

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

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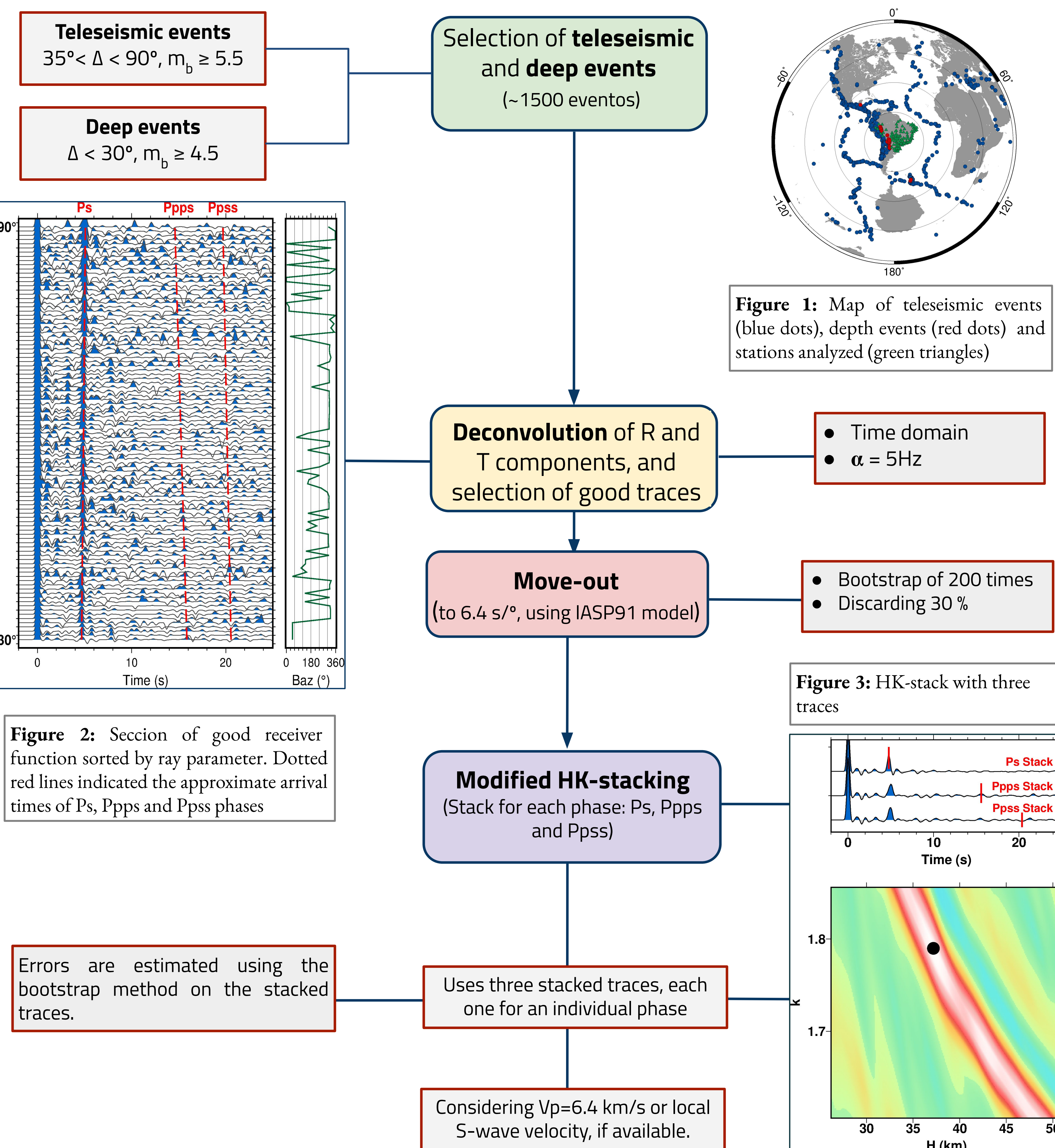
Reference paper: Rivadeneyra-Vera et al. (JGR-2019) <https://doi.org/10.1029/2018JB016811>

