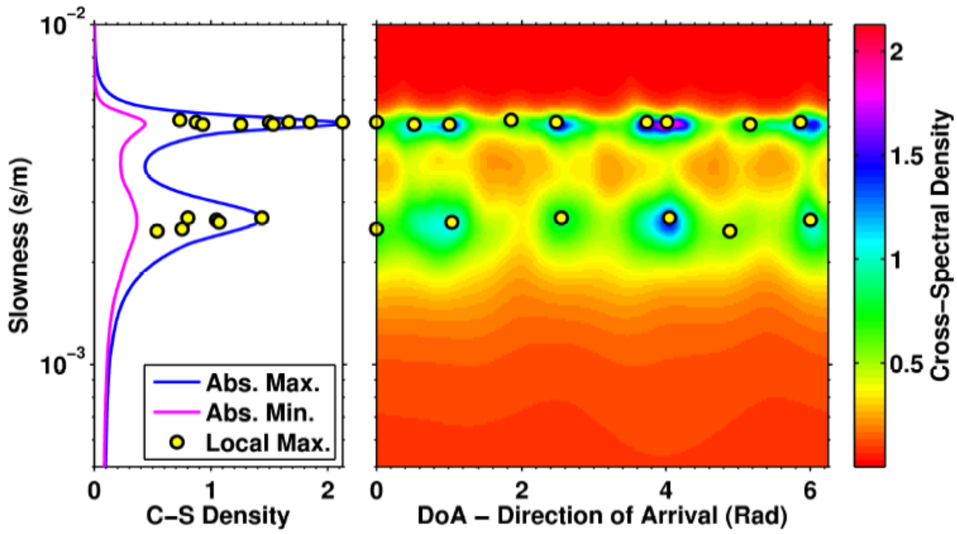


***Figure 5**: Picking of multiple signal amplitudes from cross-power spectrum (vertical component example). Two modes are clearly identifiable.*

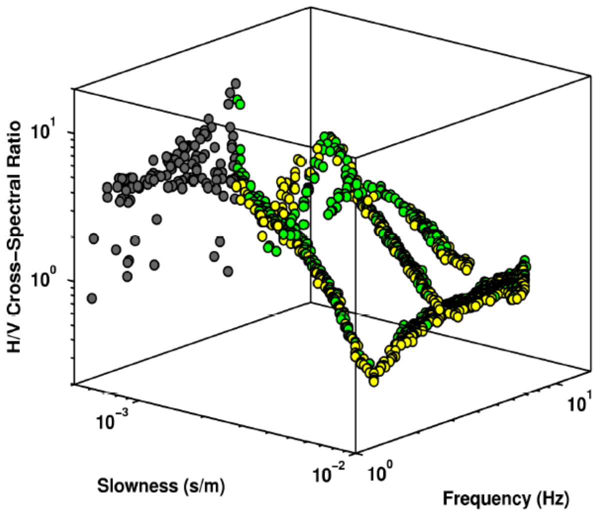


Figure 6*: Cross spectral ratio of the picked amplitudes from horizontal (green points) and vertical (yellow points) cross-power spectra. Gray points are out of resolution of the method.*

Using such information as an additional constrain for the inversion is then straightforward. This procedure allows a more accurate definition of the velocity profile (in term of Vs, but also Vp) reducing the variability of best solutions in the parameter space.

To test the method in a real situation, we conducted an experiment at two different locations in the neighbourhood of the town of Visp. From a geological point of view, this area is a quaternary sedimentary basin consisting of horizontally layered fluvial deposits (Roten et al. 2006; Roten et al. 2008). For the first test location, a single array of 14 stations has been set up. For the second, two separate array configurations with different radii were employed, of 14 (configuration 1) and 11 (configuration 2) stations each. The acquisition was performed using three-component velocity sensors (Lennartz, LE3D-5s).

Application of hv-fk analysis gave good results, especially for the second array (figure 7). The fundamental mode dispersion curve is here always clearly identifiable within the resolution limits, and the corresponding ellipticity is also well defined. The ellipiticities of the first and second higher modes appear reliable, showing a pattern similar to those obtained from previously elaborated synthetic tests.

This study led to a submitted journal paper, entitled “Estimating Rayleigh wave particle motion from three-component array analysis of ambient vibrations” (Poggi and Fäh, 2009, under review for Geophysical Journal International). Outcomes have also been presented and discussed during the 31th General assembly of the European Seismological Commission (ESC) 2008.

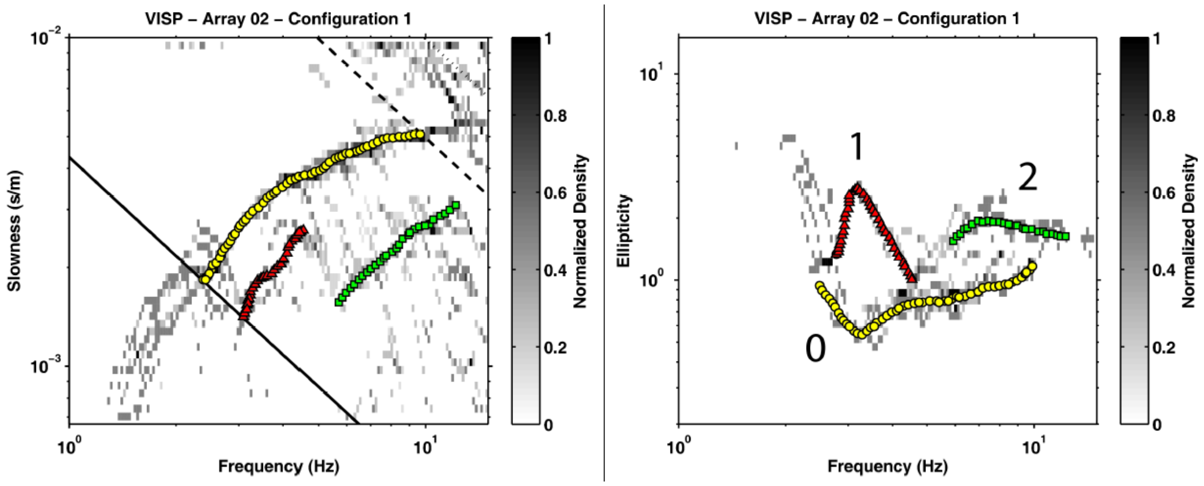


***Figure 7**: Dispersion and ellipticity histograms for the array 02 (configuration 1) in Visp. Three modes are clearly identifiable: fundamental (in yellow), the fist higher (in red) and the second higher (in green).*

