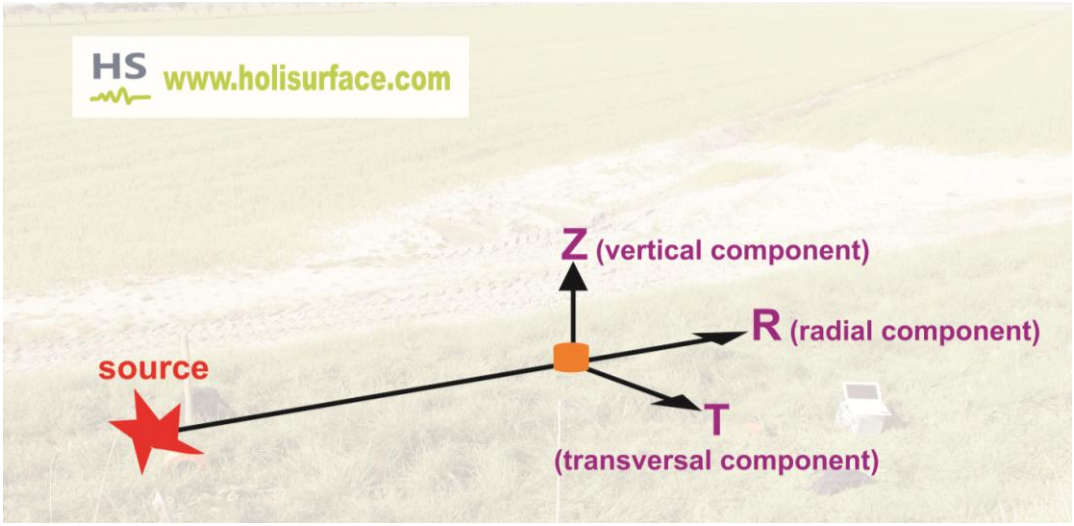
HoliSurface® - joint inversion of surface-wave dispersion

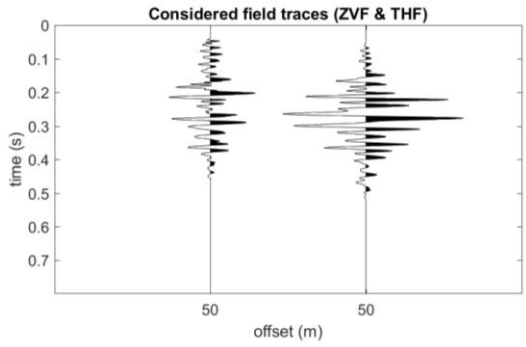
One source + one 3-component geophone

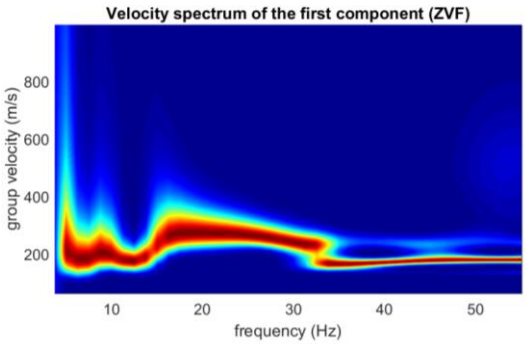


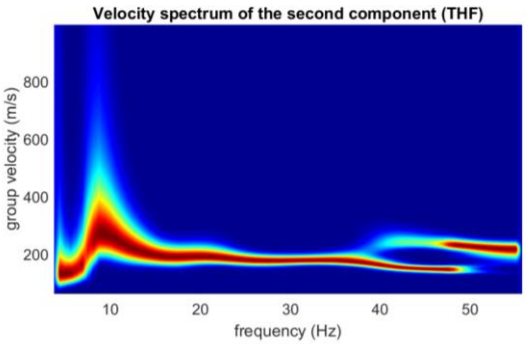
First-component dispersion file: ZVF-50m-4-56Hz.mat
Second-component dispersion file: THF-50m-4-56Hz.mat

component#1: ZVF (Rayleigh waves)
component#2: THF (Love waves)
Rayleigh and Love waves - Adopted number of modes: 9

