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Numerical dynamos with outer boundary heat flux inferred from probabilistic tomography – Consequences for latitudinal distribution of magnetic flux

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Mantle control on the geodynamo is often simulated using numerical dynamos with imposed outer boundary heat flux inferred from lower mantle tomography, assuming that seismic and thermal anomalies in the lowermost mantle are highly correlated. However, non-thermal effects might perturb this idealized linear seismic-thermal mapping. Here we use a probabilistic tomography model to isolate the thermal part of the seismic anomaly in order to impose a more realistic core-mantle boundary heat flux pattern on the outer boundary of numerical dynamo simulations. We demonstrate that on time-average these dynamo models have more low-latitudes convective and magnetic activity than corresponding models with conventional tomographic heat flux. In addition, the low-latitudes magnetic flux and kinetic energy contributions are more time-dependent in the dynamo models with a probabilistic tomography heat flux, and thus may recover the observed latitudinal distribution of geomagnetic flux on the core-mantle boundary, which we propose as a morphological criterion for Earth-like dynamo models.