5. References

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6. Appendix

Table 1: *Single station measurements done in summer 2007 in the area of Visp.*

	X-coord	Y-coord	$f_{0\ classical}$	$[f_Q\ f_R]_{classical}$	$Ampl_{classical}$	$f_{0\ FTAN}$	$[f_Q\ f_R]_{FTAN}$	$Ampl_{FTAN}$	Quality
Visp01	634559	126319	4.8	[4.6 - 5.0]	0.3	4.9	[4.6 - 5.1]	0.4	1.4
Visp02	634562	126410	5.6	[4.6 - 6.4]	0.1	4.6	[4.4 - 4.7]	0.3	1.3
Visp03	634575	126449	5.7	[4.8 - 6.5]	0.5	6.8	[6.1 - 7.5]	0.4	1.3
Visp04	634607	126509	-	-	-	-	-	-	-
Visp05	634558	126531	6.4	[5.1 - 7.5]	0.2	6.5	[5.6 - 7.1]	0.1	1.2
Visp06	634455	126452	5.6	[4.4 - 6.9]	0.3	5.7	[4.6 - 6.7]	0.3	1.3
Visp07	634302	126396	8.0	[6.2 - 10.0]	0.2	7.8	[6.2 - 10.0]	0.2	1.1
Visp08	634426	126294	4.9	[4.5 - 5.9]	0.4	4.8	[4.5 - 5.2]	0.5	1.5
Visp09	634210	126298	9.1	[8.3 - 9.2]	0.6	9.2	[8.4 - 9.5]	0.5	1.7
Visp10	634370	126166	5.0	[4.9 - 5.1]	0.7	5.0	[4.9 - 5.1]	0.7	1.7
Visp11	634331	126493	-	-	-	-	-	-	-
Visp12	634560	126630	6.6	[5.9 - 8.1]	0.3	7.2	[6.4 - 8.0]	0.2	1.2
Visp13	634435	127300	1.4	[0.9 - 1.7]	0.6	1.1	[0.9 - 1.5]	0.7	2.5
Visp14	634366	127517	1.7	[1.3 - 2.6]	0.6	1.2	[0.8 - 1.7]	0.6	2.5
Visp15	634641	127421	-	-	-	-	-	-	-
Visp16	634061	127770	1.5	[1.3 - 1.8]	0.7	1.4	[1.2 - 1.6]	0.6	1.9
Visp17	634237	127793	1.6	[1.3 - 1.9]	0.6	1.4	[1.2 - 1.8]	0.6	1.8
Visp18	634471	127671	1.5	[1.3 - 1.7]	0.5	1.4	[1.3 - 1.6]	0.5	1.7
Visp19	634733	127606	1.8	[1.5 - 2.0]	0.3	1.8	[1.5 - 2.1]	0.3	1.7
Visp20	634868	127546	1.6	[1.4 - 1.8]	0.3	1.7	[1.3 - 2.0]	0.2	1.5
Visp21	634996	127450	-	-	-	-	-	-	-
Visp22	634868	127397	-	-	-	-	-	-	-
Visp23	635283	127272	1.4	[1.2 - 1.6]	0.7	1.3	[1.1 - 1.5]	0.6	2.3
Visp24	634843	127186	1.5	[1.2 - 1.8]	0.5	1.3	[1.0 - 1.7]	0.5	2.6
Visp25	634878	127788	1.9	[1.5 - 2.2]	0.2	2.0	[1.7 - 2.2]	0.0	1.8
Visp26	634509	127174	1.5	[1.1 - 1.8]	0.4	1.3	[0.9 - 1.7]	0.4	2.1
Visp27	634012	127640	1.3	[0.9 - 2.0]	0.7	1.2	[0.9 - 1.5]	0.6	1.6
Visp28	634333	127124	1.6	[1.2 - 2.1]	0.5	1.3	[1.1 - 2.0]	0.5	1.6
Visp29	634175	127100	1.7	[1.4 - 2.0]	0.5	1.6	[1.3 - 1.8]	0.5	1.8
Visp30	634590	127883	2.9	[2.0 - 3.7]	0.4	2.7	[1.8 - 3.2]	0.5	2.1
Visp31	634377	127918	-	-	-	-	-	-	-
Visp32	633927	126626	8.9	[7.2 - 10.6]	0.2	8.1	[6.4 - 9.3]	0.2	1.3
Visp33	633917	126301	-	-	-	-	-	-	-
Visp34	633781	126943	10.0	[8.8 - 11.2]	0.3	11.0	[9.8 - 12.9]	0.3	1.2
Visp35	633963	126933	2.1	[0.9 - 3.4]	0.6	2.1	[1.0 - 3.5]	0.6	2.3
Visp36	634219	126862	3.0	[2.2 - 3.8]	0.5	3.0	[2.2 - 3.5]	0.7	2.5
Visp37	634439	126846	2.2	[1.8 - 2.4]	0.5	2.0	[1.8 - 2.1]	0.5	1.8
Visp38	634394	127021	1.4	[1.2 - 1.7]	0.6	1.4	[1.1 - 1.7]	0.5	1.7
Visp39	634412	126903	1.8	[1.5 - 2.1]	0.6	1.9	[1.3 - 2.1]	0.6	1.8
Visp40	634835	127064	1.3	[1.2 - 1.6]	0.6	1.3	[1.0 - 1.6]	0.6	2.0
Visp41	634579	126812	2.7	[2.2 - 3.3]	0.4	2.6	[2.2 - 2.9]	0.7	2.5
Visp42	634847	126984	1.5	[1.3 - 1.8]	0.5	1.4	[1.1 - 1.7]	0.5	1.9
Visp43	634749	126844	2.0	[1.4 - 2.8]	0.5	2.0	[1.4 - 3.0]	0.6	3.2
Visp44	634744	126926	1.5	[1.3 - 1.8]	0.3	1.6	[1.3 - 1.9]	0.5	1.7
Visp45	634836	126868	2.7	[2.1 - 3.4]	0.2	2.3	[1.7 - 3.1]	0.4	2.0
Visp46	634968	126913	6.3	[4.6 - 7.5]	0.2	6.3	[4.7 - 7.9]	0.3	1.8

