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The internal structure of the Zone of Exhumed Continental Mantle in the Southern Iberia Abyssal Plain: insights from mapping the distribution of deformation structures in the overlying post-rift sediments.

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Deep-sea drilling and geophysical surveys in the Southern Iberia Abyssal Plain (SIAP) have revealed the existence of a Zone of Exhumed Continental Mantle (ZECM) up to 130 km wide. The ZECM has geophysical characteristics that match neither those of oceanic crust nor those of a thinned continental crust. This zone is characterized by weak and non-linear magnetic anomalies, variable topography, seismic velocities which increase steadily with depth and no clear Moho reflection. During ODP Legs 149 and 173, drilling in the ZECM penetrated tectonised mantle at three sites (Sites 1068, 897 and 1070) and pre-rift sediments overlying continental crust at Site 1069, interpreted as an allochthon stranded over exhumed mantle. The rocks recovered from the basement as well as from reworked basement within debris flows show a surprising variety in the composition and structure of the mantle rocks across the ZECM. They comprise mylonitized to undeformed spinel dunite, harzburgite and lherzolite. Up to 20 vol% of plagioclase within some peridotites suggests a strong impregnation of the mantle within the ZECM. Because all the drill sites targeted highs, despite of the large number of geophysical surveys and the many scientists studying the SIAP, the internal structure and nature of basement in the ZECM are still poorly known and highly debated.

An alternative way of getting more constraints on the internal structure of the ZECM is to study how this zone behaved during subsequent Cenozoic compression. Inherited

heterogeneities within the basement, defined either by compositional and/or structural variations, are likely to control the distribution of the deformation within the margins. Therefore, mapping the strain distribution within the overlying post-rift sediments permits us to gain insights into the internal structure and nature of basement rocks in the ZECM. In order to test this conceptual idea, we used a dense network of seismic reflection lines in the SIAP (Lusigal 12, Sonne, CAM). We mapped the distribution of deformation structures in the post-rift sediments and compared it with the distribution of basement domains showing characteristic seismic aspects, which can be mapped throughout the SIAP. Preliminary results suggest two major conclusions: (1) deformation in the SIAP is localized within a zone overlying basement with well-defined seismic characteristics, and (2) deformation occurs within the ZECM and not at its transition to continental or oceanic crust. Our results show that the ZECM in the SIAP cannot be considered as a homogeneous domain. A more precise description of the zones of deformation combined with a characterization of the nature of contacts between deformed and undeformed regions will allow us to derive further constraints on the type of heterogeneities and their spatial distribution in the ZECM. In a next step, we plan to compare the distribution of the different basement domains mapped in the SIAP with magnetic and gravity data and the results of ODP Legs 149 and 173.