

Interactive comment on “Plio-Quaternary tectonic evolution of the southern margin of the Alboran Basin (Western Mediterranean)” by Manfred Lafosse et al.

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This paper deals with the recent tectonic evolution of part of the southern margin of the Alboran Basin (and not the whole southern margin as wrongly stated in the title). Actually, the authors focus on the offshore southernmost part of the Trans-Alboran Shear Zone (TASZ) representing a broad area of deformation which is not as well documented as other areas in the Alboran domain. The interest of the work is to further document this area with new, high-quality seismic data of high to very high resolution and to better assess and/or discuss the reasons for the fast stress changes that occurred since Pliocene. As a whole, this contribution appears stimulating and rather

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convincing and is worth to be published. However, several limitations appear in the way the authors reports previous studies and discuss their interpretations; furthermore, the bad organization of the figures and the poorly written English make the paper quite difficult to read. Actually, I have identified an important weakness: an important point supported by the authors is to suggest that besides the well-assessed processes of indentation in the central Alboran domain and extrusion of the Rif, the major change of tectonic style in the study area is related to a clockwise rotation of the Alboran tectonic domain instead of a change in the Eurasia/Africa plate convergence vector. The reality is that (1) uncertainties on kinematic data (DeMets et al., 2015) prevent from assessing any significant change in the obliquity angle or in slip direction in the study area since the Messinian, although Nubia-Eurasia angular velocities estimated from geodetic and geologic observations appear to differ significantly; (2) the block rotation model proposed by Meghraoui and Pondrelli (2013) is a large-scale model (“restraining bend”) based on the assumption of a right-lateral deforming zone with large fault systems in the offshore domain: in my opinion, the fault geometry, sense of motion and continuity are far from being clearly assessed, preventing from concluding firmly that a block rotation model (either bookshelf or pinned) is responsible for the change in tectonic style. It results from (1) and (2) that the choice made by the authors is quite questionable, in my opinion. Other parameters such as, for instance, changes of body forces during crustal thickening of the South Alboran Ridge or even further south, or transpressive fold propagation (as suggested, lines 403-404), or also effects of propagation of the Al-Idrissi fault on strain distribution, should be included in the discussion on this challenging question. I have other comments below: - The introduction part is full of unclear statements (i.e., lines 79-80, 81-82, 129-130, etc...), so that facts are often confused and mixed with interpretations. I recommend to carefully check the reported assessments in order to clarify between what is established and what is an hypothesis. - The term “inversion” is systematically used throughout the paper, however it appears that not only inversion is actually occurring, but merely reactivation, or tectonic re-organization. I urge the authors to distinguish a true tectonic inversion of

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structures (or of the margin) from other types of tectonic changes (for instance, from a strike-slip to an extensional strain change). I also urge the authors to better highlight the new features and facts they bring compared to previous studies instead of speculating too much on a possible cause of strain re-organization. For instance, the clear change of strain pattern (both in tectonic style but also in strain expression) shown on Figure 9 between Pliocene and Quaternary is an excellent example of strain superimposition at short time scale on a same geological structure and deserves for instance a comparison with the well-expressed NW-SE set of diffuse, secondary faults identified between the Carboneras fault and the north Alboran Ridge further north (Perea et al., *Marine Geology*, 399, 23-33, 2018). - The role of volcanism in the tectonic evolution is only quickly mentioned but not enough discussed: in some way, the big and small Al-Idrissi volcanoes seem to play the role of “nucleation” points and to focus strain: is it what you suggest? How to explain the occurrence of such a volcanic activity during the major compressional phase? How do you imagine to infill the syncline axis during folding (l. 300)? Why do you suspect the same age for volcano-clastic deposits and volcanics north of the Alboran Ridge (l. 302)? In Fig. 15b, you suggest subsidence initiation along the big Al-Idrissi volcano: is it linked to the syncline formation during folding? - I have a problem to clearly identify the left-lateral deflections of the hinge axis of the Pliocene folds (l. 235) in Fig. 10: it is not so obvious from your drawing. The differences between this structural sketch and the ones on Fig. 15a and 15b are large. This is important because this pattern is assumed to support the left-lateral transpression in the SAR. - although the left-lateral transtension along the AIF is well evidenced, the southward propagation of the AIF toward the Nekor fault is claimed by the authors but not documented in their study: the role played by this propagation in the change of strain pattern in the area is not a new feature and has been already described in previous studies. For these reasons, I recommend publication after major revision. A rewriting of the manuscript is also necessary to improve the English and to address the many mistakes left behind (sentences without verbs or with two verbs, incorrect grammar, etc. . . ; confusion between terms: compressive or extensive for compressional

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and extensional, register for recording, channels for drifts, mass transport complex for MTD with a complex internal structure, northern for western in Figure 14 caption, etc). Figures must be logically presented and all line positions must appear on Figure 3. A Table is also needed at the end in order to summarize the time line and main tectonic and volcanic events with respect to the main structures of the area. Figure 15 should clearly display opposite left-lateral double arrows and mention in Figure 15a the Nekor fault and the SAR.

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