Visp47	634712	126703	6.8	[5.3 - 8.9]	0.3	7.0	[5.7 - 8.9]	0.2	1.3
Visp48	634408	126545	-	-	-	-	-	-	-
Visp49	634504	126718	4.2	[3.5 - 4.9]	0.7	3.6	[2.3 - 4.7]	0.7	2.0
Visp50	633594	127219	1.9	[1.5 - 2.3]	0.5	1.9	[1.8 - 2.1]	0.5	1.7
Visp51	633315	127445	1.3	[1.0 - 1.5]	0.6	1.1	[1.0 - 1.3]	0.6	1.7
Visp52	633305	127179	4.2	[3.4 - 5.0]	0.2	4.2	[3.4 - 5.0]	0.3	1.3
Visp53	633004	127324	1.4	[1.1 - 1.9]	0.4	1.4	[1.1 - 1.7]	0.4	1.6
Visp54	633069	127865	1.1	[0.6 - 1.7]	0.6	1.1	[0.7 - 1.5]	0.7	1.6
Visp55	633645	127494	1.3	[0.9 - 1.4]	0.5	1.1	[0.9 - 1.4]	0.5	1.5
Visp56	633479	127835	1.5	[1.3 - 2.2]	0.3	1.5	[1.3 - 1.7]	0.3	1.8
Visp57	633331	127957	1.5	[1.3 - 1.8]	0.7	1.5	[1.2 - 1.7]	0.6	1.9
Visp58	631274	127520	1.3	[1.0 - 2.0]	0.3	1.5	[1.1 - 1.8]	0.3	1.5
Visp59	632773	127416	1.5	[1.2 - 1.7]	0.5	1.4	[1.1 - 1.8]	0.5	1.9
Visp60	632945	127627	1.4	[1.2 - 1.7]	0.2	1.3	[1.1 - 1.4]	0.3	1.8
Visp61	632798	127729	1.4	[1.1 - 1.5]	0.5	1.2	[0.9 - 1.4]	0.5	1.9
Visp62	632290	127460	-	-	-	-	-	-	-
Visp63	632286	127796	1.2	[0.9 - 1.4]	0.7	1.0	[0.7 - 1.3]	0.6	1.8
Visp64	632303	127979	1.1	[0.9 - 1.3]	0.8	1.0	[0.8 - 1.1]	0.7	1.8
Visp65	632525	128115	1.2	[0.9 - 1.3]	0.9	1.0	[0.8 - 1.2]	0.8	1.8
Visp66	632299	128356	1.1	[0.9 - 1.2]	0.8	0.9	[0.7 - 1.1]	0.7	1.5
Visp67	632616	128319	1.3	[1.0 - 1.4]	0.7	1.1	[0.9 - 1.3]	0.7	1.7
Visp68	632422	128575	1.5	[1.3 - 1.6]	0.7	1.4	[1.1 - 1.7]	0.6	1.6
Visp69	632781	128131	1.5	[1.2 - 1.8]	0.5	1.4	[1.1 - 1.6]	0.5	1.5
Visp70	632752	128516	1.9	[1.6 - 2.1]	0.6	1.8	[1.6 - 2.1]	0.6	1.9
Visp71	632841	128323	2.2	[1.7 - 2.4]	0.3	2.0	[1.4 - 2.8]	0.3	1.5
Visp72	632930	128553	0.8	[0.6 - 1.2]	0.4	1.4	[0.9 - 2.0]	0.3	1.1
Visp73	632972	128275	10.3	[7.9 - 12.7]	0.2	10.3	[7.9 - 12.7]	0.2	1.2
Visp74	633092	128112	0.7	[0.5 - 0.9]	0.6	0.9	[0.7 - 1.0]	0.4	1.1
Visp75	633266	128155	4.6	[3.8 - 5.8]	0.4	5.0	[3.4 - 5.9]	0.5	1.5
Visp76	633483	128104	6.2	[5.8 - 6.6]	0.6	6.2	[5.6 - 6.7]	0.6	1.9
Visp77	633833	128113	4.1	[3.2 - 5.0]	0.4	4.0	[3.0 - 5.1]	0.4	1.5
Visp78	634131	128023	8.1	[7.0 - 9.0]	0.7	8.4	[8.0 - 8.7]	0.7	1.4
Visp79	634927	127920	8.6	[7.4 - 9.5]	0.3	8.7	[7.5 - 9.7]	0.4	1.6
Visp80	635032	127792	1.7	[1.5 - 2.1]	0.5	1.8	[1.6 - 2.0]	0.4	1.7
Visp81	635444	127826	-	-	-	-	-	-	-
Visp82	635134	127641	1.6	[1.3 - 2.1]	0.5	1.5	[1.2 - 1.7]	0.5	1.5
Visp83	635547	127062	3.3	[3.0 - 3.6]	0.6	3.3	[3.0 - 3.6]	0.6	1.9
Visp84	635323	127097	1.7	[1.4 - 2.0]	0.6	1.6	[1.4 - 2.0]	0.6	2.0
Visp85	635706	127157	1.6	[1.3 - 2.0]	0.7	1.6	[1.3 - 1.9]	0.7	2.0
Visp86	635785	127083	1.8	[1.5 - 2.1]	0.6	1.6	[1.3 - 2.0]	0.7	2.0
Visp87	635965	127235	1.9	[1.4 - 2.8]	0.6	1.6	[1.2 - 2.1]	0.6	2.0
Visp88	636066	127055	3.2	[1.6 - 4.7]	0.5	3.5	[1.5 - 4.9]	0.5	1.9
Visp89	636221	127188	1.2	[1.0 - 1.5]	0.6	1.2	[1.0 - 1.3]	0.6	1.1
Visp90	636470	127068	1.5	[0.9 - 1.8]	0.3	1.6	[1.4 - 2.0]	0.4	1.5
Visp91	635904	127474	0.9	[0.5 - 1.4]	0.6	0.9	[0.7 - 1.0]	0.6	2.0
Visp92	636532	127269	3.6	[3.0 - 4.3]	0.6	3.9	[3.3 - 4.3]	0.6	2.5
Visp93	635592	127459	1.6	[1.2 - 2.0]	0.6	1.4	[1.1 - 1.7]	0.7	1.6
Visp94	636071	127618	6.0	[4.9 - 8.0]	0.3	6.1	[4.8 - 7.9]	0.3	1.2
Visp95	635398	127415	1.6	[1.3 - 1.8]	0.7	1.3	[1.0 - 1.6]	0.7	2.0
Visp96	636270	127561	5.3	[4.8 - 5.7]	0.5	5.2	[4.8 - 5.5]	0.5	1.4
Visp97	635476	127603	1.6	[1.3 - 2.1]	0.6	1.5	[1.2 - 1.9]	0.7	1.7

Visp98	636279	127408	2.0	[1.7 - 2.3]	0.7	1.9	[1.7 - 2.1]	0.7	1.7
Visp99	635588	127672	1.8	[1.0 - 2.1]	0.9	1.8	[1.2 - 2.1]	0.8	2.4
Visp100	635674	127784	1.0	[0.5 - 1.4]	0.8	1.1	[0.8 - 1.5]	0.7	2.4
Visp101	635183	127939	6.0	[4.6 - 6.7]	0.2	6.1	[4.6 - 8.0]	0.3	1.2
Visp102	632002	128028	1.2	[0.7 - 1.6]	0.6	1.0	[0.7 - 1.4]	0.6	1.7
Visp103	632475	127870	1.2	[0.9 - 1.5]	0.7	1.1	[0.8 - 1.5]	0.6	2.0
Visp104	631266	127924	1.1	[0.7 - 1.5]	0.6	1.0	[0.7 - 1.4]	0.6	1.8
Visp105	632488	127962	1.4	[0.8 - 1.7]	0.6	1.2	[0.7 - 1.6]	0.6	1.8
Visp106	634189	127990	6.9	[6.0 - 7.6]	0.6	6.7	[5.4 - 7.5]	0.6	1.6
Visp107	633483	128017	2.1	[1.7 - 2.7]	0.3	2.0	[1.7 - 2.5]	0.4	1.5

Table 2: *Single station measurements done in summer 2007 in the area of St.Niklaus and Grächen.*

	X-coord	Y-coord	$f_{0\ classical}$	$[f_Q\ f_R]_{classical}$	$Ampl_{classical}$	$f_{0\ FTAN}$	$[f_Q\ f_R]_{FTAN}$	$Ampl_{FTAN}$	Quality
StNi01	627945	112937	8.2	[6.5 - 9.2]	0.3	8.0	[6.7 - 9.3]	0.4	1.5
StNi02	627974	113212	1.0	[0.8 - 1.1]	0.2	1.1	[0.9 - 1.2]	0.2	1.1
StNi03	627923	113345	1.0	[0.8 - 1.5]	0.3	1.2	[0.8 - 1.7]	0.3	1.4
StNi04	627958	113444	1.6	[0.7 - 2.4]	0.2	1.6	[0.9 - 2.2]	0.3	2.1
StNi05	628058	113502	1.7	[0.8 - 2.6]	0.2	1.9	[1.1 - 2.5]	0.3	1.3
StNi06	627864	113535	1.4	[0.8 - 2.1]	0.4	1.6	[1.0 - 2.1]	0.4	1.6
StNi07	627931	113602	1.4	[1.1 - 1.7]	0.3	1.3	[1.0 - 1.9]	0.3	1.3
StNi08	628007	113789	1.4	[1.1 - 2.7]	0.2	3.0	[1.5 - 5.4]	0.1	1.2
StNi09	628183	113921	1.7	[1.0 - 2.5]	0.4	1.6	[1.0 - 2.3]	0.4	1.5
StNi10	628012	113956	1.7	[1.2 - 2.4]	0.4	1.7	[1.1 - 2.3]	0.4	1.3
StNi11	627925	113925	1.4	[0.8 - 2.2]	0.4	1.6	[1.0 - 2.2]	0.4	1.4
StNi12	628133	114184	1.6	[1.1 - 2.5]	0.3	3	[1.6 - 5.3]	0.1	1.4
StNi13	628230	114125	1.6	[0.9 - 2.2]	0.4	1.5	[1.0 - 1.9]	0.4	1.5
StNi14	628228	114214	1.6	[0.8 - 1.9]	0.4	1.5	[1.0 - 1.9]	0.4	1.4
StNi15	628324	114219	1.9	[1.4 - 2.3]	0.2	1.5	[0.9 - 2.0]	0.3	1.2
StNi16	628326	114422	1.7	[1.2 - 2.4]	0.4	1.5	[1.1 - 2.1]	0.3	1.3
StNi17	628329	114562	1.1	[0.6 - 1.4]	0.2	1.3	[1.0 - 1.6]	0.2	1.2
StNi18	628426	114398	1.8	[1.0 - 2.5]	0.3	1.8	[0.9 - 2.5]	0.3	1.4
StNi19	628397	114247	1.7	[0.9 - 2.7]	0.2	1.7	[1.0 - 2.7]	0.2	1.3
StNi20	628326	114130	1.6	[0.6 - 2.2]	0.4	1.6	[0.9 - 2.0]	0.4	1.5
StNi21	628233	114040	1.7	[1.1 - 2.4]	0.4	1.5	[0.9 - 2.3]	0.4	1.4
StNi22	628328	114008	1.6	[0.7 - 2.5]	0.1	1.7	[0.9 - 2.4]	0.1	1.3
StNi23	628422	114080	2.1	[1.1 - 3.5]	0.2	2.0	[1.3 - 2.7]	0.3	1.4
StNi24	628447	114190	2.5	[1.1 - 3.6]	0.3	2.3	[1.5 - 3.1]	0.3	1.4
StNi25	628873	115400	10.3	[9.8 - 10.8]	0.1	9.9	[8.8 - 10.8]	0.1	1.1
StNi26	628745	115223	1.2	[0.8 - 2.2]	0.2	1.3	[1.0 - 2.3]	0.2	1.2
StNi27	628711	114837	1.9	[1.0 - 2.7]	0.5	2.0	[1.3 - 2.7]	0.5	1.4
StNi28	628690	115038	1.5	[0.8 - 2.3]	0.3	1.6	[1.0 - 2.3]	0.2	1.2
StNi29	628922	114990	1.9	[1.2 - 3.6]	0.2	2.0	[1.6 - 2.5]	0.2	1.2
StNi30	628582	114867	1.2	[0.6 - 2.0]	0.3	1.7	[0.9 - 2.3]	0.3	1.2
StNi31	629206	113730	2.1	[1.6 - 2.6]	0.3	2.2	[1.7 - 2.7]	0.3	1.3
StNi32	629064	113668	2.2	[1.3 - 3.0]	0.4	2.3	[1.8 - 3.1]	0.4	1.3
StNi33	629197	113961	2.5	[1.9 - 3.0]	0.3	3.9	[2.7 - 5.0]	0.2	1.3
StNi34	628936	113770	2.6	[2.2 - 3.2]	0.3	2.7	[2.2 - 3.1]	0.4	1.2
StNi35	628986	113972	3.7	[3.0 - 4.2]	0.3	3.9	[3.4 - 4.3]	0.3	1.2
StNi36	629035	114115	2.5	[2.0 - 2.9]	0.1	2.7	[2.5 - 2.9]	0.1	1.2

