

DID OVERPRESSURES GENERATE BEFORE THE MARQUES DE POMBAL MASS TRANSPORT EVENTS HAPPENED?

D. Mencaroni^{1*}, J. Llopart¹, R. Urgeles¹, E. Gràcia¹

¹Institut de Ciències del Mar (CSIC), Passeig Marítim de la Barceloneta 37-49, Barcelona, Spain

**e-mail: mencaroni@icm.csic.es*

The hanging wall of the Marques de Pombal fault, in the Northern section of the Gulf of Cadiz (SW Iberian Margin), displays multiple slope failures, the most recent of which, the Marques de Pombal Mass Transport Complex (MTC), has an estimated volume of 1.3 km³. The location of the MTC, at the bottom of the Marques de Pombal active fault, suggests earthquake shaking as the most likely triggering mechanism for local mass wasting events. Moreover, the Marques de Pombal fault is considered by several authors as a possible candidate for the generation of the 1755 Great Lisbon catastrophic earthquake and tsunami event.

Sediment distribution of the area is characterized by an extensive contourite depositional system related to the Mediterranean Outflow Water (MOW) that flows northward over the upper and middle part of the slope. IODP expedition 339 explored the stratigraphy of the Gulf of Cadiz by drilling 6 different wells in the area, one of which (Well 339-U1391) was drilled approximately 50 km away from the Marques de Pombal MTC. Furthermore, the INSIGHT cruise conducted by ICM – CSIC in May 2018 collected new seismic, bathymetric and gravity core data from the undisturbed sediments at the top of the Marques de Pombal fault scarp.

The aim of this project is to investigate the contribution of excess pore pressure (pre-conditioning factor) versus earthquake cyclic loading (trigger mechanism) in the Marques de Pombal area, to understand pore pressure and slope stability evolution through time and make inferences about the magnitude of the events that triggered the failures.

The workflow adopted in this study consists of integrating into finite element numerical models geotechnical data from the sediments collected during the INSIGHT cruise, such as initial porosity, compressibility and permeability, with a stratigraphic model of the basin derived from seismic profiles and well and log data from the IODP well 339-U139, in order to obtain the computed excess pore pressure history for the sediments in the Marques de Pombal area.

Our modelling results show the development of mid-to-high overpressure values (up to 0.4), which started developing in the Middle Pleistocene and continued through the Holocene. Considering the not particularly high sedimentation rate of the contourite system in the middle part of the Marques de Pombal continental slope, we found the reasons of the overpressures development in the area in the physical properties of the sediments, and especially in their high compressibility. Assuming the Marques de Pombal fault as the main responsible for triggering the multiple MTC observed in the area, we can make some assumptions about the fault activity by comparing the ages of the deposits with overpressure modelling results.