

# Reply to anonymous reviewer

Dear Sir, Madam,

thank you very much for your input on the manuscript, it is highly appreciated. Here is our reply to your comments. We hope the changes we implemented improve the shortcomings of the manuscript highlighted by your comments and suggestions. Please do not hesitate to contact us shall this not be the case for some comments.

## 1. Comments from anonymous reviewer

### Comment 1: General Comments

This is my second review of the paper by Koehl et al. In general, it is readily apparent that the authors took ample time to take the reviewers' comments into consideration and to make adjustments as seen fit. This updated draft reads much better, and helps the reader to understand the importance of the work. I especially like the detailed Discussion section, notably the regional comparisons. Some changes are pretty sizable: e.g., the names of faults, and hence their structural significance, have changed between versions (what was termed the Banning fault is now recognized as the main SAFZ, it seems). I assume these changes reflect issues brought up by the other reviewer, and trust the new interpretations are sound.

Comment 2: There are a couple instances where the authors talk of a convergent plate boundary along the San Andreas fault. I think this is an error, and they may be referring to local contraction along the transform plate boundary?

Comment 3: The authors took care to address my biggest concerns. This includes making an updated Figure 1 (which looks great, by the way), and to add coordinates to the GoogleEarth image on Figure 2. However, the authors refrained from adding coordinates to all maps/images in Figs. 3, 5, and 6.

Comment 4: I don't feel strongly that Figs. 3, 5, and 6 all need coordinates, since they are shown clearly on Fig. 2, but if it were my paper I would certainly add coordinates, north arrows, scales, etc., to all map figures. However, this is not an issue that warrants rejecting the manuscript, and I think it is okay to leave Figs. 3, 5, and 6 without coordinates if the authors choose to.

Comment 5: One major issue I brought up was partly addressed, but still appears. I still worry about how features are mapped on Figure 2, and then subsequently represented on Figs. 3, 5, and 6. One major issue I had with the original figures was that geologic features (faults, fold axes, etc.) appeared short and discontinuous on Figs. 3, 5, and 6, whereas on Figure 2 it was apparent these features were continuous. Some instances of this mistake still persists. I feel strongly that the geology should be represented accurately, and if strike/trend lengths are continuous across and past the bounds of the figure area, then those features strike/trend lengths should go all the way to the ends of the image, not be cut short to fit within the bounds of the figure. In geologic mapping, we do not stop mapping features because they get close to the end of the map, we keep the lines going to hit the edges of the map if that is what the geology is on the ground. I suggest the authors take a careful look at all interpreted images and make sure that geologic features are mapped correctly.

Comment 6: Specific Comments –

Line 14 – “...southern California (USA),...”

Comment 7: Line 28 – “...southeast along strike...” (add “along strike”)

Comment 8: Line 29 – I feel that a closing sentence is warranted to pull the reader back into why this work is important. E.g., “Our work allows for better understanding of along-strike complexity and fault zone structure of a major transform plate boundary fault.”

Comment 9: Lines 40-42 – This parentheses section may be better suited in the Geologic Setting section?

Comment 10: Lines 47-48 – As noted in my original revisions, I believe shear zone should be decapitalized in Eastern California shear zone. Most recent work do not capitalize it. However, if you choose to use it make sure you are consistent.

Comment 11: Lines 52-54 – This is a great addition to the paper; brings the reader back to why this work is important at a broader scale.

Comment 12: Line 83 – Be consistent. Eastern California shear zone; eastern California shear zone (either way, I think shear zone should be decapitalized).

Comment 13: Line 85 – is axis an appropriate word here? Could it be omitted and just use trending?

Comment 14: Lines 97-101 – This sentence is pretty dense. Could break it up into two.

Comment 15: Lines 143-145 – Should there be a reference at the end of this sentence, or is this your observation?

Comment 16: Lines 154-157 – Could probably merge this single-sentence paragraph with the previous paragraph.

Comment 17: Line 249 – suggest decapitalizing “fault” in all named faults

Comment 18: Lines 249 and 258 – This is a problem from the original manuscript that persists into the present manuscript. Is it “East Shoreline fault” or “Eastern Shoreline fault”? Either way, fault should not be capitalized (as it is in Line 249), and you need to check the entire manuscript so that all names are the same (East or Eastern).

Comment 19: Line 279 – omit dash

Comment 20: Line 331 – suggest changing to “(see subsequent Southeastern macro-fold section)”

Comment 21: Line 387 – omit period at beginning of sentence

Comment 22: Line 759, and throughout manuscript – In some places you dash Landers-Mojave, in other areas of the text you do not (e.g., Landers Mojave Line). I assume dashed is correct. Be consistent throughout manuscript.

