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Global CMT source inversions using 3D Earth models: comparisons with InSAR

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We carry out long-period surface-wave CMT (Centroid Moment Tensor) inversions using various global 3D tomographic models and two different forward modeling techniques for 32 large earthquakes previously studied using Interferometric Synthetic Aperture Radar (InSAR) data. Since InSAR methods provide an alternative way to study shallow continental earthquakes, comparisons of our source parameters with those from InSAR are a novel, independent way of testing wave propagation formulations as well as 3D Earth models. We show that comparing InSAR results with our seismic source solutions is valuable to identify inaccuracies in the earthquake slip distribution retrieved using InSAR. Moreover, we find that using more accurate formulations, together with the best fitting Earth models, substantially reduces biases and differences between moment magnitude and fault strike determined using InSAR and seismic data. In addition, spurious deviations from a pure double-couple earthquake mechanism are on average smaller for the best fitting Earth models and the more accurate formulation of wave propagation. There are large differences between InSAR centroid locations and those obtained in this study and, on average, no clear improvements to the Global CMT (GCMT) locations are achieved. Higher-resolution global Earth models are necessary to further refine long-period CMT centroid locations.