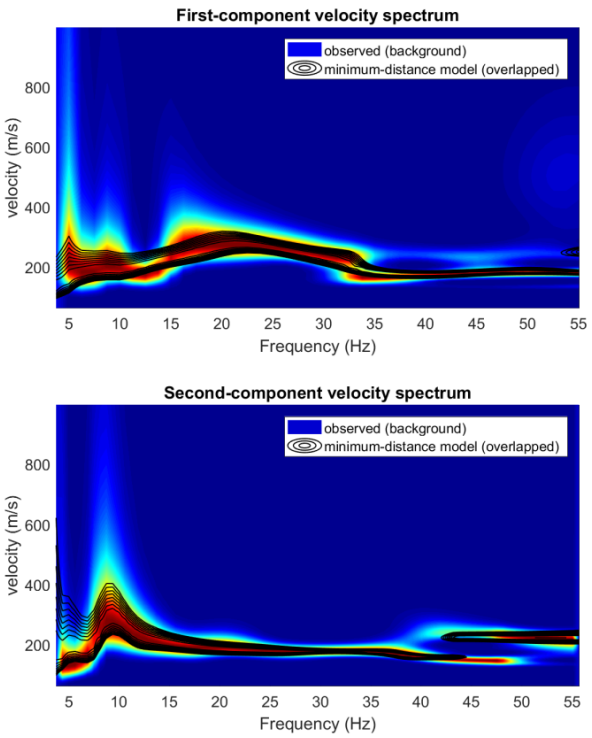
FIELD DATA

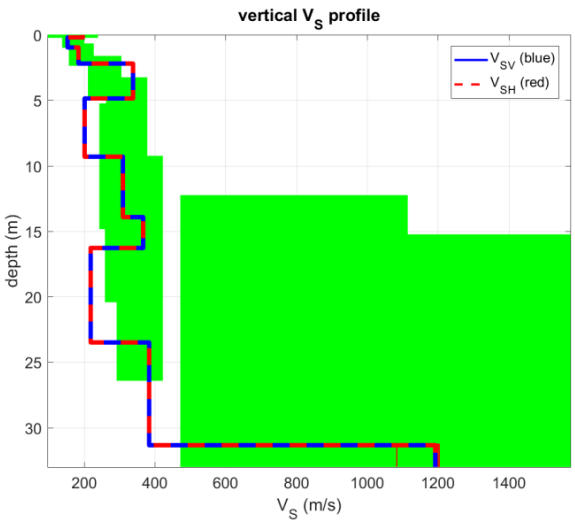






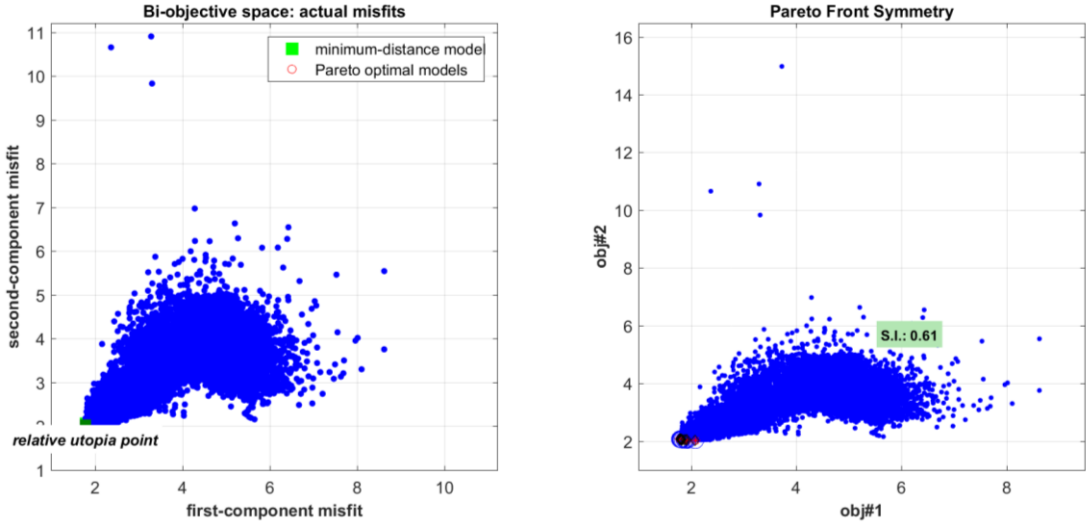
Solution (V_S profile)





First-component spectrum: ZVF-50m-4-56Hz.mat
Second-component spectrum: THF-50m-4-56Hz.mat

Minimum-distance model:
Vs (m/s): 197, 154, 184, 339, 202, 310, 367, 219, 384, 1193, 1050, 1677
thickness (m): 0.2, 0.8, 1.2, 2.7, 4.5, 4.6, 2.3, 7.2, 7.8, 21.4, 108.7
Vs30 (m/s): 264



Model distribution in the bi-objective space

Mean model:
Vs (m/s): 197, 154, 184, 339, 202, 310, 367, 219, 384, 1182, 1043
Thickness (m): 0.2, 0.8, 1.2, 2.7, 4.5, 4.6, 2.3, 7.2, 7.9, 21.3

Comment:

For this site only active data were available (recorded for geotechnical goals). The retrieved V_S profile (shown in the previous page) puts in evidence that the bedrock is not present in the first 20 m (which was the maximum depth relevant for the present work).
Please notice for (both the components) the good agreement between the field group velocities (background colours) and the synthetic values (overlaying black contour lines).
The high level of noise (industrial area) and the limited vertical stack are responsible for data that cannot be soundly analyzed for frequencies lower than about 5 Hz, so the Vs30 value and the depth of the bedrock cannot be soundly determined but, again, we must consider that the actual purpose was not the determination of the Vs30 but the verification that the bedrock was deeper than 20 m.

References

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Efficient acquisition and holistic analysis of Rayleigh waves (Dal Moro G., Moustafa S.R., Al-Arifi N.), Proceedings of the Near-Surface EAGE 2015 congress (Turin - Italy) [having received a very high score from the reviewers, the work was invited to be published in Near Surface Geophysics]

Joint Inversion of Rayleigh-Wave Dispersion and HVSR of Lunar Seismic Data from the Apollo 14 and 16 sites (Dal Moro G., 2015), ICARUS, 254, 338-349

Unconventional Optimized Surface Wave Acquisition and Analysis: Comparative Tests in a Perilagoon Area (Dal Moro G., Ponta R., Mauro R., 2015), Appl. Geophysics, 114, 158-167

Surface Wave Analysis for Near Surface Applications (Dal Moro G., 2014), Elsevier, ISBN 978-0-12-800770-9, 252pp (theory, field practice and advanced joint analysis) [see in particular paragraphs 2.2, 7.2 and case studies #2, 6, 8, 12 and 14]

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