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Interactive comment on "Structural expression of a fading rift front, a case study from the Oligo-Miocene Irbid rift of northwest Arabia" *by* Reli Wald et al.

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We are very thankful for this thorough and productive interactive comment of referee #2, P. Krzywiec. This review significantly improved the paper in fine tuning of the evidence. Not only technical issues suchlike vertical exaggeration and fault imaging were dealt with, but also careful examination of our evidence from the rift front (i.e. termination) west of the Dead Sea fault in relation with the main body of the rift east of the Dead Sea fault.

We list below the main subjects attended in this thorough review.

All of the detailed corrections according to the referee's comments are submitted in the attached pdf file. We will follow-up in another reply with a clean revised manuscript for the reader's convenience.

The whole Irbid rift in comparison to its western front: The term "rift front" refers to the rift zone termination sensu Lyakhovsky et al. (2012) and Segev et al (2014), that is the terrain in which the rifting process decays. A nearby example is northern Sinai referring to the Suez rift termination (Steckler and ten Brink, 1986; Segev et al., 2017). An explanation to this term has been added in the abstract "Our results show that a series of basins subsided at the rift front, i.e. rift termination, across the southern Galilee". Figure 1 has been updated, (a) to include a schematic extent of the Irbid rift, (b) to present the full structure of the Irbid rift across both sides of the Dead Sea fault.It should be noted that the study area is located off the Dead Sea transform, a major plate boundary. Plio-Pliocene uplift effected the plate boundary shoulders. A wide damage zone of at least 50 km from each side of the plate boundary has been affected (Wdowinski and Zilberman, 1997). More specifically, the interaction between the Irbid rift and the lateral offset on the Dead Sea fault has been stressed out in the discussion. In the Galilee, basin subsidence sheltered the data at relatively shallow depths of up to 1 km. For depth cross sections of the Irbid rift vicinity see also figure 6 in Segev et al. (2014), a geologic cross-section from SW Jordan to NE Syria across the Azraq-Sirhan graben (modified after Konert et al., 2001 and references therein) and Luening and Kuss (2014) In: Petroleum Systems of the Tethyan Region, AAPG, Editors: Marlow, L, Kendall, C and Yose, L.A.

Faulting characterization: The referee has commented about the lack of clear vertical subsidence of the Cretaceous units (Judea and Mt. Scopus Groups) at the bottom of the seismic sections (Fig. 5 and 8). In the Galilee, most imaged faults began as normal, but later deformation obscures the reflectors near the fault planes and fault branches in addition to lower resolution above 0.5 msec two way time. Actually, the Galilee amalgamates significant geodynamic stages discussed in the paper. Seismic profiles reflect the current structure hence need careful observation. Multi-stage deformation causes slip reversals on fault planes, folding, branching and other phenomena that inhibit clear imaging of the Neogene tectonics. Even so, the vast amount of data, counting in the supplementary files attached to this manuscript provides a sound base supported by intersecting seismic profiles and well data. In addition, isopach maps and structural maps further support normal faulting. The figure captions have been rephrased to further verify the fault types. For example, the Nahalal fault shown in Figure 11, is currently a strike-slip fault with a very distinct flower structure also verified by cross lines and from EQ focal solution. It did begin as a normal fault down-faulting Kefar Baruch basin to the south. Kefar Baruch and Gevat faults are normal but have a strike-slip sense of movement that might explain the folding of Neogene layers adjacent to the fault planes. The graben between these two faults is verified by potential methods (Segev and Rybakov, 2011) and by crossing seismic lines interpreted herein. We focus on the Pliocene-Pleistocene faulting characterization in a future publication.

