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Recovery of three-dimensional slab-backarc structures in the Mediterranean region by nonlinear seismic travel time tomography

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Upper mantle structure in the Africa-Eurasia collision belt is dominated by the images of subducting lithosphere and back-arc basins. We simulate recovery of these structures by nonlinear high-frequency P-wave travel time tomography. We use realistic distribution of seismic sources and stations, and calculate P first arrival travel times by the accurate and efficient finite difference scheme of *Podvin and Lecomte (1991)*, based on systematic application of Huygens' principle, adapted to work in spherical geometry. We use different meshes for the crust (2 km spacing) and the mantle (6 km) to account for Moho depth with high precision. We use a perturbative iterative approach for the inversion, starting with a one dimensional prior model. Different strategies are used and compared in the nonlinear inversion. Realistic upper mantle structures strongly deflect seismic rays, and the correct paths can only be approached after a few iterations. We verify the importance of using a flexible and general three-dimensional ray tracing scheme. Some features, like broken slab continuity, may result from irregularity in ray density.