We thank the comments and suggestions to improve the manuscript made by Referee 1. In this file, we will reply (italic format) the major issues included in the revision. Minor changes will be added to the last version of the manuscript as well as improvement of the figures quality.

Major issues:

1) P2, L19-24, P12, L6, and P14 last sentence: The authors state that results from the passive methods could be used for statics corrections (I assume for P-wave reflection seismics). Even if the depths are correct (however, they have a rather large uncertainty; see below) the P-velocities are also needed (however, not provided by these methods). So, its use for statics corrections might be rather small. Furthermore, I doubt that the depth resolution e.g. of the H/V method is accurate enough for statics. For example, you need a good value of the shear velocity to convert frequencies to depths (which might be difficult to obtain). In any case, also the other methods (FK & SPAC) have rather uncertainties for layer depths (easily visible e.g. in Figure 8). Please add some more discussion and/or mention these potential limitations.

Reply: Yes you are right. H/V method can only partially help to statics calculation with bedrock depth values. However, we think that in an area with a great change in this value (such as a karstic area) and with scarcity of well information, H/V become a useful tool as a first approach to assess a range of depth variation. In addition it can help to locate areas where a high-resolution refraction survey would be critical for statics calculation. We will adjust the sentences regarding statics correction to make clear that the contribution of H/V is as a first approach and only for bedrock depth.

The Vs estimation can be done using array techniques or use H/V method in a place with a known bedrock depth (e.g. close to a well with a lithological log). In page 11, we explain the use of both approaches for obtaining a range of Vs for sediments of the area. A H/V station close to a borehole with known geology has been used as quality control of the shear-wave array measurements. Decreasing uncertainty of the Vs for the first layer and bedrock depth would require array measurements with lower minimum distances between sensors or an active surface wave survey. Anyhow, we think that this study shows the potential of these techniques to obtain bedrock depth in a fast and effective way.

2) Could you say something about the conversion of the group velocity (derived from the dispersion) to layer velocity (material property)? Maybe also important for the last paragraph of the Discussion section discussing differences between the velocity derived by sonic log and those by array techniques.

The surface wave velocity derived by array techniques is the phase velocity. In order to obtain shear-wave velocity, an inversion of the dispersion curve (phase velocity versus frequency) is performed. The basis was developed for suggesting that S-wave velocities fundamentally control changes in Rayleigh-wave phase velocities for a layered earth model (Xia et al. 1999). In the software used (Geopsy www.geopsy.org), the forward computation of the dispersion curve is done using Dunkin's formulation (1965) to link parameters (Vp, Vs, density and thickness) of a stack of layers with the dispersion curve. The inversion is done using a Monte Carlo approach (neighborhood algorithm, Sambridge 1999).

3) P3, L24ff: Why is the information regarding "adaptation of oil acquisition techniques to shallow applications" important? If it is important for the article, please provide more information. If not, please skip this information. In any case, it's difficult to understand in the current form. Are "oil acquisition" and "oil logging" the correct terms?

The development of small probes for near-surface applications became important for the spreading of well logging surveys for other applications other than oil exploration. It allowed to acquire geophysical well logging datasets to academia or government centers without using the sophisticated and expensive *oil equipment. Maybe it is out of the scope of the article, hence we will skip that in the last version of the manuscript.*

4) Figures 3 and 8 seem to be direct printouts of the program code and are of poor quality. Labels/annotations are too small; color scale in Figure 3 missing. Please revise.

Thank you for the comment. We will improve the quality of these two figures for the final version of the manuscript.

5) Figure 9: Labels too small. Please revise.

Same as 4. Label size will be increased for the final version of the manuscript.

6) Figure 11: I strongly suggest to only show interpolated values in regions with data coverage! Please fade out (or leave out - white) regions without data points. Furthermore, some of the high values in these plots seem to be caused by just one data point – please check (or remove if outlier).

Yes, we completely agree with that. The zone out of H/V stations must be white. Regarding the one-data point zones: In these sectors the good data quality assures us to keep them as useful information in spite of the paucity of measurements.

7) Figures 1, 2, 10, and 11: Please add a scale. Additionally, please state in a label or in the caption what kind of coordinates are shown (I assume UTM?).

Scale will be added to these figures. The coordinates are UTM ETRS89.

8) Section 3.2.1: From this text I cannot understand how you derive the plots in Figure 3. Please add information.

Section 3.2.1 will be completed. According to Wathalet (2005), "the horizontal velocity in the FK method is calculated for different frequency bands. The raw signals are first divided in short time windows the length of which may depend upon the considered frequency. A Fourier transform is calculated for the signal of each sensor after a proper cutting of the current time window. The FK transformation is calculated in the frequency domain on the cut signals. FK analysis assumes horizontal plane waves to travel across the array sensors. Considering a direction and velocity of propagation, the relative arrival times are calculated at all sensor locations and the phases are shifted according to these times. The semblance is calculated by the summation of shifted signals in the frequency domain." The last step is to locate the maximum of the semblance that gives us an estimation of the velocity and the azimuth of the plane wave across the array. For each time window and for each frequency we have a maximum corresponding to certain propagation velocity. Figure 3 is a compilation of histograms of the pair frequency and velocity obtained from the semblance maximum search at each time window. Each histogram corresponds to a subarray setup (one sensor in the center and six sensors located at two different radii from that center). Obviously a color scale of the histograms is missed. We will add that for the last version of the article.

9) Could you add some conclusions which of the passive seismic methods are – based on this study – better suited and which not. Summarizing strengths and weaknesses of the individual methods? Could be interesting for readers planning similar studies (last paragraph of conclusion section).

In general, passive seismic methods are suitable for areas with seismic noise or with logistical issues (no space for instrumentation setup, problems with source regulations). In addition, these techniques are cost-effective. H/V is fast, cheap, suitable as a reconnaissance step. (no need of great space for instrumentation setup less than 1 square-m) It can help to detect areas with strong variation in bedrock depth and obtain an estimation of this value with additional information. The use of the *array techniques to obtain shear-wave velocity information allows to increase the investigation depth of active surface waves technique. Also they are suitable in areas with inversion velocity such as this one, overcoming the limitation of refraction surveys for instance. FK and SPAC are based on different assumptions in the surface waves propagation. Their comparison is useful as quality control. Comparison between these two approaches can be found in different works (Wathelet et al., 2008, Cadet et al., 2011)*

References

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Wathelet, M., Jongmans, D., Ohrnberger, M., & Bonnefoy-Claudet, S. (2008). Array performances for ambient vibrations on a shallow structure and consequences over V s inversion. Journal of Seismology, 12(1), 1-19.
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