

ORIGIN OF TORE-JOSEPHINE SEAMOUNTS FROM U-PB AGES, GEOCHEMISTRY AND PB ISOTOPES

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The Tore-Josephine seamount chain is about 1000 km long, lying 300 km off the Portuguese coast. Several different hypotheses were proposed to explain its origin and the present study aims to clarify uncertainties relative to rifting of the Iberian margin and formation of the Atlantic spreading centers. It has been built up parallel to the Iberian margin roughly along the first magnetic anomaly of oceanic crust. Our new dating, geochemical, and isotope results for 8 dredged volcanic rocks from the Tore complex, an unnamed seamount, Asthon, and Jo Sister seamounts attest an alkaline affinity. Trace elements patterns show OIB characteristics having positive Nb anomalies. More than 40 U-Pb dates were obtained on different titanite and zircon fractions from the 8 samples. Although our U-Pb ages are not complete, the results document an age of about 95 Ma for the Tore seamount whose dating is hampered by the fact that Pb-loss occurred, most likely in relation to seawater alteration. Smaller degrees of relative Pb-loss was also observed for other samples. The unnamed seamount lava to the south yields an U-Pb age of 105 ± 3 (2s) Ma, and a second rock from this seamount has a series of identical fractions defining an age of 110 ± 2 Ma. The Jo Sister volcano to the south of the Josephine seamount has an age identical to the sample from the Tore complex yielding an U-Pb age of 94 ± 5 Ma. The new set of U-Pb age suggest that the seamount chain was emplaced between 110 and 94 Ma. Initial common Pb determined in cogenetic feldspars from the dated samples have isotope signatures lying well above the reference field for MORB. They are characterized by high $^{207}\text{Pb}/^{204}\text{Pb}$ such as identified for alkaline magmatism on the Ormonde seamount to the south, and the Serra de Monchique magmatic complex on the continent. In contrast, the Tore sample lies within the field of relatively radiogenic MORB ($^{206}\text{Pb}/^{204}\text{Pb}$: 19.34) being very similar to Pb isotopes measured in the very young to actual Madeira volcanic eruptions. The new ages, isotope signatures and geochemical data substantiate that the origin of the Tore-Josephine seamount chain is unrelated either to late phases of rift-related tholeiitic magmatism or initial activity of spreading centers marked by the 119-108 Ma old J-Anomaly in this region. The chain was put in place into the newly created plate either along the outermost part of

the continent-ocean transition zone or into the new oceanic crust. This would mean that its origin is due to a thermal anomaly distinct from the upwelling asthenosphere (MORB source) which created the Atlantic oceanic lithosphere.