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# New imaging strategies for constraining upper mantle anisotropy with teleseismic P- and S-wave delay times

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Teleseismic travel-time tomography remains one of the most popular methods for obtaining images of Earth's upper mantle. However, despite extensive evidence for a seismically anisotropic mantle, assuming an isotropic Earth remains commonplace in such imaging studies. This assumption can result in significant imaging artefacts which in turn may yield misguided inferences regarding mantle dynamics. Using realistic synthetic seismic datasets produced from waveform simulations through elastically anisotropic geodynamic models of subduction, I show how such artefacts manifest in teleseismic P- and S-wave tomography. The anisotropy-induced apparent anomalies are equally problematic in both shear and compressional body wave inversions and the nature of the shear velocity artefacts are dependent on the coordinate system in which the delay times are measured. In general, the isotropic assumption produces distortions in slab geometry and the appearance of large sub- and supra-slab low-velocity zones. I summarise new methods for inverting P- and S-delay times for both isotropic and anisotropic heterogeneity through the introduction of three anisotropic parameters that approximate P and S propagation velocities in arbitrarily orientated hexagonally symmetric elastic media. Through a series of synthetic tomographic inversions, I demonstrate that both teleseismic P- and S-wave delay time data can resolve complex anisotropic heterogeneity likely present in subduction environments. Moreover, including anisotropic parameters into the inversions improves the reconstruction of true isotropic anomalies. Particularly important to the removal of erroneous velocity structure is accounting for dipping fabrics as many imaging artefacts remain when simpler azimuthal anisotropy is assumed. I conclude by highlighting results from recent applications of the anisotropic imaging method to P-wave datasets in the Western US and Mediterranean.