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Magnetic evidence for a Cretaceous intrusion underlying the Gudalquivir - Portimão Banks (Gulf of Cadiz)

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The Guadalquivir and Portimão Banks region comprises the most prominent geophysical feature in the Gulf of Cadiz, displaying significant but distinct bathymetric, gravimetric and magnetic anomalies and being related to an active earthquake cluster. Both bathymetric and gravimetric anomalies are currently interpreted as resulting from uplift of upper crustal basement. However, the outstanding positive magnetic anomaly, which is offset from the bathymetric and gravity highs, has been much less studied and its origin is still not understood. We here show that previous 2D geophysical models cannot explain the observed Guadalquivir magnetic anomaly, and present new magnetic modeling. We perform inversion of magnetic data to obtain a 3D model of susceptibility, which claims for the existence of a large intrusive body in the region. We integrate the modeled body with published interpreted seismic reflection profiles and use 2D forward modeling to ensure that both the predicted magnetic and gravimetric fields fit the observed data. Our results show the Guadalquivir body intruding the necking domain of the Algarve margin, across the lower and upper crust and locally cutting across Jurassic sedimentary layers, suggestting that the Guadalquivir body intruded during the Upper Cretaceous. The imaged Guadalquivir intrusion thus becomes the southernmost element of the enigmatic Sintra-Sines-Monchique magnetic alignment.
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