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Morphostructural Mapping of the Marques de Pombal Fault Area (SW Portuguese Margin)

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The Marques de Pombal Fault (MPF), is a west-verging active thrust located 100 km offshore Cape SãoVicente in the SW Iberian Margin, characterized by a wide a diffuse seismic activity. Since 1998, the MPF has been intensively surveyed through international cooperation, and it has been proposed as plausible segment for the source of the 1755 Lisbon Earthquake [e.g. Zitellini et al., 2001; Terrinha, et al., 2003; Gràcia et al., 2003]. The geophysical dataset acquired in the area of the MPF comprise multichannel seismic reflection profiles acquired on BIGSET'98, high-resolution side-scan sonar image (TOBI) acquired on HITS'01, and Simrad EM-12 swath-bathymetry data from PARSIFAL'00 and HITS'01 cruises, which have been the base for this work.

This work concentrated on mapping and describing in detail the surface geology of the Marquês de Pombal Fault and surrounding structures, comprising an area of more than 3300 km^2. In order to integrate the whole dataset we have used GIS software. From the bathymetric data, digital terrain models of the study area were obtained together with slope gradient maps and other surface analysis maps. The TOBI sidescan sonar image was draped over the digital terrain model, giving a higher degree of accuracy to the image interpretation, and allowing the production of detailed maps of mass movements. The interpretation of the seismic profiles was digitalized, depth converted and added to the GIS software in a 3D environment, that defined the seabed features associated with the sub-surface structure. All this work was compiled on a morphostructural map at a scale of 1:250.000.

The analysis of the data shows that the morphological features are closely related to its structural components and tectonic evolution since the Middle Miocene. Folding and

reverse faulting of the Quaternary units along the MPF indicate present-day tectonic activity. Gully-incised slope failures and submarine landslides are common features in the study area. The Marques de Pombal block shows several kilometer-scale landslides, the major mass-wasting complex disrupting a total area of more than 110 km^2. The occurrence of successive landslide suggests a recurrent activity of the Marques de Pombal Fault. We suggest that the most likely triggering mechanism is seismic activity, as large earthquakes are often generated in the SW Iberian Margin due to the Africa-Eurasian Plate convergence. Studies based on slope instability processes and resulting deposits (i.e. debris flows, turbidites) are being carried out in the frame of the ESF EuroMargins SWIM project.