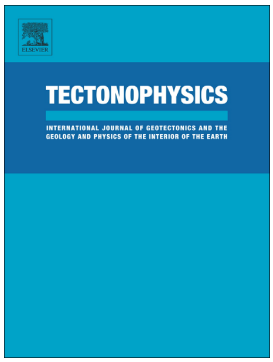

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PII: S0040-1951(18)30022-2
DOI: https://doi.org/10.1016/j.tecto.2018.01.010
Reference: TECTO 127748

To appear in: *Tectonophysics*

Received date: 5 September 2017
Revised date: 19 December 2017
Accepted date: 4 January 2018

Please cite this article as: Fabio Villani, Sebastiano D'Amico, Francesco Panzera, Maurizio Vassallo, George Bozionelos, Daniela Farrugia, Pauline Galea , Shallow high-resolution geophysical investigation along the western segment of the Victoria Lines Fault (island of Malta). The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tecto(2017), https://doi.org/10.1016/j.tecto.2018.01.010

Shallow high-resolution geophysical investigation along the western segment of the Victoria Lines Fault (island of Malta)

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Abstract

The Victoria Lines Fault (island of Malta) is a >15 km-long and N260°-striking segmented normal fault-system, which is probably inactive since the late Pliocene. In the westernmost part, the Fomm Ir-Rih segment displays comparable geologic throw and escarpment height (~150-170 m), moreover its hangingwall hosts thin patches of Middle Pleistocene clastic continental deposits (*red beds*), which are poorly preserved elsewhere. We acquired two seismic transects, by collecting ambient vibration recordings, processed by using horizontal-to-vertical spectral ratios, complemented by one high-resolution 2-D refraction tomography survey crossing this fault where it is locally covered by *red beds* and recent colluvial deposits.

We found a resonance peak at ~1.0 Hz in the hangingwall block, whereas clear peaks in the range ~5.0-10.0 Hz appear when approaching the subsurface fault, and we relate them to the fractured bedrock within the fault zone.

The best-fit tomographic model shows a relatively high-Vp shallow body (Vp 2200-2400 m/s) that we relate to the weathered top of the Miocene Upper Coralline Limestone Fm., bounded on both sides by low-Vp regions (< 1400 m/s). The latter are the smeared images of steep fault zones. Tomography further reveals a thick (~15-20 m) low-Vp (< 1000 m/s) zone, which could be a syn-tectonic wedge of colluvial deposits developed in the downthrown block. Surface waves analysis indicates lateral changes of the average shallow shear wave velocity, with Vs ~130 m/s within the inferred fault zone, and Vs > 230 m/s above the weathered top-bedrock.

Our results depict a clear seismic signature of the Victoria Lines Fault, characterized by low seismic velocity and high amplification of ground motion. We hypothesize that, during the Middle