EGU2020-436
https://doi.org/10.5194/egusphere-egu2020-436
EGU General Assembly 2020

The Lineament South fault system (SW Iberia): New insights and a multiscale view of its seismogenic and tsunamigenic potential

Cristina Sanchez Serra[1], Eulàlia Gràcia Mont[1], Roger Urgeles Esclasans[1], Sara Martínez-Loriente[1], Rafael Bartolome[1], Manuela Volpe[2], Francesco Maesano[2], Roberto Basili[2], Fabrizio Romano[2], Antonio Scala[3], and Laura Gómez de la Peña[4]

[1]Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain
[2]Istituto Nazionale di Geofisica e Vulcanologia (INGV), Rome, Italy.
[3]Dipartamento di Fisica, Università di Napoli Federico II
[4]GEOMAR Helmholtz Centre for Ocean Research, Kiel

The Lineament South (LS) is a major WNW-ESE trending dextral strike-slip fault located along all the Gulf of Cadiz (SW Iberian margin), and it has been considered as the plate boundary between Africa and Eurasia. The SW Iberian margin hosts a moderate to intermediate seismic activity, however, largest and destructive earthquakes and tsunamis have occurred in this area, such as the 1st of November 1755 Lisbon earthquake and tsunami ($M_w \geq 8.5$) and the 28th February 1969 earthquake (M_w 7.8). Our work focus on the LS active structure and their potential seismic and tsunami hazard. To study the LS, we integrated the most advanced technologies in marine geosciences covering different scales of resolution, such as: a) Multibeam echosounder that allows us to obtain a bathymetric map that provides information of the seafloor; b) Sub-bottom profiler to acquire high-resolution seismic profiles of the uppermost layers below seafloor; c) Autonomous Underwater Vehicle (AUV) “Abyss” to carry out a micro-bathymetric survey (2 m resolution); and d) High-resolution 2D multichannel seismic profiles. With these dataset, we characterized the LS structure and their sub-surface, calculated the maximum magnitude earthquake and modelled the worst-case tsunami scenario that this fault may produce. The workflow to develop the tsunami modelling involves the following tasks: 1) Interpretation of the high-resolution seismic profiles; 2) Map the trace of the LS fault; 3) Generate a seismo-stratigraphic model of the fault subsurface; 4) Define the specific attributes and seismic/tsunamigenic parameters of the LS fault system; 5) Determine the maximum magnitude and slip according to Leonard (2014) scaling-laws; and 6) Run the tsunami simulation using the Tsunami-HySEA software. The LS extends for more than 370 km, from the Horseshoe Abyssal Plain to the Gulf of Cadiz Imbricated Wedge, as demonstrated for the sequence of MCS profiles across the lineament. In the AUV map, we can recognize fault traces, which are not continuous and show a set of crests and troughs of a width of 100s of meters. The deformation associated to LS span’s about 2-3 km at the seafloor cutting the seismo-stratigraphic sequences, including the Quaternary unit, which reach up to the seafloor. According to the scaling-law of Leonard (2014), the maximum magnitude earthquake that LS can generate is up to M_w 7.9. An earthquake of this magnitude can produce a tsunami that may affect the SW Iberian Peninsula, with a wave amplitude higher than 1 m. Eventually, the LS may generate a significant earthquake

and tsunami along the Portuguese, Spanish and Moroccan coasts.