StNi37	628861	113931	2.6	[2.5 - 3.2]	0.1	2.9	[2.6 - 3.2]	0.2	1.2
StNi38	628412	114733	1.0	[0.6 - 1.5]	0.3	1.3	[1.0 - 1.6]	0.3	1.1
StNi39	628552	114695	1.7	[1.4 - 2.0]	0.4	1.8	[1.5 - 2.0]	0.4	1.4
StNi40	628540	114160	1.7	[0.7 - 2.5]	0.1	1.9	[1.3 - 2.6]	0.1	1.1
StNi41	628584	114302	2.7	[2.2 - 3.4]	0.1	2.7	[2.3 - 3.3]	0.1	1.2
StNi42	628462	113988	1.6	[1.0 - 2.0]	0.2	1.7	[1.2 - 2.0]	0.2	1.1
StNi43	628660	114278	6.6	[5.2 - 7.5]	0.2	6.3	[5.3 - 7.5]	0.2	1.1
StNi44	628886	114590	0.8	[0.6 - 0.9]	0.6	0.8	[0.8 - 0.9]	0.5	1.4
StNi45	628875	114725	1.3	[0.8 - 2.2]	0.3	2.7	[1.9 - 3.1]	0.3	1.4
StNi46	629170	114775	0.0	-	-	-	-	-	-
StNi47	629180	115256	0.0	-	-	-	-	-	-
StNi48	629104	114973	0.7	[0.6 - 0.9]	0.5	2.4	[2.1 - 2.7]	0.3	1.1
StNi49	629247	114971	0.0	-	-	-	-	-	-
StNi50	629396	114791	3.7	[3.1 - 4.0]	0.4	3.1	[2.0 - 4.4]	0.3	1.3
StNi51	629358	114680	6.4	[5.0 - 7.9]	0.1	6.0	[4.5 - 7.0]	0.1	1.2
StNi52	629390	115409	0.7	[0.6 - 0.9]	0.4	2.5	[2.4 - 2.6]	0.3	1.2
StNi53	629125	114505	2.6	[0.9 - 4.8]	0.4	2.6	[1.8 - 3.6]	0.3	1.3
StNi54	629580	114850	0.0	-	-	-	-	-	-
StNi55	629324	115237	9.1	[7.1 - 10.9]	0.4	9.3	[7.8 - 10.9]	0.3	1.3
StNi56	629549	115098	0.9	[0.7 - 1.1]	0.4	1.1	[0.9 - 1.2]	0.3	1.2
StNi57	629690	115235	0.9	[0.7 - 1.1]	0.6	1.0	[0.8 - 1.2]	0.4	1.3
StNi58	629631	115385	1.1	[0.9 - 1.3]	0.4	1.1	[1.0 - 1.3]	0.3	1.2
StNi59	629790	115585	0.9	[0.7 - 1.1]	0.4	0.9	[0.8 - 1.0]	0.3	1.2
StNi60	630075	113515	3.0	[2.5 - 3.6]	0.3	2.6	[2.4 - 2.9]	0.4	1.4
StNi61	629947	113742	2.5	[2.2 - 2.6]	0.4	3.9	[2.5 - 6.0]	0.2	1.3
StNi62	629874	114060	7.4	[6.3 - 8.8]	0.4	7.4	[6.3 - 8.0]	0.3	1.3
StNi63	629797	114210	4.2	[1.8 - 6.3]	0.4	4.4	[1.9 - 6.4]	0.3	1.4
StNi64	629842	114306	3.8	[2.8 - 4.9]	0.4	3.9	[3.6 - 5.2]	0.3	1.2
StNi65	629921	114532	0.0	-	-	-	-	-	-
StNi66	630088	114713	1.6	[0.7 - 2.1]	0.3	1.4	[0.8 - 2.2]	0.2	1.2
StNi67	629631	114355	7.1	[5.2 - 8.7]	0.3	6.0	[4.4 - 8.4]	0.3	1.2
StNi68	629782	113928	0.0	-	-	-	-	-	-
StNi69	629863	114755	7.3	[4.5 - 9.2]	0.5	7.3	[5.0 - 9.8]	0.4	1.2
StNi70	629889	115078	1.0	[0.7 - 1.3]	0.2	0.9	[0.7 - 1.1]	0.2	1.1
StNi71	629843	115313	0.0	-	-	-	-	-	-
StNi72	629914	115464	0.9	[0.6 - 1.0]	0.3	0.9	[0.8 - 1.2]	0.3	1.2
StNi73	630023	115670	2.7	[1.7 - 3.8]	0.3	3.4	[2.6 - 4.0]	0.4	1.3
StNi74	629947	115828	0.9	[0.6 - 1.0]	0.5	0.9	[0.8 - 1.0]	0.3	1.3
StNi75	630225	116166	0.7	[0.4 - 0.9]	0.5	0.8	[0.7 - 0.8]	0.4	1.3
StNi76	630160	115734	0.7	[0.5 - 0.8]	0.3	0.9	[0.7 - 0.9]	0.3	1.3
StNi77	630268	116013	0.6	[0.4 - 0.8]	0.4	0.8	[0.7 - 0.9]	0.4	1.4
StNi78	630350	115834	0.8	[0.6 - 1.0]	0.3	0.8	[0.8 - 1.0]	0.3	1.3
StNi79	630490	116064	4.7	[3.4 - 8.1]	0.3	4.6	[2.5 - 7.3]	0.3	1.3
StNi80	630620	116383	0.0	-	-	-	-	-	-
StNi81	630748	116543	0.8	[0.6 - 1.0]	0.5	0.8	[0.7 - 1.0]	0.4	1.3
StNi82	631178	116626	1.1	[0.8 - 1.1]	0.4	1.0	[0.9 - 1.1]	0.3	1.4
StNi83	630997	116351	0.0	-	-	-	-	-	-
StNi84	631214	116461	0.0	-	-	-	-	-	-
StNi85	631104	116174	0.8	[0.4 - 1.0]	0.4	0.9	[0.7 - 0.9]	0.4	1.3
StNi86	631104	116015	0.7	[0.5 - 0.9]	0.4	0.9	[0.7 - 0.9]	0.3	1.3
StNi87	627697	113020	1.6	[1.3 - 1.9]	0.3	1.6	[1.3 - 1.9]	0.3	1.3

