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Interactive comment on "Structural and rheological evolution of the Laramide subduction channel in southern California" *by* Haoran Xia and John P. Platt

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In the manuscript "Structural and rheological evolution of the Laramide subduction channel in southern California" Haoran Xia and John P. Platt investigate rock samples of the Pelona schist in the San Gabriel Mountains. The authors combine different methods like thermobarometric analyses, zircon fission track dating and microstructural investigations to relate different deformational events with PT-conditions, age and deformation mechanisms. The results are used to determine the strain rates during the exhumation of this high pressure unit and to establish an exhumational model.

The MS is well written and the results of different investigational methods provide an interesting base for the discussion, which is detailed and wide ranging. The content of

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Discussion paper

this MS is novel and will be of great interest for the reader of Solid Earth Discussions. Nevertheless the MS would contribute from minor revision. There was some mixing of results and discussion, which at some point made it seem like results from previous investigations were part of this work. Furthermore some of the conclusions drawn from the results were unclear and should be further elaborated and possibly supported by an additional figure.

I have the following suggestions to improve the MS:

p. 4, l. 23: Which other thermobarometer?

p. 6, l. 3: Why start with 3d and not 3a? (same with fig. 4)

p. 7, l. 16: “deeper than Iron Fork” is not a very precise location. This is the first time I thought the map would strongly benefit from points with the sample names at their locations. I know the locations are given with coordinates in table S1, but I think the average reader will not have the time to check where in the map the samples are from. Especially in the discussion of the shear senses it is difficult to follow, which location you are talking about. The same happens again later when you write about the PT conditions. So I would recommend putting the sample names at their locations in the map and the sample names in the text for better understanding.

p. 8, l. 25: Are you suggesting shear sense reversal due to annealing?

p.9, l. 20: “with the old muscovite grain compositions reported by Jacobson” I suggest: “with the muscovite grain compositions previously reported by Jacobson”

p. 10, l. 4-14: This whole section should either be part of the geological overview or the discussion. You make quotations, here, but later discuss this data as if it was part of your results.

p. 11, l. 14-23: Here would be the place to quote the previous studies.

p.12, l. 24-31 + p. 13, l. 1-6: I have worked on subduction channels myself and I had

difficulties reconstructing what you are writing based on your data.

Originally the subduction zone was dipping E, resulting in a top-E sense of shear in structurally higher levels (e.g. the top part of the exhumational path of the subduction channel in its original position), which would geographically be located in the E. Top-W sense of shear would be found in structurally lower levels (e.g. bottom top part of the exhumational path), which would geographically be located in the W. From the profile in fig. 1, I assume that the subduction channel was overturned at some point since everything is dipping SSW. If the exhumed subduction channel is overturned, there would be a top-E sense of shear in structurally higher levels now located geographically in the W and top-W sense of shear in lower levels, now geographically located in the E. Everything fits, but it is difficult to follow without an illustration (maybe a further step in your fig. 11) and without the sample locations in your map.

Fig. 2: This map would benefit from contour lines to be able to follow the structures better.

Fig. 11: Here a more detailed caption would be helpful and I would also include the last step explaining the current position of the schists.

Table S4: Not knowing this method too well it is difficult to retrace where your results come from with the data shown in the table. There should either be a detailed caption or a better explanation in the methodical part of the MS.

Best wishes, Ruth Keppler

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