Comment 23: Line 849, 864, 872, 873, 879 – Eastern Shoreline fault or East Shoreline fault (I think Eastern, but there are two instances in the manuscript where you say East Shoreline fault at Lines 103 and 249).

Comment 24: Technical Corrections –

Line 181 – The abstract says about 0.76 Ma, but here you say before 0.76 Ma.

Comment 25: Line 228 – steep (shallow) ?

Comment 26: Line 231 – Why not just say reverse fault instead of reverse and thrust fault? Do you have constraints on it being a thrust (i.e., <30 degree dipping plane) fault? In my mind, it should be one or the other, if you’re going to be explicit about stating fault type, but you cannot go wrong by simply stating reverse fault.

Comment 27: Line 263 – I do not think you can quantify the resolution of stitched and processed Google Earth imagery? As such, it is probably best to omit “high-resolution”

Comment 28: Line 268 – You do not present any restorations in your work. Perhaps “...notably to correlate bed displacements...” is a better wording?

Comment 29: Line 378 (and 263, 402) – Is a Google Earth image a DEM (digital elevation model) image, technically? Should “Google Earth” replace “DEM” here?

Comment 30: Line 393 – What do you mean by large-scale? Large-scale compared to what? Perhaps just say meso-scale, or macro-scale, or outcrop-scale...whatever scale you mean.

Comment 31: Line 531 – shortening strain. Shortening is the strain term, so you do not need to say strain here.

Comment 32: Lines 558-560 – It is unclear as written how the timing on the San Andreas fault-related structure is comparable to structure in Svalbard. Make more clear what you are comparing here.

Comment 33: Lines 625-626 – convergent plate boundary in the late Pleistocene? It is a full-blown transform plate boundary by then.

Comment 34: Line 734 – Again with convergent plate boundary – I don't think you mean plate boundary?

Comment 35: Line 901 – Do you actually mean convergent plate boundary (I don't think so, because it is a transform plate boundary fault system you are examining).

Comment 36: Reply to Comment 78 in review reply: Yes, a fault is a fracture that shows displacement, so you are correct in your reply, technically. However, you cannot expect a reader to know what you mean. Furthermore, technically faults are fractures, yes, but fractures are not faults and the presence/absence of both or one or the other can have different implications. Therefore, you need to be explicit for readers.

Comment 37: Detailed comments on figures and figure captions –

Figure 1

Figure 1b, in the legend the Landers-Mojave Line does not have a dash, but elsewhere in the manuscript it does. Be consistent, whichever way you choose (I think dashed is probably correct).

Comment 38: Line 1230–1231 – Eastern California shear zone (says “East”)

Comment 39: Figure 2

For the Bishop Ash, you could also add the age on the figure (e.g., “Bishop Ash X.XX Ma”)

Comment 40: Line 1246 – Probably better to say Google Earth image instead of “DEM”

Comment 41: Figures 3, 5, 6

I appreciate that coordinates were added to Figure 2. I still think adding coordinates to all maps would be good, but I will leave that up to the authors.

Comment 42: In some areas I can see that feature lines with continuous strike/trend lengths were extended to the edges of maps. However, Fig 3a and 3b is a perfect example where the mapping is not consistently/appropriately portrayed. In 3a, you show the southernmost anticlinal feature continuing for ~900 m west-east from the N-S striking fault, but in Fig 3b – which includes the

southernmost portion of 3a – that same anticlinal feature ends before the western edge of the figure. I know these are the same anticline, because in 3a and 3b, you can see the north limb's 20 degree NNW dip, and on the south limb you can see the overturned 80 degree NNE dip. As shown, some of these maps give the impression that the geologic features are shorter than they actually are on the ground. A geologic map depicts reality as best it can be interpreted, whereas these maps do not depict reality, and/or are inconsistent with each other, especially when compared with each other and overall to Figure 2.

Comment 43: I am also concerned after close inspection to see that the location of strikes and dips vary slightly in crossover sections of Figs. 3a–c. It is very apparent these orientation measurements are generally located and not properly georeferenced to an exact point on the ground. For example, the overturned 80 degree NNE dip on the southern limb of the anticline in Figs 3a (southern part of map) and 3b (northern part of map) is in slightly different locations. Sure, the overall orientation of beds is probably represented well by that orientation symbol, but it gives me suspicion how accurately located all other orientations are.

## **2. Author's reply**

Comment 1: agreed.

Comment 2: agreed.

Comment 3: agreed.

Comment 4: coordinates are not absolutely necessary in these figures.

Comment 5: agreed.

Comment 6: agreed.

Comment 7: agreed.

Comment 8: agreed.

Comment 9: agreed.

Comment 10: agreed.

Comment 11: agreed.

