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On the use of high frequency teleseismic Receiver Functions to map the crystalline basement of Ebro Basin, NE Spain

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The crystalline basement of the Ebro Basin, located in north-east Spain, has been only slightly deformed since the Variscan orogeny and shows a gentle dipping towards the north. This basement is overlaid by an eroded Mesozoic sequence and Cenozoic sediments with low tectonic expression. In recent years, we have tested on this region the ability of methods based on the autocorrelation of ambient seismic noise to map the depth of the crystalline basement. This approach has lead to obtain confident results for 37 stations along the Ebro and Jaca basins (Romero et al., 2017), documenting the significant thickness differences between them. In order to get a new insight to this subject, we have now investigated if basement depths can also be retrieved from the inspection of teleseismic Receiver Functions (RF).

Teleseismic RFs are often used for deep crust and mantle studies, but dealing with shallower structures is more difficult, as higher frequency content is needed and the signal is often complex due to local effects below the sites. Nevertheless, previous studies proved the ability of this methodology for basin studies using different deconvolution and inversion methodologies. The 14 seismic stations examined in this work have been operative in different campaigns carried on by the ICTJA-CSIC for periods ranging from 4 months to 2 years. We analysed here events with distances between 30-80° and selected those with significant high-frequency content and high signal-to-noise ratio in the target frequency band (1 to 4 Hz). Preliminary results show a strong P-to-S conversion around 1 second for several stations in the northwest of the basin that is related to be top of the basement. However, it is not straightforward to model the depth of this convertor, as large variations in the near-surface Vp and Vs profile can be present and strongly influence the estimation. The availability of previous estimations of the basement depths, both from well data and from autocorrelations of ambient seismic noise, will be used to constraint the interpretation of RF results and to evaluate its potentiality to perform this kind of investigations.

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