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1D Seismic Velocity Model with GT5 Events in Brazil and Tests of Crustal Thickness Corrections to Improve the RSTT Model for South America

Good 3D lithospheric velocity models are necessary for reliable epicentre determination. To test different models, we compiled a set of 17 Brazilian reference events, magnitudes 4.0 to 5.1. Only four were truly GT5 events. Most of the events had the epicenter assigned to the middle of the aftershock zone determined by aftershock studies, with origin times calculated with IASP91 table using teleseismic stations. The travel times were normalized to zero depths and compared to some 1D models. The average residuals, up to 1640km, were -2.6s ± 1.9s (for IASP91 model), -1.9s ± 1.7s (Herrin1968), and 0.4 ± 1.5s (Brazilian NewBR). Corrections for crustal thicknesses, using the model of Assumpcao et al.(2012), to a 40 km crust changed the average residuals very little: -2.2s ± 1.9s (IASP91), -1.4s ± 1.6s (Herrin1968), and 0.8 ± 1.3s (NewBR). The raw travel times (uncorrected for event depth and crustal thickness) were compared with the current RSTT model (basically CRUST2.0 in South America) giving average residual of +0.2s ± 1.3s, the smallest of all models. Crustal thickness corrections, while necessary, have limited impact in reducing travel time scatter, and accounting for upper mantle heterogeneities is more important to improve regional travel times in Brazil.

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