StNi88	627760	113147	1.7	[1.2 - 2.1]	0.4	1.7	[1.3 - 2.0]	0.4	1.5
StNi89	627635	112854	1.6	[1.1 - 2.1]	0.3	1.6	[1.2 - 1.9]	0.4	1.4
StNi90	630807	116223	3.5	[2.9 - 4.0]	0.6	3.3	[2.6 - 4.0]	0.5	1.3
StNi91	630727	115837	0.7	[0.5 - 0.8]	0.4	0.8	[0.7 - 0.9]	0.3	1.3
StNi92	630978	115742	1.2	[0.9 - 1.4]	0.2	0.8	[0.7 - 0.9]	0.3	1.2
StNi93	630647	115711	5.4	[4.2 - 6.6]	0.2	5.3	[4.2 - 6.4]	0.2	1.2
StNi94	630899	115501	0.8	[0.5 - 1.0]	0.4	4.0	[2.6 - 5.5]	0.1	1.1
StNi95	630802	116055	0.8	[0.7 - 0.9]	0.4	0.8	[0.7 - 0.9]	0.2	1.2
StNi96	631132	115689	1.2	[1.1 - 1.2]	0.3	1.1	[1.0 - 1.2]	0.4	1.3

Table 3: *Single station measurements done before 2007 in the area of Visp and St.Niklaus.*

	X-coord	Y-coord	$f_{0\ classical}$	$[f_Q\ f_R]_{classical}$	Ampl $_{classical}$
01_Raron_1	627799	128834	1.4	[1.0 - 1.7]	0.7
02_Raron_2	627879	128967	4.4	[3.5 - 5.5]	0.4
03_Gampel_1	623445	129642	3.7	[3.2 - 4.0]	0.8
04_Gampel_2	623287	129405	2.3	[2.0 - 2.7]	0.7
05_Hohtenn_1	624426	129710	-	-	-
06_Hohtenn_2	624406	129752	-	-	-
07_Niedergesteln_1	626414	129196	4.8	[4.3 - 5.4]	0.7
08_Niedergesteln_2	626454	129088	-	-	-
09_StGerman_1	629396	129144	-	-	-
10_StGerman_2	629442	129159	2.6	[2.2 - 3.0]	0.4
11_Baltschieder_1	633033	128714	4.4	[3.9 - 4.9]	0.6
12_Ausserberg_1	631760	129336	3.2	[2.9 - 3.4]	0.2
13_Ausserberg_2	631833	129418	-	-	-
14_Eggerberg_1	633679	128462	-	-	-
15_Eggerberg_2	633442	128208	3.1	[2.9 - 3.4]	0.5
16_Baltschieder_2	633033	128714	4.3	[3.6 - 4.8]	0.6
17_Baltschieder_3	632837	128684	2.3	[1.6 - 2.9]	0.5
18_Lalden_1	635784	127618	3.1	[2.6 - 3.6]	0.7
19_Lalden_2	635872	127731	1.9	[1.4 - 2.5]	0.3
20_Brigerbad_1	636996	127723	3.1	[2.6 - 3.6]	0.6
21_Brigerbad_2	636892	127733	1.7	[1.2 - 2.1]	0.4
22_Eischoll_1	626026	127216	2.3	[2.0 - 2.5]	0.5
23_Eischoll_2	626469	126990	2.9	[2.6 - 3.2]	0.5
24_Unterbaech_1	627696	126041	10.8	[10.4 - 11.2]	1.1
25_Unterbaech_2	628016	125907	6.4	[5.8 - 7.2]	0.5
26_Buerchen_1	629044	125505	7.0	[6.4 - 7.5]	0.7
27_Buerchen_2	629576	125449	-	-	-
28_Zeneggen_1	632569	125348	-	-	-
29_Zeneggen_2	632860	124629	-	-	-
30_Visperterminen_1	636482	122780	3.1	[2.8 - 3.4]	0.2
31_Visperterminen_2	635630	123062	2.3	[2.0 - 2.6]	0.1
32_StNiklaus_1	628086	114025	1.3	[0.9 - 1.6]	0.3
33_StNiklaus_2	628096	113955	1.9	[1.7 - 2.1]	0.4
34_StNiklaus_3	628073	113854	1.8	[1.5 - 2.1]	0.5
35_StNiklaus_4	627846	110740	1.8	[1.6 - 2.1]	0.6
36_StNiklaus_5	628203	113945	1.4	[0.9 - 1.7]	0.4
37_StNiklaus_6	628149	113963	-	-	-

38_StNiklaus_7	627946	113720	1.6	[1.2 - 1.8]	0.6
39_StNiklaus_8	628023	113847	-	-	-
40_StNiklaus_9	627427	112381	1.2	[0.9 - 1.6]	0.4
41_Stalden_1	633362	120299	3.9	[3.5 - 4.4]	0.5
42_Stalden_2	633355	120262	4.0	[3.6 - 4.4]	0.5
43_Mund_1	638758	129430	2.6	[2.1 - 3.0]	0.4
44_Mund_2	638826	129538	-	-	-
45_Naters_1	642188	130754	1.5	[1.1 - 1.9]	0.2
46_Naters_2	642276	130620	3.9	[3.3 - 4.3]	0.6
47_Naters_3	642424	130739	-	-	-
48_Brig_1	642482	129529	-	-	-
49_Brig_2	642413	129569	3.3	[2.8 - 3.9]	0.4
50_Gliss_1	641620	128960	3.0	[2.4 - 3.3]	0.2
51_Gliss_2	641458	128941	1.8	[1.4 - 2.3]	0.3
52_Gamsen_1	639774	128326	1.2	[0.8 - 1.7]	0.3
53_Gamsen_2	639906	128353	1.4	[1.1 - 1.7]	0.4
54_Eyholz_1	636992	127313	1.5	[1.1 - 1.9]	0.4
55_Eyholz_2	636221	127061	1.8	[1.3 - 2.3]	0.5
Visp1	634100	126493	-	-	-
Visp2	634136	126390	-	-	-
Visp3	634167	126548	-	-	-
Visp4	634074	126644	-	-	-
Visp5	634178	126662	9.2	[7.6 - 11.1]	0.7
Visp6	634150	126708	8.6	[7.4 - 9.8]	0.6
Visp7	634076	126726	-	-	-
Visp8	634083	126820	3.6	[3.3 - 3.9]	0.4
Visp9	634027	126503	-	-	-
Visp10	634259	127249	1.4	[1.2 - 1.6]	0.7
Visp11	633910	127423	1.3	[0.8 - 1.7]	0.5
Visp12	633863	127619	1.2	[1.0 - 1.5]	0.7
Visp13	633845	127789	1.4	[1.1 - 1.7]	0.8
Visp14	633899	127252	1.6	[1.2 - 2.1]	0.5
Visp15	633885	127124	2.2	[1.7 - 3.0]	0.9
Visp16	633875	126994	3.3	[2.6 - 3.8]	0.5
Visp17	634169	126954	1.2	[0.6 - 2.0]	0.4
Visp18	634284	126783	5.1	[4.4 - 6.0]	0.8
Visp19	634348	126628	8.9	[7.5 - 10.3]	0.9
Visp20	634226	126517	12.2	[10.7 - 14.1]	0.6
Gasenried1	629942	114823	-	-	-
St. Niklaus1	628158	113941	2.0	[1.6 - 2.4]	0.3
St. Niklaus2	627836	113596	1.6	[1.2 - 2.0]	0.5
St. Niklaus3	628500	114300	7.3	[6.7 - 8.2]	0.2

