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Strain partitioning in the Western Gibraltar Arc: new clues on the Miocene kinematics of the westernmost Mediterranean

J.C. Balanyá (1,3), A Crespo-Blanc (2,3), M. Díaz-Azpiroz (1), I. Expósito (1), M. Luján (3), F. Torcal (1,4)

(1) Dpto. de Sistema Físicos. Químicos y Naturales, Universidad Pablo de Olavide, Cra. de Utrera km 1 , 41013-Sevilla, Spain, (2) Dpto. de Geodinámica, Universidad de Granada, Avda. Fuentenueva s/n, 18071-Granada , Spain, (3) Instituto Andaluz de Ciencias de La Tierra, Avda. Fuentenueva s/n, 18071-Granada, Spain (4) Instituto Andaluz de Geofísica y Prevención de Desastres Sísmicos, Cuesta del Observatorio 1. Campus Universitario de Cartuja, 18071-Granada, Spain. (jcbalrou@upo.es).

The Gibraltar Arc, which derived from the Europe-Africa plate convergence coupled with the westward motion of the arc hinterland (Alborán Domain) results in a general oblique convergence regime on both branches (Betic and Rif chains). A structural revision made along the Western Gibraltar Arc (WGA; between 4º and 6º W) have allowed us to establish a complete inventory of structures evidencing strain partitioning, to point out a new detailed kynematic pattern of the region during the Neogene, and to introduce additional constraints on the possible arc-formation modes.

Within the northern part of the WGA our results indicate the strain mainly partitioned into structures that accommodated suborthogonal shortening (fold-and-thrust belts developed on the paleomargin derived units and the Flysch Through Complex) and structures that accommodated arc-parallel stretching. Localized transpressive structures also occur. Structures causing arc-parallel stretching during the Neogene are widely represented along the entire region and can be divided into four types: low-angle normal faults; high-angle normal faults related to small basin formation; conjugate strike-slip faults; and pervasive deformation (extensional veins, brittle-ductile shear zones) within specific units.

Additionally, the analysis of the seismicity will depict the current pattern of strain

partitioning in order to compare it with the Miocene-Pliocene evolution. Preliminary results show displacement is highly partitioned following a complex pattern that reproduce, among others, all the cases listed above.

Slip-direction map covering all the WGA clearly indicate. i) the fan-pattern of displacement related to contractional structures (around 100º when both branches are considered); ii) displacement related to folds and thrusts are suborthogonal to the structural trend; and iii) normal faults together with conjugate strike-slip faults evidence coeval stretching nearly parallel to the structural trend in each point.

On the basis of the mode and distribution of strain partitioning, the opposite sense of palaeomagnetic rotations on both branches of the arc, and the offshore geology of the Western Alboran basin, we suggest the region followed a mode of formation close to a “piedmond glacier” arc type.