Introduction

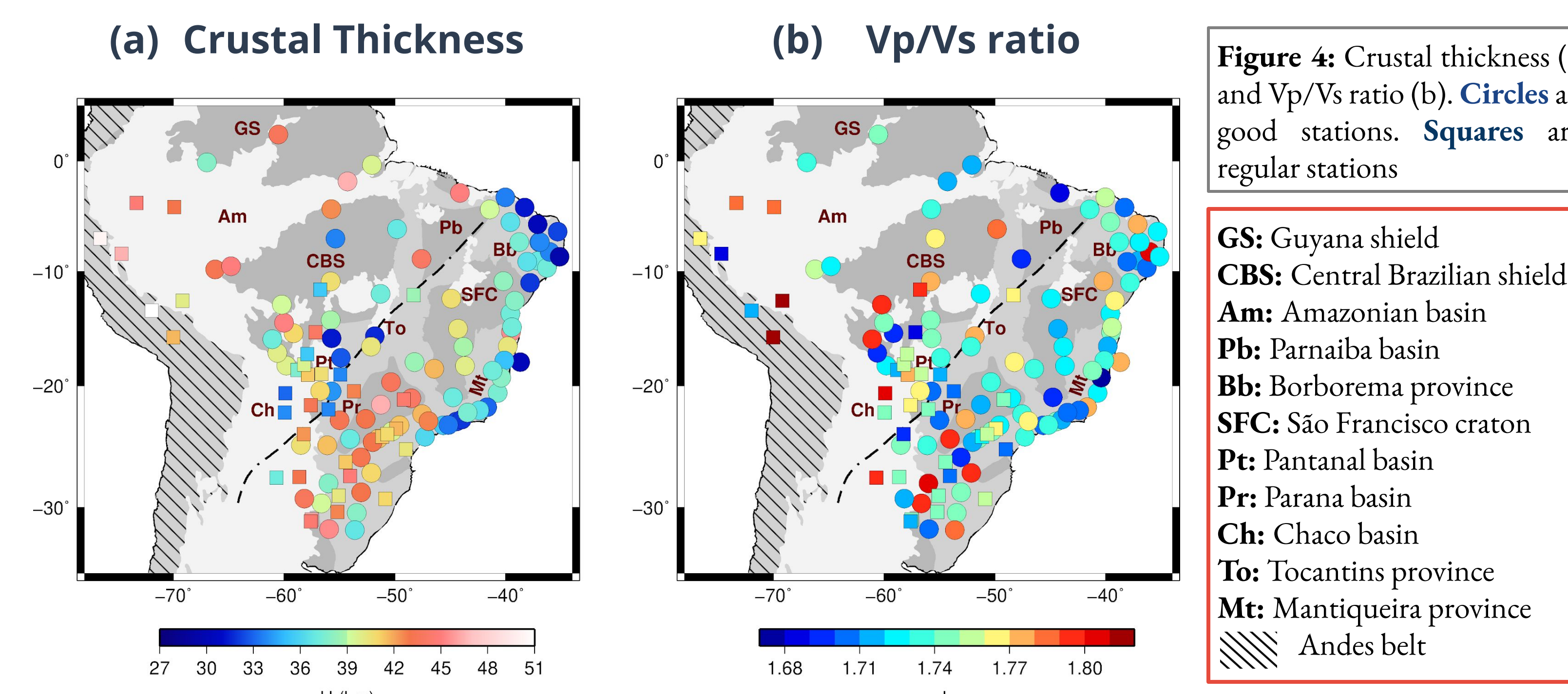
In previous data compilations of crustal structure in South America, some areas in the stable platform, present poor lateral resolution and larger uncertainties due the low coverage of stations.