Irbid rift /Azraq-Sirhan rift/ Qishon-Sirhan rift: All of the names above define the same rifting episode. Azraq-Sirhan has been used in Shaliv (1991) to asses a Neogene internal continental basin. Qishon-Sirhan has been used in Schattner's publications in 2006, to assess the northwest trending rifting from northern Jordan (Azraq-Sirhan) to Haifa Bay, later offset by the Dead Sea fault (Qishon river is the main catchment of the southwestern Galilee area). Here we use the Irbid rift following Segev et al. (2014) and Segev et al. (2017) recent publications, to further establish the Neogene geodynamic evolvement of the study area, at the northwest termination of the Irbid rift (Irbid rift front).

Locations, and local nomenclature: Our study area stretches across a very narrow terrain, immediately to the west of the Dead Sea fault plate boundary. However it plays an important role in the development of the NW oriented Oligo-Miocene rifting. Basin subsidence and more importantly subsurface preservation provide an important architecture, including depocenters and fault arrays that are very relevant to future EQ

assessments. Several focal solution surveys have already been done to model this seismogenic splay off the plate boundary (Hofstetter et al., 1996; Shamir, 2007). The largest EQ of the past decades was that of magnitude 5.4, 1984- with the epicenter in the midst of our basins. This study provides a detailed, high resolution structure never explored before. For this reason, we believe that most of the names, all of which are supported by figures and supplementary files, should stay as is in the manuscript. The names have been classified to basin codes (e.g. B1, B2. . .B11) and uplifted blocks/ highs codes (H1-H4) to avoid extra names. Our main base for the model are small-scale basins and their border faults. That is why we separate the presentation of them in the Results chapter. Separation and hierarchy (e.g. major vs secondary faults) allows relatively short chapters that provide the most important issues in regard with basin subsidence. We put effort in providing short and clear opening sentences at the beginning of each paragraph. That way, readers from abroad could interact with the data if they do not want to dive into minor details. Our presentation of subjects is logic (e.g. geographically oriented, from the big picture to the small details).

Vertical exaggeration (referring to figures 5, 8, 11 in the manuscript): A common issue found in published papers presenting seismic reflection data. Most of the times exporting the profiles from the professional interpretation software already creates a hidden exaggeration not accounted for. An interesting publication regarding this phenomena states that approximately 75% of the seismic data published involves at least x5 vertical exaggeration! (Stewart, 2011). We followed the referee's advice to stretch the seismic section (x1.5 horizontal stretch, x0.8 vertical squeeze). We believe that the new dimensions allow better presentation of the data. Stewart, S.A.: Vertical exaggeration of reflection seismic data in geoscience publications. Marine and Petroleum Geology, 28, 959-965, doi:10.1016/j.marpetgeo.2010.10.003, 2011.

Supplementary material: This study relies on vast geological and geophysical information, part of which is included in the Supplementary folder to support our results and discussions. Our supplementary files (including the Google Earth file) are very significant for the understanding of the area. Part of our responds to the referee's comments are found in these datasets.

Please also note the supplement to this comment:
https://www.solid-earth-discuss.net/se-2018-91/se-2018-91-AC2-supplement.pdf

Interactive comment on Solid Earth Discuss., https://doi.org/10.5194/se-2018-91, 2018.