***Table 4:** Data from array measurements taken in Visp and St.Niklaus/Grächen in 2007.*

	X-coord	Y-coord	$f_{0\ classical}$	$[f_Q\ f_R]_{classical}$	$Ampl_{classical}$	$f_{0\ FTAN}$	$[f_Q\ f_R]_{FTAN}$	$Ampl_{FTAN}$	Quality
VIS1_00	631860	128354	1.4	[0.8 - 1.8]	0.6	1.0	[0.7 - 1.3]	0.7	1.6
VIS1_11	631866	128363	1.3	[0.8 - 1.8]	0.6	1.0	[0.7 - 1.4]	0.7	1.6
VIS1_12	631864	128345	1.4	[0.9 - 1.8]	0.5	1.0	[0.8 - 1.3]	0.6	1.5
VIS1_13	631850	128355	1.4	[0.8 - 1.8]	0.6	1.0	[0.7 - 1.4]	0.7	1.6

VIS1_21	631866	128378	1.3	[0.9 - 1.8]	0.5	1.0	[0.7 - 1.3]	0.6	1.5
VIS1_22	631887	128359	1.4	[0.9 - 1.8]	0.6	1.0	[0.7 - 1.4]	0.6	1.6
VIS1_23	631874	128334	1.3	[0.8 - 1.8]	0.5	1.0	[0.7 - 1.3]	0.6	1.5
VIS1_24	631835	128356	1.4	[0.9 - 1.8]	0.6	1.0	[0.7 - 1.5]	0.6	1.6
VIS1_25	631846	128375	1.4	[0.8 - 1.8]	0.5	1.0	[0.7 - 1.4]	0.6	1.6
VIS1_31	631867	128407	1.3	[0.8 - 1.8]	0.5	1.0	[0.7 - 1.4]	0.6	1.7
VIS1_32	631920	128381	1.4	[0.8 - 1.8]	0.6	1.0	[0.7 - 1.3]	0.7	1.5
VIS1_33	631906	128318	1.2	[0.8 - 1.6]	0.6	1.0	[0.6 - 1.5]	0.6	1.6
VIS1_34	631802	128370	1.3	[0.8 - 1.8]	0.4	1.0	[0.7 - 1.4]	0.5	1.8
VIS1_35	631827	128405	1.3	[0.8 - 1.6]	0.6	1.0	[0.7 - 1.4]	0.6	1.8
VIS1_41	631863	128445	1.3	[0.9 - 1.6]	0.6	1.1	[0.9 - 1.3]	0.6	1.5
VIS1_42	631963	128370	1.2	[0.8 - 1.5]	0.7	0.9	[0.7 - 1.3]	0.7	1.4
VIS1_43	631944	128301	1.2	[0.7 - 1.5]	0.6	0.9	[0.8 - 1.1]	0.7	1.5
VIS1_44	631796	128240	1.3	[0.8 - 1.5]	0.6	1.0	[0.7 - 1.3]	0.6	1.9
VIS1_45	631767	128387	1.2	[0.8 - 1.6]	0.6	1.1	[0.7 - 1.4]	0.6	1.9
VIS1_51	631854	128524	1.0	[0.5 - 1.4]	0.6	1.3	[0.8 - 1.5]	0.6	1.3
VIS1_52	632015	128433	1.1	[0.5 - 1.4]	0.7	1.0	[0.7 - 1.2]	0.7	1.4
VIS1_53	632017	128268	1.2	[0.8 - 1.5]	0.6	1.1	[0.7 - 1.4]	0.6	1.6
VIS1_54	631938	128178	1.2	[0.8 - 1.7]	0.5	1.1	[0.7 - 1.4]	0.6	1.7
VIS1_55	631699	128270	1.2	[0.9 - 1.4]	0.6	1.0	[0.8 - 1.2]	0.7	2.1
VIS1_56	631698	128417	1.4	[0.9 - 1.7]	0.6	1.2	[0.8 - 1.6]	0.6	1.8
VIS2_00	632175	127582	1.5	[0.7 - 2.5]	0.5	1.3	[0.8 - 2.0]	0.5	1.6
VIS2_11	632180	127591	1.5	[0.5 - 2.1]	0.5	1.4	[0.8 - 1.9]	0.6	1.7
VIS2_12	632182	127574	1.6	[0.6 - 2.2]	0.5	1.4	[0.9 - 2.1]	0.5	1.6
VIS2_13	632165	127583	1.3	[0.5 - 1.9]	0.6	1.3	[0.9 - 1.9]	0.6	1.6
VIS2_21	632187	127604	1.3	[0.4 - 1.8]	0.6	1.3	[1.0 - 1.6]	0.6	1.6
VIS2_22	632200	127582	1.5	[0.6 - 2.1]	0.5	1.4	[0.9 - 1.9]	0.5	1.6
VIS2_23	632176	127557	1.4	[0.6 - 2.2]	0.5	1.6	[0.9 - 2.1]	0.5	1.7
VIS2_24	632152	127573	1.2	[0.5 - 2.1]	0.6	1.6	[0.3 - 1.8]	0.6	1.6
VIS2_25	632160	127602	1.5	[0.7 - 1.9]	0.6	1.4	[0.9 - 1.8]	0.6	1.6
VIS2_31	632168	127642	1.5	[1.1 - 1.8]	0.7	1.2	[0.9 - 1.6]	0.6	1.7
VIS2_32	632229	127610	1.5	[1.0 - 1.8]	0.6	1.3	[0.9 - 1.8]	0.6	1.7
VIS2_33	632216	127538	1.5	[0.6 - 2.2]	0.4	1.4	[0.7 - 2.0]	0.5	1.6
VIS2_34	632145	127531	1.4	[0.5 - 2.1]	0.5	1.3	[0.8 - 2.8]	0.5	1.7
VIS2_35	632117	127595	1.5	[0.6 - 1.9]	0.6	1.4	[0.8 - 1.9]	0.6	1.5
VIS2_41	632220	127689	1.4	[0.9 - 2.0]	0.5	1.2	[0.9 - 1.6]	0.6	1.6
VIS2_42	632299	127555	1.5	[0.7 - 2.1]	0.5	1.5	[0.9 - 2.0]	0.5	1.7
VIS2_43	632191	127462	0.8	[0.4 - 1.0]	0.4	0.9	[0.7 - 1.1]	0.3	1.1
VIS2_44	632082	127527	1.4	[0.5 - 2.6]	0.4	1.9	[1.2 - 2.9]	0.5	1.7
VIS2_45	632106	127663	1.3	[0.9 - 1.8]	0.6	1.3	[0.8 - 1.7]	0.6	1.5
VIS3_00	633293	127436	1.2	[0.6 - 1.5]	0.6	1.2	[1.0 - 1.4]	0.6	1.6
VIS3_11	633293	127446	1.4	[0.6 - 1.8]	0.5	1.2	[0.9 - 1.5]	0.5	1.6
VIS3_12	633303	127437	1.9	[1.3 - 2.6]	0.5	2.1	[1.2 - 2.8]	0.6	1.7
VIS3_13	633294	127426	1.1	[0.6 - 1.5]	0.6	1.2	[0.8 - 1.4]	0.6	1.7
VIS3_14	633283	127436	1.3	[0.6 - 1.6]	0.6	1.2	[0.9 - 1.4]	0.6	1.7
VIS3_21	633294	127461	1.5	[1.0 - 1.7]	0.6	1.1	[0.9 - 1.4]	0.6	1.5
VIS3_22	633318	127438	1.0	[0.4 - 1.3]	0.7	1.1	[0.8 - 1.3]	0.6	1.6
VIS3_23	633294	127411	1.5	[1.1 - 1.9]	0.6	1.2	[0.9 - 1.5]	0.6	1.5
VIS3_24	633268	127435	1.4	[0.8 - 1.5]	0.6	1.2	[0.9 - 1.4]	0.6	1.6
VIS3_31	633294	127486	1.5	[1.0 - 2.0]	0.5	1.2	[0.9 - 1.4]	0.6	1.5
VIS3_32	633343	127438	1.1	[0.6 - 1.5]	0.6	1.2	[0.8 - 1.5]	0.6	1.7