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



Crustal thickness and Vp/Vs ratio



Interesting new findings in crustal thickness:

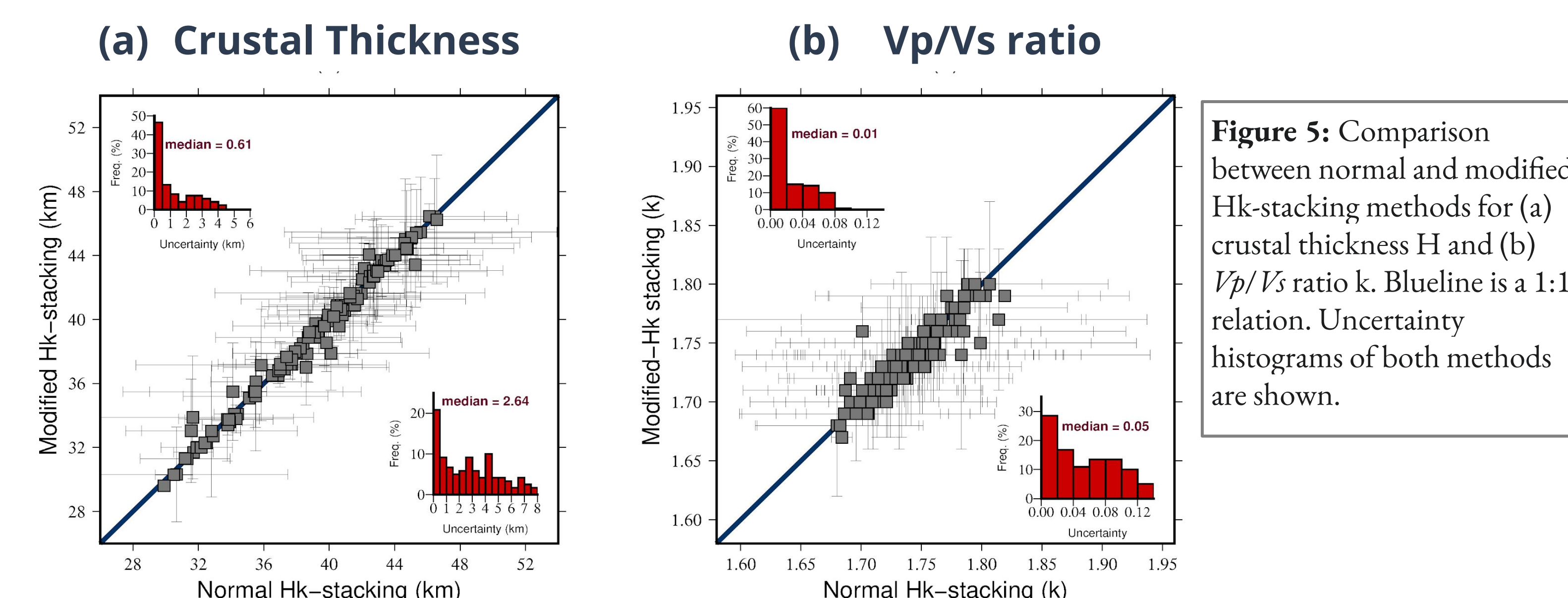
- Thin crust along the eastern edge of the Pantanal basin
- Normal to thick crust just to the west of Pantanal Basin
- Normal to thin crust in Chaco basin.

Patterns observed in previous studies: Thick crust in the northern part of Paraná basin, thinned crust in the coastal margin and Borborema province.

Interesting patterns in Vp/Vs ratios:

- The narrow belt of thin crust along the eastern Amazon Craton appears to have a thin crust (35 to 40 km)
- 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.

