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Development of computational routines for travel time data processing for finite-frequency tomography in Brazil

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Abstract

We present a set of computational routines for retrieving, processing and management of seismological datasets based on the obspyDMT package. We retrieve three components seismograms for teleseismic distances recorded by Brazilian seismic stations from 1992 to 2018. Vertical component and horizontal components rotated to the transversal one are analyzed to identify P-waves (e.g., P, Pdiff, PP, PPP, PKP, PcP) and S-waves (S, Sdiff, SS, SSS, ScS, ScS2, SKS, SKKS). For each pair source-receiver in our database, we calculate synthetic waveforms for the Earth's reference model AK135 and the Harvard-CMT source parameters. Travel time anomalies for P-phases and S-phases are estimated by cross-correlating synthetic and recorded seismograms, which are band-pass filtered for different periods. We apply the criteria of Ritsema & Van Heijst (2002) and Zaroli et al. (2010) to identify unreliable travel time anomaly measurements. We correct our measurements for the effects of Earth's ellipticity and variations of the crustal velocity structure using the model CRUST1.0. Thus, we build a travel time anomalies table to derive new P-wave and S-wave seismic tomography models based on finite-frequency theory for Brazil. From here on, with this set of computational routines, we can easily update our travel time anomalies table for newly recorded seismograms and future seismic stations deployments in order to constantly obtain P and S velocity structure models beneath Brazil.

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