VIS3_33	633293	127386	1.5	[1.1 - 1.9]	0.6	1.4	[1.1 - 1.5]	0.6	1.4
VIS3_34	633244	127433	1.5	[1.0 - 1.6]	0.6	1.3	[0.9 - 1.5]	0.6	1.5
VIS3_41	633296	127538	1.5	[1.0 - 1.9]	0.5	1.2	[0.7 - 1.4]	0.6	1.5
VIS3_42	633392	127441	1.1	[0.6 - 1.3]	0.7	1.2	[0.9 - 1.4]	0.6	1.7
VIS3_43	633298	127336	1.6	[1.1 - 2.0]	0.5	1.5	[1.0 - 1.8]	0.5	1.6
VIS3_44	633195	127429	1.5	[1.0 - 1.8]	0.6	1.3	[0.9 - 1.5]	0.6	1.5
VIS4_00	633900	127392	1.8	[1.1 - 2.6]	0.4	2.1	[1.2 - 2.9]	0.4	1.5
VIS4_11	633895	127401	2.0	[1.2 - 2.9]	0.3	2.3	[1.2 - 3.0]	0.4	1.5
VIS4_12	633908	127381	1.4	[0.6 - 2.2]	0.4	1.9	[0.7 - 2.9]	0.5	1.5
VIS4_13	633889	127388	1.4	[0.6 - 1.8]	0.5	1.1	[0.8 - 1.4]	0.6	1.2
VIS4_21	633887	127414	2.1	[1.4 - 2.9]	0.3	2.1	[1.3 - 3.0]	0.4	1.5
VIS4_22	633919	127406	1.7	[0.8 - 2.7]	0.4	1.5	[0.9 - 3.0]	0.5	1.6
VIS4_23	633920	127381	2.0	[1.4 - 2.8]	0.3	2.1	[1.4 - 3.0]	0.4	1.5
VIS4_24	633898	127366	1.1	[0.4 - 1.9]	0.4	1.3	[0.7 - 1.9]	0.5	1.5
VIS4_25	633872	127384	1.0	[0.5 - 1.7]	0.5	1.0	[0.6 - 1.7]	0.5	1.5
VIS4_31	633866	127449	1.7	[1.1 - 2.8]	0.5	1.8	[1.2 - 3.0]	0.5	1.6
VIS4_32	633950	127414	1.7	[0.4 - 2.8]	0.5	1.7	[0.8 - 3.0]	0.5	1.6
VIS4_33	633942	127359	1.8	[1.1 - 2.6]	0.3	1.9	[1.1 - 3.0]	0.4	1.5
VIS4_34	633896	127329	1.5	[0.5 - 2.5]	0.4	1.3	[0.8 - 2.9]	0.5	1.5
VIS4_35	633843	127377	1.1	[0.4 - 1.8]	0.6	1.1	[0.6 - 1.7]	0.5	1.8
VIS4_41	633886	127515	1.9	[1.3 - 2.6]	0.5	1.2	[0.8 - 1.5]	0.5	1.6
VIS4_42	634022	127411	2.0	[1.3 - 3.5]	0.3	1.5	[1.0 - 2.1]	0.4	1.4
VIS4_43	633993	127323	1.9	[0.9 - 2.6]	0.4	1.7	[1.1 - 2.7]	0.4	1.3
VIS4_44	633900	127295	1.9	[1.3 - 2.7]	0.3	1.8	[1.2 - 3.0]	0.4	1.4
VIS4_45	633810	127364	1.4	[0.6 - 2.6]	0.5	1.3	[0.8 - 1.6]	0.5	1.6
VIS4_46	633819	127483	2.1	[1.5 - 2.8]	0.3	2.1	[1.5 - 3.1]	0.4	1.5
VIS5_00	634271	127333	2.1	[1.3 - 2.7]	0.4	2.1	[1.3 - 3.0]	0.6	2.2
VIS5_11	634282	127338	2.0	[1.2 - 2.7]	0.5	1.3	[0.9 - 1.6]	0.5	2.3
VIS5_12	634269	127325	2.1	[1.5 - 2.7]	0.4	1.4	[1.1 - 1.9]	0.4	2.2
VIS5_13	634262	127338	2.0	[1.2 - 2.7]	0.5	1.2	[0.8 - 1.5]	0.5	2.1
VIS5_21	634286	127356	2.0	[1.4 - 2.7]	0.6	1.3	[0.9 - 1.7]	0.5	2.1
VIS5_22	634272	127309	1.5	[0.6 - 2.6]	0.5	1.2	[0.6 - 1.7]	0.6	2.3
VIS5_23	634244	127347	2.1	[1.5 - 2.8]	0.5	1.3	[0.9 - 2.0]	0.5	2.1
VIS5_31	634298	127376	1.9	[1.4 - 2.7]	0.6	1.3	[0.9 - 1.6]	0.5	2.2
VIS5_32	634254	127287	1.9	[1.3 - 2.7]	0.4	1.8	[1.2 - 3.0]	0.6	2.0
VIS5_33	634230	127309	2.1	[1.3 - 3.3]	0.4	1.8	[0.9 - 3.0]	0.7	2.2
VIS5_34	634232	127355	2.1	[0.9 - 3.3]	0.4	2.0	[1.1 - 3.0]	0.6	2.0
VIS5_41	634318	127401	1.4	[1.1 - 2.8]	0.6	1.4	[0.8 - 2.1]	0.4	2.3
VIS5_42	634246	127237	2.1	[1.5 - 2.7]	0.3	1.7	[1.2 - 2.7]	0.3	1.4
VIS5_43	634180	127379	2.0	[1.2 - 2.7]	0.6	1.3	[0.9 - 2.0]	0.5	1.7
VIS6_00	634382	126753	3.7	[2.2 - 4.6]	0.4	3.7	[2.1 - 4.8]	0.5	2.4
VIS6_11	634390	126768	2.2	[1.0 - 4.0]	0.5	3.1	[2.0 - 4.3]	0.6	2.9
VIS6_12	634394	126753	3.0	[1.3 - 3.9]	0.5	3.1	[1.2 - 4.2]	0.5	2.8
VIS6_13	634387	126742	2.9	[1.2 - 4.3]	0.4	3.3	[2.1 - 4.4]	0.5	2.2
VIS6_14	634373	126749	3.9	[1.2 - 6.0]	0.5	3.8	[2.1 - 6.0]	0.5	2.3
VIS6_15	634374	126763	3.2	[1.0 - 4.4]	0.4	3.6	[2.1 - 4.4]	0.5	2.3
VIS6_21	634371	126778	3.3	[2.3 - 4.3]	0.4	3.5	[2.1 - 4.4]	0.6	2.5
VIS6_22	634403	126758	2.9	[1.1 - 3.9]	0.5	3.1	[2.0 - 3.5]	0.8	2.8
VIS6_23	634391	126732	3.5	[2.2 - 4.6]	0.5	3.2	[2.0 - 4.4]	0.6	2.4
VIS6_24	634360	126745	3.1	[2.2 - 4.0]	0.3	3.2	[2.1 - 3.7]	0.5	1.5
VIS6_31	634365	126789	3.6	[2.5 - 4.6]	0.3	3.6	[2.1 - 4.4]	0.5	2.1

