

## **Lithosphere structure in southern Madagascar from receiver function and ambient noise correlation: implication for the crustal evolution**

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Madagascar was part of Gondwanaland, sandwiched between India and Africa. The assembly during the Pan-African orogeny has left its mark on the Malagasy basement in the form of metamorphic and mineral belts and shear zones, which occupy the eastern two third of Madagascar. The western third is characterized by Triassic to Jurassic sedimentary basin formation. The main objective of our work is to determine to which extent the recent episodes and shear zones reactivation have modified the lithosphere structure in southern Madagascar.

The data used come from a temporary seismic array operated in southern Madagascar between 2011 and 2014 and two permanent stations in the study areas. We investigated the lithosphere structure in southern Madagascar by analyzing receiver functions with the H-k stacking and common conversion point stacking methods; extracting the Rayleigh wave group velocities from the ambient noise; and jointly inverting the receiver functions and Rayleigh wave dispersion curves. Results show that (1) The sedimentary thickness changes from 10 km (West) to 3 km (East) in the Morondava basin, where the crust is thin (between 23 and 30 km) and  $v_p/v_s$  ratio is relatively high (from 1.73 to 1.85); (2) In the Proterozoic terrane, the Moho depth ranges from 33 to 38 km and  $v_p/v_s$  ratio varies between 1.72 and 1.82; (3) The Archean basement has a thick crust (between 38 and 43 km) and a low  $v_p/v_s$  ratio (1.67-1.77); (4) A mafic lower crust ( $v_s > 3.9$  km/s) of 2-22 km thick is observed in the Archean basements. Our interpretation is that the shear zone reactivation after the separation combined with the crustal extension has delaminated the mafic lower crust in the Proterozoic crust and resulted in the current felsic-to-intermediate lower crustal type; and the Archean crust appears to be largely unmodified by Cenozoic tectonism.