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Lithospheric-scale anisotropies control first-order stress orientation during Cretaceous-Cenozoic plate kinematics in Western-Central Europe

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Late Mesozoic-Cenozoic plate convergence led to widespread intraplate deformation in Western-Central Europe during the Late Cretaceous-Paleogene and the Miocene until today reflecting the collision of Eurasia with Iberia-Africa and Adria, respectively. The resulting complex deformation pattern inside the plate boundary zone contrasts with a rather uniform orientation adjacent to the north. Although there is broad consensus that the orientation of the first-order stress is controlled by plate kinematics, there is no sufficient explanation for the variation of the stress field across the plate boundary. We model plate kinematic trajectories and analyze the spatial distribution of paleostress data from fault-slip inversion and tectonic stylolites. The comparison reveals the coexistence of two contrasting stress provinces in Europe throughout the Late Mesozoic-Cenozoic. Inside the diffuse plate boundary zone, trajectories of plate motion fit deformation patterns. Outside of that zone, however, there is significant deviation. Here deformation is mainly accommodated by the reactivation of Paleozoic shear zones. Thus, we argue that lithospheric-scale structural inheritance from the Pangea assemblage controls the stress-strain pattern of Western-Central Europe between the active plate boundary zone and the East European Craton since the Late Mesozoic.