An updated Crustal Thickness Map of Central South America based on Receiver Function Measurements

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Introduction

In previous data compilations of crustal structure in South America, some areas in the stable platform, present poor lateral resolution and larger uncertainties due to the low coverage of stations. Using data from the Brazilian Permanent Network (RSBR), temporary and some restricted stations, and the receiver function method we have updated the crustal thickness map of South America.

Methodology

Deconvolution of R and T components, and selection of good traces

Selection of teleseismic and deep events (>1500 events)

Move-out

Modified HK-stacking (stack for each phase: P, PpS and PpSs)

Crustal thickness and Vp/Vs ratio

Interesting patterns in Vp/Vs ratios:

- The narrow belt of thin crust along the eastern Pantanal basin has low ratios of Vp/Vs, and the western part presents higher values.
- Paraná basin presents normal range of Vp/Vs ratios.
- Low to normal values in the southern part of the Amazon Craton, however other cratonic areas seem to have different patterns.

Updated Crustal Thickness Model

There are three new features on a continental scale:

- A long N-S belt of normal to thick crust (>40 km) from the central Amazon Craton to the southern section of the Paraná basin.
- A belt of thin crust (35 to 40 km) along the low-altitude Sub-Andean region, which is narrower than the previous version.
- The eastern section of the Amazon Craton appears to have a thin crust (35 to 40 km) in the stable continental region the average crustal thickness is 39.6 km, close to the values of previous works.

Important remarks

- We have generated new valuable data in a previously unsampled region of the central part of South America, as the Sub-Andean region and Amazon craton.
- An improved HK-stacking technique produces more consistent regional results of crustal thickness and Vp/Vs ratios, and lower uncertainties than traditional method.
- The improved resolution of the updated map of crustal thickness in South America is useful for future regional studies of seismic wave propagation, crustal gravity modeling, and inferences on crustal evolution.

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