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Self-Consistent Thermochemical Piles

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Thermochemical piles have been considered to explain the seismically observed structures at the core-mantle boundary. Further, the presence of dense piles has a profound impact on the plate motion. Both, the volume of enriched material and the density excess are critical for the mantle dynamics. Though hardly constrained, present models of mantle convection require ad hoc assumptions for both.
We present double diffusive convection models with strongly variable viscosity where the thermochemical piles develop without a predefined initial dense CMB layer. Assuming, that after Earth's core formation, the mantle is chemically stratified and heated from below by the core, we then obtain self-consistently forming thermochemical piles by advection-assisted diffusion when utilizing in addition a non-zero flux of the composition at the CMB.
We discuss CMB topography of the piles and their effect on the plate motion.