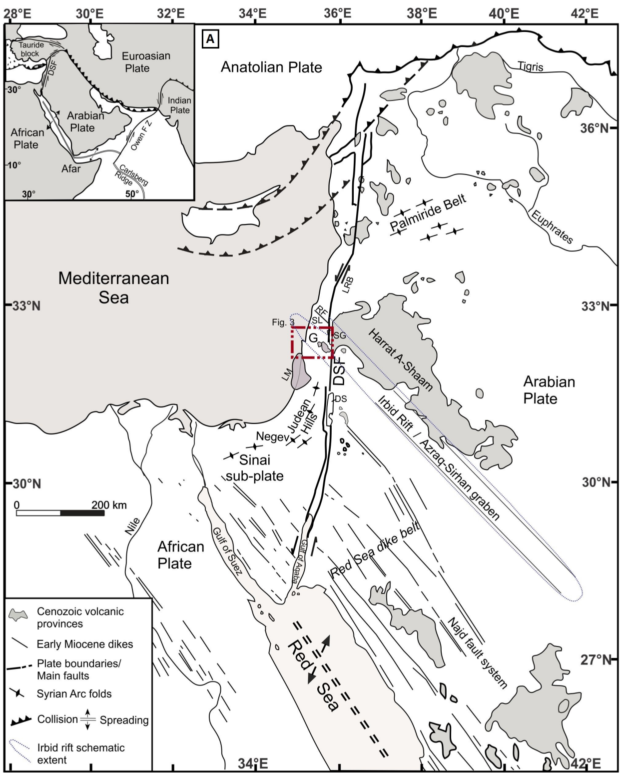

Fig. 1. Figure 1A- minor additions

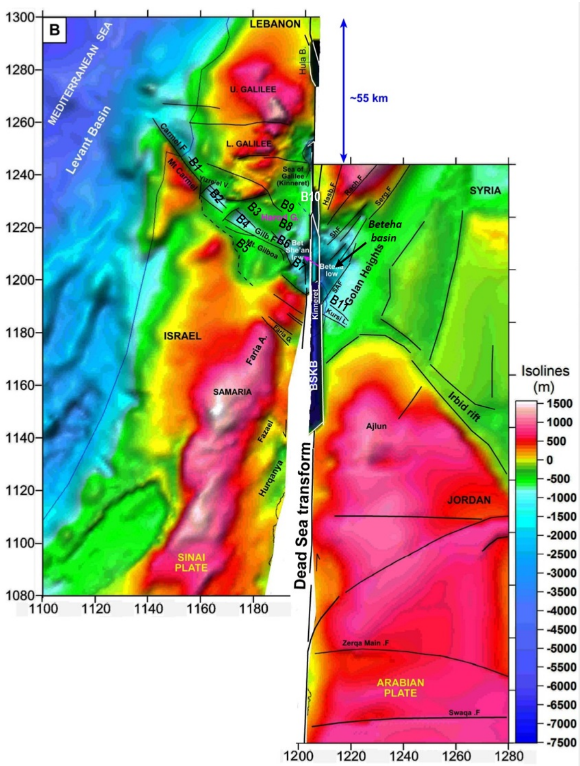

Fig. 2. Figure 1B new, modified after Segev et al., 2014

