

# ***Interactive comment on “The seismogenic fault system of the 2017 $M_w$ 7.3 Iran-Iraq earthquake: constraints from surface and subsurface data, cross-section balancing and restoration” by Stefano Tavani et al.***

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COMMENT The balanced section has a local pin in Miringeh Anticline. As a consequence, you end up with some deformation SW of the Mountain Front Flexure (i.e. 4.3km). I haven't seen the deformation front marked on any of the maps as it is further to the SW than the MFF (cf. Verges et al, 2011 Figure 1). Is there really only 4.3 km deformation SW of the MFF? RESPONSE The 4.3 km of shortening inferred to the SW of the MFF is highly compatible with published sections across the foreland far to the NW (e.g. Obaid and Allen, 2017). This will be mentioned in the revised version.

COMMENT Then, wouldn't it make sense to extend the section for 5 km, have a fixed pin in the undeformed foreland and show that it restores and balances? RESPONSE It would be fine but we have no access to subsurface data to the SE of our pin (Iraq). In addition, only Neogene sediments are exposed there, which is not particularly useful for the construction of deep cross-sections, due to the partial decoupling between Mesozoic and Cenozoic materials.

COMMENT The style how the three inverting faults accommodate shortening seem all different. The style of deformation for the Marakhil and Sheykh Saleh Faults require some coupling with thin skinned decollements to distribute the shortening. The Miringeh Fault inverts straight across these potential decollement zones and then to the SW the suggested fault underneath the MFF links to this decollement at the base of the sediments again. RESPONSE The behaviour of the Miringeh fault is well constrained by the seismic section, showing no propagation of any kind of layer-parallel shearing across it. This probably relates with the fact that this fault is in the early stage of inversion, suggesting that coupling mostly occurs due to the development of the footwall shortcut. This will be mentioned

COMMENT A problem with linked thick-thin-skinned contractional systems is that the upper part of a normal fault might be decapitated by the subhorizontal movements on decollement horizons. Could that happen here, if your pin is in the foreland? RESPONSE The observation that the major anticlines of the area sit on major basement steps (Sheykh Saleh and Marakhil anticlines), points against the activation of an important decollement level in between the Miringeh and Marakhil anticlines.

COMMENT I find it strange that to the hinterland mainly faults invert and toward the foreland one major shortcut fault exist (the one linked to the MFF). Is that plausible? One solution could be that all major normal faults have been inverted already. Towards SW there are no more major normal faults to invert? RESPONSE This is correct, in our interpretation the Miringeh fault is the innermost inherited fault and the MFF is a sort of shortcut of the inherited extensional decollement. This will be made clear.

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COMMENT I agree, that the MFF for the Lorestan arc could well be related to basement involvement. But could you discuss alternatives and why they would not work? For other areas along the Zagros the MFF is not necessarily linked to a basement fault (see Hinsch and Bretis, 2015, Georabia). For the Kirkuk embayment we propose a duplex solution on multiple arguments. As a consequence we argue that the structure of the MFF is heterogeneous along-strike the Zagros. This might well be in-line with the solution presented here, given the interpreted lateral ramp at the border to the Kirkuk Embayment – but maybe it should be discussed? RESPONSE We will mention that the thin-skinned interpretations have been proposed for the MFF. Concerning the discussion about the heterogeneous along-strike significance of the MFF, we think that this is out of the scope of our work.

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