Comment 12: agreed.

Comment 13: agreed.

Comment 14: agreed.

Comment 15: this is our observation.

Comment 16: agreed.

Comment 17: agreed.

Comment 18: agreed.

Comment 19: agreed.

Comment 20: agreed.

Comment 21: agreed.

Comment 22: agreed.

Comment 23: agreed. See also response to comment 18.

Comment 24: the abstract refers to the Indio Hills area, whereas the sentence line 185 refers to the Mecca Hills.

Comment 25: agreed, the sentence is not clear enough.

Comment 26: agreed.

Comment 27: agreed.

Comment 28: agreed.

Comment 29: agreed.

Comment 30: agreed.

Comment 31: agreed.

Comment 32: agreed. This phrase is unnecessary.

Comment 33: agreed. See also response to comment 2.

Comment 34: agreed. See also response to comment 2.

Comment 35: agreed. See also response to comment 2.

Comment 36: agreed.

Comment 37: agreed. See also response to comment 22.

Comment 38: agreed. See also response to comment 10.

Comment 39: we do not feel that it is necessary to overcrowd the figure with extra information that can be found in several places in the text.

Comment 40: agreed. See also response to comment 29.

Comment 41: see response to comment 4.

Comment 42: agreed. See response to comment 5.

Comment 43: agreed, the strike and dip symbols are not georeferenced. However, the location and geometries fold and fault structures are so well expressed on Google Earth images that

georeferencing is not necessary to plot structural measurements. In addition, slight mismatches of the location of these measurements on macro-scale folds do not impact the structure geometries at all on the presented figures.

### **3. Changes implemented**

Comment 1: none commanded by the reviewer's comment.

Comment 2: replaced "convergent" by "transform" lines 625–626, 734, and 901.

Comment 3: none commanded by the reviewer's comment.

Comment 4: none.

Comment 5: adjusted extent of structures according to the reviewer's suggestion in figures 2, 3, 5, and 6.

Comment 6: added "(USA)" line 14.

Comment 7: added "along strike" line 28.

Comment 8: added "The present work contributes to better understand the structure and tectonic history of a major fault system along a transform plate boundary." lines 29–31.

Comment 9: moved sentence in parenthesis from lines 42–44 to lines 83–85.

Comment 10: adjust all occurrences to "Eastern California shear zone" lines 49–50, 87, 202, and 1234–1235.

Comment 11: none commanded by the reviewer's comment.

Comment 12: see response to comment 10.

Comment 13: replaced "along a NNW–SSE-trending axis" by "in a NNW–SSE-trend" lines 89–90.

Comment 14: split the sentence into two line 102.

Comment 15: none.

Comment 16: merged single-sentenced paragraph lines 158–161 to previous paragraph.

Comment 17: decapitalized "Fault" lines 253, 414, 687, 758, and 1318 and "Fault Zone" line 35.

Comment 18: adjust "Eastern Shoreline fault" to "East Shoreline fault" lines 262, 853, 868, 876, 877, 883, 1235, and 1328.

Comment 19: remove the strikethrough font line 283.

Comment 20: changed phrase between brackets into "see Southeastern macro-fold section" lines 335–336.

Comment 21: deleted period and space at the beginning of the sentence line 391.

Comment 22: added en-dash lines 87, 88, 686, and 1237.

Comment 23: Janecke et al. (2018) use “East Shoreline fault”, so adjusted the name accordingly.

Comment 24: none.

Comment 25: added “portion of the” and deleted parenthesis lines 232–233.

Comment 26: deleted “and thrust” line 235.

Comment 27: deleted “high-resolution” line 268.

Comment 28: replaced “notably for restoring bed offsets” by “notably to correlate bed displacement” lines 273–274.

Comment 29: deleted “DEM” line 268, replaced “DEM” by “Google Earth images” lines 384, and 408, and replaced “DEM” by “Satellite and aerial” lines 935–936 and 1252.

Comment 30: replaced “Large” by “Macro” line 399.

Comment 31: deleted “strain” line 537.

Comment 32: deleted “, i.e., comparable to other settings (e.g., western Svalbard; Bergh et al., 1997; Braathen et al, 1999)” lines 565–566 and Bergh et al. (1997) and Braathen et al. (1999) from the reference list.

Comment 33: see response to comment 2.

Comment 34: see response to comment 2.

Comment 35: see response to comment 2.

Comment 36: added “Note that faults are also included as fractures in the stereonets.” lines 1257–1258.

Comment 37: see also response to comment 22.

Comment 38: see also response to comment 10.

Comment 39: none.

Comment 40: see also response to comment 29.

Comment 41: see response to comment 4.

Comment 42: see response to comment 5.

Comment 43: none.