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Retrodicting the late Cenozoic dynamic topography

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We reconstruct the global late Cenozoic dynamic topography by carrying out backward-in-time mantle flow simulations starting with present-day heterogeneity derived from a high-resolution joint seismic-geodynamic tomography model (Simmons et al., 2009). Herein, we will explore the associated uncertainties and geological implications of our topography retrodictions. Heuristic estimates of uncertainties are obtained using two different approaches to backward mantle convection – the backward advection method and the quasi-reversible convection method. Comparison of these two methods exposes the relative importance of diffusion in our retrodictions. Additional contributions to our uncertainties that originate from the starting models of mantle heterogeneity and rheology are also investigated. We further assess the validity of our models of topography evolution with the geological record. In particular, we focus on dynamic surface features such as the Colorado Plateau in the southwestern US, the Angolan margin and Congo-Zaire basins in Africa.