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Rayleigh wave ellipticity across the Iberian Peninsula and Morocco

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Spectral amplitude ratios between horizontal and vertical components (H/V ratios) from seismic records are useful to evaluate site effects, predict ground motion and invert for S velocity in the top several hundred meters. These spectral ratios can be obtained from both ambient noise and earthquakes. H/V ratios from ambient noise depend on the content and predominant wave types: body waves, Rayleigh waves, a mixture of different waves, etc. The H/V ratio computed in this way is assumed to measure Rayleigh wave ellipticity since ambient vibrations are dominated by Rayleigh waves. H/V ratios from earthquakes are able to determine the local crustal structure at the vicinity of the recording station. These ratios obtained from earthquakes are based on surface wave ellipticity measurements. Although long period (>20 seconds) Rayleigh H/V ratio is not currently used because of large scatter has been reported and uncertainly about whether these measurements are compatible with traditional phase and group velocity measurements, we will investigate whether it is possible to obtain stable estimates after collecting statistics for many earthquakes. We will use teleseismic events from shallow earthquakes (depth $\leq$ 40 km) between 2007 January 1 and 2012 December 31 with M $\geq$ 6 and we will compute H/V ratios for more than 400 stations from several seismic networks across the Iberian Peninsula and Morocco for periods between 20 and 100 seconds. Also H/V ratios from cross-correlations of ambient noise in different components for each station pair will be computed. Shorter period H/V ratio measurements based on ambient noise cross-correlations are strongly sensitive to near-surface structure, rather than longer period earthquake Rayleigh waves. The combination of ellipticity measurements based on earthquakes and ambient noise will allow us to perform a joint inversion with Rayleigh wave phase velocity. Upper crustal structure is better constrained by the joint inversion compared to inversions based on phase velocities alone.