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Marine magnetic survey between Cabo da Roca and Cabo Espichel (near Lisbon, Portugal): first results

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We present a magnetic survey conducted in the offshore region between Cabo da Roca and Sesimbra (mouth of Tagus River, Portugal). Strong magnetic anomalies are recognized in this area since a first marine survey in 1958 (Allan, 1965) and by further aeromagnetic survey (c.f. Silva et al, 2000). The anomalies have been linked to Cretaceous magmatic events related to the Upper Cretaceous Sintra magmatic complex and Lisbon volcanic complex, but their geometry and extension has yet not been resolved. The aim of the present survey was to unravel the location, geometry and type of the magnetic sources, thus contributing for the characterization of the main magmatic and tectonic features in the region.
The survey was conducted in two legs (October 2014 and June 2015), consisting of 27 lines and 6 tielines, extending up to 40 km from the coast. The line spacing was 1 mile for the main lines and 5-6 miles for the tielines. The bathymetry of the surveyed area varies from very shallow (about 10 m) to near 3000 m. Total field was measured with a G-882 Cesium marine magnetometer of Geometrics (self-oscillating split-beam Cesium vapor), with frequency of acquisition of 10 Hz. Layback was real-time corrected using the acquisition software. Noise was removed by despike in Magpick software (Geometrics), and further processing was done using Oasis montaj (Geosoft) software. Data were subtracted of IGRF values and levelled by tielines to retrieve the final map of anomalies.
Several punctual and linear anomalies with varying amplitude and wavenumber were identified, which cannot be explained by bathymetric variation; therefore they must then be due to the presence of higher susceptibility, likely volcanic rocks, and to structural inheritance associated with rifting and Alpine orogeny. The highest anomaly corresponds to the Cabo Raso positive magnetic anomaly, with maximum and minimum of 2800 nT and -1350 nT, respectively. This anomaly, already surveyed in 1958, has been compared to a theoretical dipole by Allan (1965), and a good fit was revealed, though geologically unrealistic. Intending to reach a more realistic interpretation of this anomaly, we will present results of inverse modeling of the Cabo Raso anomaly, and discuss the shape, geometry and nature of the magnetization of its magnetic source. We will also link our results to existing seismic reflection data.
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