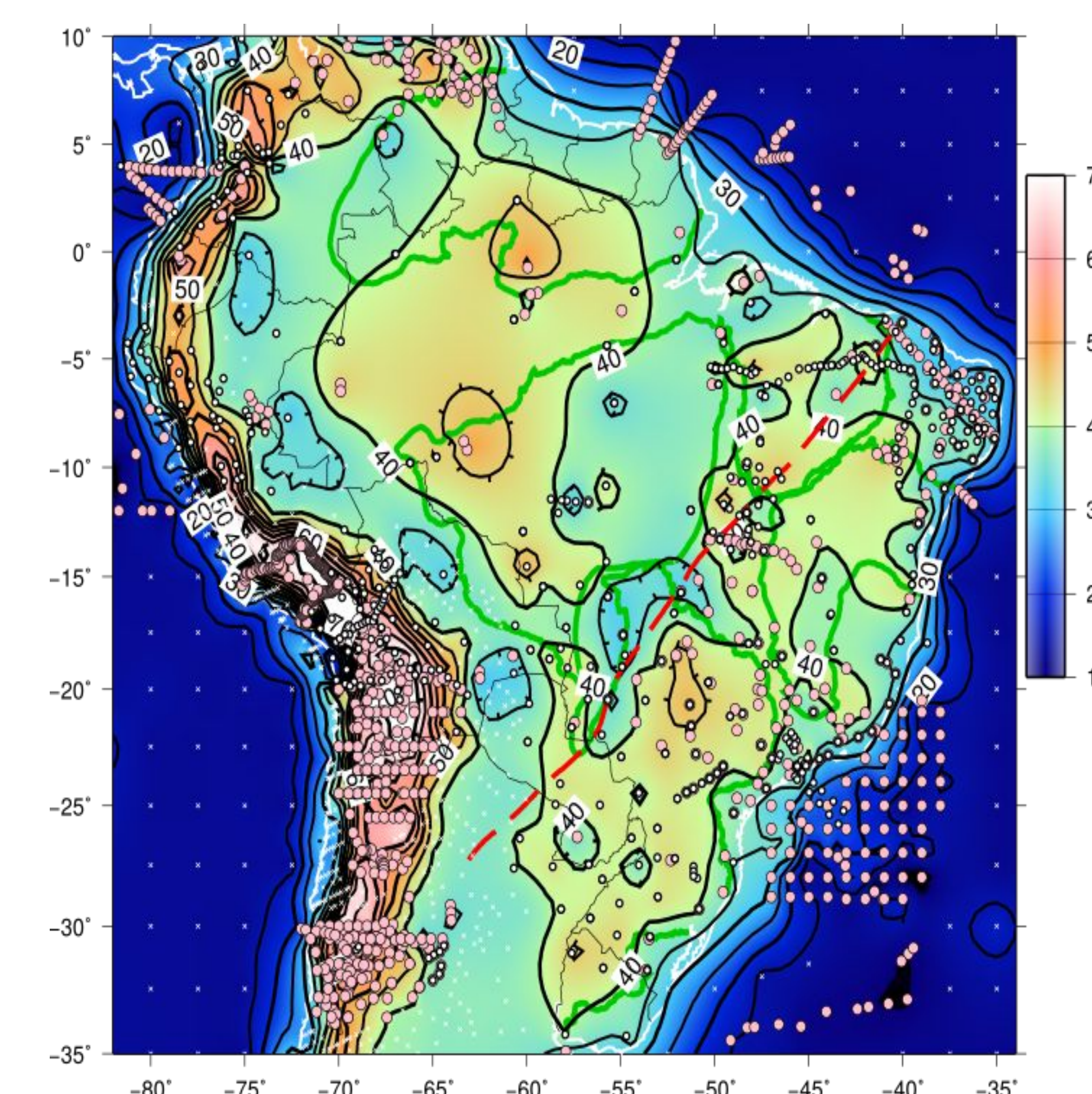
Modified vs Normal Hk-stacking



Results with both methods are similar, within the uncertainties of each other. However the uncertainties for crustal thickness and Vp/Vs ratio of the modified method are 4 to 5 times smaller than normal stacking method.

- For **crustal thickness**, 50% of the estimates have uncertainties less than 0.61 km in the modified method, compared with 2.65 km in the traditional method.
- More than 50% uncertainties in **Vp/Vs ratio** in the modified method are less than 0.01, whereas the normal HK-stacking has a median uncertainty of 0.051.

Updated Crustal Thickness Model



There is 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.

Acknowledgements:

