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The Central-East Atlantic Anomaly: its role in the genesis of the Canary and Madeira volcanic provinces

Susana Custódio¹, Chiara Civiero², João Mata¹, Graça Silveira^{1,3}, Marta Neres^{1,4}, and David Schlaphorst¹

¹University of Lisbon, Instituto Dom Luiz, Instituto Dom Luiz, Lisboa, Portugal (susanacustodio@campus.ul.pt)

²Dublin Institute for Advanced Studies (DIAS), Dublin D02 Y006, Ireland

³Instituto Superior de Engenharia de Lisboa, Lisboa 1959-007, Portugal

⁴Instituto Português do Mar e da Atmosfera, Lisboa, Portugal

The Canary and Madeira provinces, located in the central-east Atlantic Ocean, are characterized by irregularly distributed hotspot tracks displaying large age differences and variable distances between volcanoes. For this reason, the geodynamic mechanism(s) that control the spatio-temporal patterns of volcanism are still unclear. Here, we use results from seismic tomography, shear-wave splitting, and gravity to show that the Central-East Atlantic Anomaly (CEAA), rising from the African large low-shear-velocity province and stalled in the topmost lower mantle, is the source of distinct upper-mantle diapirs feeding those provinces. The diapirs detach intermittently from the CEAA and seem to be at different evolutionary stages. Geochemistry data confirm the lower-mantle origin of the diapirs, and plate reconstructions constrain their temporal evolution. Our observations suggest that the accumulation of deep plume material in the topmost lower mantle can play a significant role in governing the spatio-temporal distribution of hotspot volcanism.

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