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Effects of initial whole mantle 1-D S-velocity and Q structure on waveform inversion for 3-D S-velocity structure: Application to D″ beneath Central America and the Caribbean

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We previously inverted for the 3-D S-velocity structure in D″ beneath Central-America using PREM S-velocity and anelastic (Q) structure as the initial model (Kawai et al. 2014; Borgeaud et al. 2016, JPGU). We fixed the structure outside the target region (D″) to PREM (Dziewonski and Anderson 1981) and made static corrections for the effects of structure near the source and station by time-shifting the records based on the S-wave arrival times. We then used the ScS waveforms as the data in the inversion for 3-D structure. In this study, we infer the 1-D S-velocity and Q structure in the whole mantle beneath Central America using waveform inversion and use this new 1-D model as the starting model in and inversion for the 3-D S-velocity model in D″. Our dataset consists of ∼7000 records at USArray broadband stations and ∼40 intermediate- and deep-focus events in South-America. For the 1-D corridor inversion, we use waveforms cut around minor arc body-wave arrivals (e.g. S, ScS, S, S2, S3), including multiple reverberations at the core-mantle boundary (ScSn), which provide constraints on the difference in Q structure between the upper- and lower-mantle, and may partially account for the effect of strongly heterogeneous crust. For the 3-D inversion in D″, we use waveforms in the time windows before and after the S and ScS arrival times, respectively. We compare the 3-D model obtained using PREM as the starting model to that obtained using the newly inferred 1-D Q and S-velocity model as the starting model to study the effects of the choice of initial model on the 3-D inversion results.