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Evidence for oceanic crust in the Herodotus Basin

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Some of the fundamental tectonic problems of the Eastern Mediterranean remain unresolved due to the extremely thick sedimentary cover (10 to 15 km) and the lack of accurate magnetic anomaly data. I have collected 7,000 km of marine magnetic profiles (2012-2014) across the Herodotus and Levant Basins, Eastern Mediterranean, to study the nature and age of the underlying igneous crust. The towed magnetometer array consisted of two Overhauser sensors recording the total magnetic anomaly field in a longitudinal gradiometer mode, and a fully oriented vector magnetometer. The total field data from the Herodotus Basin reveal a newly detected short sequence of long-wavelength NE-SW lineated anomalies that straddle the entire basin suggesting a deep two-dimensional magnetic source layer. The three components of the magnetic vector data indicate that an abrupt transition from a 2D to 3D magnetic structure occurs east of the Herodotus Basin, along where a prominent NE-SW gravity feature is found. Altogether, these new findings confirm that the Herodotus Basin preserves remnants of oceanic crust that formed along the Neotethyan mid-ocean ridge system. The continuous northward and counterclockwise motion of the African Plate during the Paleozoic and Mesozoic allow predicting the evolution of remanent magnetization directions, which in-turn dictate that shape of the anomalies. The shape of the Herodotus anomalies best fit Late Carboniferous to Early Permian (300±20 Myr old) magnetization directions. Finally, I will discuss the implications of these results on the tectonic architecture of the region as well as on various geodynamic processes.