

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.

R. Hinsch

ralph.hinsch@omv.com

Received and published: 1 June 2018

Dear Stefano and co-authors. I read with interest the paper on the suggested up-dip continuation of a thrust fault from the hypocenter of the earthquake to link to the Mountain Front Flexure (MFF). The balanced section visualized nicely the anticipated structural architecture. I have some short remarks:

1) 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

C1

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? 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?

2) 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. 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?

3) 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?

4) 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, Geoarabia). 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?

I hope this comments help when reviewing your manuscript to gain higher consistency
Best regards Ralph Hinsch