Geomorphology 402 (2022) 108126

Contents lists available at ScienceDirect

Geomorphology

journal homepage: www.journals.elsevier.com/geomorphology

Understanding the complex geomorphology of a deep sea area affected by continental tectonic indentation: The case of the Gulf of Vera (Western Mediterranean)

Gemma Ercilla [a,*], Jesús Galindo-Zaldívar [b,c], Ferran Estrada [a], Javier Valencia [d], Carmen Juan [e], David Casas [a], Belén Alonso [a], Mª. Carmen Comas [c], Victor Tendero-Salmerón [c], Daniele Casalbore [f], María Azpiroz-Zabala [g], Patricia Bárcenas [h], Silvia Ceramicola [i], Francesco L. Chiocci [f], Javier Idárraga-García [j], Nieves López-González [h], Pilar Mata [k], Desirée Palomino [h], Juan Antonio Rodríguez-García [k], Manuel Teixeira [l], José Nespereira [m], Juan Tomás Vázquez [h], Mariano Yenes [m]

[a] Instituto de Ciencias del Mar, CSIC, Continental Margins Group, 08003 Barcelona, Spain
[b] Dpto. de Geodinámica, Universidad de Granada, 18071 Granada, Spain
[c] Instituto Andaluz de Ciencias de la Tierra, CSIC-UGR, 18100 Granada, Spain
[d] LYRA, Engineering Consulting, 01015 Gazteiz, Spain
[e] Instituto Español de Oceanografía, IEO-CSIC, 11006 Cádiz, Spain
[f] Dipartimento di Scienze della Terra, Università di Roma "Sapienza", 00185 Rome, Italy
[g] Delft University of Technology - Applied Geology, 2628 CN Delft, the Netherlands
[h] Instituto Español de Oceanografía, IEO-CSIC, 29640 Fuengirola, Málaga, Spain
[i] National Institute of Oceanography and Applied Geophysics - OGS, 34010 Sgonico, Italy
[j] Department of Physics and Geosciences, Universidad del Norte, Barranquilla, Colombia
[k] Instituto Geológico y Minero de España, IGME-CSIC, 28760 Tres Cantos, Madrid, Spain
[l] IDL (Laboratório Associado) – Instituto Dom Luíz, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, Edifício C1, 1749-016 Lisboa, Portugal
[m] Dpto de Geología, Universidad de Salamanca, 37008 Salamanca, Spain

ARTICLE INFO

Keywords:
Geomorphic processes
Tectonic indentation
Mass movements
Contourites
Continental margin
Western Mediterranean

ABSTRACT

We present a multidisciplinary study of morphology, stratigraphy, sedimentology, tectonic structure, and physical oceanography to report that the complex geomorphology of the Palomares continental margin and adjacent Algerian abyssal plain (i.e., Gulf of Vera, Western Mediterranean), is the result of the sedimentary response to the Aguilas Arc continental tectonic indentation in the Eurasian–Africa plate collision. The indentation is imprinted on the basement of the margin with elongated metamorphic antiforms that are pierced by igneous bodies, and synforms that accommodate the deformation and create a complex physiography. The basement is partially covered by Upper Miocene deposits sealed by the regional Messinian Erosive Surface characterized by palaeocanyons that carve the modern margin. These deposits and outcropping basement highs are then covered and shaped by Plio-Quaternary contourites formed under the action of the Light Intermediate and Dense Deep Mediterranean bottom currents. Even though bottom currents are responsible for the primary sedimentation that shapes the margin, 97% of this region's seafloor is affected by mass-movements that modified contourite sediments by eroding, deforming, faulting, sliding, and depositing sediments. Mass-movement processes have resulted in the formation of recurrent mass-flow deposits, an enlargement of the submarine canyons and gully incisions, and basin-scale gravitational slides spreading above the Messinian Salinity Crisis salt layer. The Polopo, Aguilas and Gata slides are characterized by an extensional upslope domain that shapes the

* Corresponding author.
E-mail addresses: gemma@icm.csic.es (G. Ercilla), jgalindo@ugr.es (J. Galindo-Zaldívar), festrada@icm.csic.es (F. Estrada), davidcasas@icm.csic.es (D. Casas), belen@icm.csic.es (B. Alonso), mcomas@ugr.es (Mª.C. Comas), vtendero@ugr.es (V. Tendero-Salmerón), daniele.casalbore@uniroma1.it (D. Casalbore), patricia.barcenas@ieo.es (P. Bárcenas), sceramicola@inogs.it (S. Ceramicola), francesco.chiocci@uniroma1.it (F.L. Chiocci), idarragaj@uninorte.edu.co (J. Idárraga-García), nieves.lopez@ieo.es (N. López-González), p.mata@igme.es (P. Mata), desiree.palomino@ieo.es (D. Palomino), ja.rodriguez@igme.es (J.A. Rodríguez-García), jnj@usal.es (J. Nespereira), juantomas.vazquez@ieo.es (J.T. Vázquez), myo@usal.es (M. Yenes).

https://doi.org/10.1016/j.geomorph.2022.108126
Received 25 October 2021; Received in revised form 21 January 2022; Accepted 23 January 2022
Available online 31 January 2022