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Dynamics of the active deformation beneath the Tyrrhenian basin and surrounding margins

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The Lithospheric deformation, mantle flow, and tectonic stress state in the Tyrrhenian region is influenced by the structure, density and effective viscosity of the crust and uppermost mantle beneath the basin. Here we estimate the contribution of buoyancy forces to the regional dynamics by modelling the flow field below the Tyrrhenian basin and surrounding margins using variable density data converted from well resolved S-wave velocity data obtained from ambient noise tomography. The density models for the crust and uppermost mantle derived from S-wave seismic velocities are constrained by gravity data. The seismic tomography results reveal a broad low velocity zone affecting much of the Tyrrhenian basin's uppermost mantle structure and its extension mimics the paleogeographic reconstruction of the Calabrian arc in time. The modeled lithospheric flow patterns can explain the heat flux, the regional geology and magmatism in the Tyrrhenian basin and provides new insights into the dynamic deformation beneath back-arc basins.