VIS6_32	634418	126776	1.9	[0.9 - 3.0]	0.9	2.0	[1.2 - 3.1]	0.8	2.9
VIS6_33	634398	126713	2.9	[1.2 - 3.6]	0.5	3.0	[1.2 - 3.8]	0.5	2.2
VIS6_34	634344	126742	3.4	[2.3 - 4.4]	0.3	3.5	[2.2 - 4.4]	0.3	1.6
VIS6_41	634346	126828	2.3	[1.2 - 3.3]	0.4	2.2	[1.2 - 3.2]	0.4	1.9
VIS6_42	634469	126788	2.1	[1.1 - 3.1]	0.8	1.9	[1.2 - 3.2]	0.7	2.9
VIS6_43	634416	126669	4.1	[2.3 - 5.6]	0.3	4.1	[2.1 - 5.2]	0.4	2.2
VIS6_44	634293	126739	4.8	[2.5 - 5.4]	0.3	3.9	[2.6 - 5.3]	0.3	1.5
VIS7_00	634655	126973	1.5	[1.2 - 2.1]	0.6	1.4	[1.0 - 2.0]	0.5	1.9
VIS7_11	634662	126987	1.6	[1.2 - 2.1]	0.5	1.4	[1.0 - 2.0]	0.4	1.8
VIS7_12	634672	126968	1.6	[1.2 - 2.1]	0.5	1.4	[1.0 - 1.9]	0.3	1.7
VIS7_13	634659	126960	1.6	[1.2 - 2.2]	0.7	1.3	[1.0 - 1.6]	0.6	1.9
VIS7_21	634654	127000	1.5	[1.2 - 2.1]	0.5	1.3	[1.0 - 1.9]	0.4	1.7
VIS7_22	634685	126961	1.6	[1.2 - 2.6]	0.7	1.5	[1.0 - 2.0]	0.5	1.9
VIS7_23	634670	126950	1.7	[0.8 - 2.7]	0.9	1.7	[1.1 - 2.9]	0.5	2.2
VIS7_24	634654	126947	1.4	[0.7 - 2.6]	0.8	1.4	[0.9 - 3.0]	0.5	2.2
VIS7_31	634633	127026	1.6	[1.2 - 2.1]	0.6	1.7	[1.0 - 2.0]	0.4	1.7
VIS7_32	634712	126992	1.6	[1.2 - 2.0]	0.5	1.4	[1.0 - 1.9]	0.5	2.0
VIS7_33	634693	126921	1.7	[1.2 - 2.1]	0.6	1.5	[1.0 - 2.0]	0.3	1.7
VIS7_34	634621	126929	1.7	[1.2 - 2.2]	0.3	1.5	[1.0 - 2.0]	0.4	1.7
VIS8_00	635051	126997	1.6	[0.4 - 2.8]	0.8	0.9	[0.5 - 1.9]	0.5	2.1
VIS8_11	635051	127002	2.0	[1.1 - 2.7]	0.7	2.0	[0.9 - 3.0]	0.7	2.1
VIS8_12	635055	126995	1.8	[0.9 - 2.8]	0.7	1.9	[0.9 - 3.0]	0.7	2.3
VIS8_13	635047	126995	1.7	[0.4 - 2.8]	0.8	1.9	[0.8 - 3.0]	0.7	2.5
VIS8_21	635051	127012	1.9	[1.4 - 2.3]	0.5	1.6	[1.2 - 2.1]	0.5	1.7
VIS8_22	635065	127004	2.1	[1.6 - 2.7]	0.5	2.0	[1.1 - 3.0]	0.6	1.8
VIS8_23	635060	126985	1.9	[0.9 - 2.9]	0.8	2.1	[0.8 - 3.1]	0.7	2.2
VIS8_24	635041	126986	1.6	[0.5 - 2.7]	0.8	1.3	[0.5 - 3.1]	0.6	2.0
VIS8_25	635037	127002	1.4	[0.5 - 2.7]	0.9	1.3	[0.5 - 3.0]	0.7	2.2
VIS8_31	635072	127026	1.9	[1.5 - 2.2]	0.3	1.8	[1.1 - 2.7]	0.4	1.6
VIS8_32	635086	126989	2.5	[1.9 - 3.1]	0.4	2.7	[1.2 - 3.1]	0.5	1.8
VIS8_33	635052	126962	2.9	[2.3 - 3.3]	0.5	2.8	[2.1 - 3.7]	0.5	1.7
VIS8_34	635021	126984	2.6	[2.0 - 2.8]	0.7	2.3	[1.2 - 3.1]	0.6	1.9
VIS8_35	635029	127024	2.2	[1.5 - 2.5]	0.6	1.7	[1.1 - 2.9]	0.6	2.0
STN1_00	628563	114509	1.6	[0.6 - 2.5]	0.2	1.5	[0.9 - 2.0]	0.2	1.4
STN1_11	628565	114516	1.2	[0.4 - 2.1]	0.5	1.2	[0.8 - 1.6]	0.6	1.6
STN1_12	628563	114502	1.8	[1.1 - 2.2]	0.3	1.6	[1.2 - 2.]	0.2	1.4
STN1_13	628555	114504	1.7	[0.6 - 2.3]	0.2	1.7	[1.0 - 2.0]	0.2	1.4
STN1_21	628552	114525	1.7	[1.3 - 2.2]	0.2	1.6	[1.0 - 1.9]	0.3	1.4
STN1_22	628585	114523	1.4	[0.4 - 1.9]	0.5	1.5	[0.9 - 2.0]	0.5	1.5
STN1_23	628563	114482	1.1	[0.5 - 1.6]	0.8	1.4	[0.8 - 2.2]	0.8	1.7
STN1_24	628545	114512	1.4	[0.5 - 2.3]	0.3	1.4	[0.9 - 2.1]	0.2	1.4
STN1_31	628564	114565	1.5	[0.8 - 1.9]	0.4	1.5	[0.9 - 1.8]	0.4	1.5
STN1_32	628615	114531	1.4	[0.4 - 2.0]	0.4	1.5	[0.9 - 2.1]	0.4	1.4
STN1_33	628621	114509	-	-	-	-	-	-	-
STN1_34	628577	114452	1.8	[1.1 - 2.3]	0.2	1.8	[1.3 - 2.3]	0.2	1.3
STN1_35	628503	114485	1.8	[1.1 - 2.2]	0.3	1.7	[1.1 - 2.0]	0.3	1.4
STN1_36	628522	114537	-	-	-	-	-	-	-
STN1_41	628569	114605	1.2	[0.6 - 2.0]	0.4	1.6	[1.2 - 1.9]	0.3	1.4
STN1_42	628630	114580	1.9	[1.3 - 2.5]	0.3	1.8	[1.3 - 2.2]	0.3	1.3
STN1_43	628655	114530	-	-	-	-	-	-	-
STN1_44	628636	114451	-	-	-	-	-	-	-

STN1_45	628587	114413	1.5	[0.6 - 2.4]	1.0	1.5	[1.1 - 2.2]	1.0	2.1
STN1_46	628489	114476	1.7	[1.3 - 2.00]	0.3	1.6	[1.2 - 2.0]	0.3	1.4
STN1_47	628488	114576	1.2	[0.6 - 1.7]	0.4	1.4	[0.9 - 1.7]	0.4	1.7
STN2_00	629316	115087	0.9	[0.6 - 1.3]	0.4	1.3	[0.9 - 1.6]	0.3	1.1
STN2_11	629325	115096	1.0	[0.4 - 1.5]	0.5	1.3	[0.9 - 1.5]	0.4	1.2
STN2_12	629318	115077	1.0	[0.6 - 1.2]	0.3	1.2	[0.9 - 1.4]	0.3	1.1
STN2_13	629308	115096	-	-	-	-	-	-	-
STN2_21	629331	115112	1.0	[0.4 - 1.6]	0.8	1.5	[0.8 - 2.2]	0.8	1.2
STN2_22	629332	115081	-	-	-	-	-	-	-
STN2_23	629324	115059	4.4	[3.3 - 6.1]	0.2	4.1	[3.2 - 5.1]	0.3	1.1
STN2_24	629292	115079	1.1	[0.6 - 1.7]	0.4	1.3	[0.9 - 1.5]	0.3	1.2
STN2_25	629300	115104	-	-	-	-	-	-	-
STN2_31	629312	115157	-	-	-	-	-	-	-
STN2_32	629376	115125	1.0	[0.6 - 1.4]	0.6	1.2	[0.8 - 1.5]	0.6	1.2
STN2_33	629351	115028	-	-	-	-	-	-	-
STN2_34	629280	115039	1.2	[0.7 - 1.8]	0.4	1.3	[0.9 - 1.6]	0.3	1.1
STN2_35	629275	115131	1.0	[0.6 - 1.3]	0.4	1.3	[0.9 - 1.6]	0.3	1.1