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Thermal structure across the CMB and deep mantle

H.-P. Bunge
Dept of Geosciences, Munich University

Computational resources have advanced to a point that allows us to perform 3D spherical mantle convection simulations at full numerical resolution with grid space resolutions of 20 km or less throughout the mantle corresponding to over 100 million grid points globally. Crossing this fundamental threshold means in particular that it is now feasible for computational geodynamicists to study the thermal evolution, geotherm, and partitioning of internal (radioactive) and external (core derived) heat in Earth's mantle in global models under the dynamic parameter regime appropriate for Earth. We will present early results from global fully resolved mantle convection models at Rayleigh numbers exceeding 10exp9. We will give particular consideration to the thermal structure across the CMB and the deep mantle. We will also discuss the linkage of these dynamic models to a new class of mineralogic mantle models derived from thermodynamic considerations of Gibbs free energy minimisation in order to facilitate direct comparison with tomographic mantle models that aim to constrain the the internal temperature structure of the deep mantle the CMB.