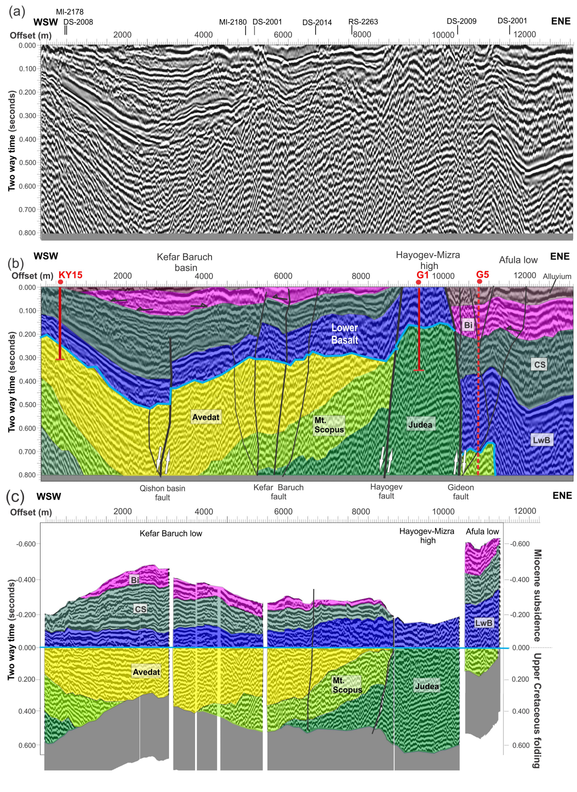

Fig. 3. Figure 5- corrected

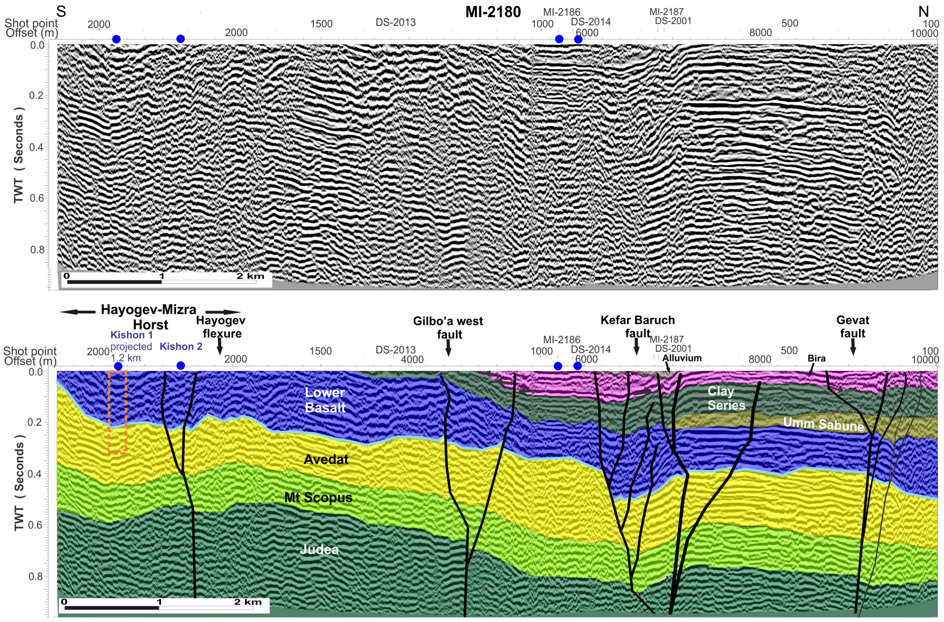

Fig. 4. Figure 8- corrected

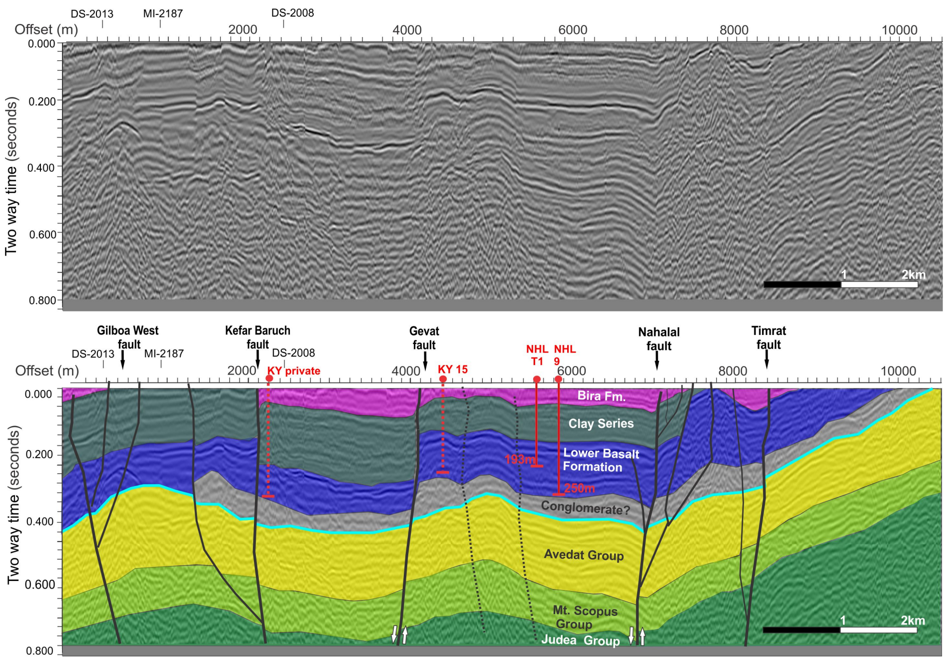

Fig